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Development of an Australian classification and costing system for palliative care, rehabilitation and aged care services

K M. Eagar

University of Wollongong, kathy_eagar@uow.edu.au

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Application for Admission to Doctor of Philosophy by Publication

K. M. Eagar

Development of an Australian classification and costing system for palliative care, rehabilitation and aged care services

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An Australian classification and costing system for palliative care, rehabilitation and aged care services

Introduction

This introductory chapter synthesises an integrated program of research conducted over six years. It begins by placing the research into context through a discussion of the relevant literature and an analysis of the strengths and weaknesses of the studies conducted to date. This includes the identification of a set of design principles that guide casemix development. It moves on to summarise the study methodology by identifying the hypotheses to be tested and by describing the study design. The results of the study are discussed in relation to the hypotheses tested. The findings of the study are then integrated in a discussion of the results. The limitations of the study methodology are highlighted and issues requiring further research are identified. The concluding sections of this chapter summarise the research and its outcomes and acknowledge the assistance of other researchers who contributed to various aspects of the research. The final section of this chapter is a list of publications that are submitted in support of this application.

In addition to this introductory chapter, ten original publications are included for assessment for the degree of Doctor of Philosophy by publication. The ten publications document an integrated program of research undertaken between 1992 and 1998, the purpose of which was to develop an Australian classification and costing system for palliative care, rehabilitation and aged care.

The research program represented by the publications submitted for assessment culminated in the development of the Australian-National Sub-Acute and Non-Acute Patient (AN-SNAP) classification. The research was undertaken in three phases. Phase 1 occurred in 1992 and involved the development of the initial conceptual framework, centred around the introduction of the concept of a ‘sub-acute’ patient. Phase 2 was undertaken in 1994 and 1995 and consisted of a research study in New South Wales to identify those patient variables that drive the cost of sub-acute and non-acute care. Phase 3, the national sub-acute and non-acute patient classification study, built on the work undertaken in Phase 2 and was undertaken in 1996 and 1997. It resulted in the development of the Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) classification.

The ten publications submitted for assessment are:

**Phase 1  Development of the initial conceptual framework**


Sub-acute casemix has been evolving for 15 years. The United States Health Care Financing Administration resolved in 1983 that payments for hospital care would be on a prospective payment system, based on acute-care diagnosis-related groups (DRGs). Rehabilitation, psychiatric, children's and long-term facilities were specifically excluded. It was recognised that these forms of care, although not acute, were still complex and expensive and often required long hospital stays.

In 1987, a US Department of Health and Social Services report reiterated that their current DRG system did not adequately take into account the special circumstances of patients requiring long hospital stays. Studies in the United States over the following few years not only confirmed that DRGs did not adequately describe costs in one of these areas of care (rehabilitation medicine), but that as a consequence quality of care had deteriorated, as measured by changed length of hospital stay, increased readmission rates and a rising number
of nursing home admissions\textsuperscript{3,4,5}.

The conclusion that the DRG system was not appropriate for some types of patients foreshadowed what has subsequently been recognised as a distinction between diagnosis-related care (acute), function-related care (sub-acute) and supportive care (non-acute, including nursing home type patients (NHTP). Diagnosis-related care, which is appropriately classified by diagnosis-based classifications such as DRGs, occurs when the patients' principal diagnosis (modified for factors such as procedures, complications and age) is a good predictor of the cost and the outcome of the episode.

The term sub-acute care was coined for use in Australia in 1992\textsuperscript{6} to describe "care which is provided for a person who requires health services but whose principal medical diagnosis (modified for factors such as age and procedures) is not adequate in explaining the need for, or the cost of, the services that s/he receives". In sub-acute (function-related) care the predominant goal is enhancement of a patient's quality of life and/or improvement in his or her functional status. In non-acute care the predominant goal is maintenance of a patient's current health and functional status. Because of this difference in goals, it is expected that factors other than diagnosis are more likely to explain the costs of these forms of care. All rehabilitation, all palliative care, some mental health and some aged care (Geriatric Evaluation and Management) are included in the definition of sub-acute care.

Sub-acute care immediately changes the acute care setting goal of curing a specific organ or body system pathology to the enhancement of the individual's function\textsuperscript{7} or, in the case of psychiatry and palliation, the enhancement of quality of life. Outcome measurements change from reducing the abnormality of vital signs or pathology to focus on activities of daily living (ADL) and successful rehabilitation.

Non-acute care includes patient episodes that provide nursing home and/or maintenance type care (respite and convalescence). It includes patients that require care pending transfer to another type of setting. These clients do not require acute care services but may require a higher level of care than is available in traditional skilled nursing facilities or at home. Once again, level of dependence for day to day living is more predictive of resource requirements than diagnosis.

Nevertheless, in the absence of more appropriate classifications, various acute classification models have been used in Australia and elsewhere for the classification of sub-acute and non-acute care. These approaches typically include rehabilitation as one class and mental health as several classes that are defined simply by the patient's principal diagnosis. No special provision is made for aged care or palliative care. This is the approach in the Australian DRG system and the UK DRG system (Healthcare Resource Groups).

The use of diagnosis-related classification systems for purposes for which they were not intended has had several consequences, one of which has been to increase the impetus for the development of more appropriate classifications. Reid\textsuperscript{8} identified four important criteria in establishing a useful classification system: the presence of a manageable number of classes; a clinically meaningful tool; similar patient episodes in terms of resource use within the same class and routinely obtainable patient characteristics available from routine hospital abstracts. These criteria are used in the following discussion to assess the appropriateness of the existing tools.
Most of the early research to develop more appropriate systems was undertaken in the United States. Like subsequent work in Australia, most research has focussed on either rehabilitation and aged care; palliative care or mental health. Very little research has attempted to transverse the full spectrum of non-diagnosis related care.

Nevertheless, the development of appropriate systems in Australia was given a major impetus in November 1993 when the Australian Health Ministers Advisory Council endorsed a five year strategic plan for the National Casemix Development Program. This plan established three priority areas - classification, costing and payments - and identified a series of required strategies including:

- determination of classification systems for rehabilitation, geriatric medicine, palliative care and psychiatric episodes;
- the development of associated cost weights; and
- the encouragement of clinicians, managers and industrial groups to link casemix accounting, information collection and budgeting to clinical management practices.

However, it was not until 1995 that the Commonwealth convened the National Sub-Acute and Non-Acute Casemix Committee whose role was to achieve national agreement on the development of a classification for sub-acute and non-acute care. In the interim period small scale studies proceeded in several Australian States but the major development work took place in the USA.

**Rehabilitation and Aged Care - international developments**

Several early classification systems for sub-acute and non-acute episodes of care were developed in the US, including Resource Utilisation Groups (RUG) and the California Long Term Care System. The RUG model was developed for skilled nursing facility (nursing home) patients and grouped them into one of seven hierarchies on the basis of patient conditions and services required. The first of these hierarchies is 'rehabilitation' and this group is further split on the amount of therapy required. Several versions of the RUG classification have been developed, the most recent being RUG 3.

In a study that used the RUG 3 Activities of Daily Living (ADL) Index as the functional assessment tool, Batavia and De Jong found that allied health costs were better explained by the RUG ADL then nursing costs (24% of nursing costs were said to be explained). Using a statistical package called Knowledge Seeker they developed a new hierarchical structure using the same predictor variables as RUG 3 which explained variances of 24% for nurses, 23% for doctors and 33% for allied health workers.

One common denominator with existing sub-acute casemix classification systems is that functional status at admission is seen to be more predictive of resource consumption than diagnosis. In a study that looked at predicting charges for Medical Rehabilitation, the combination of DRG, Severity of Illness Index (SII) and age accounted for the highest prediction of resource use.

Patients were classified into FRGs (Functional Related Groups) following their development in 1993 by Harada et al. Functional Related Groups (FRG) are a per episode classification that initially uses functional impairment groups to split the episodes into rehabilitation diagnostic categories. It then uses the motor sub-
score of the Functional Independence Measure\textsuperscript{16} (FIM) to further split the categories. Some use is made of the patient's age in the lower motor categories.

Oczkowski and Barreca\textsuperscript{17} found that DRGs explain 7\% of variance in length of stay (LOS) in rehabilitation, whereas, in acute care it explains 15\% LOS variance. The addition of FRGs increased the variance explained to 18\%. The two methods of classification within their settings are comparable. LOS was used as the dependant variable for resource utilisation due to the fact that the correlation coefficient between LOS and cost ranged from 0.83 to 0.93. Their study also found that impairment alone is not sufficient as a predictor of resource use. The inclusion of age, bladder and bowel control contributed to a more accurate prediction. Another interesting finding was that delay in admission to the rehabilitation unit was not found to influence the discharge destination.

Granger et al\textsuperscript{18} assessed the predictive power of the FIM in terms of help in minutes required by people with Multiple Sclerosis. They reported that a combination of two FIM items (transferring from tub/shower and walking/wheelchair locomotion) as well as an assessment of visual limitations was a strong prediction model. The removal of cases with visual disturbances from analysis indicated that six FIM items (transferring bed/chair, memory, walking/wheelchair locomotion, dressing lower body, bladder management and eating) were significant predictors of help in minutes when they explained most of the variance ($R^2=0.9982$, $p<.00000$).

The FRG system was refined by Stineman et al in 1994 with the development of Functional Independence Measure Functional Related Groups (FIM-FRG) version 1\textsuperscript{19}. The FIM-FRG classification represents a significant milestone in the development of an episode-based rehabilitation classification. The system contains 53 refined FRGs and explains 31\% of the variance in length of stay. The researchers report that it is stable when tested on a validation sample.

The FIM-FRG uses four predictor variables: functional impairment category (FIC), admission scores for the motor and cognitive status subscales of the Functional Impairment Measure\textsuperscript{20} (FIM) at admission and patient age. Other FIM-FRG models were developed by Stineman et al, also in 1994, using different subscales of the FIM score. A second version of this model was developed in 1997\textsuperscript{21}. It includes two new impairment categories as well as separate groups for patients admitted for evaluation only.

Other refinements of the FIM-FRG classification include forming groups based on motor FIM at discharge as well as grouping according to functional gain. The latter of these two models was developed with a view to serve as a payment model as well as a classification system. Patients were excluded from the study using the same rules as those applied during the development of the FIM-FRG. The result was a system of 74 classes based on diagnosis, motor and cognitive FIM scores at admission and age which explained 21\% of the variation in functional gain in a validation data set\textsuperscript{22}.

The Discharge Motor FIM-Function Related Groups (DMF-FRGs) form a system of 139 patient groups split according to impairment, motor and cognitive FIM at admission and age\textsuperscript{23}. The classification explains 63\% of the variation in motor FIM discharge scores. It is proposed that clinicians could use the model to assess outcomes and quality improvement and that the model could be considered in the design of an outcome-based payment system for medical rehabilitation.
The FIM-FRG classification was reviewed by the RAND corporation in 1997 using a combination of qualitative and quantitative methods in a study designed to assess their suitability as the basis of a prospective payment system. The review reported that FIM-FRGs are robust, effective predictors of resource use and are stable over time. The review recommended two significant changes. The first is that there be no more than 5 classes per Rehabilitation Impairment Class (RIC). The second is the use of a RIC-specific multiplier to address their finding that cases with interrupted stays and with comorbidities or complications cost substantially more than other cases in the same FRG. The result was a classification with 82 final classes and a reported RIV of 34%.

A study conducted in the US for the Health Care Financing Administration (HCFA) aimed to develop a prospective payment system for rehabilitation units (currently per episode funded) and skilled nursing facilities (currently per diem funded). RUG-3 and FIM-FRG were compared for hip fracture and stroke patients in rehabilitation facilities (RFs) and skilled nursing facilities (SNFs). In the rehabilitation units, FIM-FRG was found to be useful in predicting length of stay and resource use, whereas RUG-III was not. In addition, a modified FIM-FRG was used. Classes related to mobility impairment from arthritis or other joint damage were added to the hip fracture groups. In the stroke classes, the initial split into three motor FIM groups was followed by a split of the lowest motor function group using the Mini Mental State Examination followed by the presence or absence of depressive behaviour. These splits replaced an age and a further FIM motor split. The result was a further improvement in the predictability of the length of stay and resource use in rehabilitation facilities, but no improvement in the skilled nursing facilities.

One set of classes developed specifically for SNF patients has been found useful in predicting episodic nursing and therapy resource use in RFs as well. Groups were created using splits on measures of medical morbidity, functional ability, sensory/communication impairment and cognitive impairment.

FRGs satisfy most of the requirements for an Australian classification system except for the availability of the patient characteristics from routine hospital data. The FIM is collected in some units in Australia but is not a national standard. The FIM-FRG classification is the first casemix classification for rehabilitation which classifies a whole inpatient episode and which produces a satisfactory statistical result. On this basis, it is considered as a leading contender for a rehabilitation classification for Australia.

Even if the FIM-FRG system itself proves unsuitable, it is likely that the variables emerging from the various US studies will also be of relevance in Australia. These variables include patient characteristics such as functional status on admission, age, disease site, time from referral to beginning of program, comorbidities such as cognitive function and depression, and availability of resources. The one factor which appears to predict cost most accurately in these areas of care is a patient’s functional status on admission.
Rehabilitation and Aged Care - Australian developments

The Resident Classification Index\textsuperscript{30} was the first classification system developed in Australia. It was designed for use in nursing homes to classify and fund non-acute episodes of care. It included a measure of activities of daily living (ADL) and added other measures such as continence, specialised nursing procedures, mental state, behavioural problems, communication and sensory problems. Eagar and Hindle\textsuperscript{31} note that the RCI has a manageable number of classes (5 classes) but lacks clinical meaning.

The 1992 Non-Acute Inpatient Study (known as the NAIP) developed a classification system based on data collected from rehabilitation and slow stream medical wards. A per diem classification with 19 major functional categories was developed. Major classes are split using the RUG-ADL score. The study\textsuperscript{32} found that the RUG 3-ADL score alone explained 44\% of variance. This was not acceptable to clinicians as it lacked clinical meaning. The addition of the major functional categories negated this problem. However, the variance explained dropped to 26\%. It was noted that the RUG 3 ADL does not include cognition. Consequently, the Folstein Mini-Mental State\textsuperscript{33} was also collected.

Roberts\textsuperscript{34} concluded that LOS is not easily predictable, and that a daily classification may be necessary. This places a burden on staff if a daily functional assessment needs to be performed. Any such functional assessment would need to be sufficiently quick and easy to use to enable it to be collected routinely. There is some concern that it would leave the system open to gaming and that a system of audit would be required.

The NAIP satisfies most of the necessary criteria for a casemix classification system. However, not all of the necessary patient characteristics are routinely collected by hospitals. In fact, a major problem exists within Australia as there is still no consensus on a standard ADL assessment to be used nationally.

A Victorian rehabilitation study\textsuperscript{35,36} has reported results for the first and second phases of its project to develop a Victorian rehabilitation classification. Stage 1 involved a pilot study and an analysis of data collected from five inpatient units. The preferred model after preliminary analysis was a classification system based on sixteen major clinical groups (similar to the Functional Impairment Categories used in the USA). Change in functional status between admission and discharge (as measured by the Barthel Index) was predictive of variance in length of stay.

Stage 2 involved data collection in 8 rehabilitation units over 4 months and analysis of 715 episodes. Three classification trees were proposed with the best statistical result being a classification with 17 classes and a reported variance reduction of 17\%. Splits are based on impairment type and functional score at admission. The stroke branch has 4 classes and has splits based on both functional score and change in functional score.

A major limitation of all Australian studies into casemix classification of sub-acute patients is that all have been limited in their sample size and client composition. In addition to those discussed above, small scale studies have included two studies into sub-acute casemix in the Illawarra\textsuperscript{37,38} and a study undertaken at Royal Rehabilitation Centre Sydney\textsuperscript{39} to investigate the use of FRG's to classify rehabilitation patients. However, despite its small sample, this latter study concluded that, after further work is pursued, case based payments are a possibility.
Palliative Care - international developments

Preliminary development work and debate has commenced in both the US and Italy, but no classifications have been developed thus far. Toscani (1996) argued in the Italian context that the special circumstances surrounding a terminally ill patient require that a classification system for case-mix and staging take quality of life as its main endpoint. Variables relating to functional status, physical symptoms, psychocognitive problems, and financial status were isolated in order to identify a limited number of groups of patients who differ in terms of quality of life and/or survival throughout the entire period of treatment in a palliative care unit (PCU). The study was still in progress at the time it was reported and involved an estimated sample of about 900 terminal cancer patients being cared for in 61 PCUs in Italy.

Concurrently, the US Health Care Financing Administration (HCFA) announced the approval of a new diagnosis code for palliative care, which was included in the International Classification of Diseases, 9th Revision, Clinical Modification on October 1, 1996. The purpose was to study the feasibility of creating a special diagnosis-related group (DRG) that allows payment for palliative care. After one to two years of study, the agency proposed that it would decide whether to make palliative care a reimbursable DRG. The National Hospice Organization welcomed the announcement of the new diagnostic code for palliative care and the possible development of a special diagnosis-related group. However, it argued that, because it only dealt with inpatient care, it would force the terminally ill to remain in hospitals when, with the proper support, patients could be cared for in their own homes. They were also concerned that palliative care provided in hospitals under the new codes could be too narrowly focussed on a medical model of care, to the exclusion of an interdisciplinary team approach.

Palliative Care - Australian developments

Development work began in Australia in 1993, although there is very little work published on the classification of palliative episodes of care. In 1993 the Australian Association for Hospice and Palliative Care (AAHPC) held a two day workshop for palliative care clinicians which produced a draft Palliative Care Casemix Classification. It proposed a Palliative Care Casemix Classification (PCCC) that would be applicable for use in all settings. The PCCC consists of five “Phases of Care” that are defined as acute, stable, deteriorating, terminal and bereaved. Further classification is based on pain and symptoms levels as well as family support.

This classification was empirically tested in a small study conducted as part of the Western Australia Palliative Care Casemix Project. The scope of the study was limited to palliative care clients in metropolitan Perth treated by Silver Chain Hospice Care Service (domiciliary), Cottage Hospice (hospice) and Hollywood Hospital (teaching hospital). All clients registered with these services during the study period (even if admitted before the study commenced or discharged after the study concluded) were in scope.

The sample consisted of 622 cases and the dependent variable was direct costs per day. The results (Table 1) suggest that only three variables are required to explain variations in cost - phase, motor function and severity of problems.

Table 1 RIV of best performing variables, Western Australian Palliative Care study 1994
Multi-variable splits using these three variables were the most effective. First level splits were by phase, second level splits were by either RUG-ADL scores or by symptom severity with either giving similar results (approximately 40% variance reduction).

Lee and Kennedy[^45] included palliative care episodes from two units in a study that tested the NAIP classification. However, they concluded that statistical analysis was not possible due to the small sample size. Nevertheless, they argued that the trends showed that the NAIP classification was not predictive of length of stay in their palliative care units for that three month study period. Palliative care patients were shown to be more expensive than rehabilitation and geriatric patients. This was attributed to medical officer salaries and medication costs.

The 1994 Victorian Palliative Care study[^46] tested similar ideas and completed a preliminary analysis of data collected from the six inpatient sites in scope. The reduction in variance for the variables in the 1994 project are shown in Table 2.

### Table 2 RIV of best performing variables, Victorian Palliative Care study 1994

<table>
<thead>
<tr>
<th>Variable</th>
<th>Reported RIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>16.0%</td>
</tr>
<tr>
<td>RUG - ADL (total)</td>
<td>15.0%</td>
</tr>
<tr>
<td>Symptom severity (total)</td>
<td>11.0%</td>
</tr>
</tbody>
</table>

Like the Western Australian study, the preliminary analysis indicated that the stage of the illness, RUG-ADL on admission and number and severity of problems were the major indicators of resource consumption. However, as with previous studies, the authors noted that the sample size was small and was non-representative and that the results should be regarded as indicative rather than robust.

### General ambulatory care systems

Several ambulatory classifications have been developed. The first was the Ambulatory Visit Groups (AVGs) scheme that is based on diagnosis. Ambulatory Patient Groups (APGs), based on procedures, were considered to be an improvement on AVGs. Both schemes were developed in the USA and neither scheme is in use either in the USA or in Australia. Likewise, Ambulatory Care Groups (ACGs) developed in the USA in 1991 categorise diagnoses according to their likelihood of persistence[^47].

The Duke Casemix System (DUMIX) was developed in 1997 to classify patients by their risk of high future utilisation[^48]. The splitting variables chosen were age, gender, patient-reported perceived and physical health status and provider-

[^45]: Lee and Kennedy
[^46]: The 1994 Victorian Palliative Care study
[^47]: Ambulatory Care Groups
[^48]: The Duke Casemix System (DUMIX)
reported or auditor-reported severity of illness. The model explained 17% of the variance in future clinic charges and 17% of the variance in return visits.

An admission casemix system for the elderly known as ACME was developed in the UK to cater for the wide variety amongst patients encountered in geriatric medicine\textsuperscript{49}. Variables found to be important include cognitive and motor functional status as well as the acuity and potential for recovery of their presenting illness.

The Australian Ambulatory Classification (AAC) was designed in 1992. In this scheme there are two classes for rehabilitation, one with a doctor and one without. There are no other classes designated for other types of sub-acute or non-acute care. At the same time, a separate paediatric model was developed, Australian Paediatric Ambulatory Classification. Neither classification was adopted for use. Instead, where classifications are used for outpatient care in Australia (such as the Victorian Ambulatory Classification in Victoria and the Queensland Ambulatory Classification in Queensland) they are classifications based on the name of the clinic and are designed to classify each clinic visit. None are strictly casemix classifications in the sense that they classify the clinic rather than the patient.

A national study into Community Home Nursing was reported in 1995\textsuperscript{50}. This study examined resource consumption patterns in domiciliary nursing. Data were collected from 13 organisations over a 12 week period. The study data base included 95,737 visits and 6,685 episodes. It proposed an episode based classification with 49 classes. First level splits were based on episode type (including Palliative care and Support and maintenance). Second level splits for these episode types were based on level of function. Final splits were based on intervention type. The proposed classification achieved a variance reduction of 29%. Further studies are in progress.

**Strengths and weaknesses of the studies to date**

Important developmental work has been undertaken to this point, although very little of it has resulted in classifications that are sufficiently robust to be implemented. The major strengths of the work to date are twofold.

The first is that, between them, the studies conducted thus far have identified a consistent set of variables which are able to explain a significant proportion of variation in reported levels of resource use. The results have been highly consistent suggesting that functional dependency level is the key patient attribute that drives costs. Functional status is, for this care, equivalent to the role of diagnosis in acute care. But other attributes are also important. One key cost driver is the goal of care. Aged care patients have different costs to, say, rehabilitation patients, even if the patient characteristics appear to be the same. This is because different care goals result in different packages of care (at different costs) being provided.

Other patient attributes drive costs for specific types of patients. For example, the type of impairment is an important cost driver for rehabilitation but does not appear to be important for other types of care. Likewise, the stage of illness (phase) is an important factor in driving palliative care costs, as is severity of symptoms. It may be that these attributes (stage of illness and symptom severity) are also important for other care types (such as geriatric psychiatry) although the evidence is less clear.
Importantly, the various studies have consistently demonstrated that the key variables used in DRG assignment (age, diagnoses, procedures and destination after discharge) perform poorly. These findings suggest that a different approach is required for the classification of sub-acute and non-acute care.

The second strength of the work to date has been in the development of methodologies suitable for this type of research. The work to date confirms Eagar and Hindle's view that casemix classification developments should be guided by four design principles, each of which is discussed below. These principles are an important influence in deciding on the research methodology.

Cost of care is used as the response variable. Explanatory variables are selected from the variety of demographic and clinical measurements that can be recorded for patients. The question of interest is ‘Which of the possible explanatory variables best explains the cost of the care that different patients receive?’ Statistically, the ‘best’ classification tree is that which accounts for the largest proportion of variation in the cost of care, the response variable. However, statistical performance is not the only criterion.

The ultimate aim is to form distinct groups or classes, such that patients within each class are similar to each other, but different from patients in other classes. Similarity and dissimilarity between patients is measured by the cost of care, and groups are defined in terms of clinical and other attributes of the patients.

The first design principle used to guide classification development is that the cost drivers used in the design of the classification should, wherever possible, be related to patient characteristics and not to the type, or extent, of services utilised. This implies that the research needs to identify and capture patient-related cost drivers as well as measure the extent of resources utilised. While all studies conducted in the USA have used proxies for cost (either length of hospital stay or hospital charges), most Australian studies have attempted to capture actual costs.

The second design principle is that the selection of the cost drivers should result in minimum variation within each class and maximum variation across classes. Reduction in variation within classes is measured by the Coefficient of Variation (CV). The overall classification model is assessed statistically by measuring the Reduction in Variance (RIV). This statistic is the R² of regression analysis. It can be interpreted as the proportion of variability in the dependent variable that can be accounted for by the model. Mathematically, it is the ratio of the variability between the groups (rather than within the groups) to the total variability. Application of this principle implies that sample sizes are sufficiently large to allow statistical testing to be performed with a suitable level of confidence.

One of two standard statistical tools have been employed in most studies to configure the measures into a classification tree. The most sophisticated of these is CART (Classification and Regression Trees), a commercially available package released in 1995 that is based on multiple regression models. The CART logic compares each of the independent variables to determine which one offers the best binary split - that is, the variable that divides the sample into two groups (or branches), where the members of each branch are as similar to each other as possible, but as different as possible from members of the other group. CART then performs successive binary splits down each branch until there is no significant improvement to be made in terms of achieving further reduction of variance. PC-Group is the other standard tool that has been used in various studies. It was released in 1992 (three years before CART) and, like CART, is a...
commercially available computer package designed to create regression trees. The mathematical logic is essentially the same in the two packages. The difference between them is in the degree to which various functions are automated with CART having more automated functions than PC-Group.

The third design principle is that the resultant classification must contain sensible clinical groups. This criterion has significant implications for research. Irrespective of the statistical performance of a classification, it ‘fails’ as a classification if it is not clinically acceptable. This was a key lesson from the Australian NAIP study. Clinical involvement at all stages of the research, from design through to analysis, is an essential component of any successful study methodology.

The final design principle is ease of collection. The variables used in the classification should be capable of routine collection, coding and data entry. This implies that the classification should be as parsimonious as possible. It also implies that the data items and measurement tools need to be clinically acceptable. Again, the implications for future research is that clinical involvement is an essential component of any study methodology. It also implies that the researcher may have to be prepared to discard a preferred measurement instrument if that instrument is not clinically acceptable.

While the work to date has been important in identifying the key contender variables for future classification development, in articulating a set of design principles for further classification development and in establishing the utility of various statistical techniques and packages, there have also been some fundamental weaknesses.

All of the Australian studies to date have been characterised by small and non-representative samples. One reason is undoubtably the fact that participation in such research is resource-intensive for clinical services. An important consequence of the small sample sizes is that reported results are open to question. To that extent, Australian work to date can be characterised as being only of an exploratory nature.

Most of the studies conducted outside Australia have used larger samples. However, this has been possible because all studies conducted in the USA have used proxies (either length of hospital stay or hospital charges) rather than attempted to capture actual costs. A further limitation is that the results are not necessarily applicable to Australia because both clinical practice and costs in America and Australia may be quite different.

One difficulty in interpreting the results reported to date is that there are fundamental differences in the way that the response variable has been defined across the various studies. Some studies have used the cost per day as the response variable while others have used the cost of an episode of care as the response variable. Where 'episode of care' has been used, there are inconsistencies in how an ‘episode of care’ has been defined. Some of these differences are probably not material. For example, there are variations between the various studies in how leave days and length of stay have been calculated. However, others are clearly material. For example, several studies have included incomplete ‘episodes’ in their sample because they did not remove data on patients whose care straddled the study period. The issue of how to define and classify seemingly ongoing episodes has not been addressed in any study that has used the cost of an episode as the response variable.
With the exception of a small palliative care study in Western Australia with only three study sites, all studies to date have examined either hospital inpatient or hospital outpatient or community care. None have examined the full spectrum of care settings and most of the work to date has examined inpatient care only.

A key issue in almost all studies is the starting point for defining the study cohort. While the goal has been to develop a patient-based casemix classification, the scope of almost all studies has been determined by the unit of treatment rather than patient characteristics or goals of care. Patients have been classified as rehabilitation simply because they were treated in a rehabilitation unit, palliative care when treated by a palliative care service, psychogeriatric when treated in a designated psychogeriatric unit and so on.

There are two implications. The first is that only patients treated by designated services have been defined to be in scope. Patients treated by other services have been defined, by default, as not being, say, palliative care or rehabilitation irrespective of their clinical characteristics or goal of care. This has significant implications for services such as aged care services, whose patient population can include geriatric rehabilitation patients, palliative care patients and patients with conditions such as severe dementia who are variously described as mental health, psychogeriatric or aged care depending on local practices. The second implication is that the approach used to date has assumed that all patients in a designated service are appropriately classified to that designation. For example, that all patients in a rehabilitation unit are rehabilitation patients and that all patients treated by aged care services are always 'aged care' and never rehabilitation, palliative care or psychogeriatric.

One consequence is that the various studies have made no contribution to understanding the interfaces between the various streams of care. A key issue here is older people with mental health needs. This patient population may be treated by adult mental health services, general aged care services or specialist psychogeriatric services. If a casemix classification is to be based on patient characteristics, which is a fundamental design principle for casemix, how should older people with mental health needs be classified? The approach to date is that they would be classified (and potentially funded) differently depending on the service of treatment.

While the separation of acute from other types of care has represented an important milestone in the development of appropriate classification and funding systems for the health care system, some fundamental issues remain unresolved. These include the definition of acute care itself, the boundary between acute and other forms of care, definitions of streams of care and patients who are not appropriately classified by DRG, and the fundamental issue of whether it is possible to base casemix classifications on patient rather than service characteristics. Resolution of these issues is inextricably bound with the development of appropriate classification and funding models for sub-acute and non-acute care.

Method

Hypotheses to be tested
The research conducted to date suggests that sub-acute and non-acute care are distinct from acute care. Further, the work suggests that, within sub-acute and non-acute care, there are distinct Case Types. Building on the research to date, it is hypothesised that, within sub-acute and non-acute care, there are five clinically distinct Case Types: Palliative Care; Rehabilitation; Psychogeriatric Care; Geriatric Evaluation and Management (GEM); and Maintenance Care. Thus Hypothesis 1 is:

1. That, within sub-acute and non-acute care, there are five Case Types, each of which is clinically distinct as measured by patient attributes.

If the findings of the early phases of the research support Hypotheses 1, then these clinically distinct Case Types can be incorporated into the next stage of the research to develop a casemix classification for sub-acute and non-acute care. The research to date has consistently identified a set of variables that appear to be cost-drivers for this type of care. It is expected that these variables, in combination with the variable 'Case Type', can be used to develop a casemix classification that meets the four design principles discussed above. Thus Hypothesis 2 is:

2. That the patient attributes which have best predicted cost in previous studies can be used to develop an Australian classification and costing system for sub-acute and non-acute care.

**Study design**

The study was implemented as a series of integrated research projects over six years which, for the sake of clarity, are described as three phases in the overall research.

The first of these was to develop the initial conceptual framework. The study methodology for this phase did not involve empirical research. Rather, it consisted of a literature review and six months intensive consultation across Australia involving over 1,000 health care providers, funders and managers. The key task was to define source data items required for the introduction of an Australian DRG classification system. However, the consultations included consideration of the boundaries and limitations of the DRG system. The rationale for this methodology is straightforward. As already discussed, there are four design principles for casemix classifications, one of which is clinical acceptability. A widespread consultation process was an appropriate methodology for ensuring that the initial conceptual framework would be clinically acceptable in the latter stages of the research.

Once the initial conceptual framework was developed and adopted as a national standard, the study moved into the next phase. The second phase consisted of a literature review and empirical research to capture and analyse a sufficiently large quantity of data (involving over 100 variables at 35 sites) to allow for selection of a subset of the most promising variables which could then be refined and used as the basis of the next stage of the research.

Data were captured on patients receiving sub-acute and non-acute care at 35 units in NSW. The units comprised of hospitals, or district units or wards in larger facilities. In all, 24 hospitals from 8 Area Health Services participated in this phase of the study.
The data items were collected over the six month period from 1st March 1994 to 31st August 1994. A large number of variables were identified through the planning process and, in total, some 100 data items were selected for inclusion in the study. Data were collected and entered on site, using software developed for the study. The data were of four types.

The first were *Core Data Items*. These were collected at all sites for all patients. They included all items in the current discharge data set and the RUG-ADL as the core measure of function.

The second were *Speciality Specific Data Items*. These were items that were to be collected only for specific case types. For example, "Phase of Palliative Care" was collected for palliative care episodes but not for others.

The third category were *Optional Data Items*. These were items that study sites could elect to collect. The most important of these were the instruments for the measurement of function which sites could elect to collect in addition to the RUG-ADL.

The final category were *Cost Data Items*, necessary to establish cost relativities between patients. These included measures of staff time and expensive or atypical goods and services consumed by individual patients. Staff time was collected for all categories of staff with the exception of nursing staff in non-palliative care services. Allied health staff were asked to record the total time spent on each day on caring, identifying the patients who had received attention by their medical record number. A similar approach was used to capture medical time. Nursing data were not collected because the sites participating in the study argued that they did not have sufficient resources to capture nursing costs per patient per day for the six months of the study. As a result, an alternate (albeit a less satisfactory) methodology was implemented for the determination of nursing costs for all but palliative care sites. This was to use the RUG-ADL data and the nursing cost data from the NAIP study. The RUG-ADL was used as it is a direct measure of carer burden and therefore a measure of nursing resource intensity. In this sense, the RUG-ADL functions in much the same way as other nursing dependency measures. A regression model of nursing costs against RUG-ADL scores, as derived from the NAIP study, was used to impute nursing time and therefore costs. For the purposes of this stage of the study, sites were only required to provide the total direct costs associated with patients within the study, and not information on overhead costs, as the study aimed to establish relative, and not absolute, care costs for different types of patients.

The next stage of the study methodology was the preparatory analysis. During the preparatory analysis, a single patient data file was developed and the data were edited. Two versions of the combined file were made. The first contained records relating to all patients within the study, and summarised data by episode. The second contained only palliative care patients with the data being aggregated by phase. After data editing and the removing of incomplete episodes that straddled the start or end of the study, the sample consisted of a total of 5,684 linked records in the episode file. The palliative phase file contained 3,014 records.

A standard statistical analysis as described above was then undertaken to identify the cost drivers that resulted in minimum variation within each class and maximum variation across classes. This analysis was undertaken using PC-Group software as CART was not available at that time.
The analysis was performed on the complete data set. It would have been preferable to split the data into a test and validation sets so that the stability of the final classification could be assessed. However, this was not possible due to the size of the sample collected.

The analysis began by assessing the predictive power of each variable on the whole episode data set. Initially, the investigation concentrated on finding which variables could best explain the variation in mean cost per day. The power of each variable to explain variation in costs per episode was then investigated. The palliative care data was analysed both by episode of care and by phase.

This stage of the research found variations in both casemix and costs that were clinically plausible. Importantly, the analysis suggested that variations could be identified by use of only five variables (case type; functional level; diagnosis/impairment type for rehabilitation episodes; palliative care phase for palliative care episodes and severity of symptoms for palliative care episodes). Of these five variables, only one (rehabilitation impairment category) could be extracted routinely from the hospital discharge data set.

The conclusion at this stage was that there was an adequate basis for defining a classification and that the results justified the work proceeding to a more comprehensive empirical analysis in the next stage. While leading contender variables had been identified, the determination of the dependent variable (per episode or per day) remained unresolved at this point in the research. The analysis suggested that it would be possible to classify at least some fast-stream rehabilitation episodes by way of a per episode classification. However, there was no evidence at this stage to suggest that it would be feasible to develop a per episode classification for the other case types. Not one variable was identified which proved to be predictive of length of stay for case types such as nursing home or palliative care.

An important outcome at this stage was that several implications for the design of the next phase in the research were identified. These proved to be critical in shaping the methodology subsequently used. Unlike the DRG classification development process (which, in the main, uses patient variables that are already collected) the development of a classification from first principles requires study sites to collect new data items. For study sites this is resource intensive, particularly as they are also required to continue to collect all routine data irrespective of whether it is required for casemix assignment. Likewise, there are no service weights which can be routinely used for cost modelling. The SNAP development process is a threefold process incorporating the development of casemix classes, service weights and cost weights. One important lesson at this stage was that a data collection period of six months is too long a period to realistically expect study sites to collect all of the data required for classification development, the calculation of service weights and the calculation of cost weights. Three months appeared to be the maximum period that study sites could tolerate.

It also became clear that the type of episode (the 'Case Type') would emerge as an important variable in the final classification. Ensuring that the definition of an episode was both robust and valid needed to be incorporated into the methodology of the next stage of the research. Issues to be resolved included agreed definitions of episode types and rules with respect to the start and end dates of episodes by type.
The classification of psychogeriatric (psychiatry of the elderly) services within the casemix context needed to be determined. This study was the only study to date in Australia to include psychogeriatric services and it was limited in scope and size. Given that psychiatry of the elderly services represent the interface between psychiatry and geriatric medicine, the scope and boundaries of future casemix classification projects had to be resolved.

A number of other issues were identified for resolution before or during the next phase. These included the adoption of standard rules for the coding of rehabilitation impairments; the use of rigorous definitions of phase types for palliative care; the need to adopt standard measures of ADL dependency and level of functional impairment; the inclusion of services for children; and the expansion of the research agenda to include sub-acute and non-acute services provided on an ambulatory basis.

The lessons from this second phase of the research were incorporated into the methodology of the next phase. In consultation with a national clinical advisory panel established for the purpose, new definitions of various types of 'episodes of care' were drafted. The inter-rater reliability of the definitions was then tested in a study that collected data on a total of 683 patients at 10 hospitals and 2 community health services providing a range of rehabilitation, aged care and community care services.

A study coordinator at each site provided instructions to raters and managed the on-site data collection. Site coordinators selected two clinical staff from each ward/service to participate in the pilot study. The clinical staff members acting as raters included registered nurses, specialist medical staff, medical registrars, and allied health staff.

The site coordinators provided each rater with the definitions of each Case Type and ensured that they were familiar with the Case Type assignment logic. Each rater was given a written instruction sheet instructing them to assign each patient to one, and only one, Case Type.

Using a scale of 0 to 4 where 0 indicates 'Very Poor Fit' and 4 indicates 'Very Good Fit', raters were asked to indicate how well the Case Type described the key attributes or characteristics of each patient. Likewise, raters were asked to assess how difficult it was to assign each person to a Case Type. A scale of 0 to 4 was used for this purpose with 0 indicating 'Very Easy' and 4 indicating 'Very Difficult'.

Raters could also indicate if the patient did not fit into any of the five Case Types or, conversely, if the patient met the description of more than one Case Type. Finally, raters were asked to indicate any patient where they were not sufficiently familiar with the person's clinical condition to be confident about these ratings.

Each patient on the ward/receiving care was assessed independently by the two clinical raters and allocated to one of the five SNAP Case Types. Each assessment was made by each rater without discussion with the other rater. Both assessments were completed within the one 24 hour period. Single assessments were also collected for any patient/community client who was seen by only one practitioner on the day of assessment. These assessments were to be used solely to assess goodness of fit and ease of use.

After the data had been collected, clinical assessors were interviewed, either individually or in a group, by the site coordinator to identify any problems.
experienced in undertaking the required tasks and any suggestions for improving
the wording of the definitions. These were documented and forwarded to the
researcher for analysis.

The kappa statistic (κ) was used to determine the significance of the level of
agreement between raters. The kappa co-efficient of agreement is the ratio of
the proportion of times that the raters agree (corrected for chance agreement) to
the proportion of times that the raters could agree (corrected for chance
agreement).

The value of the kappa statistic was sufficiently high to support the use of the five
Case Types in the next stage of the research - the 1996 National Sub-Acute and
Non-Acute Casemix Classification Study. Although there were some differences
in the performance of the five Case Types, all five proved to be reliable. Most
patients fitted into only one Case Type and staff found the definitions easy to use.

A stratified sample of health services in Australia were selected for participation
in this next stage of the research. Five criteria were used to stratify the sample -
case type; location (urban/rural); State Territory; treatment setting (admitted/ambulatory); and ownership (private/public). In addition, a small non-
stratified sample of New Zealand sites were selected for inclusion. The final
sample of 99 sites in all Australian States and Territories and 5 sites in New
Zealand represented:

- Public hospitals, including principal referral hospitals, major referral
  hospitals, major rural base hospitals, district hospitals, small community
  hospitals and designated hospices, rehabilitation centres and other sub-
  acute and non-acute hospitals
- Private hospitals, including designated hospices, rehabilitation centres
  and general hospitals
- Community health centres, domiciliary nursing services and other
  community care agencies.

Between them, these sites collected a detailed clinical and service utilisation
profile on 30,604 sub-acute and non-acute episodes over the data collection
period. The data collection began at most sites on 1 July 1996 and continued for
3 months. Some sites began the collection in August and September. Certain
specialist spinal injury and brain injury units continued the data collection up until
Christmas 1996, making the maximum collection period 26 weeks.

A clinical profile was collected on each patient at the beginning and end of their
episode of care. This data set was designed in consultation with an expert panel
of clinical advisors established for the purpose (the SNAP study Clinical Project
Team). This method for selection of the data items and measurement
instruments was essential in ensuring that the selected measurement
instruments were clinically acceptable and that, if subsequently incorporated into
the classification, they were capable of routine collection. In addition to these two
factors, technical criteria for the selection of the instruments were identified.
The variables and the instruments chosen were the best of those available that
met the following criteria:

- the patient attribute to be measured is predictive of the need for, and cost
  of, health care
- the instrument produces reliable results
- the instrument produces valid results
• the instrument is valuable in its own right, sensitive to clinical change, and therefore potentially useful as an outcome measure
• the items to be collected place minimal demand upon participating clinicians during the study period.

The selection of some items was straightforward (for example, need for interpreter). Others were the subject of considerable controversy, debate and review. They included items where there was more than one instrument that met the criteria (for example, the measure of function to be used) and items where no suitable measure could be identified (for example, a valid and reliable measure of carer availability and adequacy). Some items and instruments were excluded because they were assessed to be too time-consuming to complete (for example, the Functional Assessment Measure [FAM]) or because they were condition-specific (for example, a Post Traumatic Amnesia measure for brain injury).

By the end of this process, nine instruments were selected for use in the study and a standard set of patient identifiers and service details was agreed. In addition, information on diagnoses and procedures would be extracted from hospital morbidity collections at the end of the study. Whilst all of the instruments selected were considered to be those that best met both the clinical and technical criteria, it was recognised that some were less than ideal and that further work is required on the development of appropriate instruments. The instruments selected through this method are shown in Table 3.

Table 3 Instruments adopted in the SNAP study

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Attribute to be measured</th>
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<tbody>
<tr>
<td>Functional Independence Measure (FIM)</td>
<td>motor function</td>
</tr>
<tr>
<td>Resource Utilisation Groups Activities of Daily Living scale (RUG-ADL)</td>
<td>motor function</td>
</tr>
<tr>
<td>Paediatric version of the FIM (the WeeFIM)</td>
<td>motor function in children</td>
</tr>
<tr>
<td>Folstein Mini Mental State Examination (MMSE)</td>
<td>cognition</td>
</tr>
<tr>
<td>Resident Classification Instrument (RCI) - three behaviour items</td>
<td>behaviour</td>
</tr>
<tr>
<td>AAHPC Palliative Care Phase</td>
<td>palliative care stage of illness</td>
</tr>
<tr>
<td>AAHPC Severity Scale</td>
<td>problem severity</td>
</tr>
<tr>
<td>Health of the Nation Outcome Scales (HoNOS)</td>
<td>psychogeriatric severity and function</td>
</tr>
<tr>
<td>UDS Functional Impairment Codes Version 4.0</td>
<td>impairment</td>
</tr>
</tbody>
</table>

No consensus could be reached among the clinical advisory panel during the study design phase on a standard measure of function to be used for Rehabilitation and Geriatric Evaluation and Management but it was agreed that the FIM would be the preferred tool for the study. However, sites already using the Barthel Index (another commonly used measure of motor function) were given the option of using a combination of the Barthel Index and the RUG-ADL instead of the FIM. In these cases, sites were required to record both the patient score and the maximum possible score for the particular version in use. Barthel scores were converted to percentages to allow comparison across different versions of the Barthel instrument.
Participating sites collected a comprehensive service utilisation profile of each episode and each episode was costed on a daily basis. The most intensive component of the collection was the capture of a daily log of time by the 14,742 participating staff.

The methodology for the analysis was broadly consistent, but considerably more extensive, than that undertaken in the previous phase. A preparatory analysis of the data was undertaken and the data were edited. An exploratory data analysis was undertaken during this first stage. This involved examining variables of interest one at a time. Means, standard deviations, medians, ranges, correlations and other descriptive statistics were calculated.

Only after the data had been thoroughly investigated in this manner was an attempt made to group observations. Both CART and PC-Group software was used for the regression analysis as each had advantages over the other. CART was used to generate the classification tree which achieved the highest RIV. PC-Group was then used to refine the classification and to improve its clinical structure.

During this exploratory stage, all single variables were tested and two preliminary classifications were developed - an episode classification and a per diem classification. Both the descriptive data and the preliminary classes were then reviewed by the Clinical Panel in order to ensure that the findings were clinically meaningful and to ensure that the final development of the classification was guided by clinical judgement.

A critical issue at this stage was to determine whether the use of the Geriatric Evaluation and Management Case Type could be supported by the data. After review, the Clinical Panel resolved that GEM should be a separate Case Type.

A further issue was to determine whether the team should proceed to develop a per diem classification, a per episode classification, or both. The exploratory analysis had indicated that both a per diem and a per episode classification were possible. However, the preliminary analysis also indicated that the best statistical results for the episode classification would be achieved using a different assignment logic and, in some instances, different variables, to that of the per diem classification.

The Clinical Panel argued that one classification should be developed using episode cost as the dependent variable. An average daily cost, as well as the episode cost, should then be calculated for each class. It was recognised that, if the classification was subsequently used for funding on a per diem basis, it may not perform as well as one specifically designed for classifying each day of care.

With the exception of Palliative Care, a set of independent variables had been captured for each episode. These variables would be tested using episode cost as the dependent variable. The independent variables for Palliative Care had been captured for each Palliative Care phase. They included the Type of Phase, RUG-ADL at phase start and phase end, and the Palliative Care Severity Score for each phase. These variables would be tested using phase cost and not episode cost as the dependent variable. A phase of Palliative Care was the equivalent of an episode of Rehabilitation, Psychogeriatric Care, Geriatric Evaluation and Management, and Maintenance Care.

One important implication of the decision to develop a classification using episode cost as the dependent variable was that episodes that straddled either...
the start or end of the study period (but not both) were removed prior to further analysis. All of these episodes were incomplete and either the patient had been in care prior to the study or they were still in care at the end of the study. These partial episodes could not be included in the analysis because none of them had a full episode cost. Rather, they had a cost only for that part of the episode that fell within the study period.

It was recognised from the outset that partial episodes would not be able to be used in the episode analysis. They had been included in the study so that they could be costed. This was necessary for the accurate costing of the remaining episodes. They were also included in the study so that, in the event that an episode classification was not possible, they could be included in the analysis of per diem costs. In total, 33.4% of the overnight episodes and 37.8% of the ambulatory episodes were incomplete and were excluded from further analysis.

This was not the approach taken with respect to ongoing episodes. Ongoing episodes were included in the analysis and were allocated a length of stay of three months. This was consistent with the initial study methodology.

Following clinical review, the data set was split into two - an overnight data set and an ambulatory data set. Detailed work was then undertaken on each separate branch.

Consistent with established statistical methods for developing casemix classifications, the overnight rehabilitation branch was split into a test sample and a re-test sample. Two thirds of the episodes were randomly assigned to the test sample and one third to the re-test sample. The overnight rehabilitation classification would be developed on the test sample and then validated on the re-test sample.

Because of the smaller volumes in the other branches, they were not split into test and re-test samples. To do so would have resulted in both sample groups being too small to test the study hypotheses and to produce results which would have been reliable.

The combination of trimming the 'starting' and 'ending' episodes and splitting the data base into a test sample and a re-test sample created difficulties even in overnight rehabilitation. The initial sample for overnight rehabilitation was 7,303 episodes. The final test sample was 3,738 and the re-test sample was only 1,569 episodes. These sample sizes were too small to use for testing the FIM-FRG classification, which had been one of the purposes of the study. In consequence, the FIM-FRG classification was tested on the full sample of 4,707 episodes that did not straddle the start or end points of the study.

In summary, the method used to develop the classification was the same as that used to develop the AN-DRG classification and other classifications. It involved the development of a set of clinical hypotheses by the Clinical Panel and then an iterative process of statistical testing and clinical review. Use was made of the test and re-test methodology but only in the branch with sufficient volume to allow it to be used - overnight rehabilitation. Again this was no different to the method used to develop the AN-DRG classification where no test and re-test could be undertaken in the low volume groups.

Consistent with established casemix development methodologies, the final stage involved the trimming of each class by the removal of outlier episodes. Reduction in variance for the full tree was then re-calculated using only the
trimmed data. Several trimming techniques were considered for the identification of outlier cases. To decide on the best technique, a number of criteria were considered. The method employed had to be able to isolate low cost as well as high cost outliers. The method of trimming had to be statistically defensible.

Outliers were considered to be atypical values of the natural logarithm of the core cost rather than the cost itself. A value was considered to be atypical within a class if it was more than 1.5 times the interquartile range above the third quartile or more than 1.5 times the interquartile range below the first quartile of its class. For the majority of classes, the natural logarithm of the core cost was Normally distributed. For the remaining classes, the distribution of the natural logarithm of the core cost was symmetric. Strictly speaking, it is not necessary to have a symmetric distribution to apply the interquartile range trim. However, a symmetric distribution increases the likelihood of detecting both low cost and high cost outliers.
Summary of results

This section summarises the results in relation to each of the two hypotheses tested.

**Hypothesis 1** That, within sub-acute and non-acute care, there are five Case Types, each of which is clinically distinct as measured by patient attributes

This first hypothesis is intrinsically linked to the definition of an 'episode of care'. While phase 1 of the research found that different types of episodes of care could be distinguished and that such an approach was acceptable to the health industry (as indicated by the subsequent resolutions of the Australian Health Ministers' Advisory Council\(^66\)), it was not until phase 3 that more definitive conclusions could be drawn.

The results of testing the definitions of various types of 'episodes of care' were measured by use of the kappa statistic (\(k\)). The value of kappa was 0.838 with a 95% confidence interval of 0.801 to 0.875, indicating that there was a significant level of agreement between raters. All five Case Types tested - Palliative Care; Rehabilitation; Psychogeriatric; Geriatric Evaluation and Management; and Maintenance Care - proved to have good inter-rater reliability, there was a good fit for most patients, and staff found the definitions easy to use. These results justified the use of these definitions in the next phase of the research. The level of inter-rater agreement suggests that clinicians were able to make a clinical distinction between patients based on the patient attributes incorporated in the various definitions.

The clinical distinctiveness of the Geriatric Evaluation and Management (GEM) case type was again tested in the national SNAP study. An equivalent analysis of the other two Case Types was not undertaken. In the case of palliative care, the initial data analysis, in combination with clinical opinion, suggested that palliative care is a distinct case type. While the data supported a further review of the Psychogeriatric Case Type, the volume in the AN-SNAP study and the existence of the parallel National Mental Health Classification and Services Cost (MH-CASC) project suggested that such a review should constitute an item for future research rather than being attempted at this point.

The view of the SNAP Clinical Panel was that episodes classified in the SNAP study as GEM would be classified either as rehabilitation or maintenance if the GEM case type was not separately identified. GEM episodes in the SNAP study were therefore compared with both Rehabilitation and Maintenance care episodes to assess whether there was any justification for the establishment of a separate Case Type.

Table 4 shows key comparative statistics for the three Case Types. On almost all key clinical indicators, the Geriatric Evaluation and Management profile was significantly different to that of either Rehabilitation or Maintenance. Patients classified to the Geriatric Evaluation and Management Case Type were, on average, 10 years older than either Rehabilitation or Maintenance. They were more likely to have cognitive problems (as indicated by scores on both the MMSE and the FIM Cognition sub-scale) and were more likely to have a non-specific impairment code. As a group, overnight Geriatric Evaluation and Management episodes showed less change in motor function from episode start to episode...
finish (whether measured by the FIM Motor sub-scale or the Barthel Index) than Rehabilitation episodes.

Table 4  GEM, Rehabilitation and Maintenance - comparative statistics

<table>
<thead>
<tr>
<th></th>
<th>Rehab</th>
<th>GEM</th>
<th>Maint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>67.4</td>
<td>79.3</td>
<td>68.2</td>
</tr>
<tr>
<td>Overnight episodes as percentage of total Case Type</td>
<td>70.5</td>
<td>36.4</td>
<td>16.6</td>
</tr>
<tr>
<td>% of Case Type that is ‘Assessment only’</td>
<td>5.3</td>
<td>41.1</td>
<td>15.4</td>
</tr>
<tr>
<td>% of episodes where care is provided by Sole Practitioner</td>
<td>9.3</td>
<td>20.4</td>
<td>36.3</td>
</tr>
<tr>
<td>% of overnight episodes where Reason for Episode Start is ‘Admit from home / elsewhere’</td>
<td>14.2</td>
<td>48.1</td>
<td>45.1</td>
</tr>
<tr>
<td>% of overnight episodes where Reason for Episode Start is transfer from another hospital or transfer from acute care on a different ward of same hospital</td>
<td>81.0</td>
<td>39.7</td>
<td>34.7</td>
</tr>
<tr>
<td>% of overnight episodes where Reason for Episode End is ‘Discharge to home /elsewhere’</td>
<td>78.0</td>
<td>58.8</td>
<td>43.8</td>
</tr>
<tr>
<td>% of overnight episodes where Reason for Episode End is ‘Discharge to Nursing Home’</td>
<td>7.1</td>
<td>20.4</td>
<td>38.3</td>
</tr>
<tr>
<td>% of ambulatory episodes where Reason for Episode Start is ‘First contact following referral’</td>
<td>61.5</td>
<td>91.3</td>
<td>68.7</td>
</tr>
<tr>
<td>% of ambulatory episodes where Reason for Episode Start is ‘Transfer from hospital’</td>
<td>24.4</td>
<td>3.0</td>
<td>13.1</td>
</tr>
<tr>
<td>% of ambulatory episodes where Reason for Episode End is ‘Discharge / case closure’</td>
<td>94.1</td>
<td>81.6</td>
<td>74.2</td>
</tr>
<tr>
<td>% of ambulatory episodes where Reason for Episode End is ‘Transfer to Hospital’</td>
<td>3.5</td>
<td>8.2</td>
<td>16.4</td>
</tr>
<tr>
<td>% of episodes with MMSE score below 20 or not recorded for reasons other than ‘other reason’</td>
<td>19.9</td>
<td>31.8</td>
<td>not collected</td>
</tr>
<tr>
<td>% of overnight episodes with impairment code of ‘Pulmonary’, ‘Other Disabling Condition’ or ‘Debility’</td>
<td>8.9</td>
<td>39.0</td>
<td>not collected</td>
</tr>
<tr>
<td>Mean change in FIM Motor score from start to end of episode (overnight episodes)</td>
<td>11.6</td>
<td>4.9</td>
<td>not collected</td>
</tr>
</tbody>
</table>

The episode profile for the three Case Types was also different. As a percentage of total Case Type, overnight episodes constituted 71% of Rehabilitation episodes, 36% of Geriatric Evaluation and Management episodes and 17% of Maintenance episodes. Over 40% of Geriatric Evaluation and Management episodes were for ‘Assessment Only’. The majority of these episodes were provided by Aged Care Assessment Teams (ACAT). Over one third of maintenance episodes and one fifth of Geriatric Evaluation and Management did not involve a multidisciplinary team. These figures compare to 9% for Rehabilitation.

The reasons why episodes started were different. For overnight episodes, over 40% of both Geriatric Evaluation and Management and Maintenance episodes...
began with a direct admission from home. Only 14% of Rehabilitation episodes began this way. The majority (81%) of Rehabilitation episodes began with a transfer from another hospital or from acute care provided on a different ward in the same hospital. This figure compares to 40% for Geriatric Evaluation and Management and 35% for Maintenance. Most ambulatory episodes began with ‘First contact following referral’, 62% for Rehabilitation, 91% for Geriatric Evaluation and Management and 69% for Maintenance. Episodes starting as a result of transfer from hospital constituted 24% of Rehabilitation, 3% of Geriatric Evaluation and Management and 14% of Maintenance episodes.

The reasons why episodes ended were also different. 78% of overnight Rehabilitation episodes ended with the patient being discharged home. This compares to 59% for Geriatric Evaluation and Management and 44% for Maintenance. Only 7% of Rehabilitation episodes ended with the patient being transferred to a Nursing Home. This was significantly lower than either Geriatric Evaluation and Management (20%) or Maintenance (38%). Of the ambulatory episodes that ended during the study period, most did so due to ‘Discharge / case closure’, 94% for Rehabilitation, 82% for Geriatric Evaluation and Management and 74% for Maintenance. Episodes ending as a result of transfer to hospital constituted 4% of Rehabilitation, 8% of Geriatric Evaluation and Management and 16% of Maintenance episodes.

The classification of patients to the GEM Case Type did not seem to be influenced by the facility or the jurisdiction in which the person was treated. GEM episodes (both overnight and ambulatory) occurred in all States and in New Zealand. GEM episodes occurred in the private sector although both the number and the percentage of GEM episodes were well below that of the public sector.

72% of overnight GEM episodes occurred in hospitals with a comprehensive rehabilitation service. This suggests that the study sites were not classifying patients based simply on the role of the facility. Sites with comprehensive rehabilitation services classified each individual episode as either rehabilitation or GEM. It appears that participating staff classified the patient rather than the stream of care/service/ward in which they worked.

Only 5% of overnight GEM episodes occurred in hospitals without a designated role in rehabilitation. Four of the 104 participating sites had overnight GEM episodes but no overnight rehabilitation episodes. These 4 sites were all rural services.

Likewise, only 7% of ambulatory GEM episodes occurred in sites without a delineated role in rehabilitation. Consistent with the pattern of the overnight episodes, 69% of ambulatory GEM episodes occurred in sites with a Level 3 rehabilitation service. Again, it appears that the classification was based on characteristics of the person rather than on the stream of service.

The overall profile of Rehabilitation and Geriatric Evaluation and Management was clearly different. However, when standardised for impairment, the episode cost and the functional level of 15% of the overnight Geriatric Evaluation and Management episodes was no different to overnight Rehabilitation.

The data comparing Rehabilitation, Geriatric Evaluation and Management and Maintenance episodes were reviewed by the National Clinical Panel. After some debate, the Panel decided that Geriatric Evaluation and Management should be a separate Case Type. On this basis, the Geriatric Evaluation and Management Case Type was incorporated into the AN-SNAP Version 1 classification.
In addition to being clinically distinct, the variable ‘Case Type’ proved to be a reasonable predictor of costs in phase 3 of the study, achieving an RIV of 12.67% with the overnight inpatient data set and 4.33% with the ambulatory data set. Table 5 shows the average cost of care for each case type in the inpatient setting. Psychogeriatric episodes were, on average, more expensive than any other case type on an episode basis but palliative care was the most expensive in relation to cost per day.

Table 5  Summary of Episode Costs by Case Type - Overnight Care

<table>
<thead>
<tr>
<th>Case Type</th>
<th>Average episode cost1</th>
<th>Average per diem cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care²</td>
<td>$1,774</td>
<td>$301</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>$6,220</td>
<td>$285</td>
</tr>
<tr>
<td>Psychogeriatrics³</td>
<td>$7,913</td>
<td>$260</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>$4,560</td>
<td>$258</td>
</tr>
<tr>
<td>Maintenance</td>
<td>$6,157</td>
<td>$191</td>
</tr>
</tbody>
</table>

1 cost of Palliative Care Phase (not episode)  
2 after trimming of 93 high cost outliers  
3 after trimming of 10 high cost outliers

Table 6 shows the equivalent results for ambulatory patients. Here the pattern is different. Rehabilitation episodes were, on average, more expensive than any other case type on both an episode and a per diem basis.

Table 6  Summary of Episode Costs by Case Type - Ambulatory Care

<table>
<thead>
<tr>
<th>Case Type</th>
<th>Average episode cost1</th>
<th>Average per diem cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care</td>
<td>$548</td>
<td>$95</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>$881</td>
<td>$99</td>
</tr>
<tr>
<td>Psychogeriatrics</td>
<td>$207</td>
<td>$53</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>$323</td>
<td>$83</td>
</tr>
<tr>
<td>Maintenance</td>
<td>$529</td>
<td>$49</td>
</tr>
</tbody>
</table>

1 cost of Palliative Care Phase (not episode)

In summary, the evidence supports the hypothesis that, within sub-acute and non-acute care, there are five Case Types - Palliative Care; Rehabilitation; Psychogeriatric Care; Geriatric Evaluation and Management; and Maintenance Care. The level of inter-rater agreement suggests that clinicians can make a clinical distinction between these five Case Types and, using the measures captured in the study, each of the Case Types is clinically distinct. In addition, each of the five Case Types has a different pattern of costs and the variable ‘Case Type’ itself proved to be a reasonable predictor of costs.
Hypothesis 2 That the patient attributes which have best predicted cost in previous studies can be used to develop an Australian classification and costing system for sub-acute and non-acute care

The key result is that a casemix classification, termed the AN-SNAP Version 1 casemix classification, was developed. It is designed to classify both overnight and ambulatory care. There are five branches, one for each of the five Case Types.

AN-SNAP has 134 classes and explains 58% of the variation in all episode costs. Of this 58%, 21% was contributed by Episode Type and 37% by the classes. The AN-SNAP Version 1 overnight classification has 66 classes and five branches, one for each of the five Case Types. The number of classes by Case Type are shown in Table 7.

<table>
<thead>
<tr>
<th>Case Type</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care</td>
<td>11</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>32</td>
</tr>
<tr>
<td>Psychogeriatric Care</td>
<td>6</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>6</td>
</tr>
<tr>
<td>Maintenance Care</td>
<td>11</td>
</tr>
</tbody>
</table>

AN-SNAP Version 1 explains 47.29% of the variance in episode costs. There was minimal trimming of the data prior to class finding. The reduction in variance within each Case Type is shown in Table 8.

<table>
<thead>
<tr>
<th>Case Type</th>
<th>RIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care</td>
<td>20.98%</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>38.21%</td>
</tr>
<tr>
<td>Psychogeriatric Care</td>
<td>36.40%</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>9.97%</td>
</tr>
<tr>
<td>Maintenance Care</td>
<td>52.95%</td>
</tr>
</tbody>
</table>

Four of the 66 inpatient classes contain long-term care episodes (1 in Psychogeriatric Care and 3 in Maintenance Care). In addition, both the Brain Dysfunction and Spinal Cord Dysfunction classes contain some long-term episodes. In these cases, the costs and the cost weights have been proportionally scaled to provide a standard 3 month episode cost.

A small number of the classes had low volumes of observations in this study. This was inevitable in a study that was a three month snapshot of only a proportion of sub-acute and non-acute care in Australia. Small volume classes were established in this first version of the classification only where the data
demonstrated that the episodes were sufficiently different from other episodes (based on both statistical and clinical criteria) and sufficiently similar to each other to justify the creation of a separate class.

The Palliative Care branch for inpatients has 11 final classes and achieves 20.01% variance reduction using data that had not undergone a final trim. This is considered to be satisfactory given that the dependent variable was phase cost, and not per diem, cost. As a further refinement, the data in each class were trimmed using the interquartile range method. This resulted in the trimming of a further 8 phases and a final reduction in variation of 20.98%. 7 of the 11 classes have a coefficient of variation of less than 1, and 4 have a coefficient of variation just over 1. The lower cost Terminal class has the highest coefficient of variation (1.26) indicating that there is considerable variability within the class.

The FIM-FRG version 1 model was tested for the Rehabilitation branch and was regarded as technically satisfactory. However, the number of classes in the FIM-FRG makes it impractical for application in Australia and New Zealand. The number of rehabilitation episodes is not sufficient to require a classification with 53 classes.

The model incorporated into the classification for overnight rehabilitation meets both statistical and clinical criteria. It has 32 classes and achieves a variance reduction of 38.21% with trimmed data. Interquartile range trimming resulted in the exclusion of 70 episodes from 18 of the classes.

Three impairment groups are terminating classes. Both the Pain Syndrome and the Cardiac Impairment groups had sufficient volume to be further split but variance explanation was not improved by doing so. Major Multiple Trauma had insufficient volume for a further split. On clinical advice, the small volume Burns Rehabilitation group were incorporated in with Stroke Rehabilitation. 6 impairment groups are incorporated together as 'All Other Impairments'. These impairment groups are Arthritis, Pulmonary, Congenital Deformities, Developmental Disabilities, Debility and Other Disabling Conditions.

Three of the 32 final classes are low volume classes. However, the episodes within each of these classes were sufficiently different from the other episodes to justify the creation of 3 low volume classes in the first version of the classification. Each of the classes is regarded as clinically sensible. All but three of the 32 classes have a coefficient of variation (CV) of less than 1 indicating that each of the classes is relatively homogeneous. One of these classes is the Assessment Only class. The other two classes are both low volume and have CVs of 1.00 and 1.02. 8 of the classes have over 200 episodes. The CVs for these 8 classes range from 0.57 to 0.81.

The Psychogeriatric inpatient branch has 6 final classes and achieves a reduction in variance of 36.40%. Only two episodes were excluded after applying the interquartile trim. All of the classes are small and range from 27 to 58 cases. However, the episodes within each of the classes were sufficiently different from the other episodes to justify the creation of each of the classes. Each of the classes is regarded as clinically sensible. All classes have a coefficient of variation (CV) of less than 1 indicating that each of the classes is relatively homogeneous. The CVs range from 0.21 through to 0.89. The CVs for the other 4 classes range from 0.66 to 0.74.

As a group, the Geriatric Evaluation and Management episodes had a starting point CV of only 0.91. This coefficient of variation indicated that the Geriatric
Evaluation and Management group was quite a homogeneous group. Because there was little variation within the group, there would not be very much variation to reduce. This proved to be the case in the results for the inpatient GEM branch. There are 6 final classes, with CVs ranging from 0.56 to 0.82 and the percentage reduction in variance (9.97%) is the lowest of the 5 overnight Case Types.

The overnight Maintenance branch has 11 final classes and achieves a reduction in variance of 42.99% on untrimmed data. This is slightly less than two alternate models that were developed. These initial models had explained 45.0% and 43.1% of the variance of cost. However, the final classification is regarded as more clinically sensible. After trimming, the classification achieves a reduction in variance of 52.95%. There is one final class for short-term Convalescent Care. This class is the most heterogeneous (CV=1.47) and requires the use of a more rigorous definition of Convalescent Care. With the exception of 'Other Maintenance', each of the classes is regarded as clinically sensible.

The AN-SNAP Version 1 ambulatory classification has 68 classes and five branches, one for each of the five Case Types. The number of classes by Case Type is shown in Table 9.

<table>
<thead>
<tr>
<th>Case Type</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care</td>
<td>22</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>15</td>
</tr>
<tr>
<td>Psychogeriatric Care</td>
<td>7</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>8</td>
</tr>
<tr>
<td>Maintenance Care</td>
<td>16</td>
</tr>
</tbody>
</table>

AN-SNAP Version 1 explains 28.11% of the variance in ambulatory episode costs. The reduction in variance within each Case Type is shown in Table 10.

<table>
<thead>
<tr>
<th>Case Type</th>
<th>RIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative Care</td>
<td>17.14%</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>28.58%</td>
</tr>
<tr>
<td>Psychogeriatric Care</td>
<td>20.06%</td>
</tr>
<tr>
<td>Geriatric Evaluation and Management</td>
<td>37.75%</td>
</tr>
<tr>
<td>Maintenance Care</td>
<td>22.49%</td>
</tr>
</tbody>
</table>

As with inpatients, several of the classes contain long-term care episodes. In these cases, the costs and the cost weights are based on the package of care provided over a 3 month episode.

For ambulatory palliative care, the best single variable for usefully explaining cost variations was the type of provider. The variable 'Provider Type' was more predictive of cost than type of phase or any other clinical variable. Type of episode was not predictive of cost. This finding was not unexpected as it had been identified during the initial study design and training period that a
considerable proportion of community palliative care is provided on a ‘shared-care’ basis with General Practitioners, Home and Community Care agencies, community nursing services and other providers. Only 21% of community palliative care services provided a 24 hour service. 68% of sites provided a service only during business hours and the remaining 11% provided an extended hours service.

By itself, the variable ‘facility’ explained only 11% of the variation in ambulatory palliative care cost. This could suggest that the ‘facility effect’ was not overly significant. However, it appears that a ‘facility effect’ was being masked by the significant variation that existed within each site.

There are 22 classes in the ambulatory palliative care branch, which is considerably more than expected. The number of classes is the result of the decision to group by Provider Type so as to control for the confounding effect of factors such as shared care arrangements and other variations between providers. The classification explains 17.14% variation in phase cost using trimmed data. This is the lowest of the 5 ambulatory Case Types. The classes are relatively heterogeneous, with only 7 classes achieving CVs of less than 1.00 and 17 classes having CVs larger than 1.00.

The ambulatory rehabilitation branch has 15 classes (4 assessment classes and 11 treatment classes) and achieves 28.58% reduction in variance. Eight of the classes have CVs less than 1.00 and 7 of the classes have CVs that a greater than 1.00. Three of the 7 classes with large CVs were created for clinical reasons as each contains patients who are regarded to be clinical homogeneous irrespective of the variations in the cost of their care. These three classes are for amputee, spinal injury and brain injury rehabilitation episodes.

The ambulatory psychogeriatric branch has 7 final classes (2 assessment and 5 treatment classes) and explains 20.06% of the variance in cost per episode with trimmed data. At the level of the class, the results are mixed. Three of the classes have CVs of less than 1.00 and 4 have CVs larger than 1.00.

The ambulatory GEM branch has 8 classes (3 for Assessment Only and 5 for treatment) and achieved 37.75% reduction in variance after the trimming of 39 episodes using an interquartile range outlier trim. This was the best statistical result of any of the ambulatory branches. However, at the level of the class, the results are again mixed. Four of the classes have CVs of less than 1.00 and 4 have CVs larger than 1.00.

The ambulatory maintenance branch has 16 classes (6 for Assessment Only and 10 for Maintenance and Support) and explains 22.49% of the variance in episode costs. As with palliative Care, the variable ‘provider type’ proved to be a good predictor of costs suggesting that the result may have been confounded to some degree by factors such as shared care arrangements and patterns of multiple agency utilisation including the provision of services by General Practitioners, Home and Community Care agencies and other community nursing services and community care providers. At the level of the class, the results are again mixed. Nine of the classes have CVs less than or close to 1.00 and 7 have CVs larger than 1.00.

The classification makes use of 6 variables that are standard across all case types and 6 variables that are specific to one or more case types. They are:

Case Type
Case Type is the first splitting variable used in each branch of the classification. This is consistent with the results of the second phase of the study.

**Assessment only**

A significant percentage of both outpatient and community care was for 'Assessment Only'. 'Assessment Only' episodes were defined as those in which the person was seen on one occasion only for assessment and/or treatment and no further intervention by the service/team was planned. 'Assessment Only' episodes were defined to include one-off treatment provided during an assessment and also an assessment that took place over more than one day.

**Episode Type**

Four Episode Types are included and, in some branches, the type of episode is used as a classification variable. The four Episode Types are:

- Overnight admitted patient;
- Same day admitted;
- Outpatient; and
- Community client.

**Provider Type**

Several splits in the classification are defined by type of provider, rather than by patient characteristics. In some cases, the split is solely into 'Sole Practitioner' versus 'Not Sole Practitioner'. In other branches, a more detailed approach is employed to define five types of Providers:

- Nursing (care provided solely or predominantly by enrolled and/or registered nurses)
- Psychosocial (care provided solely or predominantly by social workers, psychologists, Aboriginal health workers, or chaplains);
- Physical Therapy (care provided solely or predominantly by physiotherapists, occupational therapists, speech pathologists or therapy aids);
- Medical (care provided solely or predominantly by doctors);
- Multidisciplinary (multidisciplinary or inter-disciplinary care provided by a team of providers including care provided by all other designations).

As already noted, this variable is not strictly a casemix variable. Instead, it is used as a proxy for usage of other health and community services and to control for variation in provider practices.

**Function (motor and cognition)**

Consistent with previous research, a measure of motor function is incorporated as a splitting variable for all Case Types. The measurement instrument varies between the Case Types. Nevertheless, all are measuring the same underlying patient attribute, albeit with various levels of sophistication. The FIM instrument is used for Rehabilitation and GEM episodes. This instrument is the national standard of the Australasian Faculty of Rehabilitation Medicine and has well-established technical properties in relation to its validity, reliability and sensitivity67. 75.4% of all Rehabilitation and GEM episodes in the study had a FIM score, suggesting that this measure is acceptable for routine clinical use.
However, the FIM instrument requires accredited training and, with 18 items, is the most time-consuming of the measures to use. It is the only one of the tested measures that incorporates both motor and cognitive function. On the basis that it requires extensive training, that it is expensive to use in routine practice and that the cognitive items are not required for the other Case Types, the SNAP Clinical Panel did not support its use for the other Case Types.

The RUG-ADL measure is used for both palliative care and maintenance episodes. With only 4 items, it is quick and easy to use but is not sensitive to change. However, sensitivity to change is not an essential criterion for these two Case Types. Function is incorporated into the classification as a measure of dependency (particularly for nursing care) rather than as a measure of outcome.

Function also proved to be a good cost predictor for psychogeriatric episodes and the RUG-ADL also proved to be the best measure of function for psychogeriatric episodes. However, the expert clinical panel supported the use of only one measurement instrument - the HoNOS - instead of the three that would be required if the classification required usage of the RUG-ADL. In consequence, the HoNOS ‘ADL’ item was substituted for the RUG-ADL. The effect was to reduce the RIV and to increase clinical acceptability.

Age

In contrast to much of the previous research, the variable ‘age’ was found to explain variations in cost for some (but not all) types of patients. Age is used as a splitting variable to create 10 classes in four of the five case types - palliative care, rehabilitation, GEM and maintenance. The influence of this variable differs between the case types.

For both palliative care and rehabilitation, young people were found to consume more resources than older people. For GEM and maintenance episodes, the patterns were reversed.

Rehabilitation impairment

The variable ‘impairment’ is incorporated into the rehabilitation classification although its predictive power as a single variable is not great. Its value is that, by first splitting rehabilitation episodes by impairment, the underlying explanatory power of the function variable increases at the next level. However, not all rehabilitation impairments are separately identified, with 6 of the 16 impairments grouped together as ‘all other impairments’. This generic category contains 12.78% of all episodes.

In contrast to rehabilitation, the variable ‘impairment’ is not used in the GEM branches. 39% of all GEM episodes were found to have non-specific impairment codes (‘pulmonary’, ‘other disabling condition’ or ‘debility’) and the variable ‘functional impairment code’ achieved an RIV of only 2.3%.
Palliative care phase

Consistent with previous research, the stage of illness (or phase) proved to be the best predictor of costs for palliative care episodes. The measurement instrument used in the classification is a refinement on the measures used in previous studies.

Palliative care problem severity

Previous research has suggested that this variable would be a good predictor of palliative care costs in both the inpatient and ambulatory settings. This was not found to be the case in the inpatient setting and, in consequence, it was not incorporated into that branch of the inpatient classification.

The results in the ambulatory setting were mixed. Palliative care problem severity proved to predict cost for patients in the stable and deteriorating phases. However, for the unstable or deteriorating phases, the palliative care problem severity score needed to be combined with motor function (as measured by the RUG-ADL) before it could predict cost.

Challenging behaviour

A measure of challenging behaviour was the single best variable for explaining variations in cost between the psychogeriatric episodes. The RCI Behaviour Score was recommended as the first split by both CART and PC-Group. However, as the expert clinical panel supported the use of only one measurement instrument - the HoNOS - instead of the three that would be required if the classification required usage of the RCI in combination with the RUG-ADL and the HoNOS, the HoNOS ‘Overactivity’ item was substituted for the RCI. As with the RUG-ADL, the effect was to reduce the RIV and to increase clinical acceptability.

Severity of mental health disorder

Overall severity is measured in the psychogeriatric episodes by use of the HoNOS total score. This is a composite measure of health status and symptom severity. The HoNOS total score is incorporated in both the overnight and ambulatory branches although its predictive power differs according to the setting. In the overnight setting, the single measures of function and challenging behaviour are more influential than overall severity. In the ambulatory setting, the HoNOS total score proved to be the best predictor of costs for episodes not classified as being of the ‘acute’ phase.

Psychogeriatric phase

The variable ‘phase’ (termed ‘Focus of Care’ in the parallel MH-CASC study) did not explain any of the variance between overnight psychogeriatric episodes but it proved to be the best single predictor of cost for the ambulatory psychogeriatric episodes. The recommended split was the establishment of a separate class for the ‘acute’ phase. Nearly 70% of overnight episodes had been assigned to the acute phase. Only 23% of the community episodes (n=32), and none of the outpatient episodes, had been assigned to the acute phase. The community acute phase episodes proved to be the most costly on an episode basis but not on a per diem basis. They were grouped together to form a class.
Given that this variable is used to create only one split in the entire classification, the results suggest that, if it is not included in the parallel MH-CASC classification, it should be excluded from further versions of the AN-SNAP classification. The ongoing cost of data collection and data entry may not be justified by a narrow application. In that case, it may be that a combination of HoNOS items can be found to act as a substitute.

Summary of results in relation to casemix design principles

Previous research suggested four casemix design principles. The first is that the cost drivers used in the design of the classification should, wherever possible, be related to patient characteristics and not to the type, or extent, of services utilised. Of the 12 variables in AN-SNAP, 9 measure patient characteristics and 3 (episode type, assessment only and provider type) measure the type of services utilised.

The second principle is that the selection of the cost drivers should result in minimum variation within each class and maximum variation across classes. AN-SNAP explains 57.99% of the variation in all episode costs. Of this 58%, 21% was contributed by Episode Type and 37% by the classes. This suggests that the classification has achieved acceptable variation across classes. The results with respect to within-class variation are mixed. 82 of the 134 classes have a CV of 1.00 or less, indicating that they are relatively homogenous. A further 24 classes have a CV of between 1.01 and 1.20. At the other extreme, there are 6 classes with a CV of more than 1.50. Of these 6 classes, 5 are for ambulatory episodes and 1 is for inpatient episodes. Almost all of the classes with a large CV were established so that each of the classes was clinically sensible.

The third principle is that the resultant classification must contain sensible clinical groups. According to the expert clinical panel, AN-SNAP meets this criterion.

The final design principle is ease of collection. The variables used in the classification should be capable of routine collection, coding and data entry. Of the 12 SNAP variables, only 2 (Episode Type and Age) are routinely collected across all health care services.

The collection of the variable ‘Case Type’ would require a change to the definitions currently in use. Whether or not a person is seen for ‘Assessment Only’ is generally recorded in a patient medical record but is not routinely coded or analysed. While many services collect some measure of function (motor and cognition), there are no national standards and such data are not routinely coded and analysed. The same applies to a measure of ‘challenging behaviour’. Likewise, while most rehabilitation services collect a measure of ‘rehabilitation impairment’ there are no national standards and the data are not routinely coded and analysed. Five of the variables are new items for which data collection systems need to be established. These are ‘provider type’, ‘palliative care phase’, ‘palliative care problem severity’, the HoNOS for psychogeriatric episodes and psychogeriatric phase.

In summary, the data support the hypothesis that the patient attributes which have best predicted cost in previous studies can be used to develop an Australian classification and costing system for sub-acute and non-acute care. The AN-SNAP classification was developed for the classification of both overnight and ambulatory care. It explains 56% of the variation in episode costs and makes use of 12 variables, 6 of which are standard across all Case Types and 6 which are specific to one or more Case Types.
Discussion

Methodological Issues and Limitations

A key feature of this study is that several study components were undertaken as discrete phases within the overall integrated study. This meant that lessons learned from one phase could be incorporated into the next phase. On the other hand, it also meant that a certain amount of repetition was inevitable.

The study methodology for the development of the initial conceptual framework did not involve empirical research. Rather, it consisted of a literature review and six months intensive consultation with over 1,000 health care providers, funders and managers. This approach had both strengths and weaknesses. Its fundamental weakness is that it lacked scientific rigour. Nevertheless, the strength of the methodology was that it ensured that the initial conceptual framework would be clinically acceptable in the latter stages of the research.

The next phases of the study aimed to empirically test the issues and the clinical opinions identified in the first phase. The major limitation with the NSW study in phase 2 of the research was that it did not adequately address some fundamental issues. While leading contender variables were identified, the determination of the dependent variable (per episode or per day) was that adequately addressed. Likewise, issues such as the definitions of episode types and rules with respect to the start and end dates of episodes were not adequately addressed. A further methodological limitation was that the six months data collection period was too long a period to realistically expect study sites to collect all of the required data. This affected data quality. Other limitations of this phase included the lack of standard measures of ADL dependency and level of functional impairment; the exclusion of services for children; and the exclusion of sub-acute and non-acute services provided on an ambulatory basis.

The AN-SNAP study methodology had both strengths and weaknesses. The study broke new ground in that the sample was large and representative of both clinical practice and costs in Australia. At the same time, it captured actual costs and did not rely, as previous international studies had done, on using proxies for the dependent variable (episode cost). The response variable was consistently defined and strict data editing ensured that the data were of a high quality. Incomplete 'episodes' were removed so that they did not confound the results and issues relating to the definition and classification of seemingly ongoing episodes were addressed in the study design.

A further strength of the study methodology was that it included the full spectrum of care settings. The inclusion of ambulatory and community care has no international precedent.

Consistent with the goal of developing a patient-based casemix classification, the scope of the study was determined by patient characteristics and care goals rather than by unit of treatment. The sample included general as well as designated specialist treatment units and the methodology allowed patients in designated services to be classified based on their clinical characteristics rather than the designation of the service provider. In that sense, the study has made an important contribution to understanding the interfaces between the various streams of care.
A significant strength of the study methodology was the involvement of expert clinicians at all stages from initial design through to analysis. Previous research had indicated that clinical ownership is a pre-requisite for the development and acceptance of a new classification. Several classifications discussed in both the Australian and international literature reported good technical results. However, they were not clinically acceptable and were never adopted for implementation. While the involvement of expert clinicians ensured that the final result met the test of clinical acceptability, it also influenced the selection of measurement instruments and the shape of the final classification. This occurred irrespective of whether technically superior measurement instruments or classification models with higher RIV results were available.

The methodology also had limitations. The scope of the study was limited to Australia and New Zealand and it is not possible to assess the relevance of its findings to other countries. Based on the lessons learned during phase 2 of the study, the final data collection period was only 3 months. One consequence is that a significant proportion of episodes were incomplete and were removed from analysis.

While the sample size was the largest of its type ever assembled, it was not sufficiently large to allow most data sub-sets to be split into a test sample and a re-test sample. To do so would have resulted in both sample groups being too small to test the study hypotheses and to produce results which would have been reliable. The exception was inpatient rehabilitation where two thirds of the episodes were randomly assigned to the test sample and one third to the re-test sample.

The combination of trimming the 'starting' and 'ending' episodes and splitting the data base into a test sample and a re-test sample created difficulties even in overnight rehabilitation. The initial sample for overnight rehabilitation was 7,303 episodes. The final test sample was 3,738 and the re-test sample was only 1,569 episodes. These sample sizes were too small to use for testing the FIM-FRG classification, which had been one of the purposes of the study. In consequence, the FIM-FRG classification was tested on the full sample of 4,707 episodes that did not straddle the start or end points of the study.

The study did not aim to develop new measurement instruments or new statistical techniques but rather to make use of the best of the instruments and analytic methods already available. The choice of the instruments used in the study was influenced by both technical and practical considerations and several instruments proposed by the researcher were rejected by the clinical panel as being impractical for routine application.

One consequence is that other factors which may be cost-drivers were not included as they were regarded as too complicated to measure in a consistent way across 104 diverse study sites. The availability of a carer and other personal support was not captured because no validated measurement instruments could be identified that were acceptable to the clinical panel. Two previous studies have found no difference between the resource consumption of people with and without carers and the panel considered that the item should not be re-tested until a suitable instrument was developed.

The use of other health and community services by community clients was also not captured on the basis that, in the absence of validated instruments, there was no way to measure and analyse usage of other services - it remains unclear...
whether the attribute to be measured is the number of other services, the adequacy of services or the degree to which services are substitutable.

The failure to capture a measure of instrumental ADLs is a major limitation of the work to date. As with the other missing items, the collection of instrumental ADLs was rejected because of the data collection burden for staff, the lack of a validated tool and the significant training implications of introducing a new measurement instrument to every site in the study.

Two other items that may also influence costs were omitted for similar reasons. A measure of social and environmental problems was adopted for palliative care episodes (the AAHPC Severity Scale) and for psychogeriatric episodes (the HoNOS) but suitable measures could not be identified for the other Case Types. Finally, the study would have been enhanced if a quality of life measure had been included. However, the item was rejected because of the data collection burden for staff, the lack of validated tools suitable for this population and the significant training implications.

Two other limitations of the current research suggest areas for future research. The study captured the cost of average clinical practice as it existed during the study period rather than what might be considered to be good or best practice. The development of casemix classifications based on best practice remains as a significant research challenge in the next stage of casemix development.

Finally, the study did not attempt to develop a classification that spanned treatment settings (an ‘episode of illness’) but rather measured and classified each individual episode of care. Only about 15% of patients had more than one episode in the three month data collection period, with the resultant sample being too small to warrant analysis. It seems that long data collection periods (as much as one year) are required for research into the classification of episodes of illness. This implies that future research in this area will need to make use of retrospectively collected routine data rather than by the conduct of a one-off study.

In summary, the method used to develop the classification did not break new ground. It used established statistical methods and was the same as that used to develop the AN-DRG classification and other classifications. It involved the development of a set of clinical hypotheses by the Clinical Panel and then an iterative process of statistical testing and clinical review. Use was made of the test and re-test methodology but only in the branch with sufficient volume to allow it to be used - overnight rehabilitation. Again this was no different to the method used to develop the AN-DRG classification where no test and re-test could be undertaken in the low volume groups.

Discussion of results

The data support the hypotheses that, within sub-acute and non-acute care, there are five Case Types, each of which is clinically distinct as measured by patient attributes. This finding applies to both hospital inpatient and ambulatory care. An expert clinical panel reviewed the data and a detailed analysis of the Rehabilitation, GEM and Maintenance Case Types was undertaken as part of determining whether the incorporation of the GEM Case Type could be justified.
An equivalent analysis of the other two Case Types was not undertaken. In the case of palliative care, the initial data analysis, in combination with clinical opinion, suggested that palliative care is a distinct case type.

While the data supported a further review of the Psychogeriatric Case Type, the volume in the AN-SNAP study and the existence of the parallel National Mental Health Classification and Services Cost (MH-CASC) project suggested that such a review should constitute an item for future research rather than being attempted at this point. The MH-CASC study included psychogeriatric care provided within specialist mental health services whilst the SNAP study focused on psychogeriatric care provided more within aged care services. The amalgamation of the two psychogeriatric data sets will allow further analysis to be undertaken. It will be important to determine whether the clinical profiles and patterns of care of the two cohorts are similar or different. It will also be important to determine whether the AN-SNAP and the MH-CASC classifications should have common psychogeriatric classes in subsequent versions.

The results suggest that there is an underlying episode classification, not just in overnight care, but also in ambulatory care. It is possible to classify both inpatient and ambulatory episodes (outpatients and community health) on an episode basis and not just a per diem basis. The statistical performance of AN-SNAP can be reviewed against three benchmarks.

The first comparison of performance is in relation to Australian DRGs. In the AN-DRG classification, episodes are partitioned into Major Diagnostic Categories and then further partitioned into medical (non-procedural) and surgical (procedural) classes. The classification is used to classify both overnight and same day cases. Length of stay is used as the dependent variable.

Research by Palmer et al\(^70\) indicates that, after the exclusion of non-acute episodes and the removal of outliers, the AN-DRG classification explains 35.4% of variance in length of stay of overnight medical episodes. The upper outlier trimpoint was 1.5 times the Inter-Quartile Range (IQR) above the third quartile with a minimum IQR of 1. No lower trimpoint was employed. Approximately 11% of episodes were excluded prior to the calculation of variance explanation. The classification achieves much better variance explanation when surgical episodes and same day cases are included (50.83% with trimmed data). The performance of the AN-SNAP classification (both overall and in most of its branches) is better than the performance of the medical DRGs.

Finally, the statistical results achieved in the current study can be compared with previous international and Australian sub-acute and non-acute studies. The most developed (and best performing) of these is the FIM-FRG 1 classification of inpatient rehabilitation episodes. This classification has 53 final classes and the natural logarithm of the length of stay (LOS) was used as the dependent variable. The classification explained 31.3% of the variance after the removal of excluded cases (approximately 18% of all rehabilitation episodes) and outliers\(^71\). The outlier threshold was three standard deviations from the Rehabilitation Impairment Code (RIC)-specific natural logarithm of the RIC-specific mean length of stay. Again, the performance of the AN-SNAP classification (both the overall classification and its inpatient rehabilitation branch) is better than the performance of FIM-FRG 1.

The results achieved with the AN-SNAP version 1 ambulatory classification (RIV of 28.11%) are lower than that achieved with inpatient episodes. This had been expected for several reasons. First, considerable developmental work had
already been undertaken in the inpatient setting that could be used to guide the study design. Second, of the limited work that has been undertaken to date, most has been based on the premise that any classification would use the cost of an occasion of service or a day of care as the dependent variable. In contrast, the cost of an episode was the dependent variable in this study. Third, few of the available measurement instruments were designed for use in ambulatory care. Fourth, ambulatory care is inherently more complex than institutional care. The inpatient environment is much more controlled in that key decisions driving resource consumption are generally under the control of the care provider. A range of other factors are important cost drivers in ambulatory care. They include client preferences, the availability of substitutable services and the availability of carers.

Given the exploratory nature of this side of the study, this result is considered to be satisfactory for the first version of the national classification. It suggests that the classification provides a viable structure for further development. With the exception of ambulatory palliative care, the statistical result is sufficiently high to allow it to be used for both management and funding purposes provided that there is a satisfactory transition period including the modelling and analysis of results at the agency level.

A critical finding of this study is that there is significant diversity in the cost of sub-acute and non-acute care. There is a 30 fold variation in episode cost between the most expensive and the least expensive class in the AN-SNAP overnight classification and a 5 fold variation in per diem cost. Likewise, there is significant diversity in the cost of ambulatory sub-acute and non-acute care. There is a 48 fold variation in episode cost and a 5 fold variation in per diem cost between the most expensive and the least expensive class in the ambulatory classification. If there was little variation in the cost of care, there would not be a need for a casemix classification. The results of the current study suggest that the development and implementation of a casemix classification is justified.

Another important finding is in relation to cost drivers in different treatment settings. The variables driving costs in the inpatient setting are also important cost drivers in the ambulatory setting. However, there are other factors at work in the ambulatory setting. Community care is inherently more complex than institutional care. Common patient variables across institutional and community care are necessary but they are insufficient to adequately explain cost variation in ambulatory care.

Issues requiring further research

A number of the study findings, as well as its limitations, suggest an ongoing agenda for further research. A number of issues remain unresolved and warrant further research. A fundamental issue is the definition of 'acute care'. This research has attempted to separate and classify function-related (sub-acute) and supportive (maintenance) care from acute care. It was outside the scope of the current research to define 'acute care' or to test the inter-rater reliability of the current national definition of 'acute care'. A fundamental issue to be resolved is whether, for casemix purposes, the unique feature of acute care is actually the acuity of the patient or rather the presence of a clearly identified principal diagnosis that can be used to assign a patient to a "diagnosis related group". Once this issue is resolved, it will be necessary to test the boundary between 'acute care' and the care reported in this study.
In the interim, several boundary issues remain unresolved. One is the boundary between post-acute and maintenance care. The questions to be resolved through further research include the definition of post-acute care and the criteria to be used to distinguish post-acute and maintenance care. The interventions provided to post-acute and maintenance clients are often the same. The key differences appear to be in the primary goal and the expected duration of care. In post-acute care, the primary goal is restoration of previous health and function leading to care closure within a matter of weeks. In maintenance care, the primary goal is maintenance of current health and function if possible and there is no short-term expectation of case closure. However, while the differences between the two can be described, it is unclear whether they can be defined for routine application.

A related issue is the definition of the term ‘aged care’. This term is in common usage in the Australian health care system and is used to refer both to service providers and to consumers. It is clear from the analysis of the SNAP data that aged care cannot be defined simply based on the age of the consumer. The majority of all consumers in all case types were older people. Clearly, some older people require acute care while others require palliative care, rehabilitation, psychiatric or supportive care. While acute care episodes are related to a patient’s principal diagnosis, GEM episodes are related to complex and multidimensional clinical needs. However, the distinction between a GEM episode and an acute care episode is yet to be tested.

Further research is required to refine the definition of the dependent variable - the ‘episode of care’. While rules were developed and applied in the current study, there is a need for further refinement once casemix concepts move beyond the inpatient setting. One of the issues to be addressed is how to deal with concurrent episodes. Under what circumstances can a patient have two episodes of care at the same time? Can a patient have two concurrent episodes of two different case types (say, mental health and palliative care)? Can a patient have two concurrent episodes of the same case type but different episode types (say, same day admitted patient and community client)? Given that many people receive services from multiple services managed by the one organisation or funded from the same source, how can an episode of care be defined so that it is not determined by variations in the way that services are organised? If a person uses services from two community agencies, should that be defined as being one or two ‘episodes’? What is an agency for classification purposes - is it defined by funding source, management structure or some other criterion?

A related issue is to resolve is how to deal with seemingly ‘ongoing’ episodes of care. The only approach used to date has been to classify and fund such care on a daily basis. The approach taken in the current study represents a significant milestone in casemix development as it moves the dependent variable from a ‘day of care’ to an ‘episode of care’. Episodes are defined as being either ‘complete’ (with a case opening and a case closure within 3 months) or ‘ongoing’. For ongoing episodes, an ‘episode of care’ is defined as a three month period of care. At the end of each three month period, the person is reassessed. Reassessment may result in the person being assigned to their previous group, or to a new one if their need/condition has changed during the three month time period. However, other methodologies for dealing with seemingly ongoing episodes are yet to be tested.

In addition to those already identified, areas for further research include the development of more sensitive measurement instruments; analysis of a subset of the palliative care sites in order to control for the influence of ‘shared-care’
arrangements and, if necessary, to develop an alternative model based on a per
diem classification; an expansion of scope to include the acute / post-acute and
primary care provided by community health providers; and the identification of the
relationship with, and boundary between, classification development in health,
HACC and other community care.

With the introduction of routine collection of the source data items, it will be
possible to refine the lower branches of the classification. Specific areas
requiring further attention include brain injury and burns rehabilitation, the
classification of care provided to children (especially in rehabilitation and
palliative care) and resolution of the boundary issues surrounding
psychogeriatrics.

A number of data items should be tested for inclusion in subsequent versions of
the classification. One is a measure of motor function that is appropriate for
routine application in a community setting. This study employed the FIM for both
Rehabilitation and Geriatric Evaluation and Management and the RUG-ADL for
Palliative Care, Psychogeriatrics and Maintenance. The SNAP Clinical Panel
agreed that, in the absence of a measure designed specifically for use in the
ambulatory setting, the FIM was appropriate for incorporation in the classification.
The RUG-ADL is easy to use, acceptable to community providers and requires
minimal training. However, it has only 4 items and 4 levels and lacks sensitivity.
The majority of the ambulatory maintenance episodes had a RUG-ADL score of
4.

There are no existing tools that are better for the task and, pending the
development of an improved tool, both the FIM and the RUG-ADL are
recommended for routine use. Any new measurement instrument will need to be
quick to use in the ambulatory setting, require minimal observation, have
sufficient sensitivity to discriminate between the motor capacity of ambulatory
clients, be useful for clinical assessment and be demonstrated to be predictive of
cost. Given these requirements, it may be some time before a better tool is
developed that can satisfactorily replace the FIM and the RUG-ADL.

A further issue is that, regardless of sensitivity, self-care Activities of Daily Living
scales (whether measured by the RUG-ADL, Barthel or FIM) may not be
sufficient measures for use in a community setting. There are several existing
instrumental scales but little consensus on which is the best to use and little
empirical testing to assess the degree to which they predict resource utilisation.

Consultation with clinicians suggests that carer availability influences the type of
services that are provided and therefore affects resource consumption. If this
item is to be captured, it will not be sufficient to simply ask whether the person
lives alone. The key issue is to determine whether the client has a carer who is
both willing and capable of undertaking tasks that would otherwise be undertaken
by a health professional and, if so, whether this has an impact on the utilisation of
health care resources.

Whether and how to capture usage of other health and community services by
community clients needs to be resolved. If work proceeds on this issue, it will be
important to determine if the attribute to be captured is the number of other
services, the adequacy of services or the degree to which services are
substitutable.

Finally, the results from this study indicate that one-off and short-term
assessment and/or treatment constitutes a significant proportion of ambulatory...
care. Further versions of the classification need to give attention to effective ways of discriminating between these episodes.
Conclusion

Each of the original publications is included in support of this application. The ten publications include reports commissioned for government, detailed research reports, published journal articles and published conference papers. The choice of this particular selection of works is deliberate and is aimed to demonstrate that the scholarship they represent is not only rigorous but is also relevant to the real world of health service delivery. This is fundamental in demonstrating that the research has been conducted in a way consistent with two of the four key design principles of casemix classification – that the resultant classification must be clinically relevant and that the source data items are capable of routine collection and reporting.

This integrated program of research has demonstrated that it is possible to define, identify, classify and cost the various types of patients treated in the Australian health care system. An episode of inpatient care is no longer defined as being the complete period from admission to discharge. Nor is it defined by the name of the ward to which the patient is admitted. Instead, it is now recognised that a patient can move through two or more acuity episodes during the one stay in hospital. Indeed, in the case of palliative care, it is recognised that an episode of care may continue after the death of the patient. Further, it has now been demonstrated that systems can be established to allow for such identification on a routine basis, regardless of whether the care that the patient receives is delivered on an inpatient or ambulatory basis.

A conceptual framework centred around three broad streams of care (acute; sub-acute; and non-acute) has been developed over the six years represented by the publications submitted for examination. This framework, and the resultant classification and costing systems for sub-acute and non-acute care, have been tested through both through industry consultation (as represented by the publications included in Phase 1 of the research program) and through empirical research (as represented by the publications included in Phase 2 and Phase 3 of the research program).

The results of this research have already been implemented in the Australian health care industry. A further outcome is that an ongoing research agenda has been established to resolve the limitations previously identified and to examine ambulatory care in more detail.

A complete list of publications from 1992 to 1998 is submitted in support of this application.
Acknowledgements

Several components of the research submitted for assessment have involved collaboration with other researchers. Ms Kerry Innes contributed technical expertise in the definition of source data definitions and in coding standards during phase 1 of the research. Ms Carmel Kennedy worked as a research assistant during phase 2 of the project and coordinated and supported the study sites. Professor Donald Hindle assisted in the study design and undertook some preliminary analysis of the data. Mr David Cromwell contributed expertise in statistical analysis and undertook most of the statistical analysis. Dr Lynette Lee chaired the clinical advisory committee for this stage of the research. Twelve research assistants, named in the full report, contributed to phase 3 of the research. They contributed technical expertise in software development, data management, clinical costing and statistical methods and undertook training of clinical staff participating in the various studies; budget management of the various research budgets; and data management. In addition, a team of 14 clinicians contributed considerable clinical expertise as members of the SNAP clinical panel. Two of those clinicians, Dr Lynette Lee and Dr Michael Smith, contributed with the writing of one of the submitted journal articles.

The assistance of both the Commonwealth and the NSW Department of Health is acknowledged, as is their agreement to use the various research reports they funded for academic purposes including teaching, publication and further research.
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Books - editor


Books - author of chapter


Journal articles


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Published conference papers


**Reports**


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Phase 1

Development of the Initial Conceptual Framework


Creating A Common Language: The Production and Use of Patient Data in Australia

Eagar K. and Innes K. (1992)
Executive Summary

This is the final report of the Patient Abstracting and Coding Project. The Patient Abstracting and Coding Project has been funded by the Commonwealth Department of Health, Housing and Community Services as one of six projects within the Casemix Development Program. The six priority areas (patient abstracting and coding - the subject of this report, patient costing, quality assurance, education, information systems, and payment system design) will assist in the development of a hospital payment system which takes into account casemix - adjusted output. The target date for this system is 30 June 1993.

This report is the result of six months intensive consultation across Australia involving over 1000 healthcare providers, funders and managers.

The identification and definition of source data items required for the Australian DRG classification system cannot be achieved without defining the boundaries of the DRG system itself. The approach taken in this project has been to establish the boundaries of the DRG system through widespread consultation within the health industry.

In Section 4 of this report we propose that the DRG classification system should be used to classify only those patient groups whose diagnosis, modified for factors such as age and comorbidities, is a good predictor of length of stay. We do not support the use of the DRG classification system for all patients who are treated in "acute" hospitals.

We propose that patient episodes of care be categorised into three levels - acute, sub-acute and non-acute - and that only acute episodes of care be classified using the AN-DRG system. We also propose that non-inpatients, psychiatric episodes of care, teaching and research be excluded from the DRG system.

In Section 5 we discuss current variations in data collection practices. Some of these variations are of fundamental importance. Across Australia:-

* there is no agreement about the definition of a hospital
* there is no agreement about the definition of the boundary between non-inpatient and inpatient care
* there is no agreement on how to calculate hospital length of stay
* there is no agreement on the classification of boarders
* there is no agreement on the classification of newborns
* there is no agreement on the recording of activity occurring in Emergency Departments
* there is no agreement on the definition of Principal Diagnosis

In our view, the standardisation of patient information collected in the Australian hospital system is essential and we recommend in Section 5 that the
Commonwealth seek the agreement of all states and territories to the standardisation of patient information including the standardisation of source data definitions.

In Section 5 we present a conceptual overview of the proposed definitions and we outline the contentious issues involved in their formulation. These contentious issues include the definition of Principal Diagnosis (page 31), a hospital (page 38), same day patients (page 39) and the classification of newborns (page 46).

Section 6 of this report discusses the vital contribution of clinicians in the provision of source data required for casemix.

The quality of current medical record documentation varies considerably from hospital to hospital and from clinician to clinician. Some medical record documentation is of extremely high quality. Much is not.

There is clearly a need to improve source data quality through a co-ordinated strategy involving hospitals, education establishments and professional colleges and associations.

The use of casemix data should not wait until source data quality has improved. Quite the reverse, source data quality will only substantially improve when the data is used.

Strategies to improve the quality of documentation include making documentation the responsibility of the most senior doctors (and not the most junior as is currently the case), building incentives into the system, providing feedback to clinical staff and educating clinicians about the importance and role of the medical record. Administrative change to improve the logistics of documentation is required as well as cultural change within hospitals to ensure that all staff appreciate the role of the medical record in patient care and in health information and funding. Finally, we propose that, if all else fails, hospitals should institute penalties against clinicians who fail to comply with documentation standards.

In Section 7 we outline a national strategy to improve coding quality. We propose that the ICD.9.CM disease classification be maintained for use in Australia but that the ICD.9.CM procedure classification be replaced within 5 years with a classification system better suited to Australian clinical practice.

As part of this project we have developed National Coding Standards for Inpatient Data Collections. These are seen as the building block for data quality and their development represents a significant milestone in coding practice in Australia.

We have proposed that a National Coding Authority be established:

- to determine future national coding standards for ICD.9.CM

- to produce a national newsletter which outlines new and updated standards

- to answer queries on coding issues
Creating a Common Language: the production and use of patient data in Australia

- to recommend on future changes to the AN-DRG classification system from a coding perspective
- to provide advice on coding to the Australian Casemix Clinical Committee (ACCC) and other relevant clinical associations
- to review and edit ICD.9.CM yearly updates before distribution by a nominated national printer

and we have indicated that there are clear advantages in locating the National Coding Authority with the National Reference Centre for Classification in Health (Queensland).

A further strategy to improve data quality is to introduce a national standard whereby coding be undertaken from the whole record and not simply from the front sheet. The implementation of this strategy would require the agreement of the states to phase out central based coding and concurrently introduce on-site coding in hospitals.

In Section 7 we explore ways to standardise and improve coder education. Three possible approaches have been considered:

1. introduce accreditation of coding courses
2. introduce accreditation of coding teachers
3. introduce accreditation of coders

In our view the preferred approach is to introduce national accreditation of coders and for the Commonwealth, the States and the Medical Record Association of Australia to encourage a range of educational courses to develop in response to local need.

With the introduction of national coder accreditation, we expect that an industry standard will develop and that inadequate courses will cease to attract students.

Courses able to produce students capable of achieving national accreditation will develop and flourish. These courses will attract both entry-level students and experienced coders seeking re-accreditation.

We have formally proposed that a national system of coder accreditation be introduced under the responsibility of the Medical Record Association of Australia.

Accreditation would be voluntary and would be available to both Medical Record Administrators and morbidity coders.

Accreditation will be for a period of 2 years with ongoing accreditation being dependent on participation in ongoing education and other requirements as specified by the Medical Record Association of Australia. It is our expectation that accreditation testing should be available within 2 years to all coders who apply to be tested.
It is proposed that the Medical Record Association of Australia establish a Morbidity Coding Accreditation Board to manage National Coder Accreditation. The Board should consist of representatives of the Commonwealth, States and Territories, Morbidity Coders, the Health Insurance Industry and the Australian Private Hospitals Association.

The final issues addressed in Section 7 relate to coding quality improvement and audit. Specific strategies are proposed to improve data quality and particular emphasis is given to the improvement of quality at the hospital level.

Section 8 of the report addresses coding workforce issues. In our view there are several structural issues which need to be addressed as a prerequisite to improving coding quality. Coding is a task which requires a skilled and stable workforce. In contrast, the current coding workforce can be characterised as being substantially part-time, with high staff turnover and low pay. A 1991 study of the coding workforce in New South Wales found that only 13% of the workforce were full-time and that area health services in Sydney had a 64% turnover of coding staff in two years (Watson and Gough, 1991). The average salary for a skilled morbidity coder is $23000 per annum and there are few opportunities for promotion. It is hardly surprising that the workforce turnover is high.

In our view there is little point in investing in new coding technology, introducing accreditation and embarking on comprehensive coder training if basic structural issues relating to the coding workforce are not addressed. These structural issues are appropriately the responsibility of the hospitals and the State and Territory health authorities.

In Section 8 we propose coding workload standards. The proposed workload standard is one full-time equivalent coding position for 10000 - 13000 separations per annum. This standard is based on a proficient coder and includes coding, indexing, training and coding quality improvement. It does not include other functions undertaken in medical record departments.

In the final sections of the report we discuss implications for the States and Territories and for the private sector. These sections summarise issues raised elsewhere in the report.
Volume 1, Section 1  Background

This is the final report of the Patient Abstracting and Coding Project. The Patient Abstracting and Coding Project has been funded by the Commonwealth Department of Community Services and Health as one of six projects within the Casemix Development Program. The six priority areas (patient abstracting and coding - the subject of this report, patient costing, quality assurance, education, information systems, and payment system design) will assist in the development of a hospital payment system which takes into account casemix - adjusted output. The target date for this system is 30 June 1993.

The Terms of Reference of the Patient Abstracting and Coding Project are to:

1. Identify and define source data items which will be collected on an agreed national basis.
2. Identify strategies to improve the quality of source data.
3. Prepare an inaugural set of National Coding Standards for national implementation.
4. Identify a strategy to ensure the ongoing coordination, revision and development of national coding standards.
5. Identify strategies to improve the quality of medical record coding.
6. Identify workforce and training issues related to medical record coding.
7. Identify implications for State/Territory health authorities and for the private hospital sector.

Volume 1, Section 2  Report Structure

This report is presented in three volumes. Volume I outlines the consultation process undertaken by the project team and discusses each of the Terms of Reference for the project.

Included in Volume I are all of the recommendations of the Patient Abstracting and Coding Project and a discussion of options and proposals considered during the course of the project. In Volume I, we formally recommend that the source data items and coding standards provided in the other two volumes be adopted for national implementation.

Volume II defines each of the source data items recommended in Volume I. It has been prepared as a stand-alone volume which can be used at a hospital level. Accordingly, it also includes patient-level items included in the National Minimum Data Set which are not required for casemix purposes.

Volume III consists of the National Coding Standards which are formally recommended for adoption in Volume I. Again, Volume III has been prepared as a stand-alone volume which can be used at a hospital level.
Volume 1, Section 3: Project Organisation & Consultation Process

This report is the result of six months intensive consultation across Australia. During the six month life of the Patient Abstracting and Coding Project the project team undertook the following:

1. Established an Expert Reference Committee for the project consisting of:
   - Ms. Angela Cook  Medical Record Association of Australia (MRAA)
   - Ms. Irene Kearsey  Health Department of Victoria
   - Ms. Jennifer Mitchell  National Reference Centre for Classification in Health (NRCCH), Queensland University of Technology
   - Ms. Elizabeth Moss  Australian Institute of Health and Welfare (AIHW)
   - Ms. Vicki Stanley  Australian Private Hospitals Association (APHA)

2. Consulted in each state and territory with a range of health care providers and managers and with each State and Territory Health Authority. Private hospitals visited during the course of the consultation were nominated by private hospital associations. A full list of organisations consulted is listed in Appendix 3.

Consultations in each state and territory were organised by the relevant health authority. The format for each consultation varied slightly depending on the expertise and interests of the organisation being consulted. Most consultations included a discussion of background papers (discussion papers and draft definitions) prepared by the project team.

3. Undertook consultation with key national organisations including the Commonwealth Department of Health, Housing and Community Services, the Medical Record Association of Australia, the Australian Institute of Health and Welfare and other relevant organisations. A full list of national organisations is listed in Appendix 3.

4. Reviewed all State and Territory coding policies and standards, all source data definitions used in each State and territory and relevant state and Commonwealth legislation.

5. Convened a National Coding Conference in Sydney on 26/27 March 1992 attended by one representative of each State and Territory and one representative of the Australian Private Hospitals Association and produced National Coding Standards for Inpatient Data Collections (see Volume III).

6. Produced a total of seven drafts of source data definitions and sought the views of states, territories, national organisations and the royal colleges.
and associations regarding these definitions. Feedback on draft definitions was provided to us in meetings and in writing by a diverse range of individuals and organisations.

In total we estimate that we have received input from over 1000 health care providers, funders and managers. This input has significantly shaped the direction of the Patient Abstracting and Coding Project and we gratefully acknowledge the contribution made by both our Expert Reference Committee and those individuals and organisations who generously contributed to the project.

Several issues addressed during this consultancy have been matters of considerable controversy. Some have triggered quite passionate debate and disagreement. This should come as no surprise. It is a logical outcome of a consultation process which has sought the views of a diverse range of stakeholders, many of whom see the issues from quite different perspectives. It is also the expected outcome in a project which is attempting to standardise practices which are currently inconsistent and largely unregulated.

With few exceptions, we have been impressed by the willingness of most parties to compromise in order to achieve a national approach. We are confident that each of the recommendations contained in this report has significant majority support. However we also recognise that there is not unanimous support for some recommendations. In those cases, we have indicated opposing views where those views have been made known to us.

Volume 1, Section 4: Defining the Boundary of the DRG Classification System

4.1 INTRODUCTION

The Patient Abstracting and Coding Project has undertaken consultation regarding source data items required for the introduction of an Australian DRG classification system. These consultations have inevitably involved discussions regarding the boundaries and limitations of the DRG system.

The task of defining the boundaries of the DRG system requires the achievement of a balance between a technically achievable and a clinically credible system. In order to achieve the goal of technical simplicity, it is tempting to argue that the DRG system should have a broad boundary and should include all patients in acute hospitals. However this is not the approach being recommended in this report.

Defining the boundary of the DRG system would be a relatively easy task if it was simply a case of analysing available data to validate proposals submitted. This is not possible because the definitions used and the data items collected determine the available data and not vice versa. Current data collections should not be used to determine the boundaries of the DRG system. To do so would simply perpetuate the existing system, a system which is widely considered to lack credibility.
We have therefore taken the approach that the boundaries of the DRG system should be established through widespread consultation within the health industry.

4.2 **THE DRG SYSTEM - FOR ACUTE HOSPITALS OR ACUTE INPATIENTS?**

Despite a decade of casemix development work, there is a fundamental question that has not been resolved in the Australian context. Simply put, the question is whether the DRG classification system should be applied to acute hospitals or to acute inpatients.

Australian hospitals (which are typically described as "acute hospitals") treat a diverse patient population, many of whom would not meet clinical criteria for classification as acute patients. This is not to imply that such patients are, by definition, inappropriately admitted to hospitals or that their care is inexpensive. The fundamental issue is that, in the Australian context, the term "acute hospital" is a misnomer. It implies that such hospitals only treat acute patients. In reality, there are only a minority of hospitals (if there are any at all) that provide inpatient care exclusively to acute patients. The majority of hospitals, regardless of their size, treat a patient population which is diverse in terms of patient acuity.

There is a policy question about whether this is a desirable feature of the Australian hospital system. This is an issue which is outside our terms of reference and we do not propose to discuss it here. In this context it is sufficient to make the point that there are few, if any, Australian hospitals which can be classified as exclusively "acute".

In our view, patient diseases or conditions are acute. Hospitals are not. Hospitals are simply facilities in which treatment is provided to patients. Patients in hospitals undergo one or more episodes of care or phases of treatment within the one stay in hospital. It is the episode of care, and not the hospital, which should be classified according to the concept of acuity.

Accordingly the DRG classification system should be used for the classification of acute patient episodes of care. It should not be used for the classification of all patients who are treated in an "acute" hospital.

The DRG system is based on the premise that diagnosis, modified for factors such as age and comorbidities, is a good predictor of either length of stay or resource consumption. In our view, it is reasonable to argue that the DRG system should only be used to classify patient episodes of care where the evidence indicates support for this premise.

There are subsets of patients treated in Australian hospitals whose diagnosis has been shown to be a poor predictor of length of stay. We have termed these patients "sub-acute". The characteristics of these patients are:

- they have a genuine need to be treated in a hospital setting;
- their resource consumption requirements are more closely related to the patients' level of functional independence than to their diagnosis;
measures such as functional independence can be currently shown to be good predictors of resource consumption on a per diem basis; and no such evidence currently exists that either diagnosis or level of functional independence is a good predictor of length of stay and thus the concept of "cost per episode of care" is inappropriate.

This group of patients are frequently described as "non-acute". However, the term "non-acute" is also used to describe patients who do not require treatment in a hospital setting (such as nursing home type patients). Further it is clear from our consultations that the term non-acute sometimes implies both inappropriate and inexpensive care.

We therefore propose that there should be a distinction between "sub-acute" and "non-acute" patients. Sub-acute patients are those who need to be treated in a hospital setting but whose diagnosis is a poor predictor of length of stay and resource consumption. Examples of sub-acute patients include rehabilitation and palliative care patients. Non-acute patients are those who require residential care but who could be treated in another setting, should such an alternative be available. Examples of non-acute patients include nursing home patients and patients seeking residential accommodation in hostels, halfway houses and other supported accommodation environments. Not all of these services are Commonwealth funded.

This view is supported by the relevant Royal Colleges and Associations. The Australasian College of Rehabilitation Medicine, the Royal Australian and New Zealand College of Psychiatrists, the Australian Association of Gerontology and the Australian Association for Hospice and Palliative Care have all indicated support for the definitions included in this report and all have expressed support for our proposals regarding exclusions to the DRG classification system.

Thus, we recommend:

**RECOMMENDATION 1**

*That there be three acuity levels termed acute, sub-acute and non-acute, care types.*

It should be noted that the Health Department Victoria does not support this recommendation. The view of the Health Department Victoria is that there should be only two acuity levels, acute and non-acute.

The position put by the Health Department Victoria is that acute and non-acute patients should be distinguished, for definitional purposes, on the basis of a certificate as to whether a medical practitioner determines that acute care is provided. Thus the Victorian view is that the acuity levels acute and sub-acute should be combined.
4.3 THE CONCEPT OF EPISODE OF CARE

The majority of patients enter hospital for a specific condition, receive a specific service and are then discharged. However, there are other patients whose treatment pattern is more complex. These patients enter hospital and undergo two or more phases of treatment within the one hospital stay.

In the source data definitions included in Volume II of this report we have introduced the concept of Episode of Care. An episode of care is a phase of treatment defined according to the acuity of the patient. There may be more than one episode of care within the one inpatient stay.

Consider the following examples:

1. The patient, age 68 years, is admitted for an orthopaedic procedure (ie Episode 1). After 10 days the patient becomes a rehabilitation patient (ie Episode 2). On day 20, the patient has an infarct and is transferred to coronary care (ie Episode 3).

   This patient has 3 episodes of care within the one stay in hospital. The patient can potentially be assigned to 2 DRGs - one orthopaedic and one cardiac. Days 11-19 are excluded from the DRG system.

2. The patient, age 3 years, is admitted for paediatric gastroenteritis. It is the third admission in 3 months. The hospital treats the acute gastroenteritis in 4 days (ie Episode 1) and spends the next 10 days educating the parent and dealing with the child's poor health status due to history of malnutrition (ie Episode 2).

   This patient has 2 episodes of care within the one hospital stay. The patient is assigned to a gastroenterology DRG with a length of stay of 4 days. Days 5-14 are excluded from the DRG system.

There is strong clinical support for the concept of episode of care because:

* The concept of episode of care reflects clinical practice.
* The collection of episode of care data creates a rich database providing more specific information on both acute and sub-acute episodes of care than is currently available.
* Patient acute episodes, such as those given in the preceding examples, can be included in the DRG system. Without a distinction between acute and sub-acute episodes, many such patients would become outliers and excluded from the DRG system altogether.
* The DRG outlier pool is reduced. In theory, the outlier pool contains only atypical acute patients.

A Point of Clarification - Outliers and Episodes of Care

The term "outlier" has at least two distinct meanings when used in the context of casemix.

For quality and utilisation review, and for length of stay analysis, an outlier is a
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patient whose stay in hospital is considered to be atypical (ie the patient or the whole stay in hospital is the outlier).

In comparison, the USA Medicare program applies the term "outlier" quite differently. In that funding program, length of stay outliers are days of stay beyond a specified outlier threshold for each DRG. Thus, those days of stay which occur up until the threshold are considered as the standard DRG component or the "inlier". Days of stay beyond the threshold are considered as "outlier days". The inlier episode is funded using the DRG payment. Outlier days are funded at 60% of the per diem rate derived from the payment for that particular DRG.

The concept of outliers is of relevance to the concept of Episode of Care. Using a casemix model based on statistical outliers, the patient stay in hospital can be broken into two episodes, and the boundary is determined by the calculation of an outlier threshold or statistical trim point. In this model, the whole stay in hospital is excluded for quality and utilisation review purposes if the patient is an outlier and only those days of stay beyond the threshold are excluded for payment purposes.

Using the concept of Episode of Care, it is possible (but not essential) to identify more than two episodes within the one stay in hospital. Instead of using statistical trim points, the boundary is determined by clinical criteria based on patient acuity.

For utilisation and quality review, the advantages are obvious. Each episode of the patients' care can be reviewed. Additionally, the whole stay in hospital can be reviewed.

For payment purposes, several possibilities exist. The most sophisticated approach would entail a different payment for each episode of care. Thus, acute episodes could attract a DRG payment and sub-acute episodes a payment specifically developed for that purpose. Applied to example (1) on page [9], the episode of care model could potentially allow for two distinct DRG payments and another payment for the rehabilitation phase. There are no doubt other ways that the Episode of Care model could be applied for payment purposes.

Several comments need to be made about this approach. Firstly, there are only a small percentage of patients who undergo two or more distinct acute episodes within the one stay in hospital and thus the payment for two acute episodes would be the exception rather than the norm. Based on the clinical advice we have received, we would estimate that the number would be small enough to allow for individual review of those cases. In making this assessment it should be noted that an acute episode of care ends when the patient is classified as either sub-acute or non-acute. An acute episode of care does not end if the patient moves from one acute clinical specialty to another (ie a patient moving from, for example, orthopaedics to cardiology remains as an acute care patient unless there is either a sub-acute or non-acute episode in between).

Secondly, in relation to concerns that this model is susceptible to doctors classifying patients in such a way as to maximise hospital funding, it needs to be said that this model is no more open to abuse than any other. The DRG model is based on a clinical assessment of Principal Diagnosis and allocation to a DRG is
totally dependent on information provided by clinical staff. Regardless of whether or not episodes of care are considered, a casemix funding system requires audit.

Thirdly, the introduction of the concept of episode of care does not, by necessity, require the introduction of a funding model such as that described above. It is possible to:

(a) ignore episodes of care for the purposes of funding or
(b) incrementally incorporate episodes of care into the funding model or
(c) design the funding model around the episode of care.

Having said that, it is reasonable to conclude that episode of care data will only be accurately collected if there are incentives to collect it. The use of episode of care data for funding purposes (in whatever form) is a clear incentive to collect it.

4.4 DEALING WITH SUB-ACUTE AND NON-ACUTE EPISODES OF CARE

In the course of our consultation we have spent considerable time seeking the views of clinicians, administrators and health authorities regarding the management and classification of sub-acute episodes of care.

Three options have been considered in these consultations.

OPTION 1

Classify all inpatients into AN-DRG groups. Then identify those DRGs that include a large proportion of sub-acute patients. Next regroup patients in these DRGs into a sub-acute classification system.

OPTION 2

Classify all inpatients using AN-DRG groups and apply statistical trimpoints to identify patients who are long stay. Then:

- exclude the whole patient stay for the purposes of quality and utilisation review

- exclude outlier days for the purposes of the DRG payment and use an outlier funding model for each outlier day.

OPTION 3

Classify patients according to care type (acute, sub-acute and non-acute) and then use the AN-DRG classification only for those episodes of care identified as acute. Use other casemix classification tools for other patients.

Thus, in options 1 and 2 all patients are grouped according to DRGs and then sub-acute and non-acute patients are subsequently removed. In option 3, sub-acute and non-acute episodes of care are culled out before the data is grouped into DRGs.
There has been no support for option 1.

In relation to the other options:

* there has been overall agreement that option 2 is the easiest to implement.

* there has been majority agreement that, whilst option 2 is the easiest to implement, it is not the preferable option. It is widely regarded as being an inaccurate way to classify patients and it is the option which has the least clinical credibility. It makes the incorrect assumption that funding for sub-acute and non-acute episodes can be equitably determined by reference to the DRG payment for the inlier episode. However, option 2 is the option which is most widely supported by statistical researchers.

* Notwithstanding general recognition that option 3 is more difficult to implement, there has been overwhelming support for this option. There is agreement that, if option 3 were to be used for payment purposes, it would require an audit process.

The definitions included in Volume III of this report reflect our recommendation that option 3 be adopted.

**RECOMMENDATION 2**

That the AN-DRG classification be used to classify acute episodes of care.

**RECOMMENDATION 3**

That the DRG classification system not be applied to sub-acute and non-acute episodes of care.

4.5 **PSYCHIATRIC SERVICES**

It was not the brief of the Patient Abstracting and Coding Project to consider whether psychiatric services should be included in the DRG system. However, we have found it impossible to define source data items for DRGs without considering this as one of the boundary issues previously identified.

Many of the comments made previously apply to psychiatric episodes of care. In particular, our view that DRGs should only be used where it can be demonstrated that length of stay or resource consumption can be reasonably predicted from diagnosis is of particular relevance to psychiatry. DRGs do not perform well in psychiatry and it could be that functional independence, modified for admission severity and other factors, is a reasonable predictor of resource consumption.

In our interim report, we recommended that psychiatric episodes of care, regardless of acuity, be excluded from the DRG classification system. That is still our preferred position.

**RECOMMENDATION 4**
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That psychiatric episodes of care, regardless of acuity, be excluded from the DRG classification system.

However, in the event that Recommendation 4 is not adopted and that psychiatric episodes of care are not excluded from the DRG classification system, then the same principles which apply to other services should be applied to psychiatry. Accordingly we recommend that:

RECOMMENDATION 5

That if psychiatry is to be included in the DRG classification system, then only planned same day and acute episodes of psychiatric care be included.

RECOMMENDATION 6

That if psychiatry is to be included in the DRG classification system, then the definitions included in Volume II of this report be applied to psychiatric services.

4.6 SAME DAY PATIENTS

Section 5 of this report includes a discussion of the definition of same day patient. There are three issues relating to same day patients which require resolution:

1. Whether same day patients are a subset of inpatients or whether they are actually a separate hospital product.

2. Whether a same day patient should be defined prospectively or retrospectively. For example, whether the same day category should include inpatients who die or are transferred on their first day.

3. Whether the term "planned same day patient" refers to the intention to admit or to the intention to discharge a patient.

At present same day patients are regarded as a subset of inpatients and have therefore been automatically included in the DRG classification system.

In the longer term it may be appropriate to amalgamate same day patients with non-inpatients under an ambulatory classification system.

For a detailed discussion of this issue see Section 5.

4.7 NON-INPATIENTS

The DRG classification system was designed for the classification of inpatient episodes of care. It is therefore necessary to define the boundary between inpatient and other care.

In Volume II we have defined non-inpatients as patients whose treatment does
not meet criteria for classification as either an inpatient or a same day patient. In the longer term it is expected that non-inpatient occasions of service will be classified according to a national ambulatory classification system.

4.8 RECOMMENDED EXCLUSIONS FROM THE DRG CLASSIFICATION SYSTEM

Figure 1. summarises the boundaries of the DRG classification system in relation to direct patient services. Of the five patient categories (non-inpatient, same day patient, acute inpatient, sub-acute inpatient, and non-acute inpatient) only same day and acute inpatients are recommended for inclusion in the AN-DRG classification.

In the longer term, it may be appropriate to further refine the usage of the AN-DRG classification and to include same day patients in a national ambulatory classification.

Psychiatric patients can also be classified according to the five categories shown in Figure 1. Our preferred view is that, regardless of acuity, psychiatric patients should be excluded from the DRG classification. However, in the event that they are not, only same day and acute psychiatric inpatients should be included.

There are three other hospital activities which are recommended for exclusion from the DRG classification system. These three activities are:

1. teaching
2. research
3. provision of services to boarders.

Thus, we recommend:

RECOMMENDATION 7

That in addition to sub-acute episodes of care, non-acute episodes of care and psychiatric episodes of care the following sit outside the boundary of the DRG classification system:

1. Non-inpatients
2. Boarders
3. Teaching
4. Research
Volume 1, Section 5: Source Data Requirements

5.1 INTRODUCTION

The majority of items required for casemix purposes are collected in all states and territories. However, despite the existence of the National Minimum Data Set, there are significant variations in the definition of those items.

There are a small number of source data items which are presently not collected in all states but which will be required for the implementation of the first version of the AN-DRG classification.

Finally, there are some items which are anticipated for inclusion into further versions of the AN-DRG grouper. These items should be introduced as early as possible so that data analysis can be undertaken before further versions of the AN-DRG grouper are developed.

Thus, there are three separate tasks involved in standardising source data for the implementation of the AN-DRG classification:

1. The standardisation of the definition of data items already collected.
2. The introduction of additional standardised data items which have been incorporated in the first version of the AN-DRG grouper.
3. The introduction of those data items which are anticipated for further versions of the AN-DRG grouper.

5.2 CURRENT VARIATIONS IN SOURCE DATA DEFINITIONS

No two states and territories collect the same patient information. There are variations between and within every state and territory.
Whilst there is little value in compiling a detailed list of every difference, it is useful to provide some examples of differences in current data collection practices. The following serve as examples only of some important differences.

There is no agreement about the definition of a hospital.

- Some data collections cover only treatment provided within the four walls of the hospital. Others cover treatment provided in satellite facilities owned and staffed by the hospital. Thus, for example, same day treatment for stabilisation of diabetes provided in the hospitals’ Diabetic Resource Centre will be classified as outpatient treatment in one hospital and a day-only admission in another.

- Patient movements between sites in a multi-campus hospital are managed differently between and within states. Some hospitals discharge the patient from one campus and admit them to the other. Others regard them as a ward transfer and thus do not discharge and readmit.

There is no agreement on the boundary between non inpatient and inpatient care.

- Some hospitals treat same day treatment, (for example, chemotherapy) as outpatient treatment. Others classify it as inpatient treatment.

- Some hospitals apply a 4 hour rule for distinguishing between outpatient and inpatient care. Others define an inpatient as someone treated in a licensed bed, regardless of the treatment time.

There is no agreement on how to calculate hospital length of stay.

- Not all states exclude leave days before calculating length of stay.

- One state allocates a length of stay of 0.5 days to a same day patient. Others allocate a length of stay of 1.0 day.

There is no agreement on the classification of boarders.

- Some hospitals admit boarders and include them in the inpatient data collection. Others don’t.

There is no agreement on the classification of normal newborns.

- Some hospitals routinely admit normal newborns as non chargeable patients. Some hospitals register, but do not admit, normal newborns. Some do neither.

There is no agreement on the recording of activity occurring in Emergency Departments.

- Some hospitals admit as same day inpatients all patients who are treated in the Emergency Department for more than 4 hours. Other hospitals admit only those patients who proceed to an observation ward or an
inpatient ward.

In situations where a patient is treated in the Emergency Department prior to proceeding to a ward, some hospitals record an occasion of service for the Emergency Department and a separate admission for the ward treatment. Other hospitals treat the care in the Emergency Department as part of the inpatient treatment.

Based on these and other differences we can only conclude that the DRG information system is currently being used with inpatient data sets which are different in scope and coverage between and within states. At times these differences exist within the one city. Of more concern, it is reasonable to conclude that it is virtually impossible at the present time to calculate accurate hospitalisation rates for Australia or to realistically compare hospital activity between states.

It is therefore recommended,

**RECOMMENDATION 8**

*That the Commonwealth seek the agreement of all states and territories to the standardisation of patient information collected in the Australian hospital system including the standardisation of source data definitions.*

5.3 **A CONCEPTUAL OVERVIEW OF THE PROPOSED DEFINITIONS**

In order to frame definitions it is necessary to have a model of the care process.

The definitions contained in Volume II are framed around 2 basic constructs:

1. The concept of a patient.
2. The concept of an episode of care.

At the highest level, a patient is classified into one of three categories,

- non-inpatient
- planned same day patient
- other inpatients

At the next level, the episode of care construct is classified into one of three categories,

- acute
- sub-acute
- non-acute.
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Within this conceptual approach, the definitions have been framed with the goal of achieving maximum utility. Patient level data is used for a multitude of reasons, only one of which is casemix and it is important that the data can be used with maximum flexibility. Thus, using the definitions, it is possible to:-

- extract information on all inpatients as well as distinguish between planned same day and other inpatients.

- extract information on same day patients in two ways. Firstly, on the basis of intention. Secondly, on the numbers of patients who were admitted and discharged on the same day.

- extract information on the full patient stay in hospital as well as information on specific episodes of care within that stay.

This approach allows the data user to extract and manipulate different data for different purposes. Thus, for example, one data set may be analysed for quality or utilisation review purposes whilst another could be used for payment purposes. Equally, for the purposes of payment, it would be possible to use one data set now (for example, information on the full patient stay) and another in the future (for example, episodes of care).

The definitions contained in Volume II have been framed without reference to the casemix payment system which may be introduced after 1 July 1993. However, they have been framed so that, after the payment system is determined, the required information will be available as required.

**RECOMMENDATION 9**

That the definitions and data items which form Volume II of the report of the Patient Abstracting and Coding Project be adopted for national implementation.

Figure 2. diagrammatically represents this conceptual approach and indicates those subsets of patients who we have recommended be included in the DRG classification system.
FIGURE 2.

```
PATIENT

ADMIT

NO

NON-INPATIENT

YES

INTEND TO DISCHARGE TODAY

NO

RECORD OCCASION OF SERVICE

YES

PLANNED SAME DAY PATIENT

SEPARATE

DERIVE DRG

INPATIENT

SEPARATE

ASSESS EPISODE

ACUTE

<PERIODIC> REASSES

SUB-ACUTE

<PERIODIC> REASSES

NON-ACUTE

SEPARATE

DERIVE DRG
```
5.4 THE NATIONAL MINIMUM DATA SET (NMDS)

Substantial work has already been undertaken towards the achievement of standardised patient data in Australia. The National Minimum Data Set (1989) identified and defined standardised data to be collected at both the patient and establishment level.

The development of a National Minimum Data Set (NMDS) is a dynamic process which is acknowledged to require amendment and development to keep abreast of changing health care system requirements.

The definitions recommended in this report build on the existing work of the National Minimum Data Set (NMDS) and the Australian Institute of Health and Welfare. The NMDS Review Committee has recently recommended to the Australian Health Minister's Advisory Council (AHMAC) that the National Minimum Data Set (NMDS) become named as the National Health Data Dictionary (NHDD) and that it include all data definitions and derived specifications. That subset of items which will be collected nationally will become the NMDS.

In the short-term, the definitions and data items recommended in this report will require incorporation into the NHDD.

In the longer-term, all source items required to generate casemix information should be automatically incorporated into the NHDD. This should include source items for DRGs and for any other casemix classification system adopted for ambulatory or sub-acute care.

RECOMMENDATION 10

That the definitions and data items which form Volume II of this report be incorporated into the National Minimum Data Set/National Health Data Dictionary

RECOMMENDATION 11

That all source items required to generate casemix information be automatically incorporated into the National Minimum Data Set/National Health Data Dictionary.
National Minimum Data Set (NMDS) Data Items

The patient-level data items that are in the NMDS and which will not require amendment are:

P1. Establishment identifier
P2. Patient identifier
P4. Sex
P5. Date of Birth
P6. Country of Birth *
P7. Aboriginality *
P8. Marital Status *
P9. Area of Usual Residence *
P14. Employment Status *
P15. Occupation *
P16. Patient Accommodation Status *
P18. Compensable Status *
P19. Insurance Status *
P24. Admission date
P26. Discharge date
P27A. Total leave days
P29. Source of referral *
P37. Principal Procedure
P39. External cause *
P40. Place of occurrence of P 39 *
P41. DRG (derived)

* NMDS item not required for casemix purposes.

Data items within the National Minimum Data Set which require amendment are:

P21. Type of episode
P31. Mode of separation
P35. Principal diagnosis
P36. Secondary diagnoses
P38. Additional procedures (up to 3),
A 7. Treatment mode - inpatients
A 9. Type of non-inpatient care

The changes required are:

P21. Deletion of this item and replacement with "Care type" as defined in Volume 2 of this report.
P31. Amendment of this item to include separation categories as defined in Volume 2 of this report.
P35. Amendment of this definition to that given in Volume 2 of this report.
P36. Amendment of this item to delete the limit on the number of diagnoses to be recorded.
P38. Amendment of this item to delete the limit on the number of additional procedures to be recorded.
A 7. Amendment of categories in this item consistent with Volume II of this report.
A.9. Amendment of this definition to that given in Volume II of this report.

5.5 ADDITIONAL ITEMS REQUIRED FOR THE AN-DRG GROUPER

There are two additional items which are required for the first version of the AN-DRG grouper.

1. Admission Weight (Neonates Only)
   If a neonate is born in hospital during the current admission, then the admission weight is the birth weight. For neonates born elsewhere or born during a mothers' previous admission to hospital the admission weight is the neonates weight on admission.

2. Days on Mechanical Ventilation (DMV)
   Days on mechanical ventilation can now be coded using ICD.9.CM procedure coding (October 1991 version).

   Only three codes are available:
   
   - mechanical ventilation of less than 96 hours duration,
   - mechanical ventilation of over 96 hours duration.
   - mechanical ventilation unspecified duration.

   These codes are sufficient for the first version of the AN-DRG grouper.

There are several other items which were proposed by the Australian Casemix Clinical Committee for incorporation into the AN-DRG grouper and which may be incorporated into second and subsequent versions. There is value in collecting these data items as early as possible so that data will be available for analysis prior to the development of the second version of the AN-DRG grouper. These items are:

3. Days in Intensive Care
   The Australian Casemix Clinical Committee (ACCC) have expressed concern about the need to develop efficient indicators of Intensive Care Unit activity and have noted that DRG type systems do not adequately predict the costs associated with intensive care. Work on intensive care is currently in progress in Adelaide, and in consultation with ACCC members it has been proposed that information on days in intensive care be collected in order to create a database for further work on this issue.

   In our view the collection of this data item should be carefully piloted before it is incorporated into the morbidity collection on a routine basis.

   We therefore propose that days in intensive care be collected by the study hospitals participating in the National Costing Study and that the Australian New Zealand Intensive Care Society be actively involved in analysing the data collected before any further decisions are made regarding casemix and intensive care services.

   The following definition of Intensive Care has been developed in conjunction with the Australian New Zealand Intensive Care Society for use in the pilot study.
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Whilst there are some reservations that the definition may prove to be too rigid to capture the required data, the Australian New Zealand Intensive Care Society have agreed that it is an appropriate definition for use during the pilot study.

INTENSIVE CARE

An Intensive Care Unit is a designated ward of the hospital which meets all of the following criteria:

* Specialist Medical Director with a recognised post graduate qualification in Intensive Care who is on site during the day.

* 24 Hour medical cover in the unit and 24 hour access to appropriate consultants.

* Formal admission and discharge policies and patient care review programs.

* Capable of ventilation and able to support all body systems.

* Nursing care equivalent to at least 16 hours/patient/day or according to dependency of patients.

* A minimum of one registered nurse per shift who has specialised training in Intensive Care.

In our view, data on other resource intensive services (High Dependency Units, Coronary Care Units and so on) should not be collected until such time as data analysis has been undertaken on intensive care services as defined above.

4. Up/Down Transfer

The Australian Casemix Clinical Committee (ACCC) proposed that certain DRGs in Major Diagnostic Category 15 (Newborns) and MDC 22 (Burns) be split based on whether a patient is transferred to a higher level of care (an "up transfer") or to a lower level of care (a "down transfer"). Down transfers would be regarded as equivalent to discharge to home. The rationale for this split is that the resource consumption patterns of patients differ according to the reason for patient transfer. The ACCC proposal is that the data be collected only on patients transferred between hospitals.

There are practical difficulties in collecting this data including issues such as who should make the assessment and what criteria should be used. There is a further difficulty because the information is only required for burns patients and for newborns.

It is proposed that data collection of separate up and down transfer should be undertaken on a pilot basis before any decision is made to collect it on a national basis. Data analysis can then be undertaken before the development of the second version of the AN-DRG grouper.

5. Days on Mechanical Ventilation (DMV)

The first version of the AN-DRG grouper uses DMV data which can be obtained as coded data from the list of procedures contained in the medical record.
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However, the Australian Casemix Clinical Committee (ACCC) proposed that DMV data should be collected in greater detail and proposed that DMV categories be:-

- less than 4 days duration
- 4-21 days duration
- greater than 21 days duration.

This requires the collection of DMV data as an additional data field as, in this form, it could not be coded using ICD.9.CM procedure coding.

6. **Nursing Dependency**

There is a need for a nationally agreed approach to the collection of nursing dependency data. In the longer term, nursing dependency should be a collectable data item at the national level.

The initial requirement is for a national standard for the collection of nursing dependency. Once that standard has been established, nursing dependency should be included in the National Minimum Data Set.

**RECOMMENDATION 12**

*That the study hospitals participating in the National DRG Costing Study be asked to pilot the data item "Up/Down Transfer" so that data analysis can be undertaken before the development of the second version of the AN-DRG grouper.*

**RECOMMENDATION 13**

*That the study hospitals participating in the National DRG Costing Study be asked to pilot the data item "Days on Mechanical Ventilation" so that data analysis can be undertaken before the development of the second version of the AN-DRG grouper.*

**RECOMMENDATION 14**

*That the study hospitals participating in the National DRG Costing Study be asked to pilot the data item "Days in Intensive Care" so that data analysis can be undertaken before the development of the second version of the AN-DRG grouper.*

5.6 **PRINCIPAL DIAGNOSIS**

The Issue

Five definitions of Principal Diagnosis are in use in Australia.

**South Australia** defines Principal Diagnosis as "The diagnosis or condition established after study to be chiefly responsible for occasioning the admission of the patient to hospital".

**Victoria & Tasmania** define Principal Diagnosis as "The most significant
condition which uses most resources in treatment and best justifies the length of stay as an acute inpatient”.

**New South Wales** defines Principal Diagnosis as “The final diagnosis which best accounts for the period of inpatient care”.

**Western Australia & the ACT** defines Principal Diagnosis as “The condition which best accounts for the stay in hospital”.

**Queensland** defines Principal Diagnosis as “The condition which at the time of discharge is considered to have been the main problem addressed during the patient episode ie the diagnosis which most accounts for the length of stay”.

These definitions fall into 2 categories. The South Australian definition rests on the concept of reason for admission. The other definitions are based on the concept of reason for resource consumption and/or length of stay.

The introduction of the Australian National DRG Classification requires the adoption of a consistent definition for use in Australia.

**The Problem**

The basic problem is that the concept of Principal Diagnosis is inherently flawed. Principal Diagnosis is a single dimension which is used to describe a multidimensional issue. Not all patients have a Principal Diagnosis. Frequently the decision to admit a patient is based on a combination of factors, all of which contribute both to the reason for admission and to the utilisation of resources.

Thus for many patients the identification of Principal Diagnosis is an artificial decision which bears no resemblance to clinical practice. At the present time the DRG classification system is simply not sufficiently sophisticated to deal with multiple system conditions.

In the long term classification systems require modification to take into account multiple system conditions. Some work has already been undertaken which is of relevance to this issue. For example, the concept of “diagnoses clusters” incorporated into Patient Management Categories may provide a useful model from which further work can be undertaken.

In the interim, the introduction of a national casemix system requires the adoption of one definition on a nation wide basis.

**The Size of the Problem**

Roberts, Reid and Irwin (1985) investigated the effect of the two different definitions of principal diagnosis on DRG allocation. They found that 94% of cases did not change principal diagnosis regardless of the definition used. Application of the two definitions led to a 6% change in diagnosis sequencing and a 4% change in DRG allocation.

There is no doubt that a 4% change in DRG allocation is important. However there are many other factors which we believe have a far greater effect on DRG allocation. These include the quality of clinical documentation, variations in other
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coding practises, the quality of coder education, and the level of commitment to
coding quality improvement.

Consultation Process

Of all of the issues considered by the Patient Abstracting and Coding Project, the
issue of which Principal Diagnosis to adopt in Australia has triggered the most
passionate debate. There are strong proponents for both definitions, all of whom
believe that their preferred definition is clearly superior. The depth of feeling is
sufficiently strong for us to conclude that it is impossible to reach unanimous
agreement on this issue.

Given the depth of feeling on this issue, it is helpful to outline our consultation
process. In the initial stages of the project, we sought the views of the Medical
Record Association of Australia (MRAA) and the Australian Casemix Clinical
Committee (ACCC). Both the MRAA and the ACCC recommended that the
South Australian definition be adopted (ie. reason for admission). Following
these recommendations, the issue was considered by the project's Expert
Reference Committee. Again the Expert Reference Committee recommended
that the South Australian definition be adopted.

In the light of these recommendations, we prepared a short discussion paper on
principal diagnosis. The paper included a recommendation that the South
Australian definition be adopted.

State and territory consultations occurred in New South Wales, Western
Australia, South Australia, the Northern Territory, and Tasmania during February
and March of 1992. Each agreed to the adoption of the South Australian
definition. New South Wales also indicated its intention to collect an additional
data item namely "the diagnosis which best accounts for resource consumption if
that condition differs from Principal Diagnosis".

A National Coding Conference was held in late March 1992 to develop national
coding standards (see Volume 3). The development of these standards required
a working definition of principal diagnosis and the South Australian definition was
used. Participant feedback at the conference indicated that the use of the South
Australian definition was a factor in the conferences' successful achievement of
national coding standards.

Subsequent consultations were held in Queensland, Victoria, and the Australian
Capital Territory. In both Queensland and the Australian Capital Territory we
found strong support for the South Australian definition. However, in Victoria, our
consultations indicated quite diverse views on this issue. Both the Health
Department of Victoria and the LaTrobe University indicated concern about the
proposed change. Nevertheless, we attended a consultation with the Victorian
Medical Record Association (VMRA) Casemix Special Interest Group which
indicated a contradictory position. This group was well attended, with in excess
of 50 Medical Record Administrators present. The issue was put to a vote and
only 5 participants opposed the adoption of the South Australian definition.
Similar views were expressed in other field consultations in Victoria.

At the time of writing, the Health Department of Victoria has reserved its opinion
regarding Principal Diagnosis pending further consultation with key interest
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groups. In the interim, Victoria will continue to use its existing definition. All other states and territories have agreed to adopt the definition based on admission and are planning for its implementation. Some states are planning to implement this change in July 1992, whilst others have targeted an implementation date of 1 January 1993.

Nothing in the above discussion is meant to imply that there is unanimous agreement in all other states and territories regarding this issue. In New South Wales, for example, there are individuals who do not support the change.

Nevertheless, we are firmly of the view that there is sufficient support for the South Australian definition to recommend its adoption Australia-wide.

The Case For and Against

There are a range of arguments both in favour and in opposition to the use of the South Australian definition. The following section briefly summaries these arguments.

The case for the current definitions based on resource consumption or length of stay.

1. DRGs are being introduced into Australia for payment purposes. The resource consumption definition is more closely allied with the purposes of DRGs.

2. The health system is more interested in resource consumption than in reason for admission.

3. This definition more closely matches principal procedure.

4. This is the definition currently used by the majority of states and territories. It is easier for South Australia to change than for all others to change, particularly as there is no scientific evidence indicating the superiority of the South Australian definition.

5. The quality of medical documentation is so poor that it is generally impossible to determine why a doctor chose to admit a patient.

The case for the definition based on reason for admission (current South Australia definition).

1. This definition is more straightforward to use.

2. It is more objective in its application and therefore more consistently applied.

3. It is the definition used in the design of the DRG system.

4. It is a better tool for quality assurance because it more readily identifies patients with an unusual length of stay. These patients will be identified more easily as the Principal Diagnosis does not justify the length of stay.
5. It is the definition best suited to research into the rates of, and reasons for, hospitalisation.

6. This definition allows for a consistent comparison of treatment regimes for patients being admitted for the same or similar reasons and highlights unusual cases which need to be considered separately. Thus this definition is consistent with the health systems interest in resource utilisation (and not simply resource consumption).

7. The current Australian definition is inconsistently applied. The terms "resource consumption" and "length of stay" are not synonymous. Some coders and clinicians select Principal Diagnosis on the basis of length of stay, others on the basis of resource consumption.

8. There is no reasonable way that a coder can determine resource consumption. Information on the resource consumption patterns of Principal Diagnosis (as against DRG) is simply not available nor will it be in the future.

9. The change in the definition of Principal Diagnosis will occur in the context of many other changes in source data and coding. The change is easy to make and the cost is marginal.

**Assessment and Recommendations**

In our view, there is validity in many of the arguments put by proponents of both options. The case is far from black and white. However, on balance, we have decided in favour of the current South Australian definition for the following reasons:

1. There is a clear majority support for the South Australian definition.

2. The arguments in favour of the resource consumption definition would be significantly enhanced if there was any evidence to indicate that the individuals selecting Principal Diagnosis actually know which is the most resource intensive condition. No such evidence exists. Quite the contrary, during our consultations clinical and coding staff have repeatedly expressed interest in learning about casemix so that they can learn about resource consumption patterns in hospital usage. However, casemix information gives information about DRG resource consumption and not simply about diagnosis resource consumption. In our opinion it is simply unreasonable to expect either a clinician or a coder to select Principal Diagnosis on the basis of resource consumption when there is no information available about such resource consumption.

3. The South Australian definition is the easiest to use and is more objective in its application.

In preparing this report it was tempting to argue that further research should be undertaken before a decision is made. However, we are not recommending this approach. We do not believe that the size and importance of this issue warrants the commitment of significant research funds. Further, we believe that available
research funds would be better committed to dealing with the real problem which is that the DRG system allows for only one condition to be coded as the Principal Diagnosis.

We therefore recommend that:

**RECOMMENDATION 15**

That the Australian definition of Principal Diagnosis be

"The diagnosis or condition established after study to be chiefly responsible for occasioning the admission of the patient to hospital."

**RECOMMENDATION 16**

That states and territories wishing to produce comparative data introduce an additional data item

"The diagnosis or condition which best accounts for length of stay or resource consumption if that condition differs from Principal Diagnosis."

**RECOMMENDATION 17**

That the priority for research funding in this area be given to the development of enhancements which provide for the coding of multiple significant diagnoses and the incorporation of such coding into later versions of the AN-DRG classification system.

5.7 **THE DEFINITION OF A HOSPITAL**

There are two aspects of the definition of a hospital which require comment.

Firstly, the definition of a hospital includes two or more sites in a multi-campus hospital. The other option considered was to define each site as a hospital. This was rejected simply on the grounds that each site is not a hospital. Secondly, the definition of a hospital includes satellite units managed and staffed by the hospital. This is current practice by some hospitals but not others. Standardisation to include satellite units may potentially have the effect of increasing the volume of same day patients.

The alternative is to exclude all satellite units. This was not recommended on the basis that it is against current developments in hospital care whereby care is increasingly being provided in non-institutional settings. The exclusion of satellite units may have the effect of providing disincentives towards providing non-institutional healthcare as well as underestimating the amount of same day care provided by the hospital sector.

5.8 **THE DEFINITION OF A SAME DAY PATIENT**
There are three separate, but related, issues to be resolved in the classification of same day patients.

**Prospective or Retrospective?**

The first issue is whether a same day patient is defined according to actual practice or intention (retrospective or prospective classification).

If a same day patient is defined simply as a patient whose admission and discharge dates are the same (retrospective), then the same day category:

- includes inpatients who die or are transferred on their first day in hospital. Thus, for example, a multitrauma patient who is admitted through the Emergency Department, undergoes sophisticated medical and surgical treatment but subsequently dies is classified as a same day patient. If the patient had survived they would have been classified as an inpatient.

- excludes planned day only surgical patients who subsequently remain in hospital overnight because they are not well enough for discharge.

Conversely, if a same day patient is defined as a patient who was admitted with the intention of discharge on the same day (prospective), then the same day category:

- excludes inpatients who die or are transferred on their first day in hospital.

- includes same day patients who subsequently remain in hospital overnight.

In our view "same day" should be defined according to intention, that is, prospectively. This view is based on three arguments:

1. Inpatients who are transferred or die on their first day in hospital should not be classified as same day patients. They have different resource consumption patterns and, for utilisation review and quality assurance purposes, should be considered as inpatients with a length of stay of one day.

2. Information on patients who attend hospital for a planned same day procedure and who are subsequently required to remain in hospital should be easily identifiable to allow for quality and utilisation review.

3. If information on actual same day patients is required, it can be statistically derived. Thus, by introducing a prospective definition of same day, data becomes available on both intention and actual practice.

**RECOMMENDATION 18**

*That the term "same day patient" be defined prospectively.*

**Intention to Admit or Discharge?**
The second issue relates to the term "planned" same day patient. The term "planned" is variously used to refer both to the decision to admit and to the decision to discharge.

When the term "planned" is used to apply to the decision to admit a patient, it implies that the patient is an elective patient and that the procedure or treatment is booked in advance.

When the term "planned" is used in relation to the patient discharge, it means that the patient is admitted to hospital with the intention that they will be discharged on the same day. Used in this sense, the planned same day category not only includes elective patients but can also include emergency patients.

For example, a paediatric patient presents in the Emergency Department suffering an acute asthma attack. The patient’s treatment includes more than four hours of care and thus the patient is formally admitted. The Emergency Department intends to discharge the patient after the condition has been stabilised. In this example, the patient is a "planned same day patient" because they are admitted with the intention of discharge on the same day.

The patient in the above example would not be classified as a planned same day patient if the term "planned" is used to apply to the admission rather than the discharge.

We have used the term "planned same day patient" to refer to the intention to discharge on the same day.

**RECOMMENDATION 19**

That the term "planned same day patient" refer to the intention to discharge the patient on the day they are admitted.

**A Subset of Inpatients?**

The third issue to be resolved is whether same day patients are a subset of inpatients or are actually a separate hospital product. There are three options:
OPTION 1

Same day patients are defined as a subset of inpatients.

Perceived Advantages

1. Provides incentives to achieve efficiency in the management of short stay inpatients. For example, to reduce length of stay from two days to one day for certain categories of surgical patients.

2. Option 1 is consistent with existing Commonwealth legislation (National Health Act 1953, Health Insurance Act 1973).

3. The quality of the data collection will be better if same day patients are classified as inpatients. The volume and turnover of ambulatory patients may prohibit the collection of quality data.

Perceived Disadvantages

1. The classification of same day patients as inpatients potentially excludes patients treated in satellite settings because "inpatient" is used implicitly to refer to patients actually in the hospital.

2. Length of stay analysis is difficult because of the volume impact of same day patients. As same day volume increases, length of stay declines regardless of whether there is any actual length of stay decrease in multiday inpatients.

OPTION 2

Create a category of "Same day patients" (as distinct from "inpatients") which includes patients treated on a same day basis in a hospital bed as well as equivalent patients treated on a same day basis in a community setting.
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Perceived Advantages

1. Option 2 recognises that same day patients are intrinsically different to other patients (i.e. that same day patients are a separate hospital product).

2. Provides incentives to achieve efficiency through transferring the management of same day patients from an inpatient to a community setting. For example, to manage patients in satellite health care facilities for treatment such as dialysis, chemotherapy and stabilisation of diabetes.

3. Allows for length of stay trends to be monitored more easily because the volume impact of same day patients is controlled.

4. Can be seen as an intermediate step towards a longer-term re-definition of same day patients as a subset of ambulatory care.

Perceived Disadvantages

1. Requires legislation change because same day patients are defined in relevant Commonwealth legislation as "inpatients".

2. Will financially disadvantage hospitals unless funding arrangements are changed. Currently same day patients attract an inpatient bedday benefit.

OPTION 3

Define same day patients as ambulatory patients and include them in a non-inpatient classification system. This is the approach used in the U.S.A.

\[\text{PATIENT} \rightarrow \text{INPATIENT} \]

\[\text{NON-INPATIENT} \leftarrow \text{A&E} \rightarrow \text{OUTPATIENTS} \rightarrow \text{COMMUNITY} \rightarrow \text{SAME DAY} \rightarrow \text{MULTIDAY} \]

Perceived Advantages & Disadvantages

Option 3 as with Option 2 but this option is dependent on the development of a comprehensive national ambulatory classification system.

There are divergent views regarding the classification of same day patients.

The Australian Casemix Clinical Committee, the Health Department of Western Australia, and the Australian Private Hospitals Association have all recommended that same day patients be classified as a subset of inpatients.
However, the Department of Health Tasmania, the NSW Health Department and the South Australian Health Commission have all supported the view that same day patients be classified as a separate hospital product.

The Australian Private Hospitals Association has raised two important concerns regarding Option 2. Firstly, if Option 2 was introduced, both the National Health Act and the Health Insurance Act would require amendment to classify same day patients as “patients” rather than “inpatients”.

Secondly, there are serious financial implications for hospitals because same day patients currently attract a bedday fee. Option 2 would only be acceptable if financial arrangements were changed such that it was financially neutral to the hospital sector.

In resolving this issue it is important to separate out the definition issues from the financial implications.

In our view, there is value in the longer term in defining same day patients as a separate hospital product. This would provide maximum flexibility because same day patients could be amalgamated with inpatients for some purposes whilst being amalgamated with non-inpatients for others. Thus, for example, same day patients could be excluded from the inpatient data set when the data is being used to undertake international comparisons (note that the USA defines same day patients as ambulatory) but could be included for other purposes such as payment or utilisation review.

However, this approach is not possible under current legislation. We therefore recommend a phased approach to the classification of same day patients.

**RECOMMENDATION 20**

That, in the short-term, same day patients be classified as a subset of inpatients and that the definition of a hospital include satellite units managed and staffed by the hospital.

**RECOMMENDATION 21**

That the National Health Act 1953 and the Health Insurance Act 1973 be amended to define same day patients as "patients" rather than as "inpatients".

**RECOMMENDATION 22**

That, following appropriate legislative amendment, same day patients be defined as a separate hospital product subject to alteration of financial arrangements such that hospitals are not financially disadvantaged.

**RECOMMENDATION 23**

That, after recommendations 20, 21 and 22 have been implemented consideration be given to the incorporation of same day patients into a National Ambulatory Classification System.
The definitions which form Volume II of this report have been prepared consistent with Recommendation 21.

5.9 THE CLASSIFICATION OF A NEWBORN

Current Situation

The current classification of newborns is determined under the National Health Act 1953. The National Health Act specifically excludes newborns from being classified as "patients" of the hospital except as provided by the Health Insurance Act 1973.

The Health Insurance Act specifically excludes newborns from being classified as "inpatients" of the hospital except under certain circumstances. Thus, in terms of the legislation, it could be interpreted that the term "patient" is synonymous with the term "inpatient".

The Health Insurance Act provides for the following newborns to be classified as inpatients:

(a) a newborn who occupies an approved bed in an intensive care facility which is approved by the Minister.

(b) in the case of a multiple birth, each child in excess of one.

The National Health Act allows for newborns to be classified as patients in situations when the mother of the newborn does not occupy a bed in the hospital.

Implications

With the exception of the cases specified above, newborns cannot be legally admitted to the hospital. As a result:

- newborns may not be allocated a medical record and thus information on the newborn (such as pathology results) is stored on the mothers record. This is widely considered to be an unacceptable practice.

- information on newborns is not included in the hospital morbidity collection, and thus the DRG for normal newborns is used solely for the allocation of multiple birth newborns.

- fees and charges cannot be raised on normal newborns.

- for the purposes of DRG costing, costs of units such as the normal nursery are allocated to the mother rather than to the baby.

In practice, many hospitals admit newborns to the hospitals and classify them as non-chargeable inpatients. This practice allows the hospital to establish a separate medical record for the newborn and to collect information on the
newborn in their morbidity collection. This information is subsequently extracted out of the morbidity system by the state health authority.

There is widespread clinical opposition to the current legislative arrangements. Paediatricians argue that the legislation reflects a model of clinical practice which is outdated because it reflects a belief that the mothers' obstetrician is the primary carer of the newborn. In current practice it is more commonly the paediatrician and not the obstetrician who is the primary carer of the newborn. From the paediatrician perspective, the current legislation fails to recognise the contribution and workload of the paediatrician.

Hospitals are concerned that the legislation underestimates the workload of the hospital and argue that the morbidity system should include information on all patients treated by the hospital, including normal newborns. They also argue that it is poor practice to include information on two people (mother and baby) on the one medical record.

However there are clear financial implications from any change to the current arrangement. From a payers perspective, the costs of caring for the newborn are already incorporated into the cost structure for the mother. This view is widely disputed by providers.

Several financial anomalies exist. For example, if a mother and newborn transfer to another hospital for post-natal care, the mother is classified as a medical (and not an obstetric) patient. Accordingly, the cost of care of the newborn, who uses the same resources as if in the hospital of birth, is not compensated for at all.

A change to the current arrangement would also have implications in relation to the workload of medical record departments. Well over half of the hospitals consulted during the course of this project already collect morbidity information on all newborns. However, for those hospitals which do not currently collect this information, there are implications in relation to the cost of opening and storing additional medical records and in additional coding and data entry.

However, there are opportunities to rationalise current information systems which may well offset this additional workload. At present, the perinatal collection runs in parallel to the morbidity collection. There are opportunities to rationalise these separate collections such that the morbidity collection is a by-product of the perinatal collection. The integration of these two collections would minimise the workload implications of any change.

A proposed strategy for the classification of newborns

In our view it is both possible and desirable to separate the classification issues from the financial issues. There are good arguments to support the view that all newborns should be classified as patients of the hospital and, in our view, it should be possible to do so without necessarily increasing the costs to payers. Whether or not costs should increase is outside our terms of reference.

We therefore propose that the Commonwealth should review the legislation regarding the classification of newborns with a view to amending the legislation such that newborns can be legally regarded as patients of the hospital.
It may also be appropriate for the Commonwealth in conjunction with payers and providers to separately review current financial arrangements as they apply to newborns.

**RECOMMENDATION 24**

*That the National Health Act (1953) and the Health Insurance Act (1973) be amended to allow for normal newborns to be classified as patients.*

**RECOMMENDATION 25**

*That the Commonwealth consider the need to review current financial arrangements relating to normal newborns.*

Volume II of this report includes a definition of an admission consistent with the current legislation. Should recommendation 24 be adopted, the definition and explanatory notes will require appropriate amendment.

**5.10 SOURCE DATA ITEMS FOR OTHER CASEMIX CLASSIFICATION SYSTEMS**

The source data items outlined in Volume 2 of this report are those required for an acute care classification system. This is consistent with the Commonwealth’s implementation strategy for casemix whereby acute care has first priority and subsequent work will deal with non-inpatients and sub-acute care.

In relation to health services which fall outside a DRG system, the work of the Patient Abstracting and Coding Project has been limited to defining the boundary between:

*  Non-inpatient and inpatient services and
*  Acute and sub-acute episodes of care.

In practice, health service delivery falls along a continuum and the boundary between service types is often blurred. This continuum can be represented as:

**Non-inpatient - Same day - Acute - Sub-acute - Non-acute**

The National Ambulatory Casemix Project, which is funded by the Commonwealth and managed by the NSW Health Department, is investigating the classification of non-inpatient services.

The National Non-Acute Inpatient Project which is funded by the Commonwealth and is being undertaken at five sites, is investigating the classification of what is defined in Volume 2 of this report as both sub-acute and non-acute care.

Thus, in the longer term there will be three distinct casemix classification systems in place - one for non-inpatients, one for acute patients and one for sub-acute
patients.

The classification systems which will be developed for non-inpatient and sub-acute inpatients will each require the collection of specific source data items. The nature of those items cannot be identified until further development work on those systems is undertaken.

With the development and introduction of these classification systems it will be necessary to investigate their requirements in relation to source data and coding.

Thus it is recommended that:

**RECOMMENDATION 26**

*That work similar to that undertaken by the Patient Abstracting and Coding Project be commissioned in relation to standardisation of source data items and coding for the classification of ambulatory services.*

**RECOMMENDATION 27**

*That work similar to that undertaken by the Patient Abstracting and Coding Project be commissioned in relation to standardisation of source data items and coding for the classification of sub-acute episodes of care.*

5.11 **OPPORTUNITIES TO RATIONALISE DATA COLLECTION SYSTEMS**

As the information requirements of the health system grows, there are increased demands on hospitals to undertake detailed data collection. Concurrently, there are demands on hospitals to improve efficiency and reduce administrative overheads. Frequently these two requirements are in conflict.

During the last decade several new data collection systems have been implemented. These systems have each been established for a specific purpose and each have different requirements in relation to data items collected, frequency of collection and so on. One key characteristic of these collections is that they each run in parallel to each other and in parallel to the hospital morbidity collection. As a consequence, it is not uncommon for hospitals to collect information for up to six separate data collections.

Information systems which run in parallel to the morbidity collection in most states and territories include:-

- a Perinatal collection
- a Cancer Registry
- a Mental Health/Psychiatric Services collection
- an Injury Surveillance collection.

In addition, planning is underway in several states to introduce other specific
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purpose collections.

Whilst recognising that each collection exists to fulfil a specific purpose, we are concerned that a proliferation of separate data systems is an inefficient use of health system resources. Further, it has been suggested to us in the course of our consultations that the quality of the morbidity system is reduced as the demands of other systems are increased.

As a matter of principle health authorities should aim to ensure that data collection systems do not stand alone. The data collection process should be a by-product of the management and clinical activities of the hospital rather than be established as an independent administrative function. Further, all other collections should be either by-products of the morbidity collection or should be able to be integrated with it.

If the morbidity collection is adequately fulfilling its role as the central patient information system in the hospital sector, it should be possible to collect information for other systems as a by-product of the morbidity collection. Thus, for example, it may be both possible and appropriate to compile a Cancer Registry as a by-product of the morbidity system.

Alternatively, it may be appropriate to collect information for the morbidity collection as a by-product of another system. Thus, for example, it may be both possible and appropriate to collect morbidity information pertaining to newborns as a by-product of the Perinatal collection.

Some central health authorities have expressed concern about the practical difficulties in rationalising data collection systems. They make the point that, whilst information is collected from one source (ie the hospital), it is compiled and analysed in different sections or departments of the central health authority or by different organisations. They also express concern that some specific information may be lost if collections are rationalised.

There is clearly a need to strike a balance between the needs of the hospitals and the needs of the central authorities health on this issue. However, our specific concern is that the quality of all collections may be reduced if the information demands on hospitals continue to grow without some attempt to evaluate the cost effectiveness of the present system.

**RECOMMENDATION 28**

That the Commonwealth raise with the states and territories the possibility of central health authorities reviewing their current data collection systems with a view to rationalising,

- the morbidity collection
- the perinatal collection
- the cancer registry
- the psychiatric services collection
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and any other collections which currently run in parallel with the morbidity collection.

Volume 1, Section 6  Source Data Quality

6.1  BACKGROUND

The patient medical record is the source of all data used in the casemix classification process. It is therefore essential that the information contained in the medical record be clear, concise and comprehensive.

Each patient admitted to hospital is assigned a unique medical record. This medical record serves several purposes and its adequacy can be determined by an assessment of whether the record enables:

- the patient to receive continuity of care
- other clinicians to assume the care of the patient if required
- both the hospital and the doctor to meet legal requirements
- evidence to be extracted which indicates the reason for admission, provides documentation to support clinical decisions which were made and details the nature and outcome of the care provided
- information in the record to be extracted, sequenced and coded for research and casemix purposes.

Whilst the whole record is used for coding, the key sources of information are:

- the front sheet
- the progress notes
- the discharge summary
- investigation results
- operation report

All staff contributing to the care of the patient are responsible for recording information in the medical record. These include, but are not limited to, the admissions clerk, resident medical staff, consultants, nursing and allied health professionals.

6.2  REASONS FOR SUBSTANDARD MEDICAL RECORD DOCUMENTATION

The quality of medical record documentation varies considerably from hospital to hospital and from clinician to clinician. Some medical record documentation is of extremely high quality. Much is not.

In our consultations with clinicians and managers several reasons have been identified for the poor quality of much medical record information.
Firstly, some clinicians do not believe that the medical record is an integral part of patient care. They regard medical records documentation as an administrative, and not a clinical task, and argue that they should not be responsible for the quality of medical record documentation.

As a consequence, documentation is regarded as an administrative burden and, if attempted at all, is frequently incomplete, inaccurate or illegible. Alternatively, the task of completing medical record documentation is delegated to the most junior doctor available.

Secondly, the hospital system has a history of not using much of the information it collects. Data goes into a black hole and is never seen again. Under these circumstances it is difficult to maintain the motivation to continue with a data collection system which gives nothing back.

This second point is illustrated by the number of clinicians who maintain separate records for their own purposes. This apparently growing number of clinicians demonstrate that clinical staff are, in the main, interested in information about the patients they treat. They have established separate systems because the hospital patient information system is not meeting their needs.

The third reason is related to confidentiality. Some clinicians believe that patient confidentiality is compromised if comprehensive documentation is provided in the medical record. They argue that they are protecting their patients interests by not complying with medical records standards.

The fourth reason relates to the logistics of data collection. Clinicians and medical records need to be in the same place at the same time. In many hospitals they are not. Other hospitals have organised their medical records so that it is easy for clinicians to complete documentation. Obvious examples include surgeons having access to the record in the operating theatre suite and medical records being left on wards for a short time after discharge so that the discharge summary can be completed.

A final reason which is proposed by many medical record administrators is that the clinicians are not adequately educated in the reasons this documentation is required. It is suggested that better understanding of the uses of the data will produce better documentation. It seems evident from our consultations that the medical record administrator plays a key role in this education process and that education can be very effective if approached at the hospital level.

6.3 STRATEGIES TO IMPROVE THE QUALITY OF DOCUMENTATION.

Improvement in data quality requires a coordinated strategy involving hospitals, educational establishments, and professional colleges and associations. Hospitals are responsible for creating an appropriate organisational culture and for implementing administrative change which make it easy for clinicians to record quality information in the medical record. Educational establishments are responsible for educating health professionals about their responsibilities in medical records documentation. This process needs to begin at the undergraduate level. Professional colleges and associations need to be active in the process of attitude change by stressing the clinical advantages of good medical records documentation.
If there is one single strategy which will improve the quality of data it is simply to use the data. Use improves quality.

Responsibility

Medical record documentation will only improve when it is the clear responsibility of the medical officer responsible for the care of the patient. This requires the most senior doctors (and not the most junior) to be responsible for the quality and accuracy of medical documentation.

Incentives

In the current system there are very few incentives for clinicians to improve data quality. This is rapidly changing with the increasing use of casemix data for quality assurance, utilisation review and costing.

The major incentive available now is the availability of relevant, useable and interesting data. The use of this data acts as a further incentive.

Financial incentives are a key to improving source data quality. In those states where DRG information is already used as a factor in determining public hospital budgets, there is an incentive for both clinicians and managers to improve medical record documentation. However, this incentive only exists when the relationship between the medical record and the hospital budget is understood by both clinicians and managers alike.

Feedback

Hospitals need to create feedback loops so that clinicians receive something back from the information system. Clear and tangible communication channels need to be established between coders and clinicians.

Clinicians and coders must liaise much more closely in regard to documentation and coding issues. Clinicians should receive regular information which allows them to compare their performance with other clinicians working at the hospital and in other comparable settings. Information feedback to clinical departments and wards can thus provide the database for peer review and other quality assurance activities.

Medical Record Administrators should use the information rather than just storing it in the medical record department. Different variables can be accessed such as length of stay by procedure by doctor (use of clinical unit and doctor codes can be used rather than names) and provided to clinicians as a demonstration of the potential of the information system. Even if clinicians are not interested in that particular issue, the process increases awareness and may trigger interest in other areas.

Education

There is a need to educate all health care professionals about the role and importance of the medical record and about the relationship between the medical record and casemix classification.
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This requires a multi-pronged educational strategy and is being addressed by the National Casemix Education Project.

However, education at the hospital level can, and does occur already in some instances, in the form of in-service training on:

- what are DRGs and casemix
- definition of principal and secondary diagnoses
- definition of comorbidity and complications
- the impact of clinician documentation on code allocation
- examples of cost weights
- examples of individual documentation practice.

Administrative Change

There are three issues which require attention. Firstly, hospital policy and culture needs to reflect the importance of the medical record both as an integral component of patient care and as a source of data which will impact on the hospital's performance and budget. The issue can only be addressed by the management of each hospital.

Secondly, administrative change at the hospital level is frequently required to improve the logistics of medical record documentation. The following serve as examples only of the sorts of administrative changes which result in improved documentation.

1. Surgeons completing documentation in the operating theatre suite as they complete operation reports

2. Forms are designed in such a way as to minimise duplication (eg Sameday Endoscopy operation reports produced in duplicate with follow up details and final diagnosis recorded. The duplicate can be used as a discharge summary).

3. Comfortable dictation facilities provided in accessible locations in the hospital (and not in the basement!)

4. Medical records left on wards for 7 days after discharge to enable completion of documentation

5. Progress notes redesigned so that a column is provided down one side to progressively record diagnoses and procedures

6. Legibility assessments incorporated into quality assurance programs

7. Investigate ways that administrative functions of specialists rooms, such as patient billing or referral could be produced as a by-product of hospital data systems.

8. Computerised medical records with direct entry available in wards, operating suite and other clinical areas.

Thirdly, there is a move away from the longstanding requirement that clinicians
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complete both a discharge summary and front sheet on each patient. From our consultations it is apparent that many hospitals rely on only one of these documents due largely to the fact that often only one is completed.

We believe consideration should be given to the amalgamation of the two functions of front sheet and discharge summary. This is an attempt to streamline the needs of the clinician with those of medical record documentation. A more structured discharge summary may meet the coders requirements whilst at the same time reducing the clinicians workload.

The types of administrative changes required varies from hospital to hospital. What is common across hospitals is that every hospital needs to develop a plan to implement strategies such as those listed above. The plan should be developed by and with clinical staff and should be implemented in a systematic way.

Participation

The wealth of data available from casemix information systems can only be fully utilised when clinical staff are actively participating in the management of the hospital. This issue is well canvassed in the literature and it is not proposed to repeat it here.

It is sufficient here to make the point that the more active the participation of clinical staff in the management of the hospital, the more incentives are available to provide quality medical record documentation. Hence, the more likely it is that the relationship between the medical record and casemix is understood.

The participation of clinical staff in the management of the hospital will also address the attitude problems canvassed in Section 6.2 of this report. Specifically the attitude that exists among some clinicians that record documentation is just an administrative task is an issue which is best addressed in the context of broader organisational and attitude change.

Penalties

Penalties against clinicians who fail to comply with medical records standards need to be considered as a last resort.

Attached as Appendix 1 is a protocol in place in one private hospital we have visited. The final option, the suspension or withdrawal of clinical privileges, is included in the protocol for use if education and counselling have failed.

We believe that all hospitals, public and private, need to establish and implement similar protocols.

Other penalties which have been successfully used by hospitals include reducing admission rights and restricting availability to certain designated beds. Perhaps the most successful strategy used in relation to penalties was implemented in one hospital which removed parking privileges for doctors whose records were incomplete!
RECOMMENDATION 29

That all hospitals develop in conjunction with their medical staff an annual management plan to improve the quality of clinical documentation.

Volume 1, Section 7  A National Strategy to Improve Coding Quality

7.1 INTRODUCTION

No single strategy will improve coding quality. The quality of coding is the result of several factors and a number synchronous activities must be in play to effect significant change.

The quality of coding is directly affected by:

- the quality and availability of source data documentation
- the use of an appropriate classification system
- the availability of coding resource material (coding manuals and updates and standards)
- the skill of the coder
- the availability of technology to improve coding (encoders and computerised data editors)
- the implementation of continuous quality improvement and audit programs.

Each of these factors must be addressed if the quality of coding is to be maximised.

7.2 THE INTERNATIONAL CLASSIFICATION OF DISEASES

All states and territories in Australia code their inpatient data using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD.9.CM).

ICD.9.CM is based on the World Health Organisation publication ICD-9. ICD.9 was designed for the classification of morbidity and mortality information for statistical purposes. ICD.9 is still used for the classification and coding of mortality data.

ICD.9.CM differs from ICD.9 in that it has been modified and extended for clinical use especially in acute care hospitals. In order to describe the clinical characteristics of a patient much of the classification is more detailed and precise than in ICD.9.
ICD.9.CM consists of 3 volumes. Volume I is a tabular list of diseases. Volume II is an alphabetic index to Volume I. Volume III contains both a tabular list and an alphabetic index of procedures.

The World Health Organisation (WHO) is currently planning for the release of ICD.10. To this end, the National Reference Centre for Classification in Health has been established by the Australian Institute of Health and Welfare (AIHW) to co-ordinate the introduction of ICD.10 into Australia. ICD.10 will be used for mortality coding by the Australian Bureau of Statistics (ABS), probably from 1996. Any decision to introduce ICD.10 for morbidity coding will have to take into account the use of the classification for casemix. At present the United States have no definite plans to produce a CM version of ICD.10. Health Care Financing Administration (HCFA) has stated that it will not be implementing ICD.10 prior to the year 2000.

**ICD.9.CM**

An updated version of ICD.9.CM is released by the US National Centre for Health Statistics in October of each year. Until this year, New South Wales has been the only state to routinely update to the latest version of ICD.9.CM.

During the course of this project, all states and territories except South Australia have indicated their agreement to update to the 1991 version of ICD.9.CM on or before 1 July 1992. South Australia data for the corresponding period will need to be mapped to the 1991 version to allow comparative data.

Both the National Coding Standards for Inpatient Data Collections (Volume III of this report) and the AN-DRG classification have been developed using the October 1991 version of ICD.9.CM. Annual updates of both the National Coding Standards and the AN-DRG grouper will be required in line with the annual update of ICD.9.CM.

**RECOMMENDATION 30**

*That the National Standard be that all hospitals update annually to the latest version of ICD.9.CM and that the new version be in use no later than 1 July of the following year.*

**The ICD.9.CM Disease Classification**

The ICD.9.CM Disease Classification is considered to be a relatively comprehensive classification of diseases.

**RECOMMENDATION 31**

*That the ICD.9.CM disease classification be maintained for use in Australia.*

**The ICD.9.CM Procedure Classification**

The Australian Casemix Clinical Committee (ACCC) report on the Development of the Australian Inpatient Casemix Classification raises significant concerns
regarding the ICD.9.CM procedure classification. In some cases, deficiencies relating to ICD.9.CM restricted the ACCC in its recommendations about the Australian DRG grouper. A full list of the ACCC recommendations relating to ICD.9.CM are given in Appendix 2.

The ACCC concern was reinforced during our clinical consultations regarding the shortcomings of the ICD.9.CM procedure classification. Coders are also acutely aware of the problems created by a classification system which does not reflect current practice. There is also a problem because of the use of two procedure classification systems in Australia (ICD.9.CM and the Commonwealth Medical Benefits Schedule)

Although it is accepted that no classification system can keep pace with changing clinical practice and technology, there are areas in ICD.9.CM which come under continual criticism, such as microvascular reconstructive surgery and plastic surgery. In many areas of surgery there is a 3 to 10 year lag time between established changes to clinical practice and changes to the coding convention.

Inconsistencies are evident; a number of procedures are now being performed laparoscopically, such as cholecystectomy, hysterectomy and herniorrhaphy but unfortunately only laparoscopic cholecystectomy has been allocated a distinct code in the October 1991 version of ICD.9.CM.

These deficiencies in the ICD.9.CM procedure classification are well recognised internationally. Whilst it is commonly assumed that ICD.9.CM is used internationally, this is in fact not the case. Only a small number of countries (including Australia, the USA, China and Israel) use the ICD.9.CM classification and the World Health Organisation has recommended to its member nations that they each develop their own procedure classification. (Personal communication J Mitchell, WHO Collaborating Centres for the Classification of Disease, Beijing, China 1992)

In relation to the USA, 3M HIS America have submitted a proposal to Health Care Financing Administration (HCFA) regarding a substantial upgrading of ICD.9.CM procedure coding. The 3M HIS proposal is for a 7 digit classification system. HCFA have yet to agree to this proposal however 3M HIS have indicated that, if funded, the project could be completed within 2 years.

Should such a project be undertaken it may be appropriate for introduction into Australia. However, there may be three potential difficulties. Firstly, a 7 digit system would be difficult and costly to implement. Secondly, the procedure classification would be licensed as a commercial product and its use in Australia would be subject to an annual license fee. Finally, the classifications' use in Australia would require the establishment of a process which allowed for the classification to rapidly respond to changes in Australian clinical practice.

In the longer term, it may be a more viable option for Australia to implement a classification specifically suited for use in Australia. Such an approach may prove to be no more expensive than using a commercial product under license and would have the added advantage of being able to respond rapidly to changes in Australian clinical practice.
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RECOMMENDATION 32

That, within 5 years, ICD.9.CM procedure coding be replaced with a classification system better suited to Australian clinical practice.

RECOMMENDATION 33

That the Commonwealth provide research and development funding for the development of an Australian procedure classification system which could be either:

- a modification of the ICD.9.CM procedure classification
- a modification of another existing procedure classification
- a classification system developed specifically for use in Australia.

ICD.9.CM Coding Manuals

ICD.9.CM is published by a number of companies in the USA and as a result comes in various formats. The most widely used version in Australia is that published by the US Commission on Professional and Hospital Activities (CPHA) as a three volume set. Other versions being used to varying degrees are:

* St Anthony's Publications - looseleaf binder
* American Medical Record Association - Volume 3
* Channel Publishing - Educational Annotation
* PMI Publications - looseleaf binder

The advantage of looseleaf binders (ease of updating) is making St. Anthony’s, Channel and PMI more popular options. However, there are problems of inconsistency in the text and updates provided in these various publications. For example, in the October 1990 version of CPHA there is an index entry for “Syndrome, toxic shock 040.89” which does not appear in the October 1990 version of St. Anthony’s.

Thus, it cannot be assumed that a published version of ICD.9.CM contains identical information as all other current versions. This is clearly a problem because it is a prerequisite of standardised data collection that all coders are using the same codes.

It is also clear that much time and money is expended by individual hospitals in ordering various versions of ICD.9.CM either through local book suppliers or in many cases directly to the USA. The South Australian Health Commission addressed the cost constraints experienced by their hospitals by bulk buying manuals which are sold to the hospitals at a reduced cost.

State Health Authorities also carry the burden of providing updates (usually photocopies) to all their hospitals using the Commission on Professional and Hospital Activities manual.

There is no copyright on ICD.9.CM and thus it is possible to print and distribute it within Australia. This has advantages in relation to cost, accuracy and
standardisation.

The Tasmanian Department of Health has undertaken printing of a looseleaf binder and has taken orders from most states, with delivery expected in June 1992.

**RECOMMENDATION 34**

_that an Australian organisation take the responsibility for printing and distribution of ICD.9.CM and subsequent updates within Australia._

**ICD.9.CM Diagnosis & Procedure Recording**

There are significant variations in the maximum number of diagnosis and procedures which can be recorded in each state. This, in turn impacts on DRG allocation in relation to complications and comorbidities.

The current maximum number of codes in the states morbidity systems are:

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<th>Diagnoses</th>
<th>Procedures</th>
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<td>- private</td>
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<td>ACT</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

The cost benefit of collecting more than five codes is not known. However, it is clear that five diagnoses and five procedure codes is the minimum which should be collected and that hospitals collecting less than this number will be disadvantaged under any payment system which takes into account the casemix of the hospital.

7.3 **NATIONAL CODING STANDARDS**

The work which forms Volume III of this report represents a significant milestone in coding practice in Australia. It is the first time that agreement has been reached on coding standards for Australia.

The development of National Coding Standards for Inpatient Data Collections (Volume III of this report) is seen as the building block for data quality. The standards were developed by delegates from each state and territory and from...
the private sector and agreement was reached in relation to every coding standard.

The National Coding Standards were developed after a review of the coding standards and guidelines used by each state. Initial review found that of 81 coding standards, 25% were in agreement, 36% differed, and 39% were not reported in all state manuals.

Subsequent to that review, draft national standards were prepared by the Patient Abstracting and Coding Project and a two day national coding conference was convened. The final standards reflect the views of all delegates to the conference.

It was recognised by the Coding Reference Committee that there were many more specific coding issues which required attention, but the committee could not hope to standardise these within the time frame of this project. However, it was agreed that to achieve national standardisation of the existing coding policies was a very sound basis for further development.

**RECOMMENDATION 35**

*That the National Coding Standards for Inpatient Data Collections which form Volume III of this report be adopted.*

**RECOMMENDATION 36**

*That the National Coding Standards for Inpatient Data Collections be in operation in all states and territories on or before 1 July, 1993.*

7.4 **THE NEED FOR A NATIONAL CODING AUTHORITY**

The National Coding Standards will require regular review and updating. Such review is required to ensure that the standards keep abreast of changes in clinical practice, versions of ICD.9.CM and user requirements. We therefore consider Volume III of this report as simply the first edition.

There is a need for a national body - a National Coding Authority - to be responsible for the ongoing development and review of coding standards.

The role of a National Coding Authority would be:

- to determine future national coding standards for ICD.9.CM
- to produce a national newsletter which outlines new and updated standards
- to answer queries on coding issues
- to recommend on future changes to the AN-DRG classification system from a coding perspective
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- to provide advice on coding to the Australian Casemix Clinical Committee (ACCC) and other relevant clinical associations
- to review and edit ICD.9.CM yearly updates before distribution by the nominated national printer.

The characteristics required for an organisation to take on this role are:

- **Infrastructure.** The organisations' resources infrastructure is sufficient to develop expertise in specialist areas of classification and coding.
- **Credibility.** The Coding Authority has acknowledged specialist expertise and is seen to be independent of user requirements.

In our view, there are only three organisations which currently meet these characteristics. These are the schools of Health Information Management at LaTrobe University (Victoria), University of Sydney (New South Wales) and the Queensland University of Technology (Queensland). Neither of the schools in Western Australia and South Australia are of sufficient size to fulfil this role.

In addition to meeting these requirements, the Queensland University of Technology has the added advantage that it is the site of the National Reference Centre for Classification in Health (NRCCH). The (NRCCH) is an Australian Institute of Health and Welfare reference centre and is managed jointly by Australian Institute of Health and Welfare, the Australian Bureau of Statistics, the Queensland Department of Health and the Queensland University of Technology. It is funded until July 1994. There are clear advantages in vesting responsibility for ICD.9.CM in this body.

**RECOMMENDATION 37**

That a National Coding Authority be established and that its role be:

- to determine future national coding standards for ICD.9.CM
- to produce a national newsletter which outlines new and updated standards
- to answer queries on coding issues
- to recommend on future changes to the AN-DRG classification system from a coding perspective
- to provide advice on coding to the Australian Casemix Clinical Committee (ACCC) and other relevant clinical associations
- to review and edit ICD.9.CM yearly updates before distribution by the nominated national printer.

**RECOMMENDATION 38**

That consideration be given to establishing the National Coding Authority as part of the National Reference Centre for Classification in Health.

**RECOMMENDATION 39**
That the National Coding Authority have an advisory committee consisting of:
- 1 representative of the Commonwealth Department of Health, Housing and Community Services
- 1 representative of the Medical Record Association of Australia (MRAA)
- 1 representative of each state and territory Coding Committee/Authority
- 1 representative of the Australian Casemix Clinical Committee (ACCC)
- 1 representative of the National Reference Centre for Classification in Health

7.5 THE ROLE OF STATE CODING AUTHORITIES AND COMMITTEES

Each state has a state coding committee or authority which produces guidelines or standards for ICD.9.CM, as well as answering queries raised by coding staff throughout their state.

State Coding Authorities and Committees will continue to play an important role in the formulation of coding standards.

With the establishment of a National Coding Authority, the role of state committees will be:
- to answer queries from coding staff in both private and public hospitals on coding matters which are covered by the National Standards.
- to consider other coding queries and to make recommendations to the National Coding Authority.
- to continue their existing roles in relation to ongoing coder education and coding quality assurance.

7.6 THE CODING WORKFORCE

The availability and expertise of the coder is clearly a critical issue in relation to coding quality.

Issues relating to the coding workforce are discussed in Section 8 of this report.

7.7 THE NEED FOR ON-SITE CODING

The number of hospitals in Australia which do not complete coding on site is of concern when addressing problems of coding quality.

The coding process requires abstraction of a number of significant details from the patient's medical record. These details include:
- diagnoses and clinical problems
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- procedures, both operative and non-operative
- cause of injury, trauma and poisoning.

The level of detail required to allocate an ICD.9.CM code necessitates careful perusal of the medical record. Of particular importance is the abstraction of details of procedures performed from the operation report and review of laboratory and radiology results to verify clinical diagnoses.

It is recognised across Australia, particularly by State Health Authorities who code data for hospitals, that quality coding is considerably compromised by not having access to the entire medical record.

In Western Australian, of 125 hospitals submitting to the Inpatient Data Collection, 107 do not code their own data. In New South Wales 110 of 390 hospitals do not code their own data. In Queensland 142 of 187 hospitals do not code their own data.

The State Health Authorities rely totally on the accurate and complete recording of diagnostic and procedural information onto a morbidity form which is then coded by coders based in the head office. There are needless to say many forms received for coding which do not provide sufficient information to accurately and completely reflect the episode of care through the application of codes. In particular, under-reporting of secondary diagnosis is common. Even with the very best of reporting, this method of coding is not as reliable as medical record based coding.

We have also learned of situations in which coding is done on site but without access to the whole medical record. The front sheet is separated from the record, the record is filed and the front sheet is coded at a later time. We find this practice inexplicable.

**RECOMMENDATION 40**

That the National Standard be that ICD.9.CM coding is undertaken from the whole record and not simply from the front sheet or other summary.

**RECOMMENDATION 41**

That the Commonwealth seek the agreement of the States to phase out central based coding and concurrently introduce on site coding in hospitals.

7.8 CODER EDUCATION AND ACCREDITATION

**Introduction**

Coding of medical record data requires special skills. It is not simply a function which can, or should, be undertaken by a person without specialist training in
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coding.

The coding workforce consists of two distinct groups, each of whom have specific educational needs.

**Medical Record Administrators**

The Medical Record Association of Australia has established Policies and Standards for Approval of Educational Programs for Medical Record Administrators. It defines standards for those fields of study which should be included in all educational programs for Medical Record Administrators. These include human biology (anatomy and physiology), medical terminology, medical science, clinical classification and casemix in addition to other studies in management, research, computing, law and quality assurance.

Five (5) Universities currently offer undergraduate degree programs in Health Information Management/Medical Record Administration. These universities are located in Brisbane, Sydney, Melbourne, Adelaide and Perth. There are no university courses available in Tasmania, the Australian Capital Territory or the Northern Territory.

Existing courses are organised differently, and coding related components vary in hours and subject structure. ICD.9.CM coding is but one component in an extremely diverse curriculum which produces graduates who have not specialised in any particular aspect of health information management.

The variation in coding education between the universities is significant. The direct teaching hours vary between the universities and there are variations in relation to level of coding competency expected of students.

Some of the universities are currently considering changes to their courses and the introduction of specialist streams. They are investigating whether, with increasing complexity in the field of health information management, it may be necessary to consider some future form of specialisation at the undergraduate or postgraduate level by offering certain advanced subjects within elective "strands". These "strands" may include nosology and casemix measurement, clinical informatics, health law, human resource and systems management, quality assurance and so on.

**Morbidity Coders**

Morbidity Coders come from a diverse range of backgrounds, with the majority being either nurses or clerical staff.

Training of morbidity coders is equally diverse. Whilst some have received no formal training, the majority have undertaken some form of training in terminology and coding.

Coder training is currently provided in the following forms:

- the New South Wales Technical and Further Education provides a Medical Records (Clerical) Course. This course is a correspondence
The health system requires that the technical proficiency of morbidity coders and Medical Record Administrator coders be equal. This equal level of proficiency can only be achieved and maintained if coder education is adequate.

* Any training course(s) must have an emphasis on distance education to facilitate access by those in country or isolated regions, and to promote flexibility for staff employed on a full-time basis.

* Innovative technologies in the preparation and presentation of teaching materials (eg: video, cassette tape, computer networks, etc) should be utilised to facilitate distance education activities.

* Staff undertaking such training should be given support by employers (eg: study leave, funding to attend residential or regional workshops, renumeration for reference materials, etc).

* The provision of ICD.9.CM coder training programs should be adequately funded and not driven by profit motives alone.

* Initial preference should be given to the enrolment of existing coding staff, however efforts must be made to recruit other students so that a small, well distributed surplus of trained coders is a long-term objective.

* ICD.9.CM Training Program(s) should be comprehensive and incorporate subjects such as: anatomy and physiology, medical terminology, medical processes, surgical techniques, ICD.9.CM classification, coding procedures and policies, data abstraction skills, and problem solving logic.
By the conclusion of the course(s) students should be able to demonstrate a level of competency which reflects their ability to:

- abstract significant clinical details from medical records
- sequence such detail in accordance with standard definitions and policies governing ICD.9.CM coding practice
- assign accurate ICD.9.CM codes in accordance with the rules of the ICD.9.CM classification.

Options for Coder Education

An option paper on this issue was developed as the basis for national consultation. It contained three options in relation to the entry level education of morbidity coders.

The three options have been the subject of extensive consultation and there has been a surprisingly high level of consensus regarding each of these options.

OPTION 1

Staff employed in medical record departments be permitted to enrol in coding-related subjects within Schools of Health Information Management/Medical Record Administration. The successful completion of this component of the course would result in a certificate or statement of attainment.

This would create a career pathway for coding staff who wish to continue studying for a qualification in Health Information Management/Medical Record Administration. Students completing only coding-related subjects would not be eligible for full membership of the Medical Record Association of Australia, nor would they be qualified for appointment to Medical Record Administrator positions.

This option would require flexibility on the part of Universities in terms of part-time enrolment, special entry requirements and timetable arrangements.

OPTION 2

The National Reference Centre for Classification in Health to conduct a distance education program for non-Medical Record Administrator coding staff on a national basis. Such a program could be conducted from a central location or delegated to accredited Training Officers based in each State. Liaison with State Health Authorities would be a necessary requirement.

The structure of such a program might incorporate various modules which integrated anatomy, terminology, disease processes, surgical techniques, ICD.9.CM classification and coding guidelines. It could be studied on a cumulative but flexible basis (for example: basic ICD.9.CM skills, specialist topics such as each ICD.9.CM Chapter, advanced skills, etc).

Modules of such a course could also be completed by Medical Record Administrators as a Refresher Program.
OPTION 3

Each State Health Authority maintain responsibility for ICD.9.CM coder training. They may choose to assume direct responsibility for training, or contract an appropriate organisation to supply training services (e.g. State Branch of Medical Record Association, School of Health Information Management, private agency, etc).

One major difficulty with this third option is the potential for perpetuating inconsistencies in coding practices and standards across state borders. It also requires the infrastructure for coder training to be duplicated in each state. It would be recommended that each organisation must use endorsed training materials from the National Reference Centre, and employ accredited training staff.

Underpinning each of these three options is the need to regulate coder education so as to achieve national consistency. In relation to this issue, three possible approaches have emerged:

(1) introduce accreditation of coding courses
(2) introduce accreditation of coding teachers
(3) introduce accreditation of coders.

In discussing these options, we have been surprised at the consistency in the viewpoints expressed across states, and between Medical Record Administrators and morbidity coders:

* There has been unanimous agreement that coding should only be undertaken by staff who have received formal training in coding.

* There has been overwhelming support for the introduction of national coder accreditation.

* There has been overwhelming concern that none of the options outlined above will adequately address educational needs. Instead, it is recognised that a variety of education approaches is both desirable and possible.

* There has been a consistent view that, if accreditation of coders is in place, it is not necessary to regulate or accredit coding courses. Courses will only survive if they produce students capable of achieving national accreditation.

* Finally, reflecting widespread concern about current variation in coding education, there has been a unanimous view that there should be no "grandfather clause" for those already working as coders. This view is unanimously supported by the coding workforce itself.

Preferred Option Regarding Coder Education
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In our view the preferred approach is for the Commonwealth, the States and the Medical Record Association of Australia to encourage a range of educational courses to develop in response to local need. These courses may be consistent with any of the three options previously outlined.

With the introduction of national coder accreditation, we expect that an industry standard will develop and that inadequate courses will cease to attract students. Courses able to produce students capable of achieving national accreditation will develop and flourish. These courses will attract both entry-level students and experienced coders seeking re-accreditation.

There is clearly a role for employers in ensuring that they have access to a suitably trained coding workforce. For further discussion of this issue, see Section 8 of this report.

The USA Experience

The USA has recently introduced certification examinations for coders. Certification is voluntary and is the responsibility of the America Health Information Management Association (equivalent to the Medical Record Association of Australia).

7.9 THE ESTABLISHMENT OF A MORBIDITY CODING ACCREDITATION BOARD

It is proposed that a national system of coder accreditation be introduced under the responsibility of the Medical Record Association of Australia. Accreditation would be voluntary and will be available to both Medical Record Administrator and morbidity coders.

Features of Coder Accreditation

* A process of coder accreditation will provide a means of assessing the competency of existing ICD.9.CM coding staff, identifying areas of deficiency and defining training needs for individual coders.

* Comprehensive criteria will be developed to define and assess proficiency of ICD.9.CM coders.

* Accreditation will utilise realistic assessments which assess all components of the ICD.9.CM coding process
  - abstraction of clinical data
  - sequencing of clinical data
  - ICD.9.CM code assignment.

* The same standards will apply to Medical Record Administrators and morbidity coders.

* There is a requirement for different levels of accreditation as it is impossible to adequately test skills in a single assessment. Also certain facilities may have a need for specialist or advanced skills. Further
mechanisms for differentiating between or grading coding staff will be required over time.

* Accreditation will be for a period of two years with ongoing accreditation being dependent on participation in ongoing education and other requirements as specified by the Medical Record Association of Australia.

* Accreditation testing will be available within two years to all coders who apply to be tested.

**Proposed Accreditation Levels**

Two accreditation levels will be required:

* **Entry level Coding Accreditation**
  This will be the basic accreditation level for both Medical Record Administrators and morbidity coders.

* **Advanced Level Coding Accreditation**
  Accreditation at the advanced level may include accreditation in specialist areas (e.g. obstetrics, trauma, psychiatry etc) or general coding competency at an advanced level.

It will be necessary to introduce accreditation over a period of time, and the first priority should be to introduce, and formerly establish, entry-level coding accreditation.

**Management of Accreditation**

Coder accreditation should be establish under the responsibility of the Medical Record Association of Australia (MRAA).

It is proposed that the MRAA establish a Morbidity Coding Accreditation Board to manage National Coder Accreditation. The Board should consist of representatives of the Commonwealth, States and Territories, Morbidity Coders, the Health Insurance Industry and the Australian Private Hospitals Association.

The physical location of the Morbidity Coding Accreditation Board should be a decision of the Medical Record Association of Australia. However, we believe that there is significant value (at least in the initial stages) in co-locating the Morbidity Coding Accreditation Board with the National Reference Centre for Classification in Health.

**Funding of the Morbidity Coding Accreditation Board**

It is proposed that the Commonwealth provide establishment funding, perhaps on a cost-shared basis with the states and territories, to establish national coder accreditation for a period of 2 years. It is further proposed that the Medical Record Association of Australia charge a fee from those seeking accreditation.
After this initial establishment period, it is our expectation that the Morbidity Coding Accreditation Board will continue accreditation on a user pays basis. The amount of funding required should be a matter of negotiation between the Commonwealth and the MRAA.

**RECOMMENDATION 42**

That a formal system of National Coder Accreditation be introduced under the responsibility of the Medical Record Association of Australia.

**RECOMMENDATION 43**

That a Morbidity Coding Accreditation Board be established by the Medical Record Association of Australia to manage National Coder Accreditation consisting of representatives of the Commonwealth, States and Territories, Morbidity Coders, the Health Insurance Industry and the Australian Private Hospital Association.

**RECOMMENDATION 44**

That the Medical Record Association of Australia consider the advantages of locating the Morbidity Coding Accreditation Board with the National Reference Centre for Classification in Health until July 1994.

**RECOMMENDATION 45**

That the Commonwealth provide establishment funding, perhaps on a cost shared basis with the states, to establish national coder accreditation for a period of 2 years. After 2 years, that accreditation continue on a user pays basis.

**RECOMMENDATION 46**

That the Morbidity Coding Accreditation Board provide coding testing to all morbidity coders who apply to be tested with the goal of accrediting 60% of morbidity coders in Australia within the first two years.

**RECOMMENDATION 47**

That the Morbidity Coding Accreditation Board develop (in order of priority) 2 levels of coder accreditation:

1. entry level coding competency
2. advanced coding competency

**RECOMMENDATION 48**
That accreditation be for a period of 2 years with ongoing accreditation being dependent on participation in continuing education and other requirements as specified by the Medical Record Association of Australia (MRAA).

RECOMMENDATION 49

That there be no "grandfather clause" for existing morbidity coders regardless of academic background and experience.

7.10 USING TECHNOLOGY TO IMPROVE CODING QUALITY

Computerised coding technology can be used in one of two ways:

1. Technology which provides a means of producing ICD.9.CM code/s from an entered diagnostic or procedural phrase.

2. Technology which enable potential errors or coding problems to be identified.

Computerised Encoding Technology

It has been demonstrated in some localised trials in Australia of the 3M Encoder software that there is the potential to improve the consistency of code allocation using this type of product. As well as providing DRGs, the 3M/HIS Encoder is able to generate ICD.9.CM codes by using an interactive computer program which uses a medical encyclopaedia as part of its database.

Results of the few trials done on the 3M product are as yet unavailable. Results are available of a study done in 1984 (Law, White and Lyle) at Westmead Hospital in Sydney which concluded that manual coding has a moderate speed advantage over the Encoder while being comparable in terms of accuracy.

Royal North Shore Hospital in Sydney is the only site in Australia where the 3M Encoder has been interfaced with the mainframe and consequently is now the principle coding tool for the coding staff. They report that after trialing the product it was evident that a standalone Encoder would not meet their needs. With integration with the mainframe came advantages such as increased production and reduced data entry/transcription errors.

Other advantages were automatic updates, production of DRGs for each individual discharge at the time of coding, standardised approach to code selection and sophisticated edit functions.

Disadvantages cited were an initial decrease in production, reprogramming for local coding decisions and the high installation costs.

Although some localised trials have been done of the 3M product (the only ICD.9.CM coding software currently being marketed in Australia), there has been no substantial evaluation or cost-benefit analysis undertaken as yet.
The cost involved in establishing interfaces with existing morbidity databases may preclude its use in many hospitals. The advantages of Encoder software and its disadvantages, particularly in terms of cost, should be weighed up carefully. Before making a commitment to this coding method, consideration should be given to whether funds could be spent on other methods of improving coding quality which would realise significant coding quality improvement.

**RECOMMENDATION 50**

*That State Health Authorities undertake a cost benefit analysis before usage of encoder software is widely implemented.*

**Computerised Editing Technology**

Products such as the Clinical Data Editor (CDE) can also be of assistance in reducing clerical errors and standardising the application of coding rules.

The CDE is a computer software product designed to improve the quality of medical record abstract data. The CDE is produced by Health Systems International (HSI), the organisation which is responsible for the production of the official US Medicare DRG grouper.

Although the full potential of products such as the CDE is still unclear, it is clear that editing at, or as close as possible to, the time of coding is beneficial to the coder and to the coded data they produce.

**RECOMMENDATION 51**

*That sophisticated techniques for evaluation of coded data such as the Clinical Data Editor (CDE) be used both by hospitals and by State Health Authorities.*

**7.11 QUALITY IMPROVEMENT STRATEGIES**

Discussions with Morbidity Coders and Medical Record Administrators have indicated widespread support for the proposal that quality assurance activities be an integral part of the coding process. In fact this is already the case in many hospitals. There are some reservations about the available time to improve quality given often tight deadlines for submission of data to State Health Authorities and chronic understaffing in some hospitals.

However, there are a number of ways in which hospitals can effect quality improvement activities for the coding function:

1. Focus on error prone DRGs such as DRG 468, 469 and 470 each month.
2. Pick two of the most frequently occurring DRGs to review each month.
3. Make coding quality review part of regular coding meetings. Have
discussions about recently published articles on coding from the State Health Authority, "Coding Clinic" (USA), Medical Record Journals and other relevant publications.

4. Use outside expertise such as clinicians, laboratory staff etc to assist with interpretation of results, documentation or disease processes. Good communication channels between clinicians and coders are of particular importance as the clinicians documentation is so critical to the allocation of codes which reflect the care given.

5. In small hospitals, it is valuable to nominate a Medical Liaison Officer to provide feedback between clinicians and coders. In larger hospitals Medical Liaison Officers for each clinical specialty, department or division may be required.

6. Develop a "hit" list. This list may be based on the most common DRGs occurring for the particular hospital. Servais, (1992) cited this as a most useful tool because "we must do best that which we do most often". There clearly are advantages in reviewing specific areas particularly when time is limited.

7. Review the "hit" list regularly. For example, if coders have no difficulty coding pneumonia do not continue to review it. "Spend your time reviewing areas where you do have concern and opportunities for improvement" (Servais, 1992).

8. Select 20 records randomly or from the "hit" list which will be coded by all the coders. If there are adequate coding staff, rotate the responsibility for collating the results for each session. Discuss the results and the decisions made at regular coding meetings.

9. Review State Health Authority or State Coding Authority newsletters for areas which would be useful to review. Feedback from editing provided by State Health Authorities can also provide an indicator of target areas.

10. Talk to people who use the coded data such as planners, clinicians, accountants to see if their results make sense from a coding viewpoint.

11. Use similar principles as clinical indicators and continuous quality improvement to monitor coding quality.

Many of these strategies are more effective and easier to implement when a hospital has multiple coders employed. In those hospitals where there is a sole Medical Record Administrator or coder it can be difficult if not impossible to instigate coding audits.

RECOMMENDATION 52

That sole coders be involved in zonal, area or regional coding quality networks with other coders. These groups could be organised informally between hospitals, or with assistance from State Health Authorities or private and public hospital associations.
State Health Authorities can also play an important role in providing avenues for improving coding quality. The Health Department of Western Australia, for example, engages clinicians to discuss their specialty area at a meeting of coders. The coders are thus given an opportunity to resolve difficult coding issues and learn more about the disease processes and procedures involved in the specialty. The clinicians in turn gain a better understanding of the implications of documentation, how ICD.9.CM is structured, the coders requirements and how the data is used.

**RECOMMENDATION 53**

*That State Health Authorities develop and implement strategies for improving coding quality.*

Computers can be used to improve coding quality through the use of DRG and editing software. Most state authorities currently edit morbidity data once it is received at the state level. However, editing is not commonly undertaken at the hospital level. We believe that this situation should change and that data editing should be routinely introduced into hospitals that code on-site. Hospitals will benefit by the closer scrutiny of its coded data before submission to the State Inpatient Data Collection through:

1. Fewer queries from the State Health Authority after processing of the data which could be some months after the coding was done.
2. The data will be more accurate and can then be used with confidence at the hospital level.
3. Coding quality will improve as a result of coders being aware of the errors being generated. Most importantly coders will be made aware of errors as they occur.

State Health Authorities will benefit through:

1. Fewer queries and therefore reduced administrative costs associated with processing the data.
2. In turn this will improve the turnaround time of information to users.

In the short-term, the options available are for hospitals to purchase a commercial product or for them to gain access to the editing software developed and used by state health authorities. There is a third option which is worthy of consideration. This is the development of an Australian public domain product which can be used for data editing as well as having additional functions specifically suited for hospital usage.

**RECOMMENDATION 54**

*That in the short-term all hospitals obtain access to a computer facility for data editing. The options are either to purchase a commercial product such as the CDE HIS product or to gain access to the editing software developed*
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and used by State Health Authorities.

RECOMMENDATION 55

That the Commonwealth seek expressions of interest for the development of a public domain software product designed for patient data editing at a hospital level.

RECOMMENDATION 56

That information generated from DRG reports be maximised at the hospital level to improve coding quality before the data enters the State Inpatient Data Collections.

RECOMMENDATION 57

That all hospitals develop an annual management plan for the improvement of coding quality.

RECOMMENDATION 58

That State Health Authorities investigate the feasibility of coded data having more sophisticated edits applied (either CDE or Departmental edits currently existing) at either hospital or area/region level.
8.1 THE CODING WORKFORCE

Coding is an activity which has traditionally been regarded by many hospital managers and clinicians as boring, insignificant and irrelevant.

This attitude has been consistent with the fact that coded data has rarely been used and that it has had little impact on the day to day decision making of the hospital.

Unfortunately, this attitude has been influential in shaping the way that the coding function is organised and in shaping the views of the coding workforce itself.

For many Medical Record Administrators and Morbidity Coders, coding is a skill which is undervalued and a task which is performed only until a better job becomes available. This is reflected in the alarmingly high turn-over in the coding workforce (see Section 8.2).

Many of the comments made previously in relation to clinicians and source documentation apply equally to Medical Record Administrators and coders. With few exceptions, coders receive inadequate support in performing their role and experience significant difficulties in maintaining motivation for a task which incorporates little feedback. Many coders report that they have never seen the data again after they have coded it. They have no idea where the data goes, whether it is used and whether they are performing a useful function.

Overwhelmingly, coders cite lack of administrative and professional support as one of the key problems they experience.

The coding workforce varies from state to state. Victoria is the only state which exclusively uses Medical Record Administrators (MRA) to undertake coding. All other states and territories use a mixture of MRAs and other coders. These other coders have a variety of backgrounds with the majority having a background in either general clerical or in nursing. Most, but not all, of these coders have received training in coding. In some places, coders consider themselves to be quite separate to MRAs and are slowly developing a professional identity of their own. In Western Australia, for example, coders are called Morbidity Classification Officers (MCOs) and are active in ongoing education and policy discussions relating to coding. In some hospitals coding is no longer considered a medical record function and is managed in either the finance, computer or information systems sections of the hospital. This is not an organisational arrangement that we support.

It is apparent that there are several problems relating to the status of coding. As a consequence of the attitudes outlined above, many MRAs openly express the view that they do not like coding and that they should not be required to participate in it. Others see it as a core skill and function of the MRA. In some places, the relationship between MRAs and other coders is strained with coders being unhappy about being responsible to an MRA who has not maintained both interest and skill in coding.

In our view there is a role for both MRAs and Morbidity Coders in coding.
Further, it is clear that the coding proficiency of both groups should be equal.

However there are differences between the two workforce groups. A Medical Record Administrator is (usually) a graduate of a three year university program and belongs to a profession concerned with the development and implementation of health information systems. These systems are designed for the capture, storage, analysis, retrieval and release of information about health service provision.

The role of MRAs varies from one place of employment to another and reflect their diverse training in systems design and analysis, records management, research and statistics, quality control, medico-legal aspects, medical terminology, forms design and analysis. Knowledge, applications and analysis of clinical classification is part of the research and statistics component of the role of a MRA. MRAs may perform the actual coding function or manage those that do.

In contrast, the role of Morbidity Coders is less diverse. Coders perform the technical coding function and are less frequently involved in data analysis or design. Many Morbidity Coders are extremely proficient in undertaking coding and possess expert knowledge in all aspects of the coding process.

8.2 WORKFORCE CHANGES REQUIRED

The status of the medical record department and the coding function needs to change. With the increasing importance given to casemix it is clear that the medical records department cannot be regarded as simply the "filing room" and the coder regarded as a person who undertakes general clerical duties.

Concurrent with this attitude change, several administrative and career structure changes should be implemented.

A Change of Title

As a reflection of the specialised nature of the work, the title "Morbidity Coder" should be given to those who are primarily employed to undertake clinical coding and who are currently known as coders, coding clerks, non-MRAs, administrative assistants and so on.

More Full-time Positions

Watson and Gough (1991) investigated the status of ICD.9.CM coding in New South Wales (NSW) and the Australia Capital Territory (ACT). Their findings are alarming. In NSW, 276 coders occupied the equivalent of 99 full-time positions. Of these 276 coders:

* only 13% were full-time
* 54% spend less than 10 hours per week coding
* 32% spend less than 4 hours per week coding.
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Individuals who spend only a few hours each week coding cannot be expected to undertake intensive training and continuing education. For the employer, a substantially part-time workforce represents a poor investment.

An Investment in Training

Section 7 of this report outlined the need for the training and accreditation of Morbidity Coders.

Morbidity Coders require the support of their employer in providing access to continuing education, assistance with course fees, flexible working hours and so on.

The use of casemix for hospital funding (in whatever form) is the clear incentive for hospital managers to invest in a career structure and education for Morbidity Coders. With the quality of coding having a direct bearing on the level of hospital funding, the establishment of a career structure and a commitment to ongoing education represents a good investment by the hospital.

Reduced Staff Turn-over

Watson and Gough's findings regarding staff turn-over indicate a serious structural problems in the provision of coding services.

Their study of area health services in metropolitan Sydney found a 64% turnover of coding staff in two years. One Area Health Service had a turnover of 90%.

Establishment of a Career Structure

All the available techniques to improve quality will be fruitless if staffing levels do not allow for quality improvement measures and continuing education. Coding is a very technical and skilled job, requiring extensive knowledge in medical terminology, anatomy and physiology and disease processes. Continuing education is crucial if coders are to keep abreast of changes in clinical practice and also interpretation of yearly amendments to the coding manuals.

Many staff cite salary as their major incentive to undertake courses such as Medical Terminology or ICD.9.CM courses. However, in many instances, particularly in smaller hospitals, the coder is not rewarded in monetary terms for attaining medical terminology knowledge or indeed coding skills acquired at approved coding courses.

The average wage for a Morbidity Coder in Australia is $23000, and with few exceptions, there are no career structures and no opportunities for promotion. In this situation it is hardly surprising that the workforce turn-over is high.

In Section 7 of this report we recommended that the use of computerised encoding technology should be subject to a cost-benefit analysis before it is widely introduced. We proposed that other strategies be investigated which may well prove to be a better investment in coding improvement. In our view, a
commitment to improving the structure and skills of the coding workforce may represent a better investment than investing in computerised encoding technologies which are, as yet, untested.

**RECOMMENDATION 59**

*That the title "Morbidity Coder" be adopted for staff who primarily undertake clinical coding.*

**RECOMMENDATION 60**

*That State Health Authorities and hospitals review their morbidity coding workforce and develop a strategy to increase the number of full-time positions, reduce staff turn-over, and increase opportunities for continuing education.*

**RECOMMENDATION 61**

*That the salaries and career structures of Morbidity Coders be commensurate with their role, skills and responsibilities.*

### 8.3 IMPLICATIONS OF INTRODUCING ON-SITE CODING

In Section 7 of this report we recommended that central based coding be phased out and that coding be undertaken on-site in hospitals.

There are clear implications for Morbidity Coders currently employed by State Health Authorities and it will be necessary to ensure that the transition from central based to on-site coding occurs in such a way that individual staff needs are met and industrial rights protected.

### 8.4 WORKLOAD STANDARDS

The number of records which can be accurately and comprehensively coded in a day varies according to the casemix complexity of the hospital and the skill and experience of the coder.

As a workload standard, we believe that one Full Time Equivalent (FTE) coding position is required for 10000 - 13000 separations per annum. One to 10000 separations is the standard for hospitals with a complex casemix. 13000 is recommended for hospitals with a narrow casemix.

This workload standard of one FTE coding position per 10000 - 13000 separations is based on a proficient coder and includes the following activities:

- coding
- indexing
- training
- coding quality improvement
Creating a Common Language: the production and use of patient data in Australia

It does not include other functions undertaken in medical record departments.

**RECOMMENDATION 62**

*That a workload standard of one full time equivalent coding position for 10000 - 13000 separations per annum be adopted.*

In making this recommendation we are mindful of the findings of Wendler and Slovensky (1987) as cited in Watson and Gough (1991). Wendler and Slovensky investigated the impact of the American Prospective Payment Scheme (PPS) on coding. They found that, as a consequence of PPS, the average coding time per record increased from 7.6 minutes to 18 minutes. This is equivalent to 25 records per coder, per day.

In comparison, our recommended workload standard is equivalent to 45 records per coder per day. In the longer term, hospitals may find that it is in their interests to increase their coding workforce in order to maximise their funding under a casemix based funding scheme. No doubt the industry standard will change in response to the design of the payment system.

Applying the ratio of 1:10000 to hospital separations on a state and territory basis gives the number of FTE coders required as:

<table>
<thead>
<tr>
<th>State</th>
<th>PUBLIC</th>
<th>PRIVATE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>102</td>
<td>26</td>
<td>128</td>
</tr>
<tr>
<td>VIC</td>
<td>60</td>
<td>25</td>
<td>85</td>
</tr>
<tr>
<td>QLD</td>
<td>44</td>
<td>17</td>
<td>61</td>
</tr>
<tr>
<td>SA</td>
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<td>10</td>
<td>41</td>
</tr>
<tr>
<td>WA</td>
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<td>8</td>
<td>35</td>
</tr>
<tr>
<td>TAS</td>
<td>7</td>
<td>3</td>
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<tr>
<td>NT</td>
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<tr>
<td>ACT</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>278</strong></td>
<td><strong>89</strong></td>
<td><strong>367</strong></td>
</tr>
</tbody>
</table>


The current number of trained and available coders is not known because of the current organisation of coding services across Australia. However, from information which is available, it is clear that several states are well below the number of Morbidity Coders proposed above.
Volume 1, Section 9 Implications for the Private Sector

Our consultations to date have highlighted to us the variability of the private sector in relation to patient abstracting and coding. Some private hospitals are well in front of public hospitals of equivalent size in relation to both documentation and coding. However, others are well behind.

Many problem areas in the private sector are attributable to the size of the hospital rather than to the fact that they are privately owned and managed. In this regard, they are comparable to public hospitals of equivalent size.

However, there are four issues which are of particular relevance to the private sector. Firstly, many private hospital managers are ambivalent about attempting to improve data quality. They make the point that they cannot afford to alienate their admitting doctors. This view is by no means consistent in the private sector with some managers taking the view that "a doctor who fails to meet acceptable standards of documentation is a doctor that the hospital can do without". In every case, such managers commented that their hospital had never lost a doctor because of the hospital's attempts to improve data quality.

Secondly, there is a proliferation of computer software suppliers being used in the private sector. This is in marked contrast to the public sector where only a limited number of software suppliers are used in each state. As a result, the lead time to change source data items is longer in the private sector and, in some cases, changes can only be achieved at considerable cost to the individual private hospital. Some software currently being marketed to hospitals is completely unsuitable. For example, software which uses a unique coding classification instead of ICD.9.CM and software which does not allow for the collection of required patient level data.

With the introduction of casemix based funding, we expect that an industry standard will develop and that hospitals will only purchase software which:

* collects National Minimum Data Set (NMDS) information
* meets source data requirements for casemix
* meets National Coding Standards
* can be interfaced with AN-DRG software and with data editing software.

Hospitals need to be alerted to what to look for in purchasing software and thus we recommend that:

RECOMMENDATION 63

That the National Reference Centre for Classification in Health (NRCCH) develop guidelines which assist hospitals in the selection of suitable software including a checklist of what to look for in making a decision to purchase.

In the event that hospitals continue to experience difficulties in selecting suitable
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software, it may be necessary in the future to introduce the concept of "approved software suppliers". Under this proposal, an independent body would approve software which enables the collection of national source data items and which meets national coding standards. The system would be voluntary with suppliers submitting software for endorsement. The supplier could then advertise their product as one which meets national standards.

It is premature to formally consider this proposal until such time as Recommendation 63 has been implemented. It may be that, with the implementation of this recommendation, no further action is required.

The third issue of particular relevance to the private sector is the need to introduce on-site coding in hospitals where it is not presently undertaken. Various models exist:

1. the hospital employs an Medical Record Administrator or Morbidity Coder on a full or part time basis
2. the hospital uses contract coders (in many existing cases, such coders are employed in a public hospital and provide a contracted service to the private hospital)
3. two or more small private hospitals jointly employ a Medical Record Administrator or Morbidity Coder
4. in the case of South Australia coding staff employed in the South Australian Health Commission systematically visit private hospitals and code on-site.

In our view, it is preferable for the hospital to employ a Morbidity Coder or Medical Record Administrator. This creates a sense of ownership in the coded data and allows the Morbidity Coder to become part of a team. However, it is recognised that this is not always possible and that other options need to be considered.

The final issue in relation to the private hospitals relates to incentives and needs. The current needs of the private sector, in relation to management information systems are substantially not related to ICD.9.CM. The private sector already has a Patient Classification Schedule which groups patients into classes based on the Commonwealth Medical Benefits Schedule (CMBS).

The collection of nationally standardised data needs to take into account both short-term and long-term requirements. The CMBS is required by private hospitals for billing purposes and, under the present arrangements, there are few incentives for the private hospital sector to implement many of the recommendations in this report relating to ICD.9.CM.

In the longer term, it can be anticipated that the design of any new hospital payment system will determine whether sufficient incentives exist for the private sector to implement the recommendations included in this report.
Health Authorities

Throughout this report we have raised a number of matters which have implications for State and Territory Health Authorities. This section summarises those issues.

1. The national adoption of standardised source data items and definitions will require each of the states and territories to implement them. Not all states and territories are happy with all proposals included in this report, and we have indicated their concerns where they have been made known to us. In some cases, it is possible to collect data in accordance with the proposed national definition whilst also collecting data as required by the State Health Authority. An example is Principal Diagnosis, where it is possible to collect data according to both definitions. A further example is the collection of prospective data on same day patients and the derivation of retrospective data on patients admitted and discharged on the same day.

However, this is not always possible. An example is the definition of a planned same day patient as a separate hospital product.

In these cases, the standardisation of source data and definitions requires that all states and territories implement the one approach. Quite clearly, this requires compromise and negotiation between the parties.

2. Health authority computer systems will need to be changed to allow for the collection of new source data items. The earlier these changes occur, the better data quality will be after July 1993.

The lead time for these changes varies from state to state and, in some states, from system to system.

Most states and territories have already begun to plan for these changes with implementation planned for July 1992, January 1993 or July 1993 depending on the state.

3. States and territories need to rationalise their data collection systems. This issue is discussed in Section 5.11 of this report.

4. States and territories need to implement the recommendations in this report that relate to the improvement of coding, including the establishment of a career structure for Morbidity Coders and the development of a workforce plan.

5. Several health authorities will need to develop a strategy to phase out coding currently undertaken in the central authority and to introduce on-site coding in all hospitals.

6. States and territories need to jointly select an organisation to take responsibility for the printing and distribution of ICD.9.CM manuals in Australia. The potential cost savings achievable through this proposal will be lost unless the printing order is large enough to reduce the unit price.
7. States and territories will need to implement the National Coding Standards for Inpatient Data Collections and re-issue their coding standards so that they contain all national coding standards. There will also be a need for states and territories to agree not to introduce new coding standards unless they are in accordance with the National Standards.

8. Finally, states and territories will need to work closely with their hospitals (public and private) in implementing many of the proposals contained in this report. Hospitals will require support and technical assistance in changing both their organisational culture and their administrative practices so that the quality and consistency of source data collection and coding in Australia can be substantially improved.
Standard Definitions and Source Data
Items for Hospitals in Australia

Eagar K. and Innes K. (1992)
Volume 2, Section 1 Introduction

This volume outlines standardised definitions and data items to be collected in all general hospitals in Australia.

These definitions apply to general hospitals only. They do not apply to psychiatric hospitals or to nursing homes.

Included in this volume are all patient-level items included in the National Minimum Data Set (NMDS) with the exception of those which will require amendment in order to meet casemix requirements. It includes NMDS items which are not required for casemix purposes. They are included in this report so that this volume can be used as a stand-alone resource at the hospital level. Items marked with an * are NMDS items which are not required for casemix purposes.

Two flow charts are included in this volume. The first "Decision Model for Data Collection" is designed for the use of hospital staff participating in patient classification and data collection. The second "Length of Stay Data Analysis Model" is designed for use in administration, utilisation review and statistical analysis.
1. As defined in this report.
2. As currently defined in Commonwealth Legislation.
LENGTH OF STAY

DATA ANALYSIS MODEL

1. Defined data item collected in patient data set.
2. Derived data item.
Volume 2, Section 2 Definitions

2.1 HOSPITAL

A health care facility established under Commonwealth, State or Territory legislation as a hospital or a freestanding day procedure unit and authorised to provide treatment and/or care to patients.

Notes:
1. Each hospital has a unique provider number issued by the Commonwealth Department of Health, Housing and Community Services.
2. A hospital thus defined may be located at one physical site or may be a multicampus hospital. A multicampus hospital has one provider number and movements of patients between sites are regarded as ward transfers.
3. For the purposes of these definitions, "hospital" includes satellite units managed and staffed by the hospital.

2.2 PATIENT

A patient is a person for whom a hospital accepts responsibility for treatment and/or care.

Note:
There are three categories of patient:
1. inpatients
2. planned same day patients
3. non-inpatients

2.3 INPATIENT

An inpatient is a patient who is admitted with the intention of discharge after a minimum of one night in the hospital.

Notes:
1. An inpatient can be concurrently an inpatient in one facility and a same day patient at another (e.g. an inpatient of one hospital attending a second hospital for a same day procedure.) The patient is on leave from the first hospital while being treated as a same day patient at another. Leave days of a full calendar day are separately counted and no charges are raised for such days.
2. An inpatient in one hospital cannot be concurrently an inpatient in another hospital. Such a patient must be discharged from one and admitted to the other on each occasion of transfer.
3. The definition of an inpatient includes patients who leave of their own accord, die or are transferred on their first day in the hospital.
2.4 PLANNED SAME DAY PATIENT

A planned same day patient is a patient who is admitted with the intention of discharge on the same day.

Notes:
1. The term "planned" in the above definition does not refer to the intention to admit, i.e. a planned same day patient is not necessarily limited to booked same day procedure patients. It can also include emergency patients who are treated in the expectation that they will be discharged that day.
2. The classification of a patient as a planned same day patient is made at the time of admission. Subsequent changes to the patients treatment do not require reclassification to another patient category. Thus the definition of a Planned Same Day Patient excludes inpatients who leave of their own accord, die or are transferred on their first day in the hospital and includes patients who are subsequently required to stay in hospital for one night or more.
3. A patient cannot be both a planned same day patient and an inpatient at the one hospital. Thus emergency treatment provided to a patient who is subsequently classified as an inpatient shall be regarded as part of the inpatient episode of care.
4. Data on actual day only patients is derived by a review of admission and separation dates.

2.5 NON-INPATIENT

A non-inpatient is a patient whose treatment does not meet the minimum criteria for admission.

Note:
A patient thus defined is not admitted to the hospital.

2.6 ADMISSION

The process by which an inpatient or a planned same day patient commences an episode of care.

An admission may be FORMAL, STATISTICAL or TYPE CHANGE.

**Formal** The administrative process by which a hospital records the commencement of treatment and/or care and accommodation of a patient.

**Statistical** The administrative process by which a non-voluntary psychiatric patient who has been statistically separated recommences treatment and/or care and accommodation.¹

**Type Change** The administrative process by which a hospital records the start of each episode of care occurring within the one stay in hospital as either acute, sub-acute or non-acute.
The minimum criteria which must be met before a patient can be admitted is that the patient receives one of the following services:

1. **Day Only Surgical and Diagnostic Service** as specified in Bands 1A, 2, 3 and 4 of HBF circular No. 263 as revised from time to time. The current list (December 1991) of procedures included in this circular is summarised on page 12 of this volume.

   OR

2. **Emergency Medical Treatment** involving constant nursing care and treatment under the supervision of the admitting medical practitioner for a period of no less than four (4) hours (excluding waiting time).

   OR

3. **Medical and Rehabilitation Treatment** in which the patient undertakes an active therapeutic program with diagnosis and treatment being documented on each occasion in the patient medical record and with a treatment time of more than 4 hours.

   OR

4. The patient is a newborn and:
   * is the second or subsequent liveborn infant born of a multiple birth, and the mother is currently an inpatient.
   * requires treatment which can only be provided in a designated Neonatal Intensive Care Unit or designated Special Care Nursery. Where the baby was born in hospital during the episode of care, the admission date will reflect the first day in N.I.C.U or S.C.N.
   * is admitted to, or remains in, the hospital without its mother.  

   OR

5. The patient is expected to require hospitalisation for a minimum of one night.

**Note:**
1. The collection of "Statistical Admissions" is subject to individual state or territory legislation and/or clinical protocols.
2. As at June 1992 Commonwealth legislation prohibits other newborns from being classified as either patients or inpatients. Thus other newborns cannot be admitted to the hospital.

**SUMMARY OF PROCEDURES INCLUDED IN HBF CIRCULAR No. 263**

**Band 1a**

- Dialysis supervision.
- Administration of blood or bone marrow.
- Administration of cytotoxic agent by I.V. drip or by introduction into bladder.
- Removal of cancer of skin or mucous membrane by serial curettage or liquid nitrogen cryosurgery.
- Oesophagoscopy, gastroscopy, duodenoscopy or panendoscopy with biopsy, injection of varices, polypectomy, removal of foreign body and diathermy of bleeding lesions.
- Sigmoidoscopic examination, rigid, with diathermy or resection of one or more polyps.
- Sigmoidoscopy/colonoscopy, flexible, up to the hepatic flexure, with or without biopsy, with removal of one or more polyps.
- Fibreoptic colonoscopy beyond the hepatic flexure with or without biopsy.
Pilonidal sinus, injection of sclerosant fluid under general anaesthesia.
Gynaecologically examination under anaesthesia.
Colposcopically directed CO2 Laser Therapy for intraepithelial neoplasia of cervix, vagina, vulva, urethra or anal canal including associated biopsies.
Colposcopically directed CO2 Laser Therapy for condylomata unsuccessfully treated by other methods.
Hydrotubation of fallopian tubes as a non-repetitive procedure.
Suprapubic stab cystotomy.
Lumbar puncture, or spinal or epidural injection.
Injection of primary branch of trigeminal nerve with alcohol, cortisone, phenol or similar substance.
Ear Toilet requiring use of operating microscope and microinspection of tympanic membrane with general anaesthesia.
ENT - Cauterisation when performed under general anaesthesia, or diathermy of septum, turbinates or pharynx - one or more of these procedures not associated with any other operation on the nose.
Cryotherapy to nose in the treatment of nasal haemorrhage.
Extirpation of tarsal cyst.
Cauterisation of or injection into angioma.

Band 2
Procedures carried out under local anaesthetic, no sedation. Theatre time (actual time in theatre) less than one hour.

Band 3
Procedures carried out under general or regional anaesthesia or intravenous sedation. Theatre time (actual time in theatre) less than one hour.

Band 4
Procedures carried out under general or regional anaesthesia or intravenous sedation. Theatre time (actual time in theatre) one hour or more.

2.7 LENGTH OF STAY

The length of stay of a patient is the number of days from admission to separation minus any days on leave.

A patient whose admission and separation dates are the same shall be allocated a length of stay of 1.0 day.

Note:
Length of stay can be calculated for the stay in hospital or for episodes of care within the stay in hospital.

2.8 EPISODE OF CARE

An episode of care:
* is a phase of treatment defined according to the acuity of the patient.
There are 3 care types:
CALL NON-ACUTE
SUB-ACUTE
ACUTE

* refers to the phase of treatment rather than to each individual bedday. Within an acute episode of care there may be sub-acute beddays but that in itself does not imply disaggregation of the episode into acute and sub-acute episodes.

* is designed to reflect the changing diagnosis and/or treatment of the patient. There may be more than one episode of care within the one inpatient stay.

* Ends when the care type changes or the patient separates from the hospital.

Notes:
1. A type change separation occurs on each occasion that the care type changes.
2. All episodes of care shall be assumed to be acute unless otherwise indicated.

2.9 CARE TYPE

Care type is defined according to acuity.

There are three care type categories:

Non-acute Care Type
Sub-acute Care Type
Acute Care Type

2.10 NON-ACUTE CARE TYPE

An episode of care:

* which occurs after the patient has been assessed by a Geriatric Assessment Team (G.A.T) as requiring residential placement and the patient does not have a current Acute Care Certificate issued under Section 3B, or a determination under Section 3A, of the Health Insurance Act or,

* the patient has been in one or more hospitals (public and private) for a continuous period of more than 35 days with a maximum break of seven consecutive days (or as specified in legislation) and the patient does not have a current Acute Care Certificate issued under Section 3B, or a determination under Section 3A, of the Health Insurance Act, or
* in which the patient is receiving convalescent care or,
* in which the patient is receiving respite care.

Note:
Non-Acute Care Type applies to all patients who meet the criteria regardless of compensable status.

2.11 SUB-ACUTE CARE TYPE

A sub-acute care type is an episode of care:

1. Provided in one of the following designated units:
   - rehabilitation unit
   - geriatric rehabilitation unit
   - palliative care unit
   - psychogeriatric unit
   - psychiatric unit other than an acute psychiatric unit designated as such by the state health authority.
   
   or,

2. Under the clinical management of either:
   - a Rehabilitation Physician
   - a Palliative Care Physician
   - a Psychogeriatrician

3. If neither (1) or (2) applies, an episode of care can be classified as sub-acute if, in the opinion of the treating medical officer, the goal of the episode of care is one of the following:
   - rehabilitation and tertiary prevention¹
   - palliation

4. And which does not satisfy the criteria for classification as a non-acute care type.

Note:
1. Tertiary prevention is clinical intervention and patient education provided with the intention of preventing a re-admission of the patient to hospital.

2.12 ACUTE CARE TYPE

An acute care type refers to an episode which does not meet the criteria for classification either as a Sub-acute care type or Non-acute care type.

2.13 SEPARATION

The process whereby either a planned same day patient or an inpatient completes an episode of care.
A separation may be **FORMAL,** **STATISTICAL** or **TYPE CHANGE.**

**Formal** The administrative process by which a hospital records the completion of treatment and/or care and accommodation of a patient (discharge, transfer or death).

**Statistical** The administrative process by which a hospital records the completion of treatment and/or care and accommodation of a non-voluntary psychiatric patient.¹

**Type Change** The administrative process by which a hospital records the completion of each episode of care occurring within the one stay in hospital as either acute, sub-acute or non-acute.

**Note:**
1. The collection of "Statistical Separations" is subject to individual state and territory legislation and/or clinical protocols.

2.14 **BOARDER**

*A boarder is a person who is receiving food and/or accommodation but for whom the hospital does not accept responsibility for treatment and/or care.*

**Notes:**
1. A boarder thus defined is not admitted to the hospital. However, a hospital may register a boarder.
2. A boarder who subsequently receives clinical treatment at the health care facility shall be classified as a patient in accordance with these definitions.

**Volume 2, Section 3 Demographic & Financial Data Items**

3.1 **ESTABLISHMENT IDENTIFIER**

**Definition:** Identifier for the establishment in which inpatient episode occurred. Each separately administered health care establishment to have a unique identifier at the national level.

3.2 **PATIENT IDENTIFIER**

**Definition:** Patient identifier unique within establishment.

3.3 **SEX**

**Definition:** The sex of the patient.

3.4 **DATE OF BIRTH**
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Definition: The date of birth of the patient.

3.5 COUNTRY OF BIRTH *

Definition: The country in which the patient was born.

3.6 ABORIGINALITY *

Definition: Aboriginality of patient according to the following Commonwealth/Australian Bureau of Statistics "working definition".

An Aboriginal or Torres Strait Islander is a person of Aboriginal or Torres Strait Islander descent who identifies as an Aboriginal or Torres Strait Islander and is accepted as such by the community with which he/she is associated (Department of Aboriginal Affairs, Constitutional Section 1981).

Aboriginality shall be determined by patient self-identification.

3.7 MARITAL STATUS *

Definition: Current marital status of the patient.

3.8 AREA OF USUAL RESIDENCE *

Definition: Geographic location of usual residence as stated by the patient at time of admission.

3.9 EMPLOYMENT STATUS *

Definition: Self reported employment status, as defined by the categories in the National Minimum Data Set (NMDS).

3.10 PATIENT ACCOMMODATION *

Definition: Public/other status of the patient as defined under the Medicare Agreements.

A public patient is an eligible person who on admission to a recognised hospital, or as soon as possible thereafter, elects to be a public patient.

A public patient shall be entitled to receive the care and treatment referred to in Clause 6.2 of the Medicare Agreements without charge.

Other patients comprise private patients and ineligible patients:

A private patient is an eligible person who, on admission to a recognised hospital or as soon as possible thereafter, elects to be a private patient treated by a medical practitioner of his/her own choice.
Where such an election is made, the patient assumes responsibility for meeting certain hospital charges as well as the professional charges raised by any medical practitioner treating him/her.

An ineligible patient is a person who is not eligible under the Medicare Agreements. (An eligible person is an Australian resident or a person who is deemed to be eligible by the Minister for Community Services and Health. See Section 3 of the Health Insurance Act).

3.11 COMPENSABLE STATUS *

Definition: Any patient who is entitled to the payment of, or who has been paid compensation for, damages or other benefits (including a payment in settlement of a claim for compensation, damages or other benefits) in respect of the injury, illness or disease for which he/she is receiving care and treatment, is classified as a compensable patient.

This definition excludes entitled beneficiaries (Veteran's Affairs) and Defence Force personnel treated in public and private hospitals. It also excludes Territory Insurance Office (TIO) Motor Accident Compensation Act beneficiaries treated as public patients (on first admission) in Northern Territory hospitals. On second and subsequent admissions, TIO patients should be counted as compensable patients.

3.12 INSURANCE STATUS *

Whether the patient has private hospital insurance, that is, insurance with a health insurance fund (eg MBF, Medibank Private etc) providing benefits related to charges for private accommodation in a hospital.

3.13 ADMISSION DATE

Definition: The date on which the patient was formally, statistically or type change admitted to hospital.

3.14 DISCHARGE DATE

Definition: Date on which patient was formally, statistically, or type change separated from the hospital.

3.15 TOTAL LEAVE DAYS

Definition: The number of days between formal admission and formal separation in which the patient is not cared for in the institution (for further definition, refer to National Minimum Data Set).
4.1 **SOURCE OF REFERRAL**

**Definition:** Source from which the patient was transferred/referred to the hospital.

4.2 **PRINCIPAL DIAGNOSIS**

**Definition:** The diagnosis or condition established after study to be chiefly responsible for occasioning the admission of the patient to hospital (for further information refer to National Coding Standards for Inpatient Data Collections).

4.3 **SECONDARY DIAGNOSES**

**Definition:** Secondary diagnoses include all conditions except Principal Diagnosis

- that existed at the time of the patients admission for which treatment was given
- that arose during the patients stay in hospital, or
- that affected the patient's treatment and/or length of stay by greater than on day (for further information, refer to National Coding Standards for Inpatient Data Collections).

4.4 **PRINCIPAL PROCEDURE**

**Definition:** The principal procedure is the procedure which consumed the greatest amount of hospital resources or if this cannot be determined, that which best matches the principal diagnosis (for further information, refer to National Coding Standards for Inpatient Data Collections).

4.5 **ADDITIONAL PROCEDURES**

**Definition:** All significant procedures (diagnostic and therapeutic) undertaken from the time of admission to the time of discharge (for further information, refer to National Coding Standards for Inpatient Data Collections).

4.6 **TYPE CHANGE**

**Definition:** The recording of each episode of care occurring within the one stay in hospital as either acute, sub-acute or non-acute (for further information, refer to definition of Episode of Care).

4.7 **ADMISSION WEIGHT (NEONATES)**

**Definition:** If a neonate is born in hospital during the current admission then the admission weight is the birth weight. For neonates born elsewhere or born during
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a mother's previous admission to hospital the admission weight is the neonate's weight on admission.

A patient is a neonate if on admission she/he is aged 28 days or less. The admission weight of neonates is to be recorded in grams.

4.8 EXTERNAL CAUSE

Definition: External cause is the cause of the principal condition, where that condition is the result of injury, poisoning or violence.

4.9 PLACE OF OCCURRENCE OF EXTERNAL CAUSE

Definition: The place where the external cause of injury, poisoning or violence occurred.

4.10 MODE OF SEPARATION

Definition: Status at Separation of patient (discharge/transfer/death) and place to which patient is discharged (where applicable).
National Coding Standards for Inpatient Data Collections 1st Edition

Eagar K. and Innes K. (1992)
Volume 3 Introduction

This is the first edition of the National Coding Standards for Inpatient Data Collections. These Standards apply to all public and private hospitals in Australia. It is anticipated that these standards will be revised on a regular basis and that further editions of these standards will follow. The ongoing revision of coding standards will ensure that the standards reflect changes in clinical practice, clinical classification amendments, DRG grouper updates and various user requirements of inpatient data collections.

These clinical coding standards have been written with the basic objective of satisfying sound coding convention according to ICD.9.CM. Consideration of the various uses of inpatient data collections was secondary. Issues such as DRG allocation, research and planning aims were considered only after the requirement for cogent ICD.9.CM coding was satisfied.

The level of detail in the standards reflects the assumption that users of the document will have had training in abstracting relevant clinical information from medical records and the use of ICD.9.CM. It is assumed that coders are aware of and follow ICD.9.CM rules.

The medical record should be the primary source for the coding of inpatient morbidity data. Accurate coding is possible only after access to consistent and complete clinical information. Without good documentation coding guidelines are difficult, if not impossible, to apply. It is assumed that coding decisions are not made solely based on information provided on the medical record front sheet (or a copy of same), but that analysis of the entire medical record is performed before code assignment.

If a medical record is inadequate for complete, accurate coding, the coder should seek more information from the treating medical officer. When a diagnosis is listed for which there is no supporting documentation in the body of the record, it may be necessary to consult with the treating medical officer before assigning a code.

Sometimes reference to the appropriate section of ICD.9.CM will be enough to explain to a medical officer what is required for both diagnosis and procedure descriptions. If this action is unsuccessful the hospital management should be informed of the inadequacy of patient documentation and the resultant effect on the hospital's inpatient data.

The responsibility for recording accurate diagnoses and procedures, in particular principal diagnosis, lies with the treating medical officer, not the coder.

A joint effort between the treating medical officer and coder is essential to achieve complete and accurate documentation, code assignment, and reporting of diagnoses and procedures.
ICD.9.CM Edition

The ICD.9.CM coding manual is updated every October. This edition of the coding standards is based on the October 1991 version of ICD.9.CM and takes effect from 1 July 1992.

The National Standard is that all hospitals should update annually to the latest version of ICD.9.CM and that the new version should be in use no later than 1 July of the following year.

PRINCIPAL DIAGNOSIS

THE PRINCIPAL DIAGNOSIS IS THE CONDITION WHICH AFTER STUDY WAS FOUND TO CHIEFLY BE RESPONSIBLE FOR OCCASIONING THE PATIENT'S ADMISSION TO HOSPITAL FOR CARE

The phrase after study in the definition means the condition established after evaluation of findings, that was chiefly responsible for occasioning the admission. Findings evaluated may include information gained from the history of illness, any mental status evaluation, specialist consultations, physical examination, diagnostic tests or procedures, any surgical procedures, and any pathological or radiological examination. The condition established after study may or may not confirm the admitting diagnosis.

EXAMPLE:
Diagnoses as listed on the front sheet:
- Diabetes mellitus
- coronary artery disease
- myocardial infarct

History of present illness:
Patient experienced severe chest pain on the morning of admission. He was transported by ambulance to hospital and admitted to the coronary care unit.

In this example the information from the medical record indicates that MYOCARDIAL INFARCT is the principal diagnosis.

IF A PATIENT WAS ADMITTED FOR MULTIPLE REASONS, ANY OF WHICH COULD BE THE PRINCIPAL DIAGNOSIS, CHOOSE AS PRINCIPAL THAT DIAGNOSIS FOR WHICH DEFINITIVE TREATMENT WAS GIVEN.

EXAMPLE:
Diagnoses as listed on the front sheet:
- laceration of liver
- cerebral concussion without loss of consciousness

Procedure:
- Repair of liver laceration

As the patient underwent surgery for repair of the laceration the principal diagnosis should be the LACERATION OF LIVER.
If two or more conditions received definitive treatment of relatively equal risk, either condition could be assigned as principal diagnosis. For correct sequencing of procedures see Procedures, General, page 46-54.

FOR MORE INFORMATION REGARDING CHOICE OF PRINCIPAL DIAGNOSIS IN SPECIFIC CASES REFER TO THE FOLLOWING GENERAL RULES AND ICD.9.CM CHAPTER SPECIFIC RULES.

SECONDARY CONDITIONS

SECONDARY CONDITIONS INCLUDE ALL CONDITIONS EXCEPT PRINCIPAL CONDITION:
- THAT EXISTED AT THE TIME OF THE PATIENT'S ADMISSION FOR WHICH TREATMENT WAS GIVEN,
- THAT AROSE DURING THE PATIENT'S STAY IN HOSPITAL, OR
- THAT AFFECTED THE PATIENT'S TREATMENT AND/OR LENGTH OF STAY BY GREATER THAN ONE DAY

A COMORBID condition is a pre-existing condition that, because of its presence with a specific diagnosis, causes an increase in length of stay.

A COMPLICATION is a condition that arises during the hospital stay.

Conditions that relate to an earlier episode of ill health but which have no bearing on this hospital stay should not be coded. For example, herpes zoster treated at a previous admission would not be coded in the current admission. However, a condition such as congestive cardiac failure may have been treated at a previous admission, but has a bearing on this admission as it requires increased nursing care and is therefore coded.

For coding purposes SECONDARY CONDITIONS should be interpreted as additional conditions that affect patient care in terms of requiring:
- clinical evaluation or
- treatment or
- diagnostic procedures or
- extended length of hospital stay or
- increased nursing care and/or monitoring

Other reported diagnoses may not meet the above criteria, such as "History of coronary artery bypass", "pacemaker in situ" or "history of malignant melanoma". Hospitals may choose to code these conditions for research purposes, however, they should always be sequenced after the complications and secondary diagnoses that relate to the current admission.

The listing of diagnoses on the front sheet of the medical record is the responsibility of the treating medical officer. Before coding any diagnosis/procedure recorded, the coder must verify information recorded on the front sheet by reviewing pertinent documents in the body of the record.

EXAMPLE: A secondary diagnosis of "basal cell carcinoma of the forearm" is recorded on the front sheet. Review of the histopathology results by the coder
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shows that the lesion was in fact a solar keratosis. The solar keratosis is coded rather than the basal cell carcinoma.

Care should be taken in the following areas:

* Symptoms should only be coded if they are not explained by coded conditions and they satisfy the terms of SECONDARY CONDITIONS as outlined above. For example, a patient admitted with acute appendicitis who also has a severe headache which is investigated, should be assigned a code for both the appendicitis and the headache. For more guidelines regarding coding of symptoms, see Symptoms.

* Abnormal findings (laboratory, x-ray, pathologic and other diagnostic results) should not be coded unless their clinical significance is indicated by the treating medical officer.

USE OF "OTHER" AND "UNSPECIFIED" CODES

"Other" and "Unspecified" or residual subcategories are normally used for conditions that are specifically classified there in the index.

Example: Ulcer of mouth 528.9

Where a Treating Medical Officer uses terminology which cannot be found in ICD.9.CM, seek his/her clarification for alternative terms which are available in ICD.9.CM. If no other descriptor is provided then the condition should be coded to the "other" subcategory.

Example: Pendulous uvula 528.9

In this example "Other" and "Unspecified" are both included in the one fourth digit of "9". However, where "Other" and "Unspecified" have different fourth digits, caution should be taken to assign the "Other" subcategory where a specific diagnosis is provided:

Example: Hepatitis D, N.O.S 070.59 (not 070.9)

Any new conditions or procedures encountered by coders which do not have a code in ICD.9.CM should be notified to your State Coding Advisory body (examples - AIDS, campylobacter infection).

ACUTE ON CHRONIC

When a patient has both a chronic and an acute form of the same disease, for example, an acute exacerbation of a chronic condition, code the acute form as the principal diagnosis and the chronic form as a secondary condition. This convention of course only applies when ICD.9.CM does not provide one code which incorporates both the acute and chronic forms of the disease.

Example:

Admission for acute on chronic bronchitis
Code both forms with the acute bronchitis 466.0 as the principal diagnosis.

For acute tonsillitis with operative procedure there is an exception. See Respiratory system, Tonsillitis with operative procedure.

**ADMISSION FOR SPECIFIC PROCEDURE**

The principal diagnosis should be assigned with great care for admissions for specific procedures which result in a short stay indicative of the procedure performed rather than the underlying condition. The two common examples are admissions for renal dialysis for chronic renal failure and chemotherapy for malignant neoplasms (see Dialysis and Radiotherapy/Chemotherapy).

**IN GENERAL, THE PRINCIPAL DIAGNOSIS SHOULD INDICATE ADMISSIONS FOR A SPECIFIC PROCEDURE WITH AN APPROPRIATE V CODE RATHER THAN A CODE REFLECTING THE CONDITION**

**ADMISSION FOR SURGERY NOT PERFORMED**

If a patient has been admitted to hospital for surgery which for some reason has not been performed and the patient is discharged, code as follows:

* If surgery was not carried out due to an administrative problem:

**Example:**

Patient admitted for insertion of grommets for glue ear. Surgery postponed due to unavailability of surgeon.

Principal diagnosis: Glue ear 381.20
Secondary conditions: Cancelled surgery V64.3

* If surgery was not carried out due to a serious condition or complication arising after admission:

**Example:**

Patient admitted with tonsillitis for a tonsillectomy. Surgery postponed due to an URTI.

Principal diagnosis: Tonsillitis 474.0
Secondary conditions: Surgery cancelled due to contraindication v64.1
URT I 465.9

**ETIOLOGY/MANIFESTATION**

If the index of ICD.9.CM provides two codes (etiology and manifestation) for a diagnostic term, both codes must be recorded in the order in which they appear.
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in the index.

EXAMPLE:

Patient admitted for investigation and treatment of infertility due to tubal adhesions

Index: 614.6 [628.2]
Principal diagnosis: 614.6 Pelvic peritoneal adhesions, female
Secondary condition: 628.2 Infertility, female, of tubal origin

COMBINATION CODES

A single code used to classify two diagnoses or a diagnosis with a manifestation or an associated complication is called a combination code. Combination codes are identified by referring to subterm entries in the ICD.9.CM Index and by reading the inclusion and exclusion notes in the Tabular List.

Assign only the combination code when that code fully identifies the diagnostic conditions involved or when the Index so directs.

Multiple coding should not be used when the classification provides a combination code that clearly identifies all of the elements documented in the diagnosis.

EXAMPLE:
Admission of a newborn baby with jaundice associated with his prematurity.
Index: Jaundice, fetus or newborn, due to or associated with preterm delivery 774.2

SUSPECTED CONDITIONS

If the diagnosis documented at the time of discharge is qualified as probable, suspected, possible or any other qualifying expression, then the following steps should be taken:

1. Refer the case to the treating medical officer to establish whether a firm diagnosis can be made in preference to the query.

2. If the query diagnosis is preferred or no further information is available, then check that the reported symptoms and investigation findings support the diagnosis. If so, then code to the query diagnosis.

3. If the query diagnosis is not supported by the reported symptoms and investigation findings, then code to the symptoms, not the query diagnosis.

EXAMPLE 1: Patient admitted with headache. Diagnosed as ?meningitis with no evidence of such in investigation results.
Principal diagnosis: Headache 784.0
Secondary diagnosis: Meningitis 322.9
EXAMPLE 2: A patient was admitted with acute abdominal pain with suspected appendicitis. An appendicectomy was performed which disproved the suspected diagnosis and did not result in any differential diagnosis.

Principal diagnosis: Abdominal pain 789.0  
Principal procedure: Appendicectomy 47.0
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DIAGNOSES - ICD.9.CM CHAPTER SPECIFIC

NEOPLASMS

GENERAL

When the existence of a neoplasm has been documented and is being treated at this admission, the neoplasm along with any secondary conditions or complications are to be coded.

If tests such as pathology, X-ray or scans were performed during the admission, check all results before assigning diagnosis codes. If pathology reports are not routinely available, the matter should be reported to the hospital management.

Refer to Neoplasm Flowcharts for further assistance in the selection and sequencing of codes.

SEQUENCING

Sequencing is dependent on the treatment at each admission. If the treatment is directed at the primary malignancy, then report this as the principal diagnosis code. If a metastatic neoplasm is receiving treatment, this will be the principal diagnosis code with secondary code/s for the primary site/s if known, or 199.1 if the primary site is unknown.

When the admission is for management of an associated condition such as anemia, and treatment is directed at the associated condition, then the malignancy is coded secondary to the condition being treated.

MORPHOLOGY

The morphology (M) code numbers consist of 5 digits; the first four representing the histological type of the neoplasm and the fifth indicates its behaviour.

The assignment of M codes is a decision for each State. Coders should therefore be guided by their State policy. An M code must never appear as the principal diagnosis code.

If a morphological diagnosis contains 2 histological terms which have different M codes, select the highest number as it is usually more specific.

EXAMPLE: Transitional cell epidermoid carcinoma

"Transitional cell carcinoma NOS" is coded to M8120/3
"Epidermoid carcinoma NOS" is coded to M8070/3

In such a case the higher number (M8120/3) should be used.

PRIMARY MALIGNANCY

Contiguous sites

A primary malignancy which overlaps the boundaries of two or more
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subcategories within a three digit category, and whose site of origin cannot be established is classified to the fourth digit subcategory, "8".

ICD.9.CM provides the following codes (149.8, 159.8, 165.8) for certain malignant neoplasms whose point of origin cannot be established and whose stated sites overlap two or more three digit categories.

Vague sites

A malignant neoplasm of contiguous sites (overlapping boundaries), not elsewhere classified, whose point of origin cannot be determined should be assigned to 195 (Malignant neoplasm of other and ill-defined sites).

Extension into adjacent sites

A malignant neoplasm which extends beyond the margin of the original site to involve an adjacent site should still be coded as a primary neoplasm. The site/s the lesion has extended to should be coded as secondary site/s.

Recurrence of primary malignancy

If the primary malignancy previously eradicated from the same organ or tissue has recurred, code it as primary malignancy of the stated site, using the appropriate code from 140 - 195. Code also any secondary sites mentioned.

Follow-up examinations for patients with a history of malignancy

Category V67.- (Follow-up examination) should be used when a patient is admitted for follow-up of a malignancy and no residuals are found.

The appropriate code describing the type of previous treatment from category V67._ should be coded as the principal diagnosis. Record as a secondary condition the appropriate code from V10._ (Personal history of malignant neoplasm).

EXAMPLE: Admitted for follow-up of bladder cancer (previously treated by radiation therapy), no recurrence. V67.1 V10.51

If residuals are present, code the primary cancer as the principal diagnosis and the follow up endoscopy as a secondary code.

EXAMPLE: Carcinoma of bladder found at check cystoscopy. 188._ V67.0

METASTASES
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The adjective "metastatic" is used ambiguously, sometimes to mean secondary deposits from a primary lesion elsewhere and sometimes to mean a primary which is metastasising. No arbitrary rule can satisfactorily solve this problem, therefore the first step for a coder should be to examine the medical record for clarification.

A neoplasm described as **metastatic from** a site should be interpreted as a primary of that site. Also assign the appropriate code for the secondary neoplasm.

A neoplasm described as **metastatic to** a site should be interpreted as a secondary of that site. Also assign the appropriate code for the primary neoplasm.

If two or more sites are stated in the diagnosis and all are described as 'metastatic', code as for 'primary site unknown' and code the stated sites as secondary neoplasms of those sites.

**COMPLICATIONS**

When the admission is for treatment of a complication resulting from either the malignancy, therapy or a combination of both, designate the complication as the principal diagnosis if the treatment is directed at resolving the complication, followed by the code for the existing malignancy. For example, anemia, dehydration, postsurgical non-absorption syndrome.

**RADIOThERAPY/CHEMOTHERAPY**

When an episode of inpatient care involves surgical removal of a malignancy followed by chemotherapy or radiotherapy, code the malignancy as the principal diagnosis.

When the reason for admission is to determine the extent of the malignancy, or for a procedure such as paracentesis or thoracocentesis, the primary malignancy or appropriate metastatic site is designated as the principal diagnosis even if chemotherapy or radiotherapy is administered.

Patients who are admitted specifically for a radiotherapy session or for maintenance chemotherapy are classified to V58.0 (Radiotherapy) or V58.1 (Chemotherapy) respectively as principal diagnosis, with the malignancy coded and sequenced second.

**CIN/VIN/VAIN, GRADE III**

**CIN/VIN or VAIN, Grade III, non invasive**

| CIN III, non invasive | Code carcinoma in situ of cervix 233.1 |
| VIN III, non invasive | Code carcinoma in situ of vulva 233.3 |
VAIN III, non invasive
   Code carcinoma in situ of vagina 233.3
CIN/VIN or VAIN, invasive
CIN, invasive
   Code primary malignant neoplasm of cervix 180._
VIN, invasive
   Code primary malignant neoplasm of vulva 184.4
VAIN, invasive
   Code primary malignant neoplasm of vagina 184.0

For diagnoses of CIN/VIN or VAIN, Grades I or II see, Genitourinary System, CIN/VIN/VAIN, Grade I and II.

LYMPHOMA

Extranodal sites

Lymphomas are systemic diseases that do not "metastasise" in the same way that solid tumors do. A lymphoma, regardless of the number of sites involved, is not considered metastatic, and should be coded to the 200-202 categories. Lymphomas do not have to originate in the lymph glands. Lymphomas may originate in any lymphoid tissue throughout the body and may not necessarily be restricted to lymph nodes or glands.

Codes 197.8, 198.5 and codes from category 196 should never be used for lymphomas.

The fifth digit of "0" is assigned for lymphomas in extranodal sites, such as bone marrow, skin, or solid organ involvement.

   EXAMPLE: Gastric lymphoma (diffuse type)
   Code lymphoma 202.80

MYELODYSPLASTIC SYNDROME

Code to 238.7 (with M code of 9960/1)

ENDOCRINE, NUTRITIONAL AND METABOLIC DISEASES, AND IMMUNITY DISORDERS
**HIV/AIDS**

**SEQUENCING OF CODES**

Decisions as to sequencing of codes should be made in light of the definition of **principal diagnosis** as given in the section entitled **PRINCIPAL DIAGNOSIS**.

If the condition chiefly responsible for occasioning the patient’s admission to hospital was the HIV, use the appropriate code from 795.8, 042._, 043._ or 044._ as the principal diagnosis code.

**EXAMPLE:** Patient admitted specifically for AZT should be assigned a principal diagnosis code from the above range.

If the condition chiefly responsible for occasioning the patient’s admission to hospital was a manifestation of the AIDS virus, code the manifestation as the principal diagnosis.

**EXAMPLE:** A patient is admitted with oral candidiasis due to the HIV infection.  
Code: oral candidiasis 112.0  
AIDS 042.1

**STAGES**

The HIV infection follows a number of stages, each stage possessing its own level of severity and symptoms. Persons affected by the HIV infection will normally follow the same pattern or progression, ie. they are first diagnosed as being HIV antibody positive and as the disease advances, they progress to the disease’s next level of severity. Thus, once a patient has been diagnosed as being in the Stage 2 category, their subsequent admissions cannot be coded using the Stage 1 code (795.8). The codes for each stage are listed below:

- **STAGE 1:** 795.8 Asymptomatic infection (HIV antibody +)  
- **STAGE 2:** 044._ Conditions attributed to the HIV infection but not found in the categories below  
- **STAGE 3:** 043._ AIDS related conditions  
- **STAGE 4:** 042._ AIDS (full blown AIDS)

**DIABETES MELLITUS NOS**

Category 250.0_, Diabetes mellitus, without mention of complication, is intended to identify:

1. the diabetic state in a patient seeking medical attention for an unrelated problem (i.e. 250.0_ will be a secondary code) or,  
2. a patient admitted for diabetic education only. Such a patient will have a principal diagnosis code of V65.4 (health education) and a secondary code of 250.0_.
Unless further information can be obtained regarding specific complications, assign 250.9\_ (Diabetes with unspecified complication) if the principal diagnosis provided is, Diabetes mellitus.

When the principal diagnosis is reported as Diabetes mellitus, this will always be coded to 250.9\_ except when the patient attends for diabetic education only.

**CIRCULATORY SYSTEM**

**CEREBROVASCULAR ACCIDENT (CVA)**

**CURRENT**

"CVA" is a non-specific term. Before assigning a code attempt to obtain clarification of the type of CVA.

**LATE EFFECTS OF CEREBROVASCULAR DISEASE**

Category 438 (Late effects of cerebrovascular disease) is used to indicate conditions classifiable to categories 430-437 as the causes of late effects (neurologic deficits), themselves classified elsewhere. Unlike other late effects, the neurologic deficits caused by cerebrovascular disease are present from the onset rather than arising months later.

Assign code for the specific neurologic deficit (for example, aphasia, dysphagia, and/or hemiplegia) followed by code 438.

Do not assign code 438 when a current diagnosis classifiable to the 430-437 categories is present.

"Old C.V.A." - care should be taken when coding this diagnostic statement. This is an ambiguous statement and may mean either:

1. the patient has a history of C.V.A. with no neurological deficits now present or,
2. a history of C.V.A. with neurological deficits still present.

In (1), the appropriate code is V12.5 (personal history of diseases of the circulatory system).

In (2), the neurological deficit is coded as well as code 438.

Do not assign code 438 alone, i.e. it should always be accompanied by a code indicating a late effect manifestation, e.g. hemiparesis, aphasia.

**HYPERTENSION**

When coding combinations of hypertension, heart and renal disorders it is important to distinguish if, and how, they are related.

* hypertension may cause heart and/or renal disease

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hypertension may be caused by other conditions, including some renal disorders
* hypertension and heart and renal disease may be nrelated although they are present at the same time.

**Hypertensive heart disease (402)**

Certain heart conditions are assigned to a code from category 402 (Hypertensive heart disease), when a causal relationship is stated (due to hypertension) or implied (hypertensive). In such cases assign only a code from 402._.

The same heart conditions with hypertension, but without a stated causal relationship, are coded separately. Sequence according to the circumstances of the admission.

**Hypertensive renal disease (403)**

Assign codes from category 403 (Hypertensive renal disease), when conditions classified to categories 585 (chronic renal failure), 586 (renal failure unspecified) or 587 (renal sclerosis, unspecified), are present.

Unlike hypertension with heart disease; ICD.9.CM presumes a cause-and-effect relationship and classifies renal failure with hypertension as hypertensive renal disease.

**Hypertensive heart and renal disease (404)**

Assign codes from combination category 404 (Hypertensive heart and renal disease), when both hypertensive renal disease and hypertensive heart disease are stated in the diagnosis.

Assume a relationship between the hypertension and the renal disease, whether or not the condition is so designated.

**Secondary hypertension (405)**

Assign these codes only when secondary hypertension is specifically stated by the treating medical officer.

**CORONARY ARTERY DISEASE**

Coronary artery disease, not otherwise specified, should be assigned 414.0 (Coronary atherosclerosis) rather than 414.9 (Chronic ischemic heart disease, unspecified) as directed by ICD.9.CM Alphabetic Index.

**RESPIRATORY SYSTEM**

**ASTHMA AS PRINCIPAL DIAGNOSIS**

The term "status asthmaticus" refers to a patient's failure to respond to therapy
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administered during an asthmatic episode. Generally when patients are admitted to hospital due to asthma they have failed to respond to treatment and require more intensive therapy.

For accurate coding the assignment of status asthmaticus should be confirmed by the treating medical officer before the fifth digit "1" is assigned.

TONSILLITIS WITH OPERATIVE PROCEDURE

If a patient is admitted with tonsillitis and has an operation performed to remove tonsils and/or adenoids, assume that tonsillitis was chronic and assign code 474.0, (chronic tonsillitis) unless it is specified otherwise.

This modifies the coding instruction in ICD.9.CM for 463 and 474.

DIGESTIVE SYSTEM

INFECTIOUS/NON-INFECTIOUS GASTROINTESTINAL DISORDERS

ICD.9.CM provides separate codes for classification of colitis, enteritis, gastroenteritis and diarrhea depending upon whether these conditions are of infectious origin (009.-) or not (558.9).

A diagnosis of colitis, enteritis, gastroenteritis or diarrhea should be specified by the treating medical officer as to whether it was infectious or not. All cases that are not defined as infectious or noninfectious should be clarified with the treating medical officer.

Note: This discussion only relates to the classification of infectious/non-infectious. If the enteritis is described as viral, for example, then the code is 008.8 as listed in the index.

PER-RECTAL BLEEDING, NOS

A diagnosis of "P.R. bleeding" indicates bleeding from the gastrointestinal tract, not necessarily bleeding from the rectum and therefore 569.3 (Hemorrhage of rectum and anus) should NOT be used.

If investigation has not revealed the actual origin of the hemorrhage or investigation has not been performed "P.R. bleeding" should be coded to 578.9 (Hemorrhage of gastrointestinal tract, unspecified).

GENITOURINARY SYSTEM

CIN/VIN/VAIN, GRADES I AND II
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CIN/VIN and VAIN, Grades I and II should be coded to dysplasia of the site.

CIN I and II: 622.1 (Dysplasia of cervix uteri)

VIN I and II: 624.8 (Other specified noninflammatory disorders of vulva and perineum)

VAIN I and II: 623.0 (Dysplasia of vagina)

For standards regarding classification of CIN/VIN and VAIN, Grade III see Neoplasms, CIN/VIN/VAIN, Grade III.

PER-VAGINAL BLEEDING, NOS

A diagnosis of "P.V. bleeding" indicates bleeding from the female genital tract, not necessarily bleeding originating from the vagina and therefore, 623.8 (Other specified noninflammatory disorders of vagina) should NOT be used.

If investigation has not revealed the actual origin of the hemorrhage or investigation has not been performed, "P.V. bleeding NOS" should be coded to 626.9 (Unspecified disorder of menstruation and other abnormal bleeding from female genital tract).

PREGNANCY, CHILDBIRTH AND THE PUERPERIUM

For information on procedures, refer to Procedures, Obstetric

PREGNANCY WITH ABORTIVE OUTCOME

Abortion: premature expulsion or extraction of the products of conception by any means, before fetal viability, that being at least 20 weeks gestation or 400 gms weight.

It is important that the cause of abortion is properly recorded; in particular, whether abortion was spontaneous or induced and whether it occurred during or before the admission being coded.

If the abortion has been induced during the admission being coded, it is coded to 635. (Legally induced abortion).

If termination of pregnancy is the reason for admission to the hospital the principal diagnosis code should be from the 635 category. Any codes justifying the termination (eg. 655, Fetal abnormality affecting management of mother) should be added after 635.

DELIVERY IN A COMPLETELY NORMAL CASE - 650

650 is intended for use for spontaneous vaginal deliveries:
WITHOUT abnormality/complication classifiable elsewhere
WITHOUT manipulation or instrumentation
WITHOUT procedure other than episiotomy, or ARM during labour

Code 650 cannot be used in conjunction with any other code from 630-676.

DEFINITIONS OF OBSTETRIC CONDITIONS

These conditions should be coded only when indicated by a obstetrician/treating medical officer/midwife to be a reason for care or intervention.

If the criteria set out below are not met, but the clinician/treating medical officer/midwife states that the condition is present and is a reason for care or intervention, then the code should be recorded.

EXAMPLE: Patient has a postpartum blood loss of 400mls. Treating Medical Officer has recorded a postpartum hemorrhage in the progress notes. Record code for P.P.H in this case.

EXAMPLE: Patient delivered at 41 weeks gestation. Reported by obstetrician as being post-dates. Record code for post-dates.

DELAYED DELIVERY AFTER RUPTURE OF MEMBRANES

Delayed delivery after rupture of membranes is applicable when there has been premature rupture of membranes and at least 24 hours have elapsed between membrane rupture and onset of regular contractions with cervical dilatation.

If membranes ruptured spontaneously use 658.2_
If membranes had been ruptured by ARM use 658.3_

ELDERLY PRIMIGRAVIDA
659.5_ should be assigned if a primigravida's age equals 35 years or more.

GRAND MULTIPARITY
Refers to a woman who has delivered 5 or more viable fetuses. This is the Australian standard and is contrary to the American standard of 6 or more deliveries.

HYPERTENSION IN PREGNANCY
Codes from category 642 should not be assigned unless there is a statement such as "pregnancy induced hypertension" in the medical record.

POST-TERM DELIVERY
A delivery should be coded as "post term" only at or after 42 weeks gestation, and not on clinical signs alone. The code to use is 645.0_

POSTPARTUM HEMORRHAGE
A hemorrhage of 600mls or more is regarded as a postpartum hemorrhage (see notes above)

DEFINITIONS OF OBSTETRIC CONDITIONS, continued

PRECIPITATE LABOUR
It appears that precipitate labour is a difficult thing to define in terms of time because although a delivery may appear to be very quick, the early signs of labour may have been overlooked. It is suggested that the code for precipitate labour be used only where the treating medical officer specifies "precipitate".

PREMATURE DELIVERY
When coding "premature delivery" or delivery with onset before 37 weeks gestation, use 644.21 (Early onset of delivery). If reason for early delivery is given, code first the reason, followed by 644.21. If no reason is supplied, 644.21 can be used alone.

PREMATURE RUPTURE OF MEMBRANES
The most common sequence of events is for the membranes to rupture in the course of labour, i.e. once contractions have started and the cervix is dilated. When rupture of the amniotic sac has occurred less than 24 hours prior to the onset of labour code 658.1_. False rupture of membranes should be coded to false labour, N.O.S. 644.1_.

PROLONGED LABOUR
When labour is actively managed, as it is in hospitals, it is termed prolonged if delivery is not imminent after 18 hours of established labour.

USE OF V27 - IDENTIFICATION OF DELIVERIES
For every delivery the appropriate code from V27._ (Outcome of delivery) can be added to the mother's record.

It must not be the principal diagnosis.

4TH DIGIT ‘FILLERS’ FOR 645, 657, 670 AND 672

It is recommended that the code categories:
645 Prolonged pregnancy,
657 Polyhydramnios,
670 Major puerperal infection, and
672 Pyrexia of unknown origin during the puerperium,

which all require a fifth digit have a zero (0) inserted in the fourth digit space.
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For computerised inpatient statistics collection this may be a data processing issue rather than a coding issue.

**DELIVERY PRIOR TO ADMISSION**

If a patient has delivered a baby on the way to hospital and no operative procedures relating to the delivery are carried out during admission and the mother suffers no complications of the puerperium, code principal diagnosis to V24.0 (Postpartum care and examination immediately after delivery). If a complication arises, that should be coded as the principal diagnosis.

If a patient is transferred to a hospital following delivery to accompany a sick child, and she receives no active treatment other than routine postpartum care assign V24._ as the sole code.

If a patient is transferred from one hospital to another for post-cesarean care, then V24.0 should be reported as the principal diagnosis code and V58.4 as a secondary code.

**COMPLICATIONS OF OBSTETRIC PROCEDURES**

Complications of obstetric procedures are classified within the Pregnancy, Childbirth, Puerperium chapter, NOT the Injury and Poisoning chapter.

**CONDITIONS COMPLICATING PREGNANCY**

If a patient is admitted because of a condition that is either a complication of pregnancy or that is complicating the pregnancy, and is classifiable elsewhere in ICD.9.CM, the following rules apply:

1. If the condition is referenced to the 647-648 categories in the index, then this code should be sequenced as the principal diagnosis code and the condition code can be added as a secondary code to provide more detail.

   **EXAMPLE:** Iron deficiency anemia complicating pregnancy
   Principal diagnosis 648.2_
   Secondary diagnosis 280.9

2. If the condition is not referenced to the 647-648 categories in the index, then the appropriate residual category should be coded as the principal diagnosis, with the condition code as a secondary code.

   **Note:** In the following examples, to apply the asthma or carpal tunnel code as principal code would be to contravene the ICD.9.CM rule in the index:

   "Pregnancy, complicated (by)
   current disease or condition (nonobstetric)
   specified condition NEC 648.9"

   **EXAMPLE:** Carpal tunnel syndrome exacerbated by pregnancy
Principal diagnosis 648.9__
Secondary diagnosis 354.0

EXAMPLE: An obstetric patient admitted for asthma, complicating the pregnancy
Principal diagnosis code: 648.9__
Secondary condition code: 493.9__

If a pregnant patient is admitted for a condition which neither complicates the pregnancy nor is complicated by the pregnancy, then the condition code is reported as the principal diagnosis with a secondary code of V22.2 to indicate the incidental pregnant state.

EXAMPLE: Pregnant woman admitted with fractured shaft of metacarpal (jammed hand in door)
Principal diagnosis code: 815.03
Secondary condition code: V22.2
E918

MULTIPLE BIRTHS

If one twin (or other multiple) is delivered with a complication, eg. failed rotation, and the other is delivered normally, both deliveries should be coded.

The abnormal delivery should be sequenced first, followed by 651.__ (Multiple gestation).

5TH DIGIT SUBCLASSIFICATION

A fifth digit subclassification must be used to identify the episode of care on all codes in categories, 640-676, except code 650.

The fifth digit, zero "0" (unspecified as to episode of care, or not applicable) is mainly used when coding an abortion induced because of some condition of the mother or fetus, (eg. 655.1__ Chromosomal abnormality in fetus affecting management of mother).

It is possible for more than one EPISODE OF CARE fifth digit to be used on one admission. It usually occurs with fifth digits, 1 and 2, if an admission resulted in delivery complicated by both antepartum and postpartum conditions.

EXAMPLE: Obstructed labour due to deep transverse arrest 660.31
Antepartum hemorrhage NOS 641.91
Mastitis 675.22

MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE
MENISCUS/LIGAMENT TEAR NOS

When coding a diagnosis of torn meniscus or ligament, not specified as current or old, attempt to obtain clarification from the treating medical officer. If further information is not available assume that the injury is OLD.

This contradicts the default provided in the Alphabetic Index to current injury.

NONALLOPATHIC LESIONS, NOT ELSEWHERE CLASSIFIED

This rubric should be avoided for hospital-based coding as it does not reflect the conventional western approach to medical science which is based on body systems and organs (not body segments).

This rubric does not provide an acceptable level of detail for classifying the patient's specific conditions.

OSTEOARTHRITIS

Category 715 (Osteoarthrosis and allied disorders) provides a fourth digit breakdown to indicate the nature of involvement and a fifth digit to identify site of the osteoarthrosis.

The fourth digit subcategories are largely split according to whether the osteoarthrosis is localised or generalised and primary or secondary status. The term 'localised' should be interpreted as "one site". 'Primary' should be interpreted as meaning "no cause".

If a patient is admitted with osteoarthritis of one site with no mention of involvement (including previous) of other sites assign a code for localised, unspecified, osteoarthrosis.

EXAMPLE: Patient with osteoarthritis of the knee and no other site affected
Code: 715.36 Osteoarthrosis, localised, not specified, lower leg

SLIPPED DISC

Where the diagnosis 'slipped disc' i.e. displacement of intervertebral disc, is reported as due to a current injury, assign a code from category 839 (Other, multiple and ill-defined dislocations) and assign the appropriate E code.

If the diagnosis is not reported as due to a current injury, assign a code from category 722 (Intervertebral disc disorders). Assign a late effect E code if applicable.
CONGENITAL ANOMALIES

SYNDROMES

If no single code is available to describe all elements of a syndrome, it can be difficult to code all elements separately. The guidelines given here are provisional and will be subject to further attention.

Coders should be aware that syndromes listed in ICD.9.CM are not always exactly the same as the way they are described in a medical record.

Guidelines for sequencing when coding syndromes

1. Seek clarification from the treating medical officer for any syndrome which is not handled well in ICD.9.CM

2. Once the details of the syndrome are established, apply the principal diagnosis definition rule.

3. If the principal diagnosis definition rule is difficult to apply due to the multiple manifestations of the syndrome, and no one diagnosis is receiving definitive treatment, then code the most severe condition as the principal diagnosis code.

4. If equal severity can be applied to more than one manifestation, then code the chromosomal/genetic condition as the principal diagnosis code.

5. If the syndrome is a congenital one, then code 759.89 as a secondary code to the specified manifestations already coded. The addition of this code acts as an indication that this is a syndrome which does not have a specific code allocation in ICD.9.CM. These cases should be notified to your state coding advisory body.

CONDITIONS ORIGINATING IN THE PERINATAL PERIOD

DEFINITION OF 'CONDITIONS ORIGINATING IN THE PERINATAL PERIOD'

Note the instruction at the beginning of Chapter 15 in ICD.9.CM Volume 1 which states that this chapter includes conditions which have their origin in the perinatal period even though death or morbidity occurs later.

Most conditions originating in the perinatal period disappear after a short time. Some, however, can persist throughout life and should be classified to the codes in this chapter regardless of how old the patient is.
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EXAMPLE: Vaginal clear cell adenocarcinoma due to intrauterine exposure to DES (diethylstilbestrol). Patient is now 25 years old. Code 184.0 + (M8310/3) + 760.79 + E932.2_

BIRTH ASPHYXIA

Assign codes, 768.5 - 768.9, Birth asphyxia, only in cases of asphyxia being diagnosed. Do not assign these codes only on evidence of low apgar scores.

NEWBORNS

All newborns (age <29 days) must be coded using the following rules:

1. V30 - V39 must be used for all newborns born in hospital or on the way to hospital.

   EXAMPLE 1: Newborn, born in hospital, with mild jaundice, vaginal delivery
               Prin. code - 774.6
               Secon. code - V30.00

   EXAMPLE 2: Newborn, born in hospital, no morbidity, vaginal delivery
               Prin. code - V30.00

2. V30 - V39 cannot be used when treatment is being provided in second or subsequent admissions.

   EXAMPLE 1: Newborn, transferred from Hospital A to Hospital B, Day 2, with respiratory distress syndrome and pneumothorax, cesarean delivery.
               Hospital A codes: 769
                                      770.2
                                      V30.01
               Hospital B codes: 769
                                      770.2

   EXAMPLE 2: Newborn, readmitted Day 7 for circumcision
               Prin. code - V50.2
               Proc. code - 64.0
SYMPTOMS, SIGNS AND ILL-DEFINED CONDITIONS

GENERAL

Signs and symptoms should not be coded when a definite cause or diagnosis has been made:

EXAMPLE 1: Heartburn due to esophageal ulcer
   Code only the esophageal ulcer as it may be assumed that the heartburn is a symptom of it.

EXAMPLE 2: Patient admitted for knee pain and at arthroscopy found to have a torn meniscus
   Code only the torn meniscus as it may be assumed that the knee pain is a symptom of it.

Symptoms should be coded whenever:

* they are not associated with a diagnosis (ie. an unexplained symptom with no cause found), and
* they are severe enough to warrant special treatment or care (See Secondary Conditions for definition as to what justifies coding as a secondary condition).

INJURY

SEQUENCING, MULTIPLE INJURIES

The principle of multiple coding should be followed wherever possible. Combination categories for multiple injuries are provided for use only when there is insufficient detail regarding the individual conditions.

In a case of multiple specified injuries, select as the principal diagnosis, the condition which presents the most serious threat to life.

If the most serious condition is not identified in the record, then the following order of precedence should be used as a guide only, (ensure that the site and severity of the injury, as well as the immediacy of the treatment given are taken into account).

- skull fracture with intracranial injury,
- internal injuries,
- fractures (including skull fracture without intracranial injury),
- burns - third and second degree,
- concussion,
- crush injury,
- shock,
- open wounds and lacerations,
- dislocation,
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- sprains,
- contusions,
- superficial injuries, abrasions, first degree burns.

Superficial injuries such as abrasions or contusions are not coded when associated with more severe injuries of the same site.

**BURNS**

Burns of one site that exhibit multiple degrees (1st degree, 2nd degree and/or 3rd degree) are to be coded to the most severe degree burn of that site.

Category, 949 Burn, unspecified, is extremely vague and should rarely be assigned.

**948, EXTENT OF BODY SURFACE INVOLVED**

The use of a code from category, 948 Burns classified according to extent of body surface involved, in addition to a code identifying the site of the burn, is compulsory.

The fourth digits in category 948 identify the total body surface involved in any degree burn and are determined by adding all percents of body surface involved in any degree burn.

The fifth digits in category, 948, identify the total percent of body surface affected by third degree burn. Fifth digit zero (0) is assigned when less than 10% or when no body surface is involved in a third degree burn.

Therefore, a code assigned from 948 should always have 5 digits (includes a case with no third degree burns).

**COMPLICATIONS OF SURGICAL AND MEDICAL CARE**

Note that codes from categories, 996-999, COMPLICATIONS OF SURGICAL AND MEDICAL CARE, NOT ELSEWHERE CLASSIFIED should only be assigned when a specific code is not provided elsewhere in ICD.9.CM. The most common of such complications classifiable elsewhere are listed in exclusion notes at the beginning of the category or within the various subcategories.

**EXAMPLE:** Colostomy malfunction is coded to 569.6, COLOSTOMY AND ENTEROSTOMY MALFUNCTION

All cases with a diagnosis of adverse effects or complications of surgical and medical care, irrespective of whether the code assigned is from 996-999 or elsewhere in ICD.9.CM, must also be assigned the appropriate External Cause code.
Complications of a condition for which a procedure was performed must not be classified to complications of surgical or medical care.

**LATE EFFECTS**

A "late effect" is a current condition of the patient that was caused by a previous condition or injury. The previous condition is itself no longer present.

There is no time limit on when a late effect code can be used. The residual may be apparent early, such as following a cerebrovascular accident, or it may occur months or years later, such as that due to a previous injury.

Because the underlying (previous) condition is no longer present, the code for the acute form of that disease is not used. For example, acute forms of cerebrovascular disease are coded using categories 430-437, but late effect of cerebrovascular disease is designated by use of the category 438.

Coding of late effects should reflect the following two components:

- the residual condition or nature of the late effect (current condition)
- the cause of the late effect (previous condition).

If the cause of the late effect was an injury or poisoning, a Late Effect External cause code (E929) must also be assigned.

The residual condition or nature of the late effect is sequenced first, followed by the cause of the late effect. Specific codes for the cause of late effects are:

- 137-139 Late effect of infectious and parasitic diseases
- 268.1 Late effect of rickets
- 326 Late effect of intracranial abscess or infection
- 438 Late effect of cerebrovascular disease
- 905-909 Late effects of injury or poisoning

Further treatment of an injury (eg. removal of an orthopedic pin) is not to be regarded as a late effect of that injury and late effect codes are not to be used for such cases. Instead, such a case should be coded to the appropriate V code describing further treatment (eg. V54.0 AFTERCARE INVOLVING REMOVAL OF FRACTURE PLATE OR OTHER INTERNAL FIXATION DEVICE) with an appropriate procedure code.

**SOFT TISSUE INJURY**

Records with diagnoses of 'soft tissue injury' should be referred to the treating medical officer for more detail. The nature of the injury should be specified, such as contusion or sprain.

Where the nature of the soft tissue injury cannot be obtained, code to INJURY, SITE and not WOUND, OPEN, BY SITE as directed within the ICD.9.CM Alphabetic Index.
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**EXAMPLE:** Soft tissue injury, not otherwise specified, of ankle
Code: 959.7 Injury, other and unspecified, knee, leg, ankle, and foot

**POISONING, ADVERSE EFFECTS OF DRUGS**

**DEFINITIONS**

**POISONING**
Poisoning by drugs includes drugs taken in error, suicide and homicide, adverse effects of prescribed drugs taken in combination with self prescribed drugs and intoxication. Poisoning involves improper use.

Poisoning is classified in ICD.9.CM Chapter 17, categories 960-979, POISONINGS BY DRUGS, MEDICINAL, AND BIOLOGICAL SUBSTANCES. These codes describe the type of drug that was the cause of the poisoning.

In addition to the code for poisoning a secondary code may be used to indicate the manifestation.

**EXAMPLE:** Coma due to Codeine overdose
Code: 965.09 Poisoning by other opiates and related narcotics, 780.0 Coma and stupor

**ADVERSE EFFECT**
Adverse effects of correct substances properly administered includes allergic reactions, hypersensitivity, idiosyncratic reaction, interaction of drugs (when each is the correct substance properly administered) and similar situations primarily involving proper use of drugs.

Adverse effects of correct substances properly administered are classified according to the nature of the adverse effect. An E code must be assigned to indicate the drug or medicinal agent which caused the adverse effect.

**EXAMPLE:** Gastritis due to Aspirin
Code: 535.4 Other specified gastritis
     E935.3 Drugs causing adverse effects in therapeutic use, Salicylates

If the manifestation of the adverse drug reaction is unspecified, assign code 995.2, UNSPECIFIED ADVERSE EFFECT OF DRUG, MEDICINAL AND BIOLOGICAL SUBSTANCE.
TWO OR MORE DRUGS TAKEN IN COMBINATION

1. MEDICATION COMBINED WITH ALCOHOL

An adverse reaction to a drug taken in combination with alcohol should be coded as poisoning by both agents.

**EXAMPLE:** Severe depression of respiratory center due to Seconal taken in combination with alcohol (accidental)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>967.0</td>
<td>Poisoning by Barbiturates</td>
</tr>
<tr>
<td>348.8</td>
<td>Other conditions of brain</td>
</tr>
<tr>
<td>980.0</td>
<td>Toxic effect of ethyl alcohol</td>
</tr>
<tr>
<td>E851</td>
<td>Accidental poisoning by barbiturates</td>
</tr>
<tr>
<td>E860.0</td>
<td>Accidental poisoning by alcoholic beverage</td>
</tr>
</tbody>
</table>

**Note:** Sequencing of 'E' codes may vary from State to State

2. PRESCRIBED DRUG TAKEN IN COMBINATION WITH A NONPRESCRIBED DRUG

An adverse reaction occurring because of the combination of a prescribed drug and a nonprescribed drug should be coded as poisoning by both agents.

**EXAMPLE:** Hematemesis due to taking coumadin (prescribed) and aspirin (not prescribed) in combination (accidental)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>964.2</td>
<td>Poisoning by anticoagulant</td>
</tr>
<tr>
<td>578.0</td>
<td>Hematemesis</td>
</tr>
<tr>
<td>965.1</td>
<td>Poisoning by salicylates</td>
</tr>
<tr>
<td>E858.2</td>
<td>Accidental poisoning by agents primarily affecting blood constituents</td>
</tr>
<tr>
<td>E850.3</td>
<td>Accidental poisoning by salicylates</td>
</tr>
</tbody>
</table>

3. TWO OR MORE PRESCRIBED DRUGS TAKEN IN COMBINATION

If an adverse reaction occurs because of the combination of two or more prescribed drugs, both agents are coded as adverse effects of correct substances properly administered.

**EXAMPLE:** Coma due to antihistamine and barbiturate taken in combination (each prescribed)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>780.0</td>
<td>Coma and stupor</td>
</tr>
<tr>
<td>E933.0</td>
<td>Adverse effect of antihistamine and antiemetic drugs</td>
</tr>
<tr>
<td>E937.0</td>
<td>Adverse effect of barbiturates</td>
</tr>
</tbody>
</table>

**Note:** If the specific drug is not indexed in ICD.9.CM, use the code for the type of drug - e.g. antiallergics
SUPPLEMENTARY CLASSIFICATIONS

FACTORS INFLUENCING HEALTH STATUS AND CONTACT WITH HEALTH SERVICES - V CODES

ADMISSION FOR DIAGNOSTIC PROCEDURE WITHOUT INDICATION

A record that reports an admission for a procedure without a diagnosis or indication for the procedure should be referred to the treating medical officer for more information. A V code should be used as a principal diagnosis for such a case only as a last resort.

Provision has been made for certain procedures without reported diagnosis to be coded to a specific V code, for example, amniocentesis (V28.2) or hemodialysis (V56.0).

Procedures such as gastroscopy, colonoscopy, and cystoscopy which have no further information to enable the assignment of a diagnosis code (ie. no diagnosis, no symptoms, no significant findings) should be given a principal diagnosis code of V72.8, SPECIAL INVESTIGATIONS AND EXAMINATIONS, OTHER SPECIFIED EXAMINATIONS.

ADMISSION FOR DIALYSIS

Patients who are admitted specifically for hemodialysis or peritoneal dialysis should be coded from V56._ (Encounter for dialysis).

The instruction under the 3-digit heading, USE ADDITIONAL CODE TO IDENTIFY THE ASSOCIATED CONDITION, should be followed providing the information is available from the medical record.

If as a result of the dialysis complications arise, and the patient is in hospital for longer than usual, the V56._ is still the principal diagnosis code, the complications being sequenced as secondary codes.

ADOPTION

A healthy newborn admitted to hospital because of its 'waiting for adoption' status should be coded to V68.89, OTHER SPECIFIED ADMINISTRATIVE PURPOSE, as directed by ICD.9.CM Alphabetic Index.

CIRCUMCISION

All circumcisions performed in the absence of significant medical indication should be assigned a diagnosis code of V50.2 ROUTINE OR RITUAL CIRCUMCISION. The sequencing of this code is determined by the definition of 'principal diagnosis'.

Patients admitted after having had a 'non-medical' circumcision outside a health care setting should be coded to trauma of the penis.

CONVALESCENCE/AFTERCARE
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When a patient is transferred from another hospital for "postoperative convalescence", the code V58.4 should be used when it is clear that the patient is still receiving active treatment.

When the only treatment is "general nursing care" then the code V66.0 should be used. This code reflects the use of less intensive resources equivalent to nursing home care.

CONVALESCENCE/REHABILITATION

Patients admitted specifically for rehabilitation or convalescence should be assigned the appropriate V code (V57._ Rehabilitation procedures, V66._ Convalescence) as principal diagnosis' code.

The condition/s which led to the patient being in the rehabilitation/convalescent facility will have been coded at the hospital which provided the original acute care.

If both rehabilitation and convalescent care were provided, the appropriate rehabilitation V code should be sequenced first, then the convalescent V code.

Any unrelated conditions which are consistent with the definition of secondary condition (See Secondary conditions, page 4.) should be coded.

EXAMPLE: Patient admitted for rehabilitation. Acute asthma attack treated during the admission. 
Code: V57.9 Care involving use of rehabilitation procedures 493.90 Asthma, unspecified, without mention of status asthmaticus

LONG TERM/NURSING HOME TYPE INPATIENTS

Due to the lack of nursing home and other types of support services in some areas, patients may be admitted to hospitals as long term residents or nursing home type patients.

In such cases a code from the V63 category (unavailability of other medical facilities for care), should be used.

When patients are admitted for treatment of an acute problem and then remain in hospital as a long term resident or nursing home type, the acute condition should be coded as the principal diagnosis and a V63 code listed as a secondary condition.

EXTERNAL CAUSES OF INJURY AND POISONING

External cause, (E), codes are intended for use in addition to a code from the main chapters in ICD.9.CM to indicate the nature of the external cause of appropriate conditions. The E code is used secondary to the code for the condition.

GENERAL
An E code may be used in conjunction with any code in ICD.9.CM but must be used with codes from 800-999 and V71.3-V71.6.

More than one E code may be assigned to an admission if the diagnosis codes are such that they require the information provided by an E code to make them complete. Multiple E codes should be assigned with care to ensure that significant diagnosis codes are not removed in order to record extra E codes.

An E code must not be the principal diagnosis code.

PLACE OF OCCURRENCE

Category E849 PLACE OF OCCURRENCE is for use with all E codes to denote the place where the injury or poisoning occurred.

An indication of place of occurrence is necessary only for the first E code assigned to an episode of care.

The decision as to whether to use the complete 4-digit code (eg. E849.0) or simply the fourth digit (eg. 0) is largely a data management rather than a coding issue. The Minimum Data Set recognises a single digit field for place of occurrence.

Thus, the recommendation is that all State and Territory Inpatient Statistics Data Sets store place of occurrence information as a single digit.

ALLERGIC REACTION N.O.S.

Allergic reaction N.O.S. is coded to 995.3. The external cause code is difficult to assign as the causative agent is unknown.

The external cause code for Allergic Reaction N.O.S. should be E928.8, OTHER AND UNSPECIFIED ENVIRONMENTAL AND ACCIDENTAL CAUSES.

POISONINGS AND INJURIES - INDICATION OF INTENT

There are a number of categories within the E code classification which allow differentiation of poisonings and injuries according to whether they were accidental; suicidal or self inflicted; homicidal or injury purposely inflicted by other persons, or undetermined.

Note: Coders should not assume the intent. Intent must be recorded in the record by a medical officer.

E850-E858 Accidental Poisoning by Drugs, Medicinal Substances, and Biologicals

Note the inclusion at the beginning of the category in the ICD.9.CM Tabular List:

Includes: accidental overdose of drug, wrong drug given or taken in error, and drug taken inadvertently, accidents in the use of drugs and biologicals in medical and surgical procedures
In addition to the above inclusions the only situations in which a code from this category should be assigned is if a poisoning is described as self-inflicted but not stated or implied to be intentional or if no indication of intent is provided at all.

E860-E869 Accidental Poisoning by Other Solid and Liquid Substances, Gases, and Vapors

Codes in this category are intended primarily to indicate the external cause of accidental poisonings classifiable to 980-989. They may also be used to indicate external causes of localised effects classifiable to 001-799.

E950-E959 Suicide and Self-Inflicted Injury

This category is for use for injuries and poisonings specified as: suicide, attempted suicide, or self-inflicted, stated or implied to be intentional

E960-E969 Homicide and Injury Purposely Inflicted by Other Persons

This category is intended for indication of injuries and poisonings inflicted by another person with intent to injure or kill by any means.

E980-E989 Injury Undetermined Whether Accidentally or Purposely Inflicted

Codes from this category may only be used for:

1. Poisonings specified as 'undetermined' after a thorough investigation by the medical examiner, coroner or other legal authority. As it is extremely rare to have such documentation in a medical record it is unlikely this category will be used for poisonings.

2. Injuries other than poisoning are classified to codes in this category when the injury is self-inflicted but not specified as accidental or intentional.

PROCEDURES - GENERAL

WHICH PROCEDURES TO CODE

All significant procedures undertaken from the time of admission to the time of discharge should be coded. This includes diagnostic and therapeutic procedures.

The definition of a significant procedure is one that:

* is surgical in nature
* or carries a procedural risk
* or carries an anesthetic risk
* and requires special facilities or equipment only available in an acute care setting.
SIGNIFICANT NON-SURGICAL AND NON-OPERATIVE PROCEDURES WHICH SHOULD BE CODED

The list of inclusions is as follows:

BIOPSIES  
eg. Endoscopy with biopsy (includes with smear, brushings etc)
   Punch biopsy
   Percutaneous needle biopsy
   Percutaneous liver biopsy
   Bone marrow biopsy

RADIOLOGICAL EXAMINATIONS using injected contrast dye or radioisotopes. 
eg. IVP
   Retrograde pyelogram
   Scan - liver, brain, bone, thyroid, etc
   CT/CAT scan
   Angiogram
   Myelogram
   *Cardiac Catheterisation

SIGNIFICANT NON-SURGICAL AND NON-OPERATIVE PROCEDURES WHICH SHOULD BE CODED - continued

ANY INVESTIGATION OR MINOR PROCEDURE REQUIRING A GENERAL ANESTHETIC 
eg. Change of dressings
   Removal or change of plaster

SUTURE OF MAJOR LACERATION - except when the open wound is part of a major trauma - eg. compound fracture.

AMNIOCENTESIS

BLOOD TRANSFUSION - only when it is the reason for admission.

*CARDIAC ELECTROPHYSIOLOGIC STIMULATION & RECORDING STUDIES

*EPICARDIAL CARDIAC MAPPING, does not include endocardial mapping which is routine.

*CHEMOTHERAPY

CLOSED REDUCTION OF FRACTURE OR DISLOCATION

*CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) - only for patients aged <29 days.

DETOXIFICATION THERAPY - includes drug and alcohol

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EPIDURALS, including obstetrics

*ENDOTRACHEAL INTUBATION

LUMBAR PUNCTURE

MANIPULATION UNDER ANESTHESIA AND MANUAL RUPTURE OF JOINT ADHESIONS (see Manipulation Under Anesthesia)

*MECHANICAL VENTILATION

*NONOPERATIVE INTUBATION

*RADIOThERAPY

REMOVAL OF T-TUBE/U-TUBE, BILE DUCT OR LIVER - only when it is the reason for admission.

*RENAL DIALYSIS - includes hemodialysis & peritoneal dialysis.

TRACTION - only when it is the reason for admission or if the only definitive treatment given.

TRACHEOSTOMY

ULTRASOUND, in I.V.F.

* Indicates a non-surgical procedure which will be required for the Australian National D.R.G (AN-DRG) Grouper.

Do not code minor procedures which are incidental or an approach to a major operation, eg. laparotomy for abdominal hysterectomy. (Do not code the laparotomy)

Note: This does not include endoscopy as an operative approach (see Endoscopy)

PRINCIPAL PROCEDURE - SEQUENCING

The principal procedure is the procedure which consumed the greatest amount of hospital resources, or if this cannot be determined, that which best matches the principal diagnosis.

If there are multiple procedures, the principal procedure is normally the one performed for definitive treatment rather than for diagnostic or exploratory purposes.

EXAMPLE: Principal diagnosis - chronic pyelonephritis
Secondary condition - inguinal hernia
Procedures - retrograde pyelogram, inguinal herniorrhaphy
Herniorrhaphy is the principal procedure for it is a therapeutic procedure, while the retrograde pyelogram is a diagnostic
Incidental appendicectomy, 47.1 must never be recorded as principal procedure.

**FAILED PROCEDURES**

Failed procedures should be coded.

In the case of obstetric coding, both the successful and failed procedures should be coded. Sequence the successful procedure before the failed procedure.

**EXAMPLE:** A lower segment cesarean section performed following a failed forceps delivery.

- Code: 74.1 Lower segment cesarean section
- 73.3 Failed forceps

Where a procedure has been performed a second time because the first attempt failed, the failed attempt need not be coded.

**PROCEDURE NOT COMPLETED OR INTERRUPTED**

If a surgical procedure was interrupted or not completed for any reason, code to the extent of the procedure performed.

**EXAMPLE:** If a laparotomy had been done in order to perform an appendicectomy, but the appendicectomy was not done due to the patient having a cardiac arrest, code only the laparotomy (54.11).

**BILATERAL/MULTIPLE PROCEDURES**

If a procedure has been repeated, within one episode of care, the following rules apply:

1. If a procedure is performed bilaterally, and no code is provided in ICD.9.CM, then code the procedure twice:

   **EXAMPLE:** Stripping and ligation of varicose veins, both legs - report 38.59 twice.

2. If a procedure is performed more than once during an admission, at different operative episodes, code the procedure the number of times it is performed:

   **EXAMPLE:** Colonoscopy twice during stay in hospital - code 45.23 twice.
   **EXAMPLE:** Change of burns dressings 4 separate theatre visits - code the procedure 4 times.

3. If a procedure is repeated during the same operative episode and is not a
bilateral operation, code the procedure once:
EXAMPLE: Excision of nevi from leg, arm and shoulder - code 86.3 once.
PROCEDURES - SPECIFIC

DIATHERMY

ICD.9.CM Alphabetic Index to procedures is misleading in relation to coding 'diathermy'. Code 93.34 OTHER PHYSICAL THERAPY THERAPEUTIC PROCEDURES, DIATHERMY should not be used.

Use the applicable code for DESTRUCTION, LESION, OF THE SITE GIVEN.

EXAMPLE: Diathermy of cervix, not otherwise specified 67.39

ENDOSCOPY

If a procedure is performed endoscopically and there is no code provided which encompasses both the endoscopy and the procedure (e.g. laparoscopic cholecystectomy 51.23) then both procedures should be coded:

EXAMPLE: Laparoscopic hysterectomy 68.3 - 68.7 54.21

EXCISION OF SKIN/SUBCUTANEOUS TISSUE

Care should be taken before assigning code, 86.3 OTHER LOCAL EXCISION OR DESTRUCTION OF LESION OR TISSUE OF SKIN AND SUBCUTANEOUS TISSUE.

It is essential to refer to the list of exclusions at the beginning of the 86 category. These exclusions refer the coder to alternative site-specific codes.

Excision of lesion with graft - code to 86.4, wide excision.

EXAMINATION UNDER ANESTHESIA

If clear provision is not made in the Alphabetic Index to code 'examination under anesthesia' to the site specified, assign a code for 'other diagnostic procedure' of the site.

EXAMPLE: Examination under anesthesia (E.U.A.) of middle ear
Code: 20.39 Other diagnostic procedures on middle and inner ear

This code is accessed via PROCEDURE, DIAGNOSTIC NEC, EAR, INNER AND MIDDLE.

MANIPULATION UNDER ANESTHESIA (M.U.A.)

M.U.A., not otherwise specified 93.29
M.U.A., rupture of adhesions 93.26
M.U.A., frozen shoulder  93.61  
M.U.A., to check range of movement  81.98  

IVF  
The principal condition for an admission for GIFT or IVF would be V26.8.  

OVA PICK-UPS  
Ova are picked up by one of two methods:  

* abdominally via laparoscopy/laparotomy  
  Code aspiration of ovarian follicles by:  
    laparoscopy  65.91, 54.21  
    laparotomy  65.91, 54.19  

* transvaginally using ultrasound  
  Code aspiration of ovarian follicles by ultrasound  
    65.91, 70.12, 88.76  

TRANSFERS  
Two methods for transfers are used currently:  

* gamete intrafallopian transfer (GIFT)  66.99  

* transfer embryo straight to tubes (TEST). This is a 2 stage procedure;  

  Stage 1: aspiration of ovarian follicles (code according to whether  
           done by laparoscopy, laparotomy or ultrasound).  

  Stage 2: implant of fertilised ovum into fallopian tube  
           66.99  

OTHER FORMS OF IVF PROCEDURES ARE:  
Zygote Stage 1 (transvaginal egg pickup with ultrasound)  
  70.12, 88.76  

Zygote intrafallopian transfer Stage 2 (implant into fallopian tubes of eggs and  
  sperm separately by laparoscopy) 66.99,54.21  

Transvaginal oocyte collection  70.12, 88.76  

Transfer ova/embryo after oocyte collection  69.99  

Implantation of fertilised ovum  69.99  

Pro-nuclear stage transfer (PROST)  69.99  
(The egg is transferred prior to cell division commencing)  

OBSTETRICS
PROCEDURES WITH A NORMAL (650) PREGNANCY

The only procedures which can be reported in combination with a principal diagnosis code of 650 are:

Episiotomy, Artificial Rupture of Membranes for augmentation.

FORCEPS DELIVERIES - DEFINITIONS

ICD.9.CM does not include eponyms for forceps although this is most often how such deliveries are described in medical records. The following list is provided to assist in assigning the appropriate code - however, since some eponyms are used for a variety of techniques, the coder should be guided by the position of application of the forceps wherever this information is available.

Low forceps - Simpson’s, Wrigley’s, Lauffes’s

Forceps are applied when the baby’s head is on the perineum.

Mid forceps - Neville-Barnes, Haig-Ferguson, Simpson’s

Forceps are applied when the baby’s head is at the level of the ischial spines.

Breech extraction with forceps to aftercoming head - Simpson’s

A method of delivery when the presenting parts are the buttocks or feet. The baby’s body is delivered and forceps are applied to guide and protect the head as it is delivered.

Rotating forceps - Keilland’s, Burns Marshall

A method of rotating the baby in utero to the correct (or improved) presentation for delivery.

High forceps - possibly Keilland’s

These forceps are used when the head is not engaged or is above the pelvic brim - rarely used.

PANENDOSCOPY

Volume 3 of ICD.9.CM lists panendoscopy under 57.32, OTHER CYSTOSCOPY.

As the term ‘panendoscopy’ is also used for endoscopies of the respiratory,
alimentary tract or urinary tract, it should be coded to the furthest site viewed.

*EXAMPLE 1:* Panendoscopy involving esophagus, stomach and duodenum - code:  
Duodenoscopy 45.13

*EXAMPLE 2:* Panendoscopy involving pharynx, larynx and bronchus - code:  
Bronchoscopy 33.23

**REDUCTION OF FRACTURE**

A closed fracture can be treated by either a closed or open reduction, however an open fracture must be treated by an open reduction. For a closed fracture, where the type of reduction is not specified, a closed reduction is to be assumed.

**SIGMOIDOSCOPY, NOS**

Unless otherwise specified, a sigmoidoscopy should be assumed to be a flexible sigmoidoscopy and assigned 45.24, FLEXIBLE SIGMOIDOSCOPY.
Creating a Common Language: the production and use of patient data in Australia

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Phase 2

Initial Identification of Patient Variables that Drive Costs


SNAP Version 1: results of the first phase of the NSW Sub-Acute Casemix Area Network study

Report of a study funded jointly by the NSW Health Department and the Commonwealth Department of Human Services and Health.

By

Kathy Eagar,
Centre for Health Service Development,
University of Wollongong

David Cromwell,
Centre for Health Service Development,
University of Wollongong

and

Carmel Kennedy,
Illawarra Area Health Service,
Casemix Area Network

July 1995
SNAP Version 1: results of the first phase of the NSW Sub-Acute Casemix Area Network study

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Executive Summary

In 1994 the NSW Casemix Area Network (CAN) initiated the first phase of a study (known as SACAN) to develop a classification and funding model for sub-acute and non-acute care. The next phase is to be undertaken in 1995/96. The aim of the first phase was to capture and analyse a sufficiently large quantity of data (involving over 100 variables at 35 sites) to allow for selection of a subset of the most promising variables which could then be refined and used as the basis of the next stage of the SACAN study.

Preliminary results, based on a subset of the study sites, were reported by Hindle72 and presented to a one day national consultation held in February 1995 in Sydney. Subsequent to that consultation, data from the remaining sites has been included and the whole data set re-analysed. This report presents the findings of the full Phase I study.

It is concluded that the study measured variations in both casemix and costs. The variations identified in the study are clinically plausible. Importantly, the study found that variations can be identified by use of only five variables (case type; functional level; diagnosis/impairment type for rehabilitation episodes; palliative care phase for palliative care episodes and severity of symptoms for palliative care episodes). Of these five variables, only one (rehabilitation impairment category) can be extracted routinely from the current hospital discharge data set.

This study confirms the preliminary conclusions drawn by Hindle73 - that there is clearly an adequate basis for defining a classification for which costs can be precisely determined in the next stage of the SACAN study.

The resultant casemix classification has been termed the Sub-Acute and Non-Acute Patient (SNAP) Classification.
1. Introduction

The aim of the SACAN project is to test and refine existing casemix classifications for sub-acute and non-acute care. The purpose of the study (all phases) is to develop a classification and funding model which can be used for funding purposes.

The initial business case for the project noted that, by the conclusion of the project, a report was to be provided to the Casemix Area Network outlining key results and recommendations on the funding of Sub-acute and Non-acute care within an Area Health Service. The report would include:

1. a comparative evaluation of the NAIP, FRG and RCI as the basis of a preferred classification for sub-acute and non-acute care.

2. the incorporation of an appropriate classification for palliative care into the recommended base casemix system.

3. the refinement of accepted casemix costing methodologies.

4. the refinement of the CAN funding model to incorporate funding of sub-acute and non-acute care.

The SACAN project is to be conducted in three phases. For Phase 1 (the subject of this report) the aim was to capture and analyse a sufficiently large quantity of data to allow a subset of the most promising variables to be selected and that could be refined for use in the final phase of the SACAN study. Thus Phase 1 focused on those patient characteristics regarded as being most predictive of resource use and tested and refined those characteristics. The objective of the costing component of Phase 1 was simply to collect sufficient costing data to discriminate between potential patient classes. The study did not aim to establish the actual costs of each casemix class but simply to establish the cost relativities between classes.

In Phase II of the SACAN project, the results of Phase I would be analysed and the data items would be refined as necessary.

In Phase III, the final stage of the SACAN study, only the most promising variables would be captured and a standard cost modelling methodology would be employed to determine final casemix classes and cost weights. This final phase is due to be completed during 1995/96.

The SACAN study was designed in this way in order to minimise the burden of data collection for the study sites. The design team was concerned that sub-acute and non-acute study sites lacked the experience and the resources to concurrently collect data on all potential patient variables as well as the detailed costing data required to determine both service weights and cost weights. It was acknowledged from the onset that this study design would mean that only tentative conclusions could be drawn at the conclusion of Phase I.
2. Background

The separation of sub-acute episodes of care from acute episodes is now recognised as an essential step in understanding the outputs of the healthcare system. For the purpose of management it is important to be able to group all patients into clinically meaningful classes that have similar resource usage. Fetter, at Yale University, developed such classes by classifying patient care episodes into Diagnosis Related Groups (DRGs). However sub-acute and non-acute episodes are not adequately classified by DRGs. As a consequence work has commenced in Australia to develop a suitable classification system for sub-acute and non-acute care. This NSW study is one component of a broader national effort to develop a suitable classification.

Eagar and Innes defined sub-acute and non-acute care in the context of hospital inpatient services. Their initial definition of sub-acute care was an episode of care:

- provided in a designated rehabilitation, geriatric rehabilitation, palliative care, psychogeriatric unit or in a psychiatric unit other than an acute psychiatric unit, or
- under the clinical management of either a rehabilitation physician, a palliative care physician or a psychogeriatrician, or
- if neither of the above applies, an episode of care can be classified as sub-acute if, in the opinion of the treating physician, the goal of the episode of care is one of the following:
  - rehabilitation and tertiary prevention or
  - palliation.

Non-acute care is defined as an episode of care:

- which occurs after the patient has been classified as a nursing home type patient, or
- in which the patient is receiving convalescent care, or
- in which the patient is receiving non-complex respite care.

These care types are routinely classified in most State inpatient data sets as "Episode Types". The relevant episode types are generally:

- nursing home type
- convalescent care
- respite care
- rehabilitation
- palliative care
- psychogeriatric

"Acute, sub-acute and non-acute inpatient episodes are three distinct products that must be identified in order to be better understood and managed."
clinical presentation of people that fall within these groups, coupled with the clinical intent of the admission or episode, causes varying levels of resource consumption. Identification of these episodes is necessary to ensure that the products can be recognised and measured for both clinical management and funding purposes.

In practice, the identification and classification of sub-acute and non-acute episodes in Australia has proved to be a difficult task. One important reason is the limited availability of source data for classification development. The DRG classification uses variables which are routinely collected about each patient care episode. They include diagnoses, procedures, age and disposition. Only one new variable (admission weight for neonates) has been added to the Australian discharge data set in order to allow for DRG assignment.

In contrast, the variables currently collected in the routine discharge data set have been demonstrated to be ineffective in the classification of sub-acute and non-acute episodes. Thus, work to develop a casemix classification for sub-acute and non-acute care needs to commence from first principles. This has important implications. Most importantly, the introduction of a sub-acute casemix classification system will require new data to be routinely collected. The introduction of new data items raises questions such as what data should be collected, who should collect the data, when should the data be collected and what should be the national standard definitions.

2.1 Existing casemix classifications for sub-acute and non-acute care

The following discussion focuses on recently published literature that explores some of the leading classification systems for those patients that are not adequately described using Diagnostic Related Groups (DRG’s). Existing systems such as Functional Related Groups (FRG), Resident Classification Index (RCI) and Non-Acute Inpatient Project (NAIP) are reviewed. Finally, the proposed method for classifying Palliative Care patients77 is examined.

In arguing for the separation of acute, sub-acute and non-acute episodes, Eagar and Innes78 argued that the key characteristic that describes a sub-acute inpatient episode is that, whilst the person needs health care, the principle diagnosis is not predictive of resource use. In rehabilitation, factors such as the functional ability of the person are more predictive of resource use than whether they have had a stroke or a brain injury. Similarly, in palliative care the diagnosis is not a resource predictor whilst factors such as symptoms or pain level may prove to be useful. Sub-acute care includes inpatient episodes such as rehabilitation, palliative care, and some psychiatric care79. Sub-acute care encompasses many acute-care injuries, illnesses and chronic conditions, for example, short term post acute care (rehabilitation); as well as long term medical care clients (chronic illness, ventilator dependent, AIDS, cancer).

The common factor with these episodes is that the treatment goal is the enhancement of quality of life and/or functional gain. Sub-acute care immediately changes the acute care setting goal focus of curing a specific organ or body system pathology to the enhancement of the individual’s function80 or, in the case of psychiatry and palliation, the enhancement of quality of life. Outcome
measurements change from reducing the abnormality of vital signs or pathology to focus on activities of daily living (ADL) and successful rehabilitation. Length of stay (LOS) should not necessarily be a rehabilitation outcome measure as rehabilitation averts costs downstream\(^8\). A long length of stay may be a good outcome for a rehabilitation client who can subsequently be managed in the community if the alternative is placement into permanent institutional care.

Non-acute care includes inpatient episodes that provide nursing home and/or maintenance type care (respite and convalescence). It includes patients that require care pending transfer to another type of setting. These clients do not require acute care services but may require a higher level of care than is available in traditional skilled nursing facilities or at home. Once again, level of dependence for day to day living is more predictive of resource requirements than diagnosis.

Several classification systems for sub-acute and non-acute episodes of care have been developed to date. Resource Utilisation Groups\(^8\) and the California Long Term Care System are two American classification systems that are in use, predominantly in Nursing Homes, to classify non-acute episodes of care. The Resident Classification Index\(^8\) is an Australian classification system also used in Nursing Homes to classify non-acute episodes of care. The Non-Acute Inpatient classification\(^8\) was developed in Australia to classify both sub-acute and non-acute inpatient episodes of care. Finally, Functional Related Groups, which uses the Functional Independence Measure (FIM) of the Uniform Data System (UDS) in America, classifies rehabilitation episodes of inpatient care.

Reid\(^8\) identified four important criteria in establishing a useful classification system: the presence of a manageable number of classes; a clinically meaningful tool; similar patient episodes in terms of resource use within the same class and routinely obtainable patient characteristics available from routine hospital abstracts. These criteria are used in the following discussion to assess the appropriateness of the existing tools.

Australian studies into casemix classification of sub-acute patients have been limited in their sample size and client composition. These include the Non-acute Inpatient Project (NAIP), two studies into Sub-Acute casemix in the Illawarra\(^8\)\(^7\), and a study undertaken at Royal Rehabilitation Centre Sydney\(^8\). The SACAN project aims to draw on these experiences and test each of the tools on a sample of 5000 plus episodes of care across all of the sub-acute and non-acute patient types.

One common denominator with existing sub-acute casemix classification systems is that functional status at admission is seen to be more predictive of resource consumption than diagnosis\(^8\). In a study that looked at predicting charges for Medical Rehabilitation, the combination of DRG, Severity of Illness Index (SII) and age accounted for the highest prediction of resource use\(^8\).

The leading contenders for sub-acute classification to date are the NAIP, FRGs and RCI. Each will be examined separately.

The Non-Acute Inpatient Study (known as the NAIP study) developed a classification system based on data collected from rehabilitation and slow stream medical wards. A per diem classification with 19 major functional categories was
developed. Major classes are split using the RUG-ADL score. The study\textsuperscript{91} found that the RUG 3-ADL score alone explained 44\% of variance. This was not acceptable to clinicians as it lacked clinical meaning. The addition of the major functional categories negated this problem. However, the variance explained dropped to 26.15\%. It was noted that the RUG 3 ADL does not include cognition. Consequently, the Folstein Mini-Mental State\textsuperscript{92} was also collected.

Roberts\textsuperscript{93} concluded that LOS is not easily predictable, and that a daily classification may be necessary. This places a burden on staff if a daily functional assessment needs to be performed. Any such functional assessment would need to be sufficiently quick and easy to use to enable it to be collected routinely. There is some concern that it would leave the system open to gaming and that a system of audit would be required.

The NAIP satisfies most of the necessary criteria for a casemix classification system. However, not all of the necessary patient characteristics are routinely collected by hospitals. In fact, a major problem exists within Australia as there is still no consensus on a standard ADL assessment to be used nationally.

In another study that used the RUG 3 ADL Index as the functional assessment tool, Batavia and De Jong\textsuperscript{94} found that allied health costs were better explained by the RUG ADL then nursing costs (24\% of nursing costs were said to be explained). Using a statistical package called Knowledge Seeker they developed a new hierarchical structure using the same predictor variables as RUG 3 which explained variances of 24\% for nurses, 22.9\% for doctors and 33.3\% for allied health workers.

Functional Related Groups (FRG) are a per episode classification that initially uses functional impairment groups to split the episodes into rehabilitation diagnostic categories. It then uses the motor sub-score of the Functional Independence Measure (FIM) to further split the categories. Some use is made of the patient’s age in the lower motor categories. Baker\textsuperscript{95} undertook a study to investigate the use of FRG’s to classify rehabilitation patients and concluded that, after further work is pursued, case based payments are a possibility.

FRGs satisfy most of the requirements for a classification system except for the availability of the patient characteristics from routine hospital data. The FIM is collected in some units in Australia but is not a national standard.

Oczkowski and Barreca\textsuperscript{96} found that DRGs explain 6.9\% of variance in length of stay (LOS) in rehabilitation, whereas, in acute care it explains 15\% LOS variance. The addition of FRGs increased the variance explained to 18.3\%. The two methods of classification within their settings are comparable. LOS was used as the dependant variable for resource utilisation due to the fact that the correlation coefficient between LOS and cost ranged from .83 to .93. Their study also found that impairment alone is not sufficient as a predictor of resource use. The inclusion of age, bladder and bowel control contributed to a more accurate prediction. Another interesting finding was that delay in admission to the rehabilitation unit was not found to influence the discharge destination.

It is clear that while functional impairment is a better predictor of resource utilisation than DRGs, it should not stand alone as the sole predictor of costs. In a study in the Illawarra, Lee et al\textsuperscript{97} reported that the RUG and FIM alone were not
found to be predictors of resource utilisation. The authors suggest inclusion of functional impairment groups with the FIM or RUG to more effectively predict staff time involvement.

Granger et al98 assessed the predictive power of the FIM in terms of help in minutes required by people with Multiple Sclerosis. They reported that a combination of two FIM items (transferring from tub/shower and walking/wheelchair locomotion) as well as an assessment of visual limitations was a strong prediction model. The removal of cases with visual disturbances from analysis indicated that six FIM items (transferring bed/chair, memory, walking/wheelchair locomotion, dressing lower body, bladder management and eating) were significant predictors of help in minutes when they explained most of the variance ("R²=0.9982, p<.00000").

More recently, Stineman et al99, developed the FIM-FRG classification for rehabilitation. The FIM-FRG classification represents a significant milestone in the development of an episode-based rehabilitation classification. The system contains 53 refined FRGs and explains 31.3% of the variance in length of stay. The researchers report that it is stable when tested on a validation sample.

The FIM-FRG uses 4 predictor variables: functional impairment category (FIC), admission scores for the motor and cognitive status subscales of the Functional Impairment Measure (FIM) and patient age. Each variable will be briefly discussed.

The FIC variable can be collected in one of two ways. Firstly, the 18 FIC's can be collected as a data item. This is the approach used in the CAN study. Alternately, ICD-9-CM diagnostic codes can be collected and can be mapped to each FIC. Figure 1 is an example of the mapping which is available100.
Figure 1: ICD-9 Diagnostic Codes related to specific impairment groups: an example

Stroke (01)

The STROKE Impairment Group includes cases with the diagnosis of cerebral ischemia due to vascular thrombosis, embolism, or haemorrhage. Cerebral impairment related to non-vascular causes such as trauma, inflammation, tumour, or degenerative changes are excluded. Impairment Group Codes included in STROKE are listed, followed by the ICD-9 diagnostic codes which may relate to any STROKE Impairment Group Code (1.1-1.9)

1.1 LEFT BODY (RIGHT BRAIN)
1.2 RIGHT BODY (LEFT BRAIN)
1.3 BILATERAL
1.4 NO PARESIS
1.9 OTHER STROKE

430 Subarachnoid haemorrhage, including ruptured berry aneurism
431 Intracerebral haemorrhage
432.0 - 432.9 Intracranial haemorrhage
433.0 - 433.9 Occlusion or stenosis of precerebral arteries
434.0 - 434.9 Occlusion of cerebral arteries
436 Acute, but ill-defined cerebrovascular disease
437.0 - 437.9 Cerebrovascular disease, ill-defined and other
438 Late effects of cerebrovascular disease (use only if subject’s admission class is coded readmission).

NOTE: Do not code 435.0 - 435.9 Transient cerebral ischemia or TIA.

The FIM assesses disability on 18 individual items. The 18 items can be combined either into 6 sets of clinical sub-scales or into 2 subscales (motor and cognitive) as shown in Figure 2.
The FIM-FRG classification uses the motor/cognitive subscales of the FIM in combination with age. For some Functional Impairment Classes, the cognitive subscale is used. For others, the motor sub-scale is used. An example of a
section of the FIM-FRG classification is shown below. Figure 3 shows the 5 classes for rehabilitation after stroke.

Figure 3: The FIM-FRG Classification for Stroke

Explanatory note: Boxes with double lines are the five stroke classes. The LOS is the average length of stay for each class.

As shown above, age is used selectively as a splitting variable. It is not used in all FICs.

The following figure shows the 53 FRGs in the FIM-FRG classification.
The FIM-FRG classification is the first casemix classification for rehabilitation which classifies a whole inpatient episode and which produces a satisfactory statistical result. On this basis, it must now be considered as a leading contender for a rehabilitation classification for Australia.

The Resident Classification Instrument (RCI) is used in nursing homes within Australia. It adds other variables to ADL such as continence, specialised nursing procedures, mental state, behavioural problems, communication and sensory problems. Eagar and Hindle\textsuperscript{101} note that the RCI has a manageable number of classes (5 classes) but lacks clinical meaning.

In her paper at the Sixth National Casemix Conference, Staunton\textsuperscript{102} identified the burden of increased documentation that the RCI imposed upon nursing staff. In order to support the patients’ classification, all patient care must be documented in intricate detail. The effect is that while the necessary patient characteristics are available from routine hospital documentation, an increased burden of documentation is placed on nursing staff.

<table>
<thead>
<tr>
<th>Impairment Category</th>
<th>M/C Sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>5</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>5</td>
</tr>
<tr>
<td>Nontraumatic brain injury</td>
<td>3</td>
</tr>
<tr>
<td>Traumatic spinal cord injury</td>
<td>5</td>
</tr>
<tr>
<td>Nontraumatic spinal cord injury</td>
<td>3</td>
</tr>
<tr>
<td>Neurological</td>
<td>4</td>
</tr>
<tr>
<td>Orthopaedic - LE fracture</td>
<td>3</td>
</tr>
<tr>
<td>Orthopaedic - Joint replacement</td>
<td>4</td>
</tr>
<tr>
<td>Orthopaedic - Other</td>
<td>2</td>
</tr>
<tr>
<td>Arthritis - Osteo</td>
<td>3</td>
</tr>
<tr>
<td>Arthritis - Rheumatoid</td>
<td>2</td>
</tr>
<tr>
<td>Amputation - Lower limb</td>
<td>2</td>
</tr>
<tr>
<td>Amputation - Other</td>
<td>1</td>
</tr>
<tr>
<td>Cardiac</td>
<td>2</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>2</td>
</tr>
<tr>
<td>Pain syndrome</td>
<td>2</td>
</tr>
<tr>
<td>Major multiple trauma</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>
There is very little work published on the classification of palliative episodes of care. In 1993 the Australian Association for Hospice and Palliative Care (AAHPC) held a two day workshop for palliative care clinicians which produced a draft Palliative Care Casemix Classification\textsuperscript{103}. It was proposed that a Palliative Care Casemix Classification (PCCC), which is applicable for use in all settings. The PCCC consists of five “Phases of Care” that are defined as acute, stable, deteriorating, terminal and bereaved. Further classification is based on pain and symptoms levels as well as family support.

Some concerns have been expressed about the PCCC, including the need for daily assessment for phase change the associated documentation process involved and responsibility for this assessment. The PCCC has a manageable number of classes that are clinically meaningful but the necessary patient characteristics are not currently obtainable from routine hospital abstracts.

Lee and Kennedy\textsuperscript{104} included palliative care episodes from two units in a study that tested the NAIP classification. Due to a small sample size, statistical analysis was not possible. However, trends showed that the NAIP classification was not predictive of length of stay in their Palliative Care units for that three month study period. Palliative care patients were shown to be more expensive than the rehabilitation and geriatric patients which was attributed to medical officer salaries and medication costs.

While several casemix classification systems exist and could be refined to suit Australian needs, one question remains unanswered should the classification needs to be on a per diem or per episode basis. Insufficient work has been undertaken to investigate the progression of costs throughout sub-acute and non-acute episodes. The NAIP study collected per diem data using the RUG ADL index to assess function. Other systems that use more elaborate Functional Assessments such as the FIM\textsuperscript{105} found that data could not be collected on a per diem basis predominantly due to burden of data collection.

Many studies indicate that a per episode payment system may be unsuitable for sub-acute and non-acute care\textsuperscript{106 107 108}. Two studies into the effect of Prospective Payment Systems for Rehabilitation cite an increase in nursing home placements, aversion of acute costs downstream, increase in outpatient and follow-up services and an overall decrease in rehabilitation length of stay and the amount of therapy provided\textsuperscript{109 110}. Prospective payment systems in acute care have had similar effects on patient outcomes\textsuperscript{111}.

Willkerson, Batavia and De Jong\textsuperscript{112} examined the characteristics of four payment models in a classification system. Each of the models involved payment based on the functional assessment at different stages of the rehabilitation process:

- Admission;
- Discharge;
- Change in Function;
- Change in function combined with retention of outcome (follow-up functional assessment).

The authors suggest that each of these models provide incentives to admit patients who will attract the highest capitation. They suggest that a justification system be used in conjunction with a classification system to ensure the payment
is, or was, justified. This bears its own problems such as high administrative costs and increased documentation requirements. In addition, each of these models pose problems that need to be addressed as part of the classification development. For example, which functional assessment method is sensitive enough to be used, which of the four models best predicts resource utilisation and what is the relationship between functional outcome and resource utilisation\textsuperscript{113}.

2.2 Studies undertaken concurrently in other States in Australia

Three studies were being undertaken elsewhere in Australia whilst the first phase of the SACAN study was in progress.

The Western Australia Palliative Care Project collected clinical data on patients with the aim to test and refine the PCCC\textsuperscript{114} described above. Preliminary results are now available.\textsuperscript{115} The scope of the study was palliative care patients in metropolitan Perth treated by Silver Chain Hospice Care Service (domiciliary), Cottage Hospice (hospice) and Hollywood Hospital (teaching hospital). All patients registered with these services during the study period (even if admitted before the study commenced or discharged after the study concluded) were in scope.

Clinical data was collected for four weeks with direct costing data also collected for one week simultaneously. Data collection occurred during the three month period March to May 1994. The sample considered of 622 cases and the dependent variable was direct costs per visit-day.

The preliminary results suggest that the individual variables of most benefit in variance reduction were:

- Phase 33.7%
- RUG - ADL (total) 25.9%
- Symptom severity (total) 10.6%

Multi-variable splits using these three variables were the most effective. First level splits are by phase, second level splits are by either RUG-ADL scores or by symptom severity with either giving similar results (approximately 40% variance reduction).

The Victorian Palliative Care Casemix Development Project has also completed a preliminary analysis of data collected from the six inpatient sites in scope\textsuperscript{116}. Like the Western Australian study, the preliminary analysis indicates that Phase of Care, RUG-ADL on admission and number and severity of problems are the major indicators of resource consumption.

Preliminary results are also available for the first phase of the Victorian Rehabilitation Casemix Project\textsuperscript{117}. Stage 1 involved a pilot study and an analysis of data collected from five inpatient units. The preferred model after preliminary analysis was a classification system based on sixteen major clinical groups (similar to the Functional Impairment Categories already described). Change in functional status between admission and discharge (as measured by the Barthel
Index), was predictive of variance in length of stay.
3. Study overview

The study aimed to collect data on patient characteristics and resource use over a six month period in 1994 at a sample of sub-acute and non-acute facilities. To ensure a suitable array of variables was collected, the study sought input from clinicians and staff at the participating sites prior to the beginning of the study. The consultation also enabled data definitions to be agreed and the needs for training to be established.

3.1 Clinician input

Prior to the commencement of training and data collection, consultation was sought from clinicians. A large meeting was held in December 1993 at which a set of prospective data items was suggested to those in attendance. Participants of this meeting split into specialty groups to discuss the appropriateness of the proposed data set for their specialty and suggest additional data items. A data set was compiled through this process. The Project Coordinator then visited each site to seek advice on the proposed data set from the clinicians who would be involved in data collection. The data set was refined several times during this two month consultative period. A final meeting was held at which the final data set and data collection sheets were tabled for review and discussion.

An important outcome of the consultation process was the decision not to collect nursing data. The sites participating in the Phase I study argued that they did not have sufficient resources to capture nursing costs per patient per day for the six months of the study.

As a result, the study design team developed an alternate (albeit a less satisfactory) methodology for the determination of nursing costs for all but palliative care sites. This was to use the RUG-ADL data and the nursing cost data from the NAIP study. The RUG-ADL was used as it is a direct measure of carer burden and therefore a measure of nursing resource intensity. In this sense, the RUG-ADL functions in much the same way as other nursing dependency measures. A regression model of nursing costs against RUG-ADL scores, as derived from the NAIP study, was used to impute nursing time and therefore costs.

Thus, it was only necessary for each non-palliative care site to provide nursing cost centre data for each ward included in the study, and the RUG-ADL score for each patient on admission and discharge.

The NAIP study did not include palliative care patients and therefore neither RUG-ADL scores nor costing data was available. In consequence, palliative care sites were required to collect nursing costs. The C-Plan nursing care planning software and staff training was provided to each palliative care site for this purpose.

3.2 Types of data items

A large number of variables were identified through the consultation process. In total, some 100 data items were selected for inclusion in the study. The items
are listed in Appendix 2 and fall into 4 categories.

The first are Core Data Items. These were to be collected at all sites for all patients. They included all items in the current discharge data set and the RUG-ADL as the core measure of function.

The second are Speciality Specific Data Items. These were items that were to be collected only for specific case types. For example, "Phase of Palliative Care" was collected for palliative care episodes but not for others.

The third category were Optional Data Items. These were items that study sites could elect to collect. The most important of these were the instruments for the measurement of function which sites could elect to collect in addition to the RUG-ADL.

Last is the category of Cost Data Items, necessary to establish cost relativities between patients.

3.3 Data definitions

The following definitions were used throughout the project.

Episode type

This was based on definitions already in use in NSW and distinguishes between seven types of episode. These are Nursing home type; Convalescent care; Respite care; Rehabilitation; Palliative care; Psycho-geriatric care for patients not acutely ill; and Other patients (acute). A full description of the different types can be found in appendix 1.

Episode start

An episode is judged to have started when actions are taken to provide inpatient care that is not part of an acute inpatient episode. The start may be in one of the following ways:

- Admission from another facility or from home, for other than acute inpatient care;
- Completion of another type of inpatient episode in this facility, when the patient remains as an inpatient for whatever reason. This might be an acute inpatient episode, but can be another type of sub-acute or non-acute inpatient episode. For example, the patient's rehabilitation program may terminate, and he or she remains in the facility for nursing-home-type care.

Episode end

An episode is judged to have ended when one of the following events occurs:

- The patient is discharged from the facility, transferred to another facility or is discharged home.

The patient starts another type of inpatient episode in the same facility. This
might be an acute inpatient episode. It might also be another type of sub-acute or non-acute inpatient episode.

Episode

Each episode is the period between an episode start and continues until an episode end. A patient may have more than one episode during the same hospitalisation.

Palliative care phase

Episodes of palliative care can be further classified with respect to five categories of phase. These can be summarised as follows:

Phase 1 Acute phase, patient's condition has changed suddenly;
Phase 2 Stable phase, patient not in Phases 1, 3, or 4;
Phase 3 Deteriorating phase, patient's condition is becoming progressively more severe;
Phase 4 Terminal phase, patient is likely to die in a matter of days;
Phase 5 Bereavement phase, patient has died.

3.4 Training

Project Officers were appointed and trained in the definitions for the data set as well as any assessment tools that were to be collected at their participating sites. This information was disseminated to the participating sites in identical training sessions throughout the Areas. A handbook compiled by the Project Coordinator was distributed to all participants for ongoing reference and support. The handbook consisted of all data items with their definition and the data collection forms.
4. Data collection

Data was captured for patients receiving sub-acute and non-acute care at 35 units in NSW. The units comprised of hospitals, or district units or wards in larger facilities. In all, 24 hospitals from 8 Area Health Services contributed to the study. A list of contributors is shown in appendix 2.

The data items were collected over the six month period from 1st March 1994 to 31st August 1994. The items were split into four main sets. Each is discussed briefly below. The specific data items are listed in appendix 3.

To assist the study sites in the computer-entry of the data, software was developed for the study and provided to each participating site. Further, a PC was purchased for three sites that lacked any computer facilities.

Patient data items (SAS)

This data set captured information on the clinical attributes of each patient within the study. The data items included patient and episode identifiers, the Resource Utilisation Groups Activity of Daily Living Index (RUG-ADL), the Folstein Mini-mental State. It also included the various speciality specific items (eg. rehabilitation measures, and palliative care items such as phase) and the optional data items, namely the Functional Independence Measure (FIM), the Barthel Index, the Resource Classification Index (RCI), and the Australian Activities Index.

These data items were captured using the instruments defined in the study protocol120.

Resource consumption measures (SAT)

The second data set contained measures of staff time and expensive or atypical goods and services consumed by individual patients. Staff time was collected for all categories of staff with the exception of nursing staff in non-palliative care services. Allied health staff were asked to record the total time spent on each day on caring, identifying the patients who had received attention by their medical record number. A similar approach was used to capture medical time.

Information concerning expensive or atypical items were recorded against each patient on a specific data collection form. Clinical interventions of exceptional cost were also recorded in this way.

HOSPAS discharge data

The third set of data items was obtained from the facility's patient administration system. Generally, this was the New South Wales HOSPAS system. A subset of the HOSPAS clinical and demographic fields was retrieved from the system, removing the need for this information to be collected by staff directly. Facility code, patient identification number, and episode dates were also retrieved for the purpose of linking the data to the SAS and SAT data.

Costing data
The final data set contained the costing information. For the purposes of the Phase I study, sites were only required to provide the total direct costs associated with patients within the study, and not information on overhead costs. However, study sites were informed that this information would be required in Phase 3, and it was proposed that hospitals assemble information on overhead costs during the first phase.

It was suggested that each study site undertake the following steps in order to produce the cost data:

1. distribute hospital costs to cost centres
2. separate all cost centres, regardless of financial program, into [a] patient care cost centres [PCCCs] and [b] overhead cost centres
3. separate PCCCs into [a] Staff CCs and [b] Goods and Services CCs
4. separate Staff CCs into professions - [a] nursing [b] medical [c] social work and so on
5. for each Staff CC, identify how much of the CCs costs should actually be attributed to the sub-acute inpatients in this study

In determining the total costs for each component, the hospitals were asked to ensure that the costs are complete, and referred only to the study period (1 March to 31 August 1994). Hospitals that had more than one sub-acute unit were also asked to provide separate tables for each one studied.
5. Preparatory analysis

This section describes the stages prior to the grouping of the data. It is similar to the process already described by Hindle\textsuperscript{121}, though some significant differences exist.

5.1 Linking of the data from the main sources

The patient records in the HOSPAS, SAS and SAT files were linked to create a single patient data file. Two versions of the combined file were made. The first contained records relating to all patients within the study, and summarised data by episode. The second contained only palliative care patients with the data being aggregated by phase.

The success of the linking process varied between facilities. Overall, the episode data was the less consistent. For each facility, there were a few records in each separate file (ie. SAS, SAT, and HOSPAS) that had no corresponding record in the other files. This occurred predominately in the case of the HOSPAS records, and it is likely that these patients were not sub-acute. It was assumed that all SAS and SAT records were within scope.

At the next level, records could be linked from two files. The missing component was most often from the SAT file. For these records, this is likely to result in the allocated cost being below the true value, as allied health minutes are missing. However, as the allocation of the majority of costs was independent of this (ie. nursing costs, unallocated medical and other costs), its impact is liable to be minimal.

Because of hospital amalgamations during the study period, three facilities had more than one facility identification code. This caused problems until the codes were regarded as equivalent. In one case, many SAT records were given one code, whereas the HOSPAS and SAS records were mainly another. At another site, patients whose episode straddled the end of June had the period of stay pre-July recorded as one code in the HOSPAS data, and the post-June half as the other. The SAS data was generally all one. Thus, there were a lot of ghost patient records that were really the second part of one episode. These ghost records were removed.

Last, the linking process was disrupted when the admission and/or discharge dates failed to match exactly. In the minority of cases when this occurred, it was predominately the SAS and SAT episode dates that did not match the HOSPAS dates. Generally, the SAS and SAT dates fell inside the episode dates given in the HOSPAS data, and it is likely that a change in episode type was not recorded.

Although the linking was not perfect, it was decided not to exclude the poor matches at this stage of the analysis because the cost per case could be overestimated. Instead, the records with poor links were removed after the allocation of costs.

A total of 9904 linked records were created in the episode file. The palliative phase file contained 3638.
5.2 Preparation of patient data prior to the allocation of costs

Review of patient data

The data within the patient files were reviewed. A number of errors were identified during this process, and where possible, these were corrected. The errors and the remedies are outlined below:

- Occasionally, two concurrent episodes of care had the same patient identifier. Generally, one had been linked, while the other only consisted of HOSPAS data. In this case, the second record was deleted;
- Some episode records (that again were generally HOSPAS records) fell outside the study period. It was assumed that these patients were erroneously downloaded, and were deleted;
- Some RUG-ADL fields fell outside the valid range. However, it was found that when the components of the measure were added, a permissible value often resulted. It was also noted that some values within the range altered. It was decided to recalculate both RUG-ADL scores from their components. In those cases where the value was still invalid, the contents of the field were erased;
- The records created from just the SAT file were effectively useless, as they lacked the variable required for grouping and cost allocation. Therefore, these records were deleted;
- SAT fields with questionable cost data were also erased. For example, two records had procedure costs of approximately $131,000 and $65,000 respectively.
- Occasionally, the HOSPAS discharge date was missing. If the SAS discharge date was also missing it was assumed that the patient stay was 1 day; and
- Where the HOSPAS data had a date of birth after the admission (and discharge) date, the value was erased.

The removal of the records of patients outside the scope of the study reduced the size of the episode sample to 7022 records. The palliative phase data was not affected.

Estimation of RUG-ADL on death

The study instructed staff to record a discharge RUG-ADL of zero when a patient died. It was expected that this would only relate to palliative care patients, but other types of patients were also given a zero.

The phase data for the Palliative care episodes were analysed to discover what value should be substituted for the zero. It was discovered that the overwhelming number of patients who entered the terminal phase of care had a RUG score of 18. This was true regardless of the initial RUG-ADL score on admission. Therefore, it was decided that the RUG-ADL discharge score of zero would be replaced with a value of 18.

In the case of other episode types, it was unknown whether a value of zero indicated death or was simply an omission. However, the incidence of these records was low. As there was no other information on the likely RUG-ADL score of non palliative care patients who died, and as data error was a possible
explanation, it was decided that these patients would be given the same value as the RUG admission score, unless this was zero. In the latter case, both values was erased.

**Estimation of missing RUG-ADL scores**

The RUG-ADL scores measured on discharge and admission are necessary to allocate nursing costs. Thus, the lack of RUG-ADL scores within records that did not link to a SAS record posed a problem. Those records that had both HOSPAS and SAS records were therefore analysed to discover if any of the HOSPAS fields correlated with the RUG-ADL. Not surprisingly, no strong relationship between the HOSPAS variables and RUG-ADL was found. The best explanatory variable was the Facility Identifier (12%). It was therefore decided that missing RUG scores would be estimated based on the average scores recorded for that facility.

**Length of stay**

The patient's length of stay is used to allocate costs, but as only costs over the study period were considered, it was necessary to ensure the period of care matched the same time frame.

However, before the dates were adjusted, it was necessary to determine which set of discharge dates to use. The SAS dates were felt to be more accurate than the HOSPAS dates because there was less chance of missing a change in episode type. Thus, the SAS dates were chosen in cases where the SAS and HOSPAS data disagreed. In the few cases where the SAS discharge date was missing, the HOSPAS discharge date was substituted. However, if this was prior to the SAS admission date, the patient was given a length of stay of 1 day. These records were erased later due to the lack of dates.

For patients whose length of stay straddled an endpoint of the study period (ie. 1st March to 31st August), the Date of Admission or the Date of Discharged were altered. Patients with an admission date prior to the study date were altered to the March 1st. If a discharge date after the endpoint of the study was recorded, it was changed to the 31st August.

The LOS value to be used in the cost allocation process was calculated by subtracting the adjusted date of discharge from the adjusted admission date. When both dates were equal, the LOS was defined to be 1 day. The number of patients this affected was small.

Changing the dates of admission and discharge to reflect the study period meant that the measure of patient dependency at these times, namely the RUG scores, would be theoretically invalid. Practically though the impact would have been minimal. First, as there was no measurement in advance of the official start date of 1st March, the RUG scores would probably be closer to the patient's state rather than when they were admitted. Second, the change from the admission RUG to the discharge RUG was on average quite small, thus the inaccuracy was likely to be small. Third, the number of patients who had their dates altered was a small proportion of the whole. Therefore, it was decided that not altering the values was less risky that devising a method to take account of the changes.
A similar procedure was undertaken on the palliative care phase records, though first the discharge date for the end of the phase had to be created from either the following phase or the episode discharge date.

5.3 Cost allocation

The first step in the costing process involved categorising the costing information provided by the various units under standard patient cost types. The standard components were defined as follows:

1. Nursing labour
2. Occupational Therapists
3. Physiotherapists
4. Allied health care labour
5. Medical labour
6. Other staff
7. Imaging
8. Pharmacy
9. Medical and surgical supplies
10. Pathology
11. Other goods and services.

The definition of cost centres as patient care or overhead costs varied slightly between sites. It was therefore necessary to make minor adjustments to ensure comparability.

The comprehensiveness of the data under these categories also varied between sites. Most often, imaging and pathology costs were omitted. However, there were no obvious omissions in the major data cost categories, with the exception of three units which had not provided costs for medical services. In these cases, costs were estimated in proportion to medical costs at other sites.

One site was unable to separate physiotherapy costs from those of other allied health care professions. It was known that no occupational therapists were employed. An estimate was made of the breakdown using the allied health data provided by other similar sites.

The different cost categories were allocated to the patients according to the following rules:

Nursing
on the basis of RUG-ADL, using a regression model derived from the NAIP study;

Medical
on the basis of the minutes of care reported, where available, priced at a fixed rate. Unaccounted costs were allocated in proportion to length of stay;

Allied Health
in proportion to the minutes of care reported, unless the cost/minute exceeded an upper price. In this case, costs were allocated on the basis of the minutes of care priced at a fixed rate. The unaccounted costs were allocated in proportion to length of stay;

Other
costs of unusual services were allocated to the identified patients. Any remaining costs were allocated in proportion to length of stay. NB: Other consisted of all other cost categories (goods and services, pharmacy, etc.)

The cost per minute as derived for each facility with regards to the allied health personnel varied between facilities. This was to be expected given the nature of
the study. However, where the cost per minute exceeded the price determined for medical staff, the care provided was costed using this price. The remainder was allocated in proportion to length of stay. This was necessary in six cases.

5.4 Preparation of data for analysis

Trimming of patient records

As noted above, 2882 of the 9904 records originally in the episode data file were outside the scope of the study, and were removed prior to costing. After costing, a number of records were also trimmed from the remaining 7022 records. Three types of patient records were deleted. First, patients whose LOS straddled the study end points were deleted as their cost was only for a part of their stay (901 records). Second, patients whose date of discharge had to be estimated were deleted (363 records). Third, high-cost outlier records (bed-day cost greater than $700) were trimmed (67 records).

A number of records were also trimmed from the palliative care dataset. Again, patients whose LOS straddled the study end points were deleted (615 records), and 9 high-cost outlier records were deleted.

Correction of episode types

Records that had no episode type had a value estimated. The following rules were used:
- The records from a hospice that labelled the episode type as 0 were given the code for palliative care;
- Those records that had no diagnosis data, but had a functional impairment or FIM or Barthel score were classified as rehabilitation patients;
- Patients with a V57 code as the PRINCIPAL DIAGNOSIS, and that had a Functional Impairment code, FIM, or Barthel score were labelled rehabilitation, regardless of the original code;
- Any remaining records were labelled other.

Patients that were classified as other/acute were also reclassified where appropriate using the following rules:
- Patients whose principal diagnosis was V60.5, or V60.4 were classified as respite patients;
- Patients whose principal diagnosis was V66 were classified as convalescence patients;
- Patients with either a FIM or Barthel or Functional Impairment code were classified as rehabilitation;
- Patients with a principal diagnosis of V57 were classified as rehabilitation;
- Patients whose principal diagnosis was a mental disorder, and who were aged over 70 were classified as psychogeriatric;
- Patients who were not classified by one of the above, and had a LOS exceeding 35 days were classified as nursing home types.

Calculation of new variables

Variables for the age of the patient, and the number of diagnoses were created.
Two principal diagnosis fields were created. The first was based on the value in the first diagnosis field. The second was based on the first non V-code diagnosis. As the grouper can only handle 200 different values within a field, the diagnosis codes were grouped into bands. The width of the bands varied according to the incidence of the codes it contained, and followed the partitions in the ICD-9 classification.

Outcome

The result of the various operations reduced the episode data set to 5684 records. The palliative care data set was reduced to 3014 records. In both cases these are only slightly larger than the data sets used in the preliminary analysis despite the inclusion of the extra facilities. This is a result of the more rigorous examination of data quality undertaken in this final report.
6. Analysis and results

This chapter describes the analysis of cost variation between patient types. Specifically, the power of the 35 variables within the data set to explain the variation in cost was investigated. The aim was to identify a subset of variables that are predictive of resource use and to determine a potential set of patient classes based on that subset.

6.1 Statistical method

The analytical method used involves partitioning patients into mutually exclusive groups. Splits are made on the basis of a specified independent variable, being able to explain the variation in values of the dependent variable (in this case cost per day or cost per episode). The technique is based on an analysis-of-variance (ANOVA) model and has been used in the design of many classification systems, including DRGs, RUGs, and NAIP. The software used to perform the calculations was PC-Group, and a more detailed description of the method can be found in its manual.

The analysis was performed on the complete data set. It would have been preferable to split the data into a test and validation sets so that the stability of the final classification could be assessed. However, this was not possible due to the size of the sample collected.

6.2 Analysis of the episode data

The analysis began by assessing the predictive power of each variable on the whole data set. Initially, the investigation concentrated on finding which variables could best explain the variation in mean cost per day. The results are shown in Figure 5. The entry (...) indicates there were no significant partitions. The sample size varies because records with missing values were excluded from the classification process.

These initial results are quite different from those presented in the preliminary report. Apart from the variance explained by RUG-ADL measure, Hindle\textsuperscript{122} found only two variables that gave even a small variance reduction, namely facility and episode type. This analysis again found that daily cost is significantly linked to the facility, but the power of episode type to explain cost variation was negligible. In addition, some of the measures of patient dependency were also found to explain cost variation. The average cost per case is also considerably higher.

There are two main reasons for these apparent discrepancies. First, some of the additional facilities had a significantly higher mean daily cost than those initially used. Second, the greater attention to the patient’s eligibility into the study reduced the number of patients in the sample pre-cost allocation. As a consequence, the average cost per day rose. The extra time available to undertake a thorough examination of the data quality almost certainly contributed as well.

The high explanatory power of facility code is noteworthy, though not necessarily important. It could imply that the costs provided by the facilities differed in their
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cost and completeness. However, it might simply be a reflection of the different cases being seen, as some units were known to specialise, and these were grouped into one partition. Another possibility is that different treatment regimes exist for relatively similar patient types. However, at this stage, it is not known how much each factor contributes.

The poor performance of episode type was not unexpected. It is likely that variation within each patient type swamps this variable, and so does not preclude it from being used later within the classification tree.

The power of each variable to explain variation in costs per episode was also investigated. The results are shown in Figure 6. No variable proved a good predictor of cost relativities. Only a few were found to explain any variation. After facility, the best of these was episode type, explaining 5.3%, and the principal diagnosis including V-codes, with 5.6%. However, the majority of the power of the diagnosis field came from the V-codes indicating the nature of the episode type.

Figure 5: Cost per day variation explained, selected single variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>5063 cases</td>
<td>2.5%</td>
<td>2</td>
</tr>
<tr>
<td>Sex</td>
<td>5684 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Marital status</td>
<td>5684 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Number of diagnoses</td>
<td>4935 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Principal diagnosis, excluding V-codes</td>
<td>4889 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Principal diagnosis, including V-codes</td>
<td>4914 cases</td>
<td>1.9%</td>
<td>2</td>
</tr>
<tr>
<td>Referral source</td>
<td>4805 cases</td>
<td>10.3%</td>
<td>2</td>
</tr>
<tr>
<td>Discharge destination</td>
<td>5086 cases</td>
<td>4.3%</td>
<td>2</td>
</tr>
<tr>
<td>Episode type</td>
<td>All cases</td>
<td>1.7%</td>
<td>2</td>
</tr>
<tr>
<td>Behaviour scale, admission</td>
<td>982 cases</td>
<td>6.4%</td>
<td>3</td>
</tr>
<tr>
<td>Behaviour scale, discharge</td>
<td>982 cases</td>
<td>5.1%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental, admission</td>
<td>2567 cases</td>
<td>2.6%</td>
<td>2</td>
</tr>
<tr>
<td>Mini-mental, discharge</td>
<td>2567 cases</td>
<td>2.0%</td>
<td>2</td>
</tr>
<tr>
<td>Australian Activity Index (total)</td>
<td>689 cases</td>
<td>5.4%</td>
<td>2</td>
</tr>
<tr>
<td>Facility code</td>
<td>All cases</td>
<td>57.8%</td>
<td>6</td>
</tr>
<tr>
<td>RUG ADL, admission</td>
<td>4568 cases</td>
<td>23.4%</td>
<td>4</td>
</tr>
<tr>
<td>RUG ADL, discharge</td>
<td>4568 cases</td>
<td>18.9%</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 6: Cost per episode variation explained, selected single variables
The poor performance of the variables on all the data was not surprising because of the heterogeneity of patients' characteristics. Therefore, the patients were divided by the episode type, and analysed further.
6.3 Analysis of nursing home, convalescence, respite and psychogeriatric episode types

The predictive power of the variables was tested for the four episode types: nursing home, convalescence, respite and psychogeriatric. Their power was tested with respect to both cost per day and cost per episode. However, the sample sizes for each type were limited: 317 cases for nursing home types, 305 cases for both convalescence and respite, and 148 cases for psychogeriatric.

For cost per day, the functional dependency measures (excluding RUG-ADL) had only limited ability to explain resource use. Most notable was the Australian Activities Index with respect to convalescence and respite patients. It explained 37% and 20% respectively. However, the size of the sample on which this was based was small (66 records as not all facilities collected it), and so classes split on this variable could not be recommended. Folstein's Mini-Mental scale was also notable for its ability to explain cost variation between psychogeriatric patients. However, the number of observations within each partition are again small, and the same reservation applies.

On the whole, the variables performed worse when tested on the mean cost per episode. Where improvement was observed, it was only slight, and not sufficient to conclude that the variable could be used as the basis for a split.

In the next phase of the study it is proposed to split all episodes based on the RUG-ADL. As an indication of the result which may be expected in the final phase, splitting these episodes in this phase by RUG-ADL (admission) gave statistical results of 43.4%, 41.8%, 34.9% and 27.0% respectively.

6.4 Analysis of palliative care data

Data on palliative care was collected in two formats: by episode of care; and by phase. Each episode can contain one or more of the five phase categories, with movement between the categories generally being sequential. For example, Stable, then Deteriorating, then Terminal. The episode and phase data sets contained 1206 and 3014 cases respectively.

It was expected that the phase data would predict variation in cost better than the episode data because it contained variables specific to palliative care. This proved the case. Within the episode data set, the best predictor of variation in cost per day was the Mini-Mental functional dependency measure, explaining 15% of variation when recorded on admission. However, the number of cases with a Mini-Mental score was small.

In comparison, variables in the phase data performed much better. Figure 7 shows the results when cost per day is the dependent variable. As can be seen, two variables apart from the RUG-ADL measure give a significant reduction in variance. The first is the phase type itself. The other is the combined score of the severity index.

These results are similar to those reported by Hindle, although the explanatory power of the Phase variable is reduced. This is not surprising, though, as the method to attribute cost to the phases followed the procedure used to allocate...
episode costs, instead of the method originally used.

**Figure 7: Cost per day variation explained, palliative care phases**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>All cases</td>
<td>25.3%</td>
<td>3</td>
</tr>
<tr>
<td>Number of problems, occurrence</td>
<td>All cases</td>
<td>4.9%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, pain</td>
<td>All cases</td>
<td>8.7%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, family/culture problems</td>
<td>All cases</td>
<td>9.8%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, psych/spiritual problems</td>
<td>All cases</td>
<td>12.8%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, symptoms</td>
<td>All cases</td>
<td>20.5%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, all</td>
<td>All cases</td>
<td>27.9%</td>
<td>5</td>
</tr>
<tr>
<td>RUG ADL, admission</td>
<td>All cases</td>
<td>38.9%</td>
<td>4</td>
</tr>
<tr>
<td>RUG ADL, discharge</td>
<td>All cases</td>
<td>37.5%</td>
<td>3</td>
</tr>
</tbody>
</table>

Based on these results, phase would be the preferred choice as a splitting variable. Although severity of symptoms explains cost variation equally well, phase has greater clinical meaning. It is also more intuitive to create further splits within phase, for example by severity, than it is the other way around.

The explanatory power of the severity variables within the phases was then investigated. The total measure again explained significant degrees of variation in the Acute, Stable, Deteriorating and Terminal phases, respectively 13%, 20%, 14%, and 10%.

Given the perceived advantages of a per episode classification, it was decided to test variation in cost per episode. The results are shown in Figure 8. This table excludes results for the Mini-Mental because of the small sample. Data on severity was not collected by episode and so is also excluded from analysis. As expected, none of the variables performed well with the exception of the RUG-ADL.
Figure 8: Cost per episode variation explained, palliative care

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of problems, occurrence</td>
<td>All cases</td>
<td>9.1%</td>
<td>3</td>
</tr>
<tr>
<td>Facility</td>
<td>All cases</td>
<td>44.9%</td>
<td>3</td>
</tr>
<tr>
<td>Age</td>
<td>All cases</td>
<td>2.5%</td>
<td>2</td>
</tr>
<tr>
<td>Prin. diagnosis, excluding V-codes</td>
<td>All cases</td>
<td>1.2%</td>
<td>2</td>
</tr>
<tr>
<td>Prin. diagnosis, including V-codes</td>
<td>All cases</td>
<td>1.1%</td>
<td>2</td>
</tr>
<tr>
<td>RUG ADL, admission</td>
<td>All cases</td>
<td>26.4%</td>
<td>3</td>
</tr>
<tr>
<td>RUG ADL, discharge</td>
<td>All cases</td>
<td>29.1%</td>
<td>2</td>
</tr>
</tbody>
</table>

The explanatory power of the variables was also tested against the mean cost per phase. The variable phase still managed to explain a reasonable degree of variation (12%), but the performance of the other variables dropped significantly. This would suggest that any classification would need to be cost per diem based.

6.5 Analysis of rehabilitation data

The 2862 patients classified as rehabilitation formed the largest subset of the sub-acute episode types, and therefore it was important to identify suitable variables for a classification. To this end, several rehabilitation-only variables had been collected and their explanatory power was tested along with the standard variables.

Variation explained in costs per day

Initially, each variable was analysed for its ability to explain variation in the mean cost per day. The results are shown in Figure 9.

The explanatory power of both the rehabilitation-only functional dependency measures was good, better than the general measures. The FIM, its motor component, and the Barthel all explained in excess of 20% of cost variation when measured on admission. However, the small number of records with the Barthel measure means that the robustness of its variation statistic is not known, though its worth noting that the seventy-eight values were strongly correlated with the motor component of the FIM.

The other rehabilitation specific measure collected was the Functional Impairment Category (FIC). It was tested at three levels of detail. The first used only the major impairment categories. The second included information up to one decimal place within each impairment group. This, for example, differentiated between Traumatic and Non-Traumatic Brain Dysfunction. The last level of detail used all coded information.

The explanatory power of the FIC increased at each level of detail used. The overall power was reasonable, though not as good as the FIM. However, an advantage of this variable is its clinical meaning. Thus, it makes sense to have it
as the root of any rehabilitation tree.

To this end, the predictive power of the FIM was tested on two functional impairment categories, stroke and orthopaedics. It would have been preferable to test it on all the categories, but only these two had sufficient records to ensure the robustness of any resulting classes. The overall sample was reduced from 2862 to 1156 records because only a proportion of rehabilitation records had FIM information. The sample sizes of the orthopaedic and stroke impairment categories were 420 and 228 respectively.

As before, the FIM scores recorded on admission explained a significant amount of variation in the mean cost per day. Within the stroke sample, the FIM motor component explained 33%, while the total FIM explained 34%. For orthopaedic patients, the total FIM and its motor component both explained 20%.

Figure 9: Cost per day variation explained, rehabilitation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2530 cases</td>
<td>9.0%</td>
<td>4</td>
</tr>
<tr>
<td>Principal diagnosis, excluding V-codes</td>
<td>2470 cases</td>
<td>6.3%</td>
<td>5</td>
</tr>
<tr>
<td>Behaviour scale, admission</td>
<td>522 cases</td>
<td>6.1%</td>
<td>3</td>
</tr>
<tr>
<td>Behaviour scale, discharge</td>
<td>522 cases</td>
<td>5.9%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental, admission</td>
<td>1813 cases</td>
<td>4.6%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental discharge</td>
<td>1813 cases</td>
<td>2.6%</td>
<td>2</td>
</tr>
<tr>
<td>Australian Activity Index (total)</td>
<td>450 cases</td>
<td>3.2%</td>
<td>2</td>
</tr>
<tr>
<td>RUG-ADL, admission</td>
<td>2510 cases</td>
<td>19.9%</td>
<td>3</td>
</tr>
<tr>
<td>RUG-ADL, discharge</td>
<td>2510 cases</td>
<td>17.7%</td>
<td>3</td>
</tr>
<tr>
<td>Major Functional Impairment Categories (FIC)</td>
<td>2553 cases</td>
<td>9.5%</td>
<td>3</td>
</tr>
<tr>
<td>FIC, plus 1st decimal place</td>
<td>2516 cases</td>
<td>13.9%</td>
<td>4</td>
</tr>
<tr>
<td>FIC, all detail</td>
<td>2516 cases</td>
<td>16.4%</td>
<td>4</td>
</tr>
<tr>
<td>FIM motor, admission</td>
<td>1158 cases</td>
<td>21.3%</td>
<td>3</td>
</tr>
<tr>
<td>FIM motor, discharge</td>
<td>1158 cases</td>
<td>20.0%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, admission</td>
<td>1158 cases</td>
<td>10.2%</td>
<td>4</td>
</tr>
<tr>
<td>FIM cognitive, discharge</td>
<td>1158 cases</td>
<td>10.3%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, admission</td>
<td>1158 cases</td>
<td>22.5%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, discharge</td>
<td>1158 cases</td>
<td>21.6%</td>
<td>4</td>
</tr>
<tr>
<td>Barthel, admission</td>
<td>38 cases</td>
<td>29.4%</td>
<td>3</td>
</tr>
<tr>
<td>Barthel, discharge</td>
<td>38 cases</td>
<td>16.1%</td>
<td>3</td>
</tr>
</tbody>
</table>
Variation explained in costs per episode

Several studies have indicated that variation in resource use can be explained at the level of an episode for rehabilitation patients. Thus, this scenario was investigated.

The results are summarised in Figure 10 and suggest that variation in episode cost can be explained. The variables identified in the preceding analysis again proved to be the most powerful. However, the power of all except one measure was reduced. The exception was the Function Impairment Category, with each level tested improving by around 4%.

**Figure 10: Cost per episode variation explained, rehabilitation**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2530 cases</td>
<td>11.8%</td>
<td>3</td>
</tr>
<tr>
<td>Principal diagnosis, excluding V-codes</td>
<td>2470 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Behaviour scale, admission</td>
<td>522 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Behaviour scale, discharge</td>
<td>522 cases</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Mini-mental, admission</td>
<td>1813 cases</td>
<td>1.6%</td>
<td>2</td>
</tr>
<tr>
<td>Mini-mental discharge</td>
<td>1813 cases</td>
<td>1.0%</td>
<td>2</td>
</tr>
<tr>
<td>Australian Activity Index (total)</td>
<td>450 cases</td>
<td>5.5%</td>
<td>2</td>
</tr>
<tr>
<td>RUG-ADL, admission</td>
<td>2510 cases</td>
<td>9.6%</td>
<td>3</td>
</tr>
<tr>
<td>RUG-ADL, discharge</td>
<td>2510 cases</td>
<td>5.2%</td>
<td>2</td>
</tr>
<tr>
<td>Major Functional Impairment Categories (FIC)</td>
<td>2553 cases</td>
<td>8.7%</td>
<td>3</td>
</tr>
<tr>
<td>FIC, plus 1st decimal place</td>
<td>2516 cases</td>
<td>13.0%</td>
<td>3</td>
</tr>
<tr>
<td>FIC, all detail</td>
<td>2516 cases</td>
<td>20.0%</td>
<td>4</td>
</tr>
<tr>
<td>FIM motor, admission</td>
<td>1158 cases</td>
<td>15.9%</td>
<td>3</td>
</tr>
<tr>
<td>FIM motor, discharge</td>
<td>1158 cases</td>
<td>8.4%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, admission</td>
<td>1158 cases</td>
<td>5.9%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, discharge</td>
<td>1158 cases</td>
<td>3.5%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, admission</td>
<td>1158 cases</td>
<td>16.1%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, discharge</td>
<td>1158 cases</td>
<td>8.1%</td>
<td>3</td>
</tr>
<tr>
<td>Barthel, admission</td>
<td>38 cases</td>
<td>16.7%</td>
<td>3</td>
</tr>
<tr>
<td>Barthel, discharge</td>
<td>38 cases</td>
<td>18.8%</td>
<td>3</td>
</tr>
</tbody>
</table>

As before, the ability of the FIM to explain cost variation was tested within the
orthopaedic and stroke impairment categories. Again the best predictors were the values recorded on admission. For stroke patients, the total FIM and its motor component explained 23% and 22% respectively, a decrease on its cost per day performance. For orthopaedic patients, both explained 25.5% of the cost variation.

6.6 The proposed classification

From the analysis above, five variables have been identified as being predictive of resource use. These are:

- episode type;
- phase (palliative care);
- severity of Illness (palliative care);
- the Function Impairment Categories (rehabilitation);
- the FIM (rehabilitation).

These were then used to devise a per diem classification. From the previous analysis, it would appear that an episode-based classification is infeasible for sub-acute and non-acute care with the possible exception of rehabilitation.

The challenge in developing a classification is to find a balance between empirical results, clinical meaning, and ease-of-use. More explicitly, it should satisfy the following criteria (Roberts et al)\textsuperscript{124}:

- classes should have meaning to clinical staff, and group patients with similar clinical characteristics;
- classes should be resource homogeneous;
- there should be a manageable number of classes, and;
- the variables used should describe patients' need instead of the services actually provided, and should not be easily gamed.

The classification tree developed from the data is shown in Figure 11. The initial split is based on episode type. Although this was not an effective single variable, it is a clinically sensible starting point. For SNAP Phase 1, the episode types are the seven defined by the NSW HOSPAS system.

The overall per diem costs of the seven episode types used in Phase 1 are quite similar. In Figure 12, the per diem costs for each of the seven episode types are shown as cost relativities or cost weights, with all SNAP beddays being given a value of 1.00. The cost weights range from 0.82 for convalescent episodes to 1.05 for psycho-geriatric episodes.
## Figure 11: The SNAP Phase 1 classification tree

<table>
<thead>
<tr>
<th>Cases</th>
<th>Mean cost</th>
<th>SD cost</th>
<th>Class name</th>
</tr>
</thead>
<tbody>
<tr>
<td>6760</td>
<td>$196</td>
<td>$106</td>
<td>All Patients</td>
</tr>
<tr>
<td>317</td>
<td>$188</td>
<td>$81</td>
<td>Nursing home type</td>
</tr>
<tr>
<td>305</td>
<td>$161</td>
<td>$76</td>
<td>Convalescent</td>
</tr>
<tr>
<td>305</td>
<td>$171</td>
<td>$91</td>
<td>Respite</td>
</tr>
<tr>
<td>2130</td>
<td>$200</td>
<td>$124</td>
<td>All Rehabilitation care</td>
</tr>
<tr>
<td>228</td>
<td>$213</td>
<td>$106</td>
<td>Stroke</td>
</tr>
<tr>
<td>69</td>
<td>$290</td>
<td>$125</td>
<td>Low FIM motor</td>
</tr>
<tr>
<td>43</td>
<td>$227</td>
<td>$80</td>
<td>Medium FIM motor</td>
</tr>
<tr>
<td>116</td>
<td>$162</td>
<td>$69</td>
<td>High FIM motor</td>
</tr>
<tr>
<td>48</td>
<td>$285</td>
<td>$164</td>
<td>Non-traumatic brain dysfunction</td>
</tr>
<tr>
<td>47</td>
<td>$418</td>
<td>$215</td>
<td>Traumatic brain dysfunction</td>
</tr>
<tr>
<td>129</td>
<td>$221</td>
<td>$104</td>
<td>Neurological conditions</td>
</tr>
<tr>
<td>64</td>
<td>$252</td>
<td>$131</td>
<td>Non-traumatic spinal dysfunction</td>
</tr>
<tr>
<td>35</td>
<td>$335</td>
<td>$150</td>
<td>Traumatic spinal dysfunction</td>
</tr>
<tr>
<td>92</td>
<td>$184</td>
<td>$107</td>
<td>Amputation</td>
</tr>
<tr>
<td>91</td>
<td>$209</td>
<td>$138</td>
<td>Arthritis</td>
</tr>
<tr>
<td>188</td>
<td>$184</td>
<td>$99</td>
<td>Pain</td>
</tr>
<tr>
<td>420</td>
<td>$142</td>
<td>$74</td>
<td>Orthopaedic disorders</td>
</tr>
<tr>
<td>33</td>
<td>$233</td>
<td>$63</td>
<td>Low FIM motor</td>
</tr>
<tr>
<td>198</td>
<td>$159</td>
<td>$66</td>
<td>Medium FIM motor</td>
</tr>
<tr>
<td>226</td>
<td>$115</td>
<td>$64</td>
<td>High FIM motor</td>
</tr>
<tr>
<td>227</td>
<td>$170</td>
<td>$92</td>
<td>Cardiac pulmonary</td>
</tr>
<tr>
<td>561</td>
<td>$207</td>
<td>$134</td>
<td>Other rehabilitation</td>
</tr>
<tr>
<td>3014</td>
<td>$198</td>
<td>$102</td>
<td>All Palliative care</td>
</tr>
<tr>
<td>477</td>
<td>$199</td>
<td>$92</td>
<td>Acute</td>
</tr>
<tr>
<td>126</td>
<td>$161</td>
<td>$83</td>
<td>Low severity</td>
</tr>
<tr>
<td>311</td>
<td>$205</td>
<td>$92</td>
<td>Medium severity</td>
</tr>
<tr>
<td>40</td>
<td>$276</td>
<td>$57</td>
<td>High severity</td>
</tr>
<tr>
<td>832</td>
<td>$192</td>
<td>$91</td>
<td>Stable</td>
</tr>
<tr>
<td>412</td>
<td>$158</td>
<td>$75</td>
<td>Low severity</td>
</tr>
<tr>
<td>394</td>
<td>$220</td>
<td>$92</td>
<td>Medium severity</td>
</tr>
<tr>
<td>26</td>
<td>$315</td>
<td>$69</td>
<td>High Severity</td>
</tr>
<tr>
<td>693</td>
<td>$239</td>
<td>$84</td>
<td>Deteriorating</td>
</tr>
<tr>
<td>139</td>
<td>$199</td>
<td>$65</td>
<td>Low severity</td>
</tr>
<tr>
<td>502</td>
<td>$241</td>
<td>$81</td>
<td>Medium severity</td>
</tr>
<tr>
<td>52</td>
<td>$325</td>
<td>$78</td>
<td>High Severity</td>
</tr>
<tr>
<td>505</td>
<td>$255</td>
<td>$92</td>
<td>Terminal</td>
</tr>
<tr>
<td>138</td>
<td>$222</td>
<td>$90</td>
<td>Low severity</td>
</tr>
<tr>
<td>326</td>
<td>$258</td>
<td>$91</td>
<td>Medium severity</td>
</tr>
<tr>
<td>41</td>
<td>$337</td>
<td>$44</td>
<td>High Severity</td>
</tr>
<tr>
<td>507</td>
<td>$97</td>
<td>$80</td>
<td>Bereaved</td>
</tr>
<tr>
<td>148</td>
<td>$206</td>
<td>$77</td>
<td>Psycho-geriatric</td>
</tr>
<tr>
<td>541</td>
<td>$204</td>
<td>$92</td>
<td>Other</td>
</tr>
</tbody>
</table>
Only two of the episode types are split further, namely palliative care and rehabilitation. Splits within the other episode types are not proposed from this phase of the study because the predictive power of the variables tested was not sufficient given the sample size to warrant further splits. The one variable that could subsequently be a splitting variable, the RUG-ADL, was ruled out of this phase because of its use to estimate nursing costs. Nevertheless, given the high correlation between the RUG-ADL and nursing costs as demonstrated in previous studies, the results from this phase are encouraging (statistical results of 43.4% for nursing home, 41.8% for convalescence, 34.9% for respite and 27.0% for psycho-geriatric episodes). This variable needs to be considered in the next phase of the study.

The palliative care branch is split at two levels, first by phase and then by the total severity in all phases except Bereaved. Within the palliative branch, the split by phase achieves a variance reduction of 25.6%. Splitting each phase (except bereaved) by total severity/problem score then increased this to 34.1%.

The severity subclasses (low, medium and high) were standardised with regard to the width of each class. Although a statistically better reduction can be achieved with non-standard classes (34.7%), the small difference means the standardised approach is preferred.

An alternative second split would be to partition each phase based on the RUG-ADL functional dependency score. This has several advantages, the most important of which is that it is a rigorous variable and is less open to gaming. The variance reduction achieved by splitting each phase by functional dependency level in this study was 39.4%.

However, given the use of the RUG-ADL to impute nursing costs, this option cannot be recommended as the preferred model from this current study. The final decision on whether severity or the RUG-ADL is used as the second level split cannot be made until after the next phase of the study.

Figure 13 shows the cost weights for the palliative care classes in the Phase 1 study.
study. The cost weights range from 0.50 for the bereaved class to 1.72 for the high severity terminal class.

**Figure 13: Palliative care cost weights, Phase 1 study**

<table>
<thead>
<tr>
<th>Palliative care class</th>
<th>Cost weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>All palliative care classes</td>
<td>1.01</td>
</tr>
<tr>
<td>Terminal high severity</td>
<td>1.72</td>
</tr>
<tr>
<td>Deteriorate high severity</td>
<td>1.66</td>
</tr>
<tr>
<td>Stable high severity</td>
<td>1.61</td>
</tr>
<tr>
<td>Acute high severity</td>
<td>1.41</td>
</tr>
<tr>
<td>Terminal medium severity</td>
<td>1.32</td>
</tr>
<tr>
<td>Deteriorate medium severity</td>
<td>1.23</td>
</tr>
<tr>
<td>Terminal low severity</td>
<td>1.13</td>
</tr>
<tr>
<td>Stable medium severity</td>
<td>1.12</td>
</tr>
<tr>
<td>Acute medium severity</td>
<td>1.05</td>
</tr>
<tr>
<td>Deteriorate low severity</td>
<td>1.02</td>
</tr>
<tr>
<td>Acute low severity</td>
<td>0.82</td>
</tr>
<tr>
<td>Stable low severity</td>
<td>0.81</td>
</tr>
<tr>
<td>Bereaved</td>
<td>0.50</td>
</tr>
</tbody>
</table>

The rehabilitation subgroup is split at the first level by the Functional Impairment Category, using information up to the first decimal place. This variable proved to be a reasonable predictor of resource use. Equally important, though, is that it makes clinical sense.

The variance explained by this sub-branch is 16.2%. This figure could have been enhanced by creating a group for Multiple Trauma, and splitting the amputation class into two: Double Amputations; and Single Amputations. However, the number of cases of Multiple Trauma, and of Double Amputations were small. Therefore, the robustness of this enlarged tree was open to question, although such splits are intuitive.

The stroke and orthopaedic Functional Impairment Categories were then split by the FIM Motor score as recorded on admission. The motor component was chosen because, like the total FIM, it gave good statistical results. As before, standardised classes were defined, although this reduced the level of variance explained. The effect of these splits was to increase the overall level of variance explained within the sub-branch to 23.58%

**Figure 14** shows the cost weights for the rehabilitation classes in the Phase 1 study. The cost weights range from 0.59 for the high function orthopaedic class to 2.13 for the traumatic brain dysfunction class.
Figure 14: Rehabilitation cost weights, Phase 1 study

<table>
<thead>
<tr>
<th>Rehabilitation care class</th>
<th>Cost weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>All rehabilitation classes</td>
<td>1.02</td>
</tr>
<tr>
<td>Traumatic brain dysfunction</td>
<td>2.13</td>
</tr>
<tr>
<td>Traumatic spinal dysfunction</td>
<td>1.70</td>
</tr>
<tr>
<td>Stroke low function</td>
<td>1.48</td>
</tr>
<tr>
<td>Non-traumatic brain dysfunction</td>
<td>1.45</td>
</tr>
<tr>
<td>Non-traumatic spinal dysfunction</td>
<td>1.29</td>
</tr>
<tr>
<td>Orthopaedic low function</td>
<td>1.19</td>
</tr>
<tr>
<td>Stroke medium function</td>
<td>1.16</td>
</tr>
<tr>
<td>Neurological conditions</td>
<td>1.13</td>
</tr>
<tr>
<td>Arthritis</td>
<td>1.07</td>
</tr>
<tr>
<td>Other rehabilitation</td>
<td>1.06</td>
</tr>
<tr>
<td>Amputation</td>
<td>0.94</td>
</tr>
<tr>
<td>Pain</td>
<td>0.94</td>
</tr>
<tr>
<td>Cardiac pulmonary</td>
<td>0.87</td>
</tr>
<tr>
<td>Stroke high function</td>
<td>0.83</td>
</tr>
<tr>
<td>Orthopaedic medium function</td>
<td>0.81</td>
</tr>
<tr>
<td>Orthopaedic high function</td>
<td>0.59</td>
</tr>
</tbody>
</table>

In total, the 34 classes explain 25.1% of the variation in the mean cost per day. This is a satisfactory statistical performance given that the overall per diem costs of the seven episode types are quite similar and that most of these 34 classes will be further split after the next phase of the study based on a standard measure of function. The inclusion of final splits based on function can be expected to increase the statistical performance of the overall classification.
7. **Discussion**

Phase 1 of the CAN SACAN study has achieved what it set out to do. It captured a sufficiently large quantity of data to allow for the identification of a subset of the most promising variables which could be then be refined and used as the basis of the final phase of the SACAN study. The study did not establish the actual costs of each casemix class (nor did it aim to do so) but simply established the cost relativities between preliminary classes.

The results demonstrate that a subset of the variables captured in the study are able to explain a significant proportion of the reported levels of resource use. A high level of consistency has emerged with the three other studies undertaken concurrently in Western Australia\(^{125}\) and Victoria\(^{126}\). All studies have identified a consistent set of variables which are able to explain a significant proportion of the reported levels of resource use. They are:

- episode type,
- functional dependency level,
- impairment type (for rehabilitation only),
- phase (for palliation only) and
- severity (for palliation only).

The study has demonstrated results which are, for the most part, consistent with the international literature. Specifically, the key variables used in DRG assignment seem unlikely to be of use, regardless of the quality and quantity of data, except in very limited circumstances. Age, diagnoses, number of diagnoses, source of referral, and destination after discharge have all performed poorly in the most recent Australian studies. These findings are consistent with international experience.

Based on consistent findings reported in the literature, the final classes in the preliminary classification now need to be split by an agreed ADL measure. Both the RUG-ADL and the FIM remain as possible measurement tools.

There are a number of weaknesses with the data and the methodology employed in this study. As described above, the raw data produced by study sites was of highly variable quality. This was not unexpected. Very little priority has been given to date to data capture and data quality issues in sub-acute and non-acute care facilities and the funding for the study was very modest (approximately $150K for Phase I). Many of the participating sites have only rudimentary information systems. In fact, three of the sites in the study had no access to computers and were provided with personal computers in order that they could participate in the study.

An important finding was that most of the data problems were found in the data extracted from existing patient administration systems. Data collected specifically for the study was generally of a much higher quality than the routinely generated data produced by most sites. This raises important questions about the quality of data being routinely reported through hospital morbidity collections.

The methodology for the determination of nursing costs limited the level of analysis which could be undertaken. The use of a regression model of nursing
costs against RUG-ADL scores to impute nursing costs meant that the RUG-ADL could not be used as a splitting variable in the final analysis.

The timetable initially proposed for the study was not adhered to and the Phase I study was completed several months behind schedule. There were several reasons. One was that, in retrospect, the original timetable was unrealistic. The most important reason was that delays in the on-site coding of patient level data were much greater than originally assumed. Several sites experienced coding delays of four to six months. Data for two sites was withdrawn from the final analysis because, almost a year after the data collection period, the required data was not available.

Likewise, several sites provided inaccurate or incomplete cost centre data. Several months of the data analysis phase were spent in checking the accuracy of the costing data and seeking additional information from study sites. This, coupled with the larger sample size, explains the differences between the preliminary results presented by Hindle and the final results presented here.

These weaknesses in the data quality do not imply a lack of motivation or effort on the part of participating services. Quite the reverse, the majority of study sites provided plausible data with only very limited resources. Further, there is no reason to believe that the data produced in this study was of any poorer quality than the data routinely produced in the hospital morbidity collection or in any other classification development study of this kind.

One weakness in this study is that the common practice of separating the data into test and validation subsets of cases was not applied. Nevertheless, the findings of this study are generally consistent with the findings of the NAIP study, the three concurrent studies undertaken in other States and the results of similar studies reported in the literature.

Implications for the next phase of the SNAP study

The original study design proposed that, in the final stage of the SACAN study, only the most promising variables would be captured and a standard cost modelling methodology would be employed to determine final casemix classes and cost weights. This final phase is due to be completed during 1995/96.

The next phase of the study should now build on the results of this phase. The results of this phase of study suggest that, as expected, a number of the data items should be refined prior to the next phase of the study. Further, the next phase of the study provides an opportunity to avoid some of the methodological problems which occurred during Phase 1.

Data collection period

The development of the SNAP classification is an ambitious project which is extremely resource intensive. One important reason is the limited availability of source data for classification development. Unlike the DRG classification development process (which, in the main, uses patient variables that are already collected) it is clear that the development of the SNAP classification requires study sites to collect new data items. For study sites this is resource intensive, particularly as they are also required to continue to collect all routine data.
irrespective of whether it is required for casemix assignment.

Likewise, there are no service weights which can be routinely used for cost modelling. The SNAP development process is a threefold process incorporating the development of casemix classes, service weights and cost weights.

One important lesson from Phase 1 is that a data collection period of six months is too long a period to realistically expect study sites to collect all of the data required for classification development, the calculation of service weights and the calculation of cost weights.

For this reason, the next phase of the study is to be reduced to three months duration. This reduced data collection period should improve data quality but it will also have a down-side. Many of the patients in scope have a long length of hospital stay. With a shorter data collection period, a smaller proportion of the patients in scope will complete a complete patient care episode during the study period. This will reduce the opportunity to investigate per episode as well as per diem classification options.

**The definitions of episode type**

It is clear that episode type will be an important variable in the SNAP classification. It is therefore important that the definition of an episode is both robust and valid. One important issue is that SNAP is being designed to classify the episode of patient care (that is, the "case") and not the clinical specialty or stream of care in which the patient is treated. Three types of patient care episodes are excluded from SNAP. They are Acute, Nursing Home and Psychiatric. Acute episodes of care are classified by AN-DRG. Episodes of care provided to patients in approved nursing home beds are classified by the RCI. Work has commenced in Australia to develop a classification suitable for psychiatric patients, regardless of treatment setting.

The use of episode type raises several important issues. One is that there are agreed definitions of episode types. Another is that there are clear rules with respect to the start and end dates of episodes by type.

The episode types used in the Phase 1 study were those already collected in NSW. One key issue arising from the Phase 1 study is the episode classification of patients admitted for geriatric evaluation and management. The Phase 1 data base included a number of patients identified by the study sites as sub-acute geriatric medicine patients. Given that there was no episode type for geriatric medicine, these patient episodes appear to be scattered throughout the other episode types in the Phase 1 results. In contrast, the current Victorian data collection includes an episode type called Geriatric Evaluation and Management. Based on feedback from the study sites, there are arguments in favour of testing this episode type in further studies.

The NSW definitions included in Phase 1 included an episode type called "respite care". This episode type proved to be very heterogeneous and included patients admitted for palliative respite care, rehabilitation respite care and so on. Likewise, there is a lack of clarity about the "convalescent" episode type and there appear to be no good reasons for its continued use.
SNAP Version 1

Attached as an appendix are refined definitions which are proposed for use in the next phase of the SNAP study. Six CASE TYPES are proposed:

1. Palliative Care
2. Psychogeriatric
3. Rehabilitation
4. Geriatric Evaluation and Management
5. Non-Acute: Nursing Home Type
6. Non-Acute: Maintenance Care

The coding of impairment categories for rehabilitation

With the use of impairment category in the SNAP classification, standard coding rules need to be develop and applied. As noted in the introduction, the Functional Impairment Code can be collected in one of two ways. Firstly, the 18 codes can be collected as a data item. This is the approach used in the Phase 1 study. Alternately, ICD-9-CM diagnostic codes can be mapped to each Functional Impairment Code. The National Coding Centre is undertaking work in relation to the coding of impairment type\textsuperscript{128}. Both methods should be tested in the next stage of the study.

The definitions of phase types for palliative care

As noted by Hindle\textsuperscript{129}, there was clearly some significant degree of inconsistency in use of the acute and stable phases in the study. The current definitions should now be reviewed with a view to tightening the definitions of the acute and stable phases.

ADL dependency and a standard measure of functional impairment

Given the development of the FIM-FRG classification as discussed in the introduction section of this report, the case for adopting the FIM as the standard measure for rehabilitation services has now strengthened.

However, in relation to other episode types, there is no evidence to suggest that the RUG-ADL is inadequate. Both the FIM and the Barthel Index can be mapped to the RUG-ADL.

Based on current knowledge, further studies should adopt the FIM for rehabilitation episodes and the RUG-ADL for all others.

Psychogeriatric medicine

The classification of psychogeriatric (psychiatry of the elderly) services within the casemix context has not been determined. This study is the only study to date in Australia to include psychogeriatric services and it was limited in scope and size. Given that psychiatry of the elderly services represent the interface between
psychiatry and geriatric medicine, it is important that attention is given to the scope and boundaries of the various casemix classification projects which are now underway.

Sub-acute, non-acute and psychiatric services for children

There has been no work to date on the classification of sub-acute and non-acute services for children. Like other studies to date, the Phase 1 study was limited in scope to the classification of episodes of care for adult patients.

In the longer term it will be necessary to expand current work and to specifically consider whether the resource consumption patterns of children are similar to those of adults. There is good reason to believe that they are not. For example, palliative care for children is more likely to be provided in the family home. Likewise, functional dependency measures used in adult rehabilitation are unlikely to be relevant to children. Furthermore, children undergoing rehabilitation are more likely to be receiving disability services (for both developmental and physical disabilities) from the education and community services sectors.

Ambulatory and Community-Based Sub-Acute and Non-Acute Care

A one day national consultation was held in February 1995 in Sydney to discuss the preliminary results reported by Hindle. There was strong agreement at that consultation that further SNAP development work should be expanded to include sub-acute and non-acute services provided on an ambulatory basis. This recommendation is consistent with the approach taken in the Western Australian Palliative Care Study. The preliminary results of that study suggest that the variables which are predictive of per diem costs in an inpatient setting are also predictive of cost in an ambulatory setting.

Per case or per day classification?

The release of the FIM-FRG classification and the preliminary results of this Phase 1 study suggest that it would be possible to classify at least some fast-stream rehabilitation episodes by way of a per episode classification. However, there is no evidence (either in the published research literature or in the results of this study) to suggest that it is currently feasible to develop a per episode classification for the other case types. Not one variable has been identified to date which have proved to be predictive of length of stay for case types such as nursing home or palliative care.

This raises some critical questions. What is the impact of using a per episode classification for some extended care episodes but a per diem classification for others? What incentives are created? Should all episodes be classified using the same unit of time? These are important issues which have not been debated in Australia. Pending their resolution, it is proposed that the next phase of the SNAP study continue to focus on the development of a wholly per diem classification. In addition, the FIM-FRG classification should also be tested on the rehabilitation episodes captured in the next phase of the study.
Where to from here?

Figure 15 shows the structure of the SNAP classification that would be developed in the next phase of the study if the proposals discussed above are incorporated. In this schema the six revised episode types are used and all episodes are split on three levels of function (low, medium and high). As proposed above, all episode types except rehabilitation use the RUG-ADL as the measure of function whilst rehabilitation uses the FIM. In total there are 61 final classes.
Figure 15: The structure of the proposed SNAP version 1 classification

SNAP

- Palliative Care: 13 classes split on Phase and RUG-ADL function
- Rehabilitation: 36 classes split on Functional Impairment and FIM function
- Psycho-geriatric: 3 classes split on RUG-ADL function and/or Mini-Mental
- Geriatric Evaluation and Management: 3 classes split on RUG-ADL function
- Non-Acute: Nursing Home Type: 3 classes split on RUG-ADL function
- Non-Acute: Maintenance Care: 3 classes split on RUG-ADL function
References


77. Smith M (1993). Palliative Care Casemix Classification First Draft. Notes from the Palliative Care Workshop, Australian Association for Hospice and Palliative Care.

78. ibid.

79. ibid.


115. Personnel communication with Michael Smith, Coordinator of the Western Australian Palliative Care Casemix Classification Study, July 1995.


124. Roberts (1992) op. cit.

125. Michael Smith op. cit.

126. Rosemary Calder op. cit.


Appendix 1 Definition of episode type - Phase 1

The type of sub-acute or non-acute inpatient episodes collected for the project were:

1. Nursing home type (NHT) and long stay - any patient whose length of stay for the current episode of care exceeds 35 days but whose care is not covered by an acute care certificate. Also includes patients with an NH5 accepted.
   A. Includes patients admitted to a NHT bed.
   B. Patients that are no longer covered by an acute care certificate.
   C. Patients that in the opinion of the treating doctor is receiving maintenance care.

2. Convalescent care - any patient who is clinically well enough, to be sent home, but where there are other factors in the home environment (physical, social, psychological) which makes such action inappropriate for the patient in the short term.
   A. Includes patients with functional impairment who are not severely ill and for whom there is no multidisciplinary program aimed at improvement of functional capacity.

3. Respite care - A patient who is admitted for a period of respite care.
   A. Includes patients who were admitted to a designated respite bed or facility.
   B. Includes patients with functional impairment who are not severely ill and for whom there is no expectation of functional gain.

4. Rehabilitation - an episode of care involving a person with a disability in a multidisciplinary program aimed at improvement in functional capacity, retraining in lost skills and/or change in psychosocial adaptation, under the clinical management of a consultant in Rehabilitation Medicine or a Medical Practitioner who is an integral member of a multidisciplinary rehabilitation program.
   A. Includes patients with functional impairment who are not severely ill and for whom the focus is functional gain.
   B. Patients who are admitted to a designated rehabilitation bed or facility.
   C. Patients who are predominantly under the care of a Rehabilitation Physician.

5. Palliative care - patient's whose condition has progressed beyond the stage where a curative treatment is effective and attainable, or where the patient chooses not to pursue curative treatment. Palliation provides relief of suffering and enhancement of quality of life for such patients. Interventions such as radiotherapy, chemotherapy and surgery are considered part of the palliative episode if they are undertaken specifically to provide symptom relief.
A. Includes patients who are admitted to a designated Palliative Care Unit or bed.
B. Patients who are predominantly under the care of a Palliative Care Physician.

6. Psychogeriatric - patients that are not acutely ill.
   A. Includes patients who are admitted to a designated Psychogeriatric bed or unit.
   B. Patients who are predominantly under the care of a Psychogeriatric service.

7. Other and acute care patients.
Appendix 2  Participating sites by client type

The following sites participated in the study. The abbreviations in brackets refer to the Area Health Service.

**PALLIATIVE CARE:**

Bulli District Hospital (IAHS)
Calvary Hospital (SSAHS)
David Berry Hospital (IAHS)
Governor Phillip Special Hospital (WAHS)
Lady Davidson Hospital
Newcastle Mater Misericordiae Hospital (HAHS)
Sacred Heart Hospice (ESAHS)
St Joseph’s Hospital (WSAHS)

**PSYCHOGERIATRIC:**

James Fletcher Hospital (HAHS)
St Joseph’s Hospital (WSAHS)

**PARTICIPATING AREA HEALTH SERVICES**

Central Coast Area Health Service (CCAHS)
Eastern Sydney Area Health Service (ESAHS)
Hunter Area Health Service (HAHS)
Illawarra Area Health Service (IAHS)
Northern Sydney Area Health Service (NSAHS)
Southern Sydney Area Health Service (SSAHS)
Wentworth Area Health Service (WAHS)
Western Sydney Area Health Service (WSAHS)
Lady Davidson Hospital

**REHABILITATION:**

Blue Mountains District ANZAC Memorial Hospital (WAHS)
David Berry Hospital (IAHS)
Canterbury Hospital (SSAHS)
Coledale Hospital (IAHS)
The Entrance/Long Jetty (CCAHS)
Governor Phillip Hospital (WAHS)
Illawarra Regional Hospital - Port Kembla Campus (IAHS)
Lady Davidson Hospital
Lottie Stewart Hospital (WSAHS)
The Maitland Hospital (HAHS)
Rankin Park Hospital (HAHS)
Royal Newcastle Hospital (HAHS)
Royal Rehabilitation Centre (NSAHS)
St George Hospital (SSAHS)
St Joseph’s Hospital (WSAHS)
Sutherland Hospital (SSAHS)
Westmead Hospital (WSAHS)
Woy Woy Hospital (CCAHS)
Wyong Hospital (CCAHS)

**SUB-ACUTE/NON-ACUTE MEDICAL:**

Canterbury Hospital (SSAHS)
Coledale District Hospital (IAHS)
David Berry Hospital (IAHS)
Lady Davidson Hospital
Woy Woy Hospital (CCAHS)
Appendix 3  Data items collected

For each sub-acute and non-acute episode the following data items were extracted from the hospital discharge data set. Extraction software was used by most sites to extract this information from their HOSPAS ATS system (the standard patient administration system used by most hospitals in NSW).

<table>
<thead>
<tr>
<th>Facility code</th>
<th>Patient number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient name</td>
<td>Episode start date</td>
</tr>
<tr>
<td>Postcode</td>
<td>Birth date</td>
</tr>
<tr>
<td>Sex</td>
<td>Marital status</td>
</tr>
<tr>
<td>Date of admission</td>
<td>Date of discharge</td>
</tr>
<tr>
<td>Principal diagnosis</td>
<td>Secondary Diagnosis(es)</td>
</tr>
<tr>
<td>Episode start date</td>
<td>Episode type</td>
</tr>
<tr>
<td>Source of referral</td>
<td>Destination at episode end</td>
</tr>
<tr>
<td>Length of stay</td>
<td>Total leave days</td>
</tr>
</tbody>
</table>

For each sub-acute and non-acute episode the following data items were recorded by members of the clinical team.

<table>
<thead>
<tr>
<th>Facility code</th>
<th>Patient number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient name</td>
<td>Episode start date</td>
</tr>
<tr>
<td>Translation Problems</td>
<td>Living arrangements pre-admission</td>
</tr>
<tr>
<td>Date of onset</td>
<td>Admission RUG ADL score</td>
</tr>
<tr>
<td>D/C RUG ADL score</td>
<td>Admission Behaviour scale (Item 7 - REPDS)</td>
</tr>
<tr>
<td>Discharge Behaviour scale</td>
<td>Mini-mental State</td>
</tr>
<tr>
<td>Discharge Problems</td>
<td>Discharge delay days</td>
</tr>
</tbody>
</table>

Data was also collected for each palliative care phase change. The following data items were recorded:

<table>
<thead>
<tr>
<th>Phase change</th>
<th>Date of new phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC Phase</td>
<td>PC Pain</td>
</tr>
<tr>
<td>PC Symp: problems</td>
<td>PC Symp: severity</td>
</tr>
<tr>
<td>PC Psych: problems</td>
<td>PC Psych: severity</td>
</tr>
<tr>
<td>PC Fam: problems</td>
<td>PC Psych: severity</td>
</tr>
<tr>
<td>PC Prob: problems</td>
<td>PC Prob: severity</td>
</tr>
<tr>
<td>Mini-Mental score</td>
<td>Behaviour score</td>
</tr>
<tr>
<td>RUG ADL score</td>
<td></td>
</tr>
</tbody>
</table>

Some rehabilitation and non-acute medical units that were already collecting other dependency measures, specifically the Functional Independence Measure (FIM), the Barthel Index, the Australian Activities Index (AAI) and the Resident Classification Index (RCI). The units could collect these measures as optional data items.

Appendix 4  Preliminary results (Hindle 1995)

Hindle's analysis was based on the 5604 episodes for which there was data at the time the report was prepared. The dependent variable was mean cost per
His findings for single variables are shown in Table A1. The entry (...) indicates there were no significant solutions.

Hindle provided two alternate models. In the preferred model, Model B, each of the palliative care phases was defined to be an episode. This increased the total number of episodes from 5604 to 6969. Classes were created by splitting first on episode type and then by palliation phase (acute, stable, deteriorating, terminal and bereaved). The first split on episode type gave a variance explanation of 5.98%. The second split by phase increased variance reduction for the entire model from 5.98% to 29.46%. Third level splits were based on the rehabilitation impairment codes described above. Separate classes were created for five of the RICs (stroke, brain, neurological, spinal and amputee). All other RICs were grouped together as "other impairments".

Hindle's preferred model, which had 16 final classes, had a variance reduction value of 36.56%. Hindle noted that further splits were possible but, because of concerns about data quality, suggested that more detail should not be added until better data are available, and only then if there is a reason to do so.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, sex, marital status</td>
<td>All cases</td>
<td>6.5%</td>
<td>4</td>
</tr>
<tr>
<td>Principal diagnosis (HOSPAS)</td>
<td>All cases</td>
<td>1.0%</td>
<td>3</td>
</tr>
<tr>
<td>Number of diagnoses</td>
<td>All cases</td>
<td>1.4%</td>
<td>2</td>
</tr>
<tr>
<td>Discharge destination</td>
<td>All cases</td>
<td>1.3%</td>
<td>2</td>
</tr>
<tr>
<td>Referral source</td>
<td>All cases</td>
<td>6.0%</td>
<td>2</td>
</tr>
<tr>
<td>Facility code</td>
<td>All cases</td>
<td>19.0%</td>
<td>3</td>
</tr>
<tr>
<td>RCI ADL</td>
<td>All cases</td>
<td>17.7%</td>
<td>3</td>
</tr>
<tr>
<td>Behaviour scale, admission</td>
<td>All cases</td>
<td>22.1%</td>
<td>4</td>
</tr>
<tr>
<td>Behaviour scale, discharge</td>
<td>All cases</td>
<td>16.7%</td>
<td>6</td>
</tr>
<tr>
<td>Mini-mental, admission</td>
<td>All cases</td>
<td>4.3%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental, discharge</td>
<td>All cases</td>
<td>4.3%</td>
<td>3</td>
</tr>
<tr>
<td>Australian Activity Index (total)</td>
<td>All cases</td>
<td>6.0%</td>
<td>2</td>
</tr>
<tr>
<td>Episode type</td>
<td>All cases</td>
<td>19.0%</td>
<td>3</td>
</tr>
<tr>
<td>RUG ADL, admission</td>
<td>All cases</td>
<td>17.7%</td>
<td>3</td>
</tr>
<tr>
<td>RUG ADL, discharge</td>
<td>All cases</td>
<td>22.1%</td>
<td>4</td>
</tr>
<tr>
<td>RUG ADL, admission + discharge</td>
<td>All cases</td>
<td>5.7%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, admission</td>
<td>Rehabilitation</td>
<td>5.1%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, discharge</td>
<td>Rehabilitation</td>
<td>5.1%</td>
<td>3</td>
</tr>
<tr>
<td>FIM motor, admission</td>
<td>Rehabilitation</td>
<td>5.3%</td>
<td>3</td>
</tr>
<tr>
<td>FIM motor, discharge</td>
<td>Rehabilitation</td>
<td>57%</td>
<td>3</td>
</tr>
<tr>
<td>Impairment category</td>
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<td>2.1%</td>
<td>2</td>
</tr>
<tr>
<td>Number of problems, occurrence</td>
<td>Palliation</td>
<td>12.2%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, pain</td>
<td>Palliation</td>
<td>24.8%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, family/culture problems</td>
<td>Palliation</td>
<td>5.8%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, psych/spiritual problems</td>
<td>Palliation</td>
<td>13.9%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, all</td>
<td>Palliation</td>
<td>23.9%</td>
<td>3</td>
</tr>
<tr>
<td>Palliation phase</td>
<td>Palliation</td>
<td>49.3%</td>
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</table>
### Table A2: The Preferred Model as Reported by Hindle (1995)

<table>
<thead>
<tr>
<th>Cases</th>
<th>Mean cost</th>
<th>SD cost</th>
<th>Class name</th>
</tr>
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<tr>
<td>6969</td>
<td>175</td>
<td>81</td>
<td>All</td>
</tr>
<tr>
<td>703</td>
<td>142</td>
<td>51</td>
<td>Nursing home type</td>
</tr>
<tr>
<td>243</td>
<td>122</td>
<td>46</td>
<td>Convalescence</td>
</tr>
<tr>
<td>374</td>
<td>137</td>
<td>60</td>
<td>Respite</td>
</tr>
<tr>
<td>2079</td>
<td>179</td>
<td>88</td>
<td>Rehabilitation</td>
</tr>
<tr>
<td>524</td>
<td>187</td>
<td>70</td>
<td>Stroke</td>
</tr>
<tr>
<td>36</td>
<td>242</td>
<td>127</td>
<td>Brain</td>
</tr>
<tr>
<td>70</td>
<td>192</td>
<td>92</td>
<td>Neuro</td>
</tr>
<tr>
<td>110</td>
<td>327</td>
<td>137</td>
<td>Spinal</td>
</tr>
<tr>
<td>79</td>
<td>217</td>
<td>124</td>
<td>Amputee</td>
</tr>
<tr>
<td>1260</td>
<td>157</td>
<td>68</td>
<td>Other</td>
</tr>
<tr>
<td>2205</td>
<td>193</td>
<td>94</td>
<td>Palliation</td>
</tr>
<tr>
<td>416</td>
<td>162</td>
<td>74</td>
<td>Acute</td>
</tr>
<tr>
<td>594</td>
<td>172</td>
<td>73</td>
<td>Stable</td>
</tr>
<tr>
<td>658</td>
<td>241</td>
<td>61</td>
<td>Deteriorating</td>
</tr>
<tr>
<td>327</td>
<td>283</td>
<td>34</td>
<td>Terminal</td>
</tr>
<tr>
<td>210</td>
<td>22</td>
<td>48</td>
<td>Bereaved</td>
</tr>
<tr>
<td>100</td>
<td>149</td>
<td>54</td>
<td>Psychogeriatric</td>
</tr>
<tr>
<td>1265</td>
<td>179</td>
<td>57</td>
<td>Other</td>
</tr>
</tbody>
</table>
Appendix 5  Episodes to be included in future SNAP classification studies
- draft definitions

1. PALLIATIVE CARE

An episode of care provided for a person with an active, progressive, far advanced disease with little or no prospect of cure and for whom the treatment goal is quality of life.

Inclusions:

A. Grief and bereavement support for the family and carers during the life of the person and continuing after death.
B. Respite care provided by a palliative care service.

Exclusions:

All patients classified as acute, nursing home or psychiatric.

2. PSYCHOGERIATRIC

An episode of care provided for a patient whose age related medical and psychiatric condition requires management by a clinical team with designated responsibility for psychogeriatric services.

Inclusions:

A. Patients who are predominantly under the care of a psychogeriatric service, a geriatrician with access to liaison psychiatry, or a psychiatrist with access to geriatrician liaison.
B. Patients with a principal diagnosis of dementia with behavioural disturbance.
C. Respite care provided by a designated psychogeriatric service.

Exclusions:

All patients classified as acute, nursing home, psychiatric or palliative care.

3. REHABILITATION

An episode of care is designated as rehabilitation if it meets the following criteria:

- there are individualised and documented initial and periodic assessments of functional ability by use of the Functional Independence Measure (the FIM).
- there is an individualised rehabilitation plan which includes negotiated rehabilitation goals and indicative time frames.

Inclusions:
A. Patients with functional impairment who are not severely ill and for whom the goal is functional gain.

D. Planned respite care provided by a designated rehabilitation service.

Exclusions:

All patients classified as acute, nursing home, psychiatric, palliative care or psychogeriatric.

4. GERIATRIC EVALUATION AND MANAGEMENT

An episode of care is designated as geriatric evaluation and management if it meets either of the following criteria:

- the patient requires multidisciplinary assessment or management of complex medical, psychological and/or functional conditions and needs
- unplanned admission for care and support of a person in a stable, pre-assessed condition requiring accommodation and nursing to provide relief to carers.

Exclusions:

All patients classified as acute, nursing home, psychiatric, palliative care, psychogeriatric or rehabilitation.

5. NON-ACUTE CARE: NURSING HOME TYPE

An episode of care is designated as non-acute (nursing home type) if it meets all of the following criteria:

- care and support is being provided to the patient in order to maintain current levels of function whilst the patient is awaiting transfer to residential care
- the patient has an approved NH5.

Exclusions:

All patients classified as acute, nursing home, psychiatric, palliative care, psychogeriatric, rehabilitation or geriatric evaluation and management.

All patients without an approved NH5.

6. NON-ACUTE CARE: MAINTENANCE CARE

An episode of care is designated as non-acute (maintenance care) if it meets the following criteria:

- care and support is being provided to the patient in order to maintain current levels of functional independence whilst the patient is awaiting hostel placement, home modification or community support
the patient does not have an approved NH5.

Inclusions:

A. Planned geriatric respite care.
B. Compensable and ineligible patients who cannot be categorised as nursing home type.
C. Patients whose length of stay exceeds 35 days and who are not covered by an acute care certificate.
D. Patients who are clinically well enough to be sent home, but where there are other factors in the home environment (physical, social, psychological) which makes such action inappropriate for the patient in the short term.
E. Patients with functional impairment who are not severely ill and for whom there is no multidisciplinary program aimed at improvement of functional capacity.

Exclusions:

All patients classified as acute, nursing home, psychiatric, palliative care, psychogeriatric, rehabilitation or geriatric evaluation and management.

All patients with an approved NH5.
BIBLIOGRAPHY


Classifying sub-acute and non-acute patients: results of the NSW Casemix Area Network study

Kathy Eagar, David Cromwell, Carmel Kennedy & Lynette Lee

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Abstract

In 1994 the NSW Casemix Area Network initiated a project to develop a classification and funding model for sub-acute and non-acute care. Thirty five rehabilitation, geriatric, psychogeriatric and palliative care services were recruited into the study throughout eight Area Health Services. The aim of the first phase, summarised here, was to capture and analyse a sufficiently large quantity of data to select those variables most likely to be predictive of resource utilisation for subsequent use in a detailed costing study.

It is known that acute care Diagnosis Related Groups (DRGs) are not predictive of costs in sub-acute care. This phase of the project confirmed that, in NSW, the most predictive variables were case type, functional status measures, impairment type for rehabilitation, phase for palliative care and severity of symptoms for palliative care.

The resultant Phase 1 casemix classification, which has built on recent United States experience and studies in other Australian States, has been termed the NSW Sub-Acute and Non-Acute Patient (SNAP) Version 1 classification.

Introduction

The classification of the outputs of the health system is recognised as being necessary for its effective management. This has led to the development and use of the AN-DRG (Australian national diagnosis related group) casemix classification system which is designed to classify acute inpatient hospital episodes. However, sub-acute and non-acute episodes are not adequately classified by DRGs (Batavia & DeJong 1988, Eagar & Innes 1992) and it is now accepted that sub-acute and non-acute care requires a different classification approach.

Development has been occurring in the United States since 1983 (Fries et al 1994, Hindle & Laffey 1989, Stineman et al 1994) and in Australia since 1990 (Commonwealth Department of Health Housing & Community Services 1992; Roberts et al 1993; Smith 1993; Smith & Firms 1994; Duckett et al 1995a, 1995b) to refine a classification system for this form of care. Common to each has been the incorporation of measures of functional status, as this has shown to be more predictive of resource consumption than diagnosis (Hosek et al. 1986) although it is not the sole predictor of cost (McGinnis et al 1987; Oczkowski & Barreca 1993; Lee et al 1994). However, no measure has been used consistently across all settings, and in all studies.

Existing classification systems for sub-acute and non-acute episodes of care
were reviewed for use in this project. Resource Utilisation Groups (RUGs) comprise a classification system in use, predominantly in United States nursing homes (Fries et al 1994). It is a system which is based on grouping patients with special needs who require special procedures (including allied health therapy), and considering a nursing dependency level called the RUG-ADL score (Resource Utilisation Groups Activities of Daily Living). The Australian Resident Classification Instrument (RCI) for nursing homes uses similar concepts (Commonwealth Department Health, Housing &Community Services 1992).

The Non-Acute Inpatient Project (NAIP) classification was developed in Australia (Roberts et al 1993) to classify both sub-acute and non-acute inpatient days of care, but did not include palliative care. A per diem classification with 19 major functional categories was established, with six major classes (orthopaedic, spinal, pain, psychiatric, nervous system and medical) split using the RUG-ADL score. The study concluded that a daily classification may be necessary for this form of care as length of stay was not predictable. This was confirmed in another small study in the Illawarra (Lee, Kennedy & Aitken 1996).

For rehabilitation medicine, the most important existing classification is the FIM-Function Related Groups (FIM-FRGs). It uses the Functional Independence Measure (FIM) and classifies medical rehabilitation episodes of inpatient care into 54 groups split by Functional Impairment Category, FIM scores (or subsets) and age (Stineman et al 1994).

The Victorian Rehabilitation Casemix Project (Coopers and Lybrand Consultants 1995) subsequently developed a classification system with up to 17, similar to the Functional Impairment Categories used by FIM-FRG. Change in functional status between admission and discharge, as measured by the Barthel Index (Mahoney & Barthel, 1965), was predictive of variance in length of stay. Like FIM-FRG, length of stay was used as a proxy for cost.

In palliative care, clinicians developed a draft Palliative Care Casemix Classification (PCCC) (Smith 1993). It classified patients by five "phases of care" defined as acute, stable, deteriorating, terminal, and bereavement, and included a severity index and a measure of function (the RUG-ADL). A study of episodes from a small sample of sites in Western Australia confirmed that the PCCC was predictive of resource use in both inpatient and community settings (Smith and Firms 1994). A Victorian study obtained similar results, though the sample of hospitals was again small (Calder et al. 1995). The dependent variable in both cases was cost per day.

In summary, these studies have identified a number of functional and other measures that explained variation in the dependent variables used as a proxy for resource consumption. However, because the dependent variable was not the same across each study, the relative power of the different measures is unclear. It is also unknown whether other measures would be better predictors of resource use across sub-acute and non-acute settings. A study was therefore undertaken to assess the ability of commonly used patient measures to predict the resource consumption of sub-acute and non-acute patients. The study was designed to include previously assessed, and untested, measures of functional status. The measure of resource consumption was based on direct patient care costs. The study was designed to be phase 1 of a larger project (known as SACAN) to develop a classification and funding model for sub-acute and non-acute care.
Method

The study was designed to include patients defined by the NSW Health Department episode of care categories that were not classified as acute. These were nursing home type, convalescent care, respite care, rehabilitation, palliative care, and psychogeriatric.

The data to be collected across these patient types was defined in collaboration with clinicians and staff at the participating sites before the study began. This enabled data definitions to be agreed and training needs to be established. The outcome of this process was the selection of some 100 data items. Data would be collected at the level of a patient episode for all episode types. In addition, data were collected per phase of palliative care for patients of this type.

The data items can be grouped into four categories. The first group were core data items and were to be collected at all sites for all patients. They included all items in the current NSW inpatient discharge data set (HOSPAS) and the RUG-ADL as the core measure of functional status.

The second were specialty-specific data items and were to be collected only for specific case types. For example, the PCCC data items Phase of Palliative Care and Severity Score were collected for palliative care episodes but not for others; Folstein’s Mini Mental State Examination (Folstein et al, 1975) was collected in all psychogeriatric units but not in all palliative care units.

The third group were optional data items which sites could elect to collect. The most important of these were additional instruments for the measurement of function, namely the Functional Independence Measure (FIM), the RCI, the Barthel Index (Mahoney & Barthel, 1965) and the Australian Activities Index (AAI) which is now known as the Adelaide Activities Profile (Clark & Bond, 1995).

The fourth category were cost data items, necessary to establish cost relativities between patients. These included measures of staff time and expensive or atypical goods and services consumed by individual patients. Clinical interventions of exceptional cost were also recorded per patient. Actual cost data were collected by cost centre at the end of the data collection period, and were attributed to patients based on the recorded staff time and use of goods and services. Sites were only required to provide costs associated with patient care, not information on overhead costs.

Staff time was collected for all categories of staff with the exception of nursing in non-palliative care services. During the consultation process, the participating sites argued they did not have sufficient resources to capture nursing costs per patient per day. As a result, an alternative (albeit less satisfactory) methodology for the determination of nursing time was developed. Nursing time would be imputed using a regression model derived from nursing time and RUG-ADL scores collected during the NAIP. The RUG-ADL was a reasonable proxy as it is a direct measure of carer burden and therefore, a measure of nursing resource intensity. However, as the NAIP did not include palliative care patients, these sites were requested to collect nursing time data.

A total of 35 NSW services were selected by the project team in conjunction with
the NSW Casemix Area Network as being a representative sample of services in the participating Area Health Services. Project officers were appointed at each site, and training was provided in the definitions of the data as well as any assessment tools that were to be used. This included FIM training to sites intending to collect the FIM as a standard measure of function. A study handbook was also distributed to all participating staff.

Data were captured on all patients receiving sub-acute and non-acute care in these services over the six month period from 1 March 1994 to 31 August 1994. As noted previously, some data were collected by staff, while other data were downloaded from HOSPAS and hospital accounting systems. Patient data collected from HOSPAS and staff were linked to create a single patient data file. The success of the linking process varied between facilities, with a number of factors causing problems. The study report contains a complete description of this process (Eagar et al. 1995).

The cost centre expenditure data were then combined with the data on staff times and resource consumption to derive a cost for each patient. Costs were derived for both episode and palliative phase data sets, using the same methodology each time. As noted previously, nursing costs were allocated on the basis of the average RUG-ADL scores collected on admission and discharge. Medical and allied health costs were distributed in proportion to the minutes of care reported, with unaccounted staff costs being allocated in proportion to length of stay. Lastly, costs of atypical and expensive services were allocated to the identified patients, again with any remaining costs being allocated in proportion to length of stay. Once more, full details can be found in the study report (Eagar, Cromwell & Kennedy 1995).

The final outcome was an episode-based data set of 5684 records, and a palliative care phase data set of 3104 records. The overall level of data completeness was satisfactory. The response rate for the core data items varied from between 80% and 90% for variables such as age, principal diagnosis and the RUG-ADL to 100% on items such as sex, marital status and episode type. The response rate was satisfactory for all of the specialty-specific items except the MMSE. Only 45% of cases had an MMSE score and the completion rate varied by episode type from 15% for palliative care to 72% for rehabilitation. In contrast, there was 100% completion for the palliative care phase and severity score. The level of completion of the optional measures of function varied, with 40% of all rehabilitation cases having a FIM score but just 1.3% having a Barthel score.

Each data set was then analysed using the PC-group software. This analytical method partitions patients into mutually exclusive groups and is based on an analysis-of-variance (ANOVA) model. Splits were made on the basis of a specified independent variable being able to explain the variation in values of the dependent variable (in this case cost per day or cost per episode).
Results

Nursing home, convalescence, respite and psychogeriatric episodes

The predictive power of the variables was tested for the four episode types: nursing home, convalescence, respite and psychogeriatric. Their power was tested with respect to both cost per day and cost per episode. However, the sample sizes for each type were limited: 317 cases for nursing home types, 305 cases for both convalescence and respite, and 148 cases for psychogeriatric.

For cost per day, the functional dependency measures (excluding RUG-ADL) had only limited ability to explain resource use. Most notable was the Australian Activities Index with respect to convalescence and respite patients. It explained 37% and 20% respectively. However, it was based on a small sample (66 records, as not all facilities collected it), and so classes split on this variable could not be recommended. Folstein's MMSE was also notable for its ability to explain cost variation between psychogeriatric patients. However, the number of observations within each partition were again small, and the same reservation applies.

On the whole, the performance of the variables was reduced when tested on the mean cost per episode. Where improvement was observed, it was only slight, and not sufficient to conclude that the variable could be used as the basis for a split.

Palliative care

Data on palliative care were collected in two formats: by episode of care; and by phase. Each episode could contain one or more of the five phase categories. The episode and phase data sets contained 1206 and 3014 cases respectively.

Within the episode data set, the best predictor of variation in cost per day was the score on the Folstein’s MMSE, explaining 15% of variation when recorded on admission. However, the number of cases with a MMSEI score was small. It was expected that the phase data would predict variation in cost better than the episode data because it contained variables specific to palliative care. This proved the case.

Table 1 shows the results when cost per day is the dependent variable. As can be seen, two variables apart from the RUG-ADL measure give a significant reduction in variance. The first is the phase type itself. The other is the combined score of the severity index.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
<td>All cases</td>
<td>25.3%</td>
<td>3</td>
</tr>
<tr>
<td>Number of problems, occurrence</td>
<td>All cases</td>
<td>4.9%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, pain</td>
<td>All cases</td>
<td>8.7%</td>
<td>2</td>
</tr>
<tr>
<td>Severity, family/culture problems</td>
<td>All cases</td>
<td>9.8%</td>
<td>3</td>
</tr>
<tr>
<td>Severity, psych/spiritual problems</td>
<td>All cases</td>
<td>12.8%</td>
<td>3</td>
</tr>
</tbody>
</table>
Based on these results, phase would be the preferred choice as a splitting variable. Although severity of symptoms explains cost variation equally well, phase has greater clinical meaning. It is also more intuitive to create further splits within phase, for example, by severity, than it is the other way around. The explanatory power of the severity variables within the phases was then investigated. The total measure again explained significant degrees of variation in the Acute, Stable, Deteriorating and Terminal phases, 13%, 20%, 14%, and 10% respectively.

Given the perceived advantages of a per episode classification, it was decided to test variation in cost per episode. Data on severity were not collected by episode and so was excluded from analysis. As expected, none of the variables performed well with the exception of the RUG-ADL which achieved 26.4% of variance. The next best performing variable was Number of Problems, which achieved 9.1% variance explanation.

The explanatory power of the variables was also tested against the mean cost per phase. Phase explained 12% of variation, but the performance of the other variables dropped significantly. This would suggest that any classification for palliative care might need to be based on per diem cost.

Rehabilitation

The 2862 patients classified as rehabilitation formed the largest subset of the sub-acute episode types, and therefore it was important to identify suitable variables for a classification. To this end, several rehabilitation-only variables had been collected and their explanatory power was tested along with the standard variables.

Initially, each variable was analysed for its ability to explain variation in the mean cost per day. Table 2 shows the results.

The explanatory power of both the rehabilitation-only functional dependency measures was good, better than the general measures. The FIM, its motor component, and the Barthel measure all explained more than 20% of cost variation when measured on admission. However, the small number of records with the Barthel measure means that the robustness of its variation statistic is not known, although it is worth noting that the 38 values were strongly correlated with the motor component of the FIM.

The other rehabilitation specific measure collected was the Functional Impairment Category (FIC). It was tested at three levels of detail. The first used only the major impairment categories. The second included information up to one decimal place within each impairment group. This, for example, differentiated between Traumatic and Non-Traumatic Brain Dysfunction. The last level of detail used all coded information. The explanatory power of the FIC increased at each level of detail used. The overall power was reasonable,

<table>
<thead>
<tr>
<th>Severity, symptoms</th>
<th>All cases</th>
<th>20.5%</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severity, all</td>
<td>All cases</td>
<td>27.9%</td>
<td>5</td>
</tr>
<tr>
<td>RUG ADL, admission</td>
<td>All cases</td>
<td>38.9%</td>
<td>4</td>
</tr>
<tr>
<td>RUG ADL, discharge</td>
<td>All cases</td>
<td>37.5%</td>
<td>3</td>
</tr>
</tbody>
</table>
though not as good as the FIM. However, an advantage of this variable is its clinical meaning. Thus, it makes sense to have it as the root of any rehabilitation tree.

To this end, the predictive power of the FIM was tested on two functional impairment categories, stroke and orthopaedics. It would have been preferable to test it on all the categories, but only these two had sufficient records to ensure the strength of any resulting classes. The sample sizes of the orthopaedic and stroke impairment categories were 420 and 228 respectively. As before, the FIM scores recorded on admission explained a significant amount of variation in the mean cost per day. Within the stroke sample, the FIM motor component explained 33%, while the total FIM explained 34%. For orthopaedic patients, the total FIM and its motor component both explained 20%.

### Table 2: Cost per day variation explained, rehabilitation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample size</th>
<th>Variance explained %</th>
<th>Number of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>2530 cases</td>
<td>9.0%</td>
<td>4</td>
</tr>
<tr>
<td>Principal diagnosis, excluding V-codes</td>
<td>2470 cases</td>
<td>6.3%</td>
<td>5</td>
</tr>
<tr>
<td>Behaviour scale, admission</td>
<td>522 cases</td>
<td>6.1%</td>
<td>3</td>
</tr>
<tr>
<td>Behaviour scale, discharge</td>
<td>522 cases</td>
<td>5.9%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental, admission</td>
<td>1813 cases</td>
<td>4.6%</td>
<td>3</td>
</tr>
<tr>
<td>Mini-mental discharge</td>
<td>1813 cases</td>
<td>2.6%</td>
<td>2</td>
</tr>
<tr>
<td>Australian Activity Index (total)</td>
<td>450 cases</td>
<td>3.2%</td>
<td>2</td>
</tr>
<tr>
<td>RUG-ADL, admission</td>
<td>2510 cases</td>
<td>19.9%</td>
<td>3</td>
</tr>
<tr>
<td>RUG-ADL, discharge</td>
<td>2510 cases</td>
<td>17.7%</td>
<td>3</td>
</tr>
<tr>
<td>Major Functional Impairment Categories (FIC)</td>
<td>2553 cases</td>
<td>9.5%</td>
<td>3</td>
</tr>
<tr>
<td>FIC, plus 1st decimal place</td>
<td>2516 cases</td>
<td>13.9%</td>
<td>4</td>
</tr>
<tr>
<td>FIC, all detail</td>
<td>2516 cases</td>
<td>16.4%</td>
<td>4</td>
</tr>
<tr>
<td>FIM motor, admission</td>
<td>1158 cases</td>
<td>21.3%</td>
<td>3</td>
</tr>
<tr>
<td>FIM motor, discharge</td>
<td>1158 cases</td>
<td>20.0%</td>
<td>3</td>
</tr>
<tr>
<td>FIM cognitive, admission</td>
<td>1158 cases</td>
<td>10.2%</td>
<td>4</td>
</tr>
<tr>
<td>FIM cognitive, discharge</td>
<td>1158 cases</td>
<td>10.3%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, admission</td>
<td>1158 cases</td>
<td>22.5%</td>
<td>3</td>
</tr>
<tr>
<td>FIM total, discharge</td>
<td>1158 cases</td>
<td>21.6%</td>
<td>4</td>
</tr>
<tr>
<td>Barthel, admission</td>
<td>38 cases</td>
<td>29.4%</td>
<td>3</td>
</tr>
<tr>
<td>Barthel, discharge</td>
<td>38 cases</td>
<td>16.1%</td>
<td>3</td>
</tr>
</tbody>
</table>

Several studies (Stineman et al 1994) have indicated that variation in resource use can be explained at the level of an episode for rehabilitation patients. Thus this scenario was investigated. The results suggest that variation in episode cost can be explained. The variables identified in the preceding analysis again proved to be the most powerful. However, the power of all except one measure was reduced. The exception was the Function Impairment Category, with each level tested improving by around 4%.

As before, the ability of the FIM to explain cost variation was tested within the orthopaedic and stroke impairment categories. Again, the best predictors were
the values recorded on admission. For stroke patients, the total FIM and its motor component explained 23% and 22% respectively, a decrease on its cost per day performance. For orthopaedic patients, both explained 25.5% of the cost variation.
Discussion

The proposed classification

From the analysis above, five variables were identified as being predictive of resource use:

- episode type;
- phase (palliative care);
- severity of illness (palliative care);
- the Functional Impairment Categories (rehabilitation);
- the FIM (rehabilitation).

These were then used to devise a *per diem* classification. From this analysis, it would appear that an episode-based classification is not feasible for sub-acute and non-acute care with the probable exception of rehabilitation. The challenge in developing a classification is to find a balance between empirical results, clinical meaning, and ease of use. More explicitly, it should satisfy the following criteria (Roberts et al, 1993):

- classes should have meaning to clinical staff, and group patients with similar clinical characteristics
- classes should be resource homogeneous
- there should be a manageable number of classes
- the variables used should describe patients’ need instead of the services actually provided, and should not be easily gamed.

Table 3 shows the classification tree developed from the data. The initial split is based on episode type which, although not an effective single variable, is a clinically sensible starting point.

The overall per diem costs of the seven episode types used in Phase 1 are quite similar. Table 3 shows the costs for each of the seven episode types as cost relativities or cost weights, with all SNAP bed-days being given a value of 1.00. The cost weights range from 0.82 for convalescent episodes to 1.05 for psychogeriatric episodes.
### Table 3: The SNAP Phase 1 classification tree

<table>
<thead>
<tr>
<th>Cases</th>
<th>Cost weight</th>
<th>Class name</th>
</tr>
</thead>
<tbody>
<tr>
<td>6760</td>
<td>1</td>
<td>All Patients</td>
</tr>
<tr>
<td>317</td>
<td>0.96</td>
<td>Nursing home type</td>
</tr>
<tr>
<td>305</td>
<td>0.82</td>
<td>Convalescent</td>
</tr>
<tr>
<td>305</td>
<td>0.87</td>
<td>Respite</td>
</tr>
<tr>
<td>2.13e+42</td>
<td>1.02</td>
<td>All Rehabilitation care</td>
</tr>
<tr>
<td>1.48</td>
<td></td>
<td>Stroke Low FIM motor</td>
</tr>
<tr>
<td>1.16</td>
<td></td>
<td>Stroke Medium FIM motor</td>
</tr>
<tr>
<td>0.83</td>
<td></td>
<td>Stroke High FIM motor</td>
</tr>
<tr>
<td>1.45</td>
<td></td>
<td>Non-traumatic brain dysfunction</td>
</tr>
<tr>
<td>2.13</td>
<td></td>
<td>Traumatic brain dysfunction</td>
</tr>
<tr>
<td>1.13</td>
<td></td>
<td>Neurological conditions</td>
</tr>
<tr>
<td>1.29</td>
<td></td>
<td>Non-traumatic spinal dysfunction</td>
</tr>
<tr>
<td>1.70</td>
<td></td>
<td>Traumatic spinal dysfunction</td>
</tr>
<tr>
<td>0.94</td>
<td></td>
<td>Amputation</td>
</tr>
<tr>
<td>1.07</td>
<td></td>
<td>Arthritis</td>
</tr>
<tr>
<td>0.94</td>
<td></td>
<td>Pain</td>
</tr>
<tr>
<td>1.19</td>
<td></td>
<td>Orthopaedic disorders Low FIM motor</td>
</tr>
<tr>
<td>0.81</td>
<td></td>
<td>Orthopaedic disorders Medium FIM motor</td>
</tr>
<tr>
<td>0.59</td>
<td></td>
<td>Orthopaedic disorders High FIM motor</td>
</tr>
<tr>
<td>0.87</td>
<td></td>
<td>Cardiac pulmonary</td>
</tr>
<tr>
<td>1.06</td>
<td></td>
<td>Other rehabilitation</td>
</tr>
<tr>
<td>3.01e+38</td>
<td>1.01</td>
<td>All Palliative care</td>
</tr>
<tr>
<td>0.82</td>
<td></td>
<td>Acute Low severity</td>
</tr>
<tr>
<td>1.05</td>
<td></td>
<td>Acute Medium severity</td>
</tr>
<tr>
<td>1.41</td>
<td></td>
<td>Acute High severity</td>
</tr>
<tr>
<td>0.81</td>
<td></td>
<td>Stable Low severity</td>
</tr>
<tr>
<td>1.12</td>
<td></td>
<td>Stable Medium severity</td>
</tr>
<tr>
<td>1.61</td>
<td></td>
<td>Stable High Severity</td>
</tr>
<tr>
<td>1.02</td>
<td></td>
<td>Deteriorating Low severity</td>
</tr>
<tr>
<td>1.23</td>
<td></td>
<td>Deteriorating Medium severity</td>
</tr>
<tr>
<td>1.66</td>
<td></td>
<td>Deteriorating High Severity</td>
</tr>
<tr>
<td>1.13</td>
<td></td>
<td>Terminal Low severity</td>
</tr>
<tr>
<td>1.32</td>
<td></td>
<td>Terminal Medium severity</td>
</tr>
<tr>
<td>1.72</td>
<td></td>
<td>Terminal High Severity</td>
</tr>
<tr>
<td>0.50</td>
<td></td>
<td>Bereaved</td>
</tr>
<tr>
<td>148</td>
<td>1.05</td>
<td>Psychogeriatric</td>
</tr>
<tr>
<td>541</td>
<td>1.04</td>
<td>Other</td>
</tr>
</tbody>
</table>

Only two of the episode types are split further: palliative care and rehabilitation. Splits within the other episode types are not proposed from this study because, given the sample size, the predictive power of the variables tested was not sufficient given the sample size to warrant further splits. The one variable that could subsequently be a splitting variable, the RUG-ADL, was ruled out of this phase because of its use to estimate nursing costs for all but palliative care. Nevertheless, given the high correlation between the RUG-ADL and nursing costs found in previous studies, this variable needs to be considered in the next study.
Palliative care

The palliative care branch is split at two levels, first by phase and then by the total severity in all phases except bereavement. Within the palliative branch, the split by phase achieves a variance reduction of 25.6%. Splitting each phase (except bereavement) by total severity/problem score then increased the variance reduction to 34.1%.

An alternative second split would be to partition each phase based on the RUG-ADL functional dependency score. This has several advantages, the most important of which is that it is a rigorous variable and is less open to gaming. The variance reduction achieved by splitting each phase by functional dependency level in this study was 39.4%. However, given the use of the RUG-ADL to impute nursing costs, this option cannot be recommended as the preferred model from this current study.

The cost weights for palliative care in this study range from 0.50 for the bereavement class to 1.72 for the high severity terminal class.

Rehabilitation

The rehabilitation subgroup is split at the first level by the Functional Impairment Category, using information up to the first decimal place. This variable proved to be a reasonable predictor of resource use. Equally important, however, is that it makes clinical sense. The variance explained by this sub-branch is 16.2%.

This figure could have been enhanced by creating a group for Multiple Trauma, and splitting the amputation class into two: Double Amputations and Single Amputations. However, the number of cases of Multiple Trauma, and of Double Amputations were small. Therefore, the robustness of this enlarged tree was open to question, although such splits are intuitive.

The Stroke and Orthopaedic Functional Impairment Categories were then split by the FIM Motor score as recorded on admission. The motor component was chosen because, like the total FIM, it gave good statistical results. Standardised classes were defined, although this reduced the level of variance explained. The effect of these splits was to increase the overall level of variance explained within the sub-branch to 23.58%.

The cost weights for rehabilitation in this study range from 0.59 for the high function orthopaedic class to 2.13 for the traumatic brain dysfunction class.

The influence of cost differences between facilities

The variable ‘facility code’ proved to be a powerful predictor of cost and explained 57.8% of cost variance. This figure could imply that the costs provided by the facilities differed in their construction and completeness. However, it might be that different treatment protocols exist for relatively similar patient types. Another possibility is that each of the facilities treats a different mix of cases and the variable facility code is simply a reflection of differences on casemix. The critical issue is the degree to which facility code predicts costs after standardisation for casemix.
The high explanatory power of facility code was therefore subjected to further analysis (Cromwell & Eagar 1996). This demonstrated that, whilst the variable facility code influenced the cost estimates of the final classes to some degree, in all but one case (rehabilitation for arthritis) the cost relativities between the defined classes remained sufficiently large to justify the splits made and the splitting variables used.

The classification

In total, the 34 classes outlined in Table 3 explain 25.1% of the variation in the mean cost per day. This is a satisfactory statistical performance given that the overall per diem costs of the seven episode types are quite similar and that most of these 34 classes will be further split in the next study based on a standard measure of function. This SACAN classification has been termed the NSW SNAP Version 1 classification. More detailed analysis of costs, particularly nursing, in the next phase can be expected to increase the statistical performance of the overall classification.
Conclusion

Phase 1 of the NSW Casemix Area Network Project on sub-acute and non-acute care has achieved what it set out to do. It captured a sufficiently large quantity of data to allow for the identification of a subset of the most promising variables which could then be refined and used as the basis of the final phase of a sub-acute classification study. The study did not establish the actual costs of each casemix class (nor did it aim to do so,) but simply established the cost relativities between preliminary classes.

The study has demonstrated results which are, for the most part, consistent with the international literature. Specifically, the key variables used in DRG assignment seem unlikely to be of use, regardless of the quality and quantity of data, except in very limited circumstances. Age, diagnoses, number of diagnoses, source of referral, and destination after discharge have all performed poorly in the most recent Australian studies.

Based on consistent findings reported in the literature, the final classes in the preliminary classification now need to be split by an agreed ADL measure. Both the RUG-ADL and the FIM remain as possible measurement tools.

The next step

A national SNAP casemix classification study has subsequently been initiated to develop the first version of a national casemix classification for sub-acute and non-acute care. This national study is collecting data during 1996 and will report in 1997.

Acknowledgements

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Phase 3

The National Sub-Acute and Non-Acute Patient Classification Study


Defining an Episode of Care: a study of five Case Types

Defining an Episode of Care: a study of five Case Types

Abstract

This is the first study in Australia to test definitions of various types of 'episodes of care'. The definitions reported here are those used in the 1996 National Sub-Acute and Non-Acute (SNAP) Casemix Classification Study.

The study collected data on a total of 683 patients at 10 hospitals and 2 community health services providing a range of rehabilitation, aged care and community care services. The kappa statistic (κ) was used to determine the significance of the level of agreement between raters. The value of κ was 0.838 with a 95% confidence interval of 0.801 to 0.975.

The results of this study are encouraging and support the use of the five Case Types - Palliative Care; Rehabilitation; Psychogeriatric; Geriatric Evaluation and Management; and Maintenance Care. All five Case Types proved to have good inter-rater reliability, there was a good fit for most patients, and staff found the definitions easy to use.

Introduction

The question of how to define an episode of patient care has been the subject of much recent debate. This debate was triggered in part by the 1992 report of the National Patient Abstracting and Coding Project (Eagar and Innes 1992a, 1992b). Eagar and Innes argued that an episode of care should not be defined as that care which begins at admission and ends at discharge. Instead, they proposed that the definition of an episode of care be based on the acuity of the patient and the goal of care. They also proposed that the AN-DRG (Australian national diagnosis related groups) classification be used to classify only 'acute' patient episodes of care and that existing information systems be amended to allow for 'statistical type changes' within the one hospitalisation.

In response to that report, the Australian Health Ministers' Advisory Council (AHMAC) agreed in 1992 to the introduction of a standardised national data collection system to distinguish between different episodes of inpatient care (AHMAC 1992). The resolutions of AHMAC are important. An episode of inpatient care is no longer defined as being the complete period from admission to discharge. Nor is it defined by the name of the ward to which the patient is admitted. Instead, it is now recognised that a patient can move through two or more acuity episodes during the one stay in hospital. Indeed, in the case of palliative care, it is recognised that an episode of care may continue after the death of the patient.

A definition of acute care was subsequently developed and included in version 4.0 of the National Health Data Dictionary on the basis that it be used only for casemix definition development until it had been tested and refined. In the process, the National Health Information Management Group recommended that the boundaries between care types be defined to allow for the identification of the

The most recent version of the National Health Data Dictionary (version 5.0) defines an episode of care as a phase of treatment and recognises six types of episode - acute; rehabilitation; palliative care; non-acute care; unqualified neonate; and other care (Australian Institute of Health and Welfare 1996). Consistent with the National Health Information Agreement, all States and Territories are implementing these definitions.

None of the definitions now incorporated in the National Health Data Dictionary have been subjected to testing and, in the absence of data, there are questions about their validity, reliability and clinical meaning. These questions apply equally to all episode types.

This paper presents the results of the first study undertaken to test definitions of care that is not 'acute' care. The definitions were developed by the Clinical Project Team of the National Sub-Acute and Non-Acute Casemix Classification Study (Centre for Health Service Development 1996).

The definitions reported here are those employed in the 1996 National Sub-Acute and Non-Acute Casemix Classification Study. In addition to testing inter-rater reliability, the purpose of the study was to ascertain the views of clinical assessors regarding the adequacy of the Case Type definitions for the classification of sub-acute and non-acute patients and to assess the goodness of fit of the definitions.

Five Case Types are included in the National Sub-Acute and Non-Acute Casemix Classification Study and a key research hypothesis to be tested is whether each Case Type is clinically distinct as measured by the patient attributes to be captured in that study. An algorithm is used to assign each patient to one, and only one, Case Type. In the event that there is more than one Case Type which could appropriately define an episode, the episode is allocated to the first Case Type identified in the algorithm. The five Case Types listed in the order in which they appear in the algorithm are:

1. Palliative care
2. Rehabilitation
3. Psychogeriatric
4. Geriatric evaluation and management (GEM)
5. Maintenance care.

Each Case Type has been defined by describing the patient, by defining the goal of care, and by describing the service characteristics for the Case Type.

The definitions of the five Case Types are included in the appendix.
Method

Data were collected at 10 hospitals and 2 community health services in NSW, Victoria, South Australia and Western Australia. Sites in the study provide a range of rehabilitation, aged care and community care services. One site (representing less than 10% of all observations) is a designated rehabilitation centre. Four sites provide a range of acute, rehabilitation and aged care services, whilst seven sites provide a range of rehabilitation and aged care but no acute care. Specialist palliative care services and specialist adult mental health services were excluded from the study because these units rarely care for patients whose episode is other than palliative care or mental health.

A study coordinator at each site provided instructions to raters and managed the on-site data collection. Site coordinators selected two clinical staff from each ward/service to participate in the pilot study. The clinical staff members acting as raters included registered nurses, specialist medical staff, medical registrars, and allied health staff.

The site coordinators provided each rater with the definitions of each Case Type and ensured that they were familiar with the Case Type assignment logic. Each rater was given a written instruction sheet instructing them to assign each patient to one, and only one, Case Type.

Using a scale of 0 to 4 where 0 indicates 'Very Poor Fit' and 4 indicates 'Very Good Fit', raters were asked to indicate how well the Case Type described the key attributes or characteristics of each patient. Likewise, raters were asked to assess how difficult it was to assign each person to a Case Type. A scale of 0 to 4 was used for this purpose with 0 indicating 'Very Easy' and 4 indicating 'Very Difficult'.

Raters could also indicate if the patient did not fit into any of the five Case Types or, conversely, if the patient met the description of more than one Case Type. Finally, raters were asked to indicate any patient where they were not sufficiently familiar with the person's clinical condition to be confident about these ratings.

Each patient on the ward/receiving care was assessed independently by the two clinical raters and allocated to one of the five SNAP Case Types. Each assessment was made by each rater without discussion with the other rater. Both assessments were completed within the one 24 hour period. Single assessments were also collected for any patient/community client who was seen by only one practitioner on the day of assessment. These assessments were to be used solely to assess goodness of fit and ease of use.

After the data had been collected, clinical assessors were interviewed, either individually or in a group, by the site coordinator to identify any problems experienced in undertaking the required tasks and any suggestions for improving the wording of the definitions. These were documented and forwarded to the study team.
Results

In total, 683 patients were classified to one of the five Case Types. Of this total number, 559 patients (81.8%) were assessed by two raters and 124 (18.2%) by one rater. As expected, most of the sole ratings occurred in community settings where the patient was seen by only one practitioner on the day of assessment. These cases were excluded from the analysis of inter-rater reliability but included for other analyses.

Figure 1 shows the ratings for the 559 patients assessed by two raters. Figure 1 also shows each combination as a percentage of total observations. There was a perfect match for 496 (or 88.7%) of patients. For the remaining 63 (or 11.3%) of patients, the largest number of mismatches are between Rehabilitation and Geriatric Evaluation and Management (19 or 3.4% of total observations) and Rehabilitation and Maintenance Care (18 or 3.2%). However, there were also a small number of mismatches for all other combinations except Palliative Care and Rehabilitation.

Table 1 shows the mismatches in more detail. Three types of mismatch account for 78% of all mismatches - Rehabilitation/GEM; GEM/Maintenance Care and Rehabilitation/Maintenance Care. Rehabilitation, GEM and Maintenance Care also account for 78% of all matches.

<table>
<thead>
<tr>
<th>Case Type Rater 1</th>
<th>Case Type Rater 2</th>
<th>Total number</th>
<th>Percentage of all mismatches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative care</td>
<td>Psychogeriatric</td>
<td>1</td>
<td>1.59</td>
</tr>
<tr>
<td>Palliative care</td>
<td>GEM</td>
<td>1</td>
<td>1.59</td>
</tr>
</tbody>
</table>

Table 1: Mismatch by Case Type
The kappa statistic ($\kappa$) was used to determine the significance of the level of agreement between raters. The kappa coefficient of agreement is the ratio of the proportion of times that the raters agree (corrected for chance agreement) to the proportion of times that the raters could agree (corrected for chance agreement). The value of kappa was 0.838 with a 95% confidence interval of 0.801 to 0.875.

**Goodness of fit**

Each rater used a scale of 0 to 4 to indicate how well each Case Type described the key attributes or characteristics of each patient. A score of 0 indicated 'Very Poor Fit' and a score of 4 indicated 'Very Good Fit'. Goodness of fit was calculated based on a total of 683 patients. This includes the 124 patients with only one rater. The average goodness of fit score was 3.48, indicating that there was a good fit for most patients. Table 2 shows the goodness of fit score by Case Type. At 3.70 with two raters and 3.44 with one rater, the Maintenance Care Case Type had the best fit score. Among the Case Types, GEM had the lowest fit score (3.27). Not surprisingly, the mismatch group Rehabilitation/GEM has the lowest score overall (2.90), indicating that these patients did not fit the definitions as well as other patients assigned to either Rehabilitation or GEM.

**Ease of assignment**

Each rater used a scale of 0 to 4 to indicate how easy it was to assign each patient to a Case Type. A score of 0 indicated 'Very Easy' and a score of 4 indicated 'Very Difficult'.

Again, ease was calculated based on a total of 683 observations. The average ease score was 0.91, indicating that there were no significant difficulties assigning sub-acute and non-acute patients to one of the five Case Types.

Table 3 shows the ease of assignment score by Case Type. At 0.54 with two raters and 0.17 with one rater, the Psychogeriatric Case Type had the best ease score. Among the Case Types, GEM had the lowest ease score (1.15). Overall, the match groups have better ease of assignment scores than the mismatch groups. However, the numbers in some cells are very small and so it is difficult to draw any definitive conclusions.
Feedback on the Case Types

Raters were asked to identify any patient who could be assigned to more than one Case Type and to identify patients who did not meet the description of any Case Type. In addition, raters were asked to identify any patient where the rater was not sufficiently familiar with the person’s clinical condition to be confident about the ratings given.

Raters indicated that 11.7% of cases could be assigned to more than one Case Type and included a brief description of difficult cases. These cases were spread across all Case Types. In total, 3.4% of patients did not meet criteria for any Case Type. These patients were mostly identified as acute care. There were 12 cases where one or other of the raters indicated that they were not sufficiently familiar with the persons condition.

Table 2: Goodness of Fit by Case Type

<table>
<thead>
<tr>
<th>Rater 1</th>
<th>Rater 2</th>
<th>Number of Raters</th>
<th>Mean Fit Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>PALLIATIVE</td>
<td>PALLIATIVE</td>
<td>40</td>
<td>3.54</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>REHABILITATION</td>
<td>464</td>
<td>3.56</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>PSYCHOGERIATRIC</td>
<td>82</td>
<td>3.54</td>
</tr>
<tr>
<td>GEM</td>
<td>GEM</td>
<td>150</td>
<td>3.27</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>MAINTENANCE</td>
<td>212</td>
<td>3.7</td>
</tr>
<tr>
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<td>7</td>
<td>4</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>NIL</td>
<td>30</td>
<td>2.93</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>NIL</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>GEM</td>
<td>NIL</td>
<td>36</td>
<td>3.27</td>
</tr>
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<td>45</td>
<td>3.53</td>
</tr>
<tr>
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<td>PSYCHOGERIATRIC</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>GEM</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>MAINTENANCE</td>
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<td>3.14</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>PSYCHOGERIATRIC</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>GEM</td>
<td>40</td>
<td>2.9</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>MAINTENANCE</td>
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<td>3.19</td>
</tr>
<tr>
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<td>GEM</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>MAINTENANCE</td>
<td>8</td>
<td>3.48</td>
</tr>
<tr>
<td>GEM</td>
<td>MAINTENANCE</td>
<td>28</td>
<td>3.14</td>
</tr>
<tr>
<td>RATER 1</td>
<td>RATER 2</td>
<td>NUMBER OF RATERS</td>
<td>EASE OF ASSIGNMENT</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
<td>------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>PALLIATIVE</td>
<td>40</td>
<td>1.02</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>REHABILITATION</td>
<td>464</td>
<td>0.78</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>PSYCHOGERIATRIC</td>
<td>82</td>
<td>0.54</td>
</tr>
<tr>
<td>GEM</td>
<td>GEM</td>
<td>150</td>
<td>1.15</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>MAINTENANCE</td>
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<td>0.72</td>
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<td>0</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>NIL</td>
<td>30</td>
<td>1.87</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>NIL</td>
<td>6</td>
<td>0.17</td>
</tr>
<tr>
<td>GEM</td>
<td>NIL</td>
<td>36</td>
<td>1.62</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>NIL</td>
<td>45</td>
<td>1.11</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>PSYCHOGERIATRIC</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>GEM</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PALLIATIVE</td>
<td>MAINTENANCE</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>PSYCHOGERIATRIC</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>GEM</td>
<td>40</td>
<td>1.48</td>
</tr>
<tr>
<td>REHABILITATION</td>
<td>MAINTENANCE</td>
<td>38</td>
<td>0.82</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>GEM</td>
<td>4</td>
<td>0.25</td>
</tr>
<tr>
<td>PSYCHOGERIATRIC</td>
<td>MAINTENANCE</td>
<td>8</td>
<td>1.88</td>
</tr>
<tr>
<td>GEM</td>
<td>MAINTENANCE</td>
<td>28</td>
<td>0.78</td>
</tr>
</tbody>
</table>
Discussion

The results of this study are encouraging and the five Case Types are to be employed in the 1996 National Sub-Acute and Non-Acute Casemix Classification Study. Although there were some differences in the performance of the five Case Types, all five proved to be reliable. Most patients fitted into only one Case Type and staff found the definitions easy to use.

The kappa value indicates that there is very good inter-rater reliability. Likewise, the assessments completed by the raters indicated that the raters found the definitions easy to use. In addition to the quantitative ratings reported above, raters also provided subjective comments on the definitions and their application. Raters reported that they were happy with the wording of the definitions of the five Case Types and had few suggestions for improving them.

For raters in a community setting, the key issue was the boundary between primary care, post-acute care and maintenance care. For example, it was unclear to community raters whether care of a patient with a chronic leg ulcer was primary care or maintenance care. A further example given was an elderly lady referred for monitoring and wound dressings following surgery. She was expected to require dressings for 6-12 weeks. The rater found it hard to determine if this was acute, post-acute or maintenance care.

With the exception of this one issue, community raters indicated no significant difficulties with applying the definitions. On the whole their inter-rater results, goodness of fit scores and ease of use scores were equivalent to, or better than, those of hospital-based raters.

The issue of the boundary between acute care and other care was also raised by some hospital raters. Some suggested that a clearer definition of acute care is required.

However, a more important issue in this study is whether assignment to a Case Type is based on the reason for admission/episode start (a prospective assessment) or on an assessment of the whole episode (an assessment that can be made concurrently or retrospectively). This study was a snap-shot study. It captured all patients receiving care on a specific day. As such, most patients were well into an episode of care at the point at which they were assessed. Vignettes provided by the raters indicated that some patients had been admitted for one reason and, subsequent to the admission, new problems had emerged which required a new care plan. The most obvious example given was a patient admitted for palliative care and who fractured their femur during the hospital stay. The patient is now receiving rehabilitation. However, there were other less extreme examples. This includes patients who were admitted for rehabilitation and who have subsequently demonstrated little capacity for functional improvement.

An analysis of the comments provided indicates that about half of the mismatches occurred because one rater based their assessment on reason for episode start and the other rater based their assessment on the situation at the time of rating. Not all raters commented on all patients subsequently in the mismatch cohort and so a more detailed analysis is not possible.
There are two differences between this inter-rater study and the way that the definitions are applied in the National Sub-Acute and Non-Acute Casemix Classification Study. In the National Sub-Acute and Non-Acute Study, all patients will be assigned to a Case Type at the start of their episode of care. Further, for patients whose Case Type changes during the one hospitalisation or episode of community care, there will be capacity for a "type change". Episode end data will be collected when a type change occurs and the patient will be admitted to a new Case Type. All patient data items will be repeated at each type change. This should overcome the problems reported in this study.

Finally, some raters reported difficulties with assignment when the evidence as stated in the definition was not available. For example, the study cohort included six patients admitted to a designated rehabilitation unit and who were reported as receiving rehabilitation. However, there was no rehabilitation plan and no indicative time frame. This issue has implications for both quality and for funding. The section "as evidenced by" is included in the definitions to minimise the capacity for manipulating the classification in order to receive a higher level of funding. It is reasonable to expect evidence to exist if a provider is to be funded for providing a specific type of care.

Case Types as defined in this study have not been used before and it will be important to ensure that appropriate training is provided to all staff making Case Type assignments. Staff need to know that they are classifying the patient and not the stream of care in which they work. Further, they need to know that patients are classified to a Case Type at the beginning of their care. Given that some patients could be assigned to more than one Case Type, it is critical that staff making Case Type assignments understand the algorithm. Of specific importance is that Rehabilitation overrides both Geriatric Evaluation and Management and Maintenance Care.

A test of the inter-rater reliability of the definition of 'acute care' is yet to occur. A fundamental issue to be resolved is whether, for casemix purposes, the unique feature of acute care is actually the acuity of the patient or rather the presence of a clearly identified principal diagnosis that can be used to assign a patient to a "diagnosis related group".

Once this issue is resolved, it will be necessary to test the boundary between 'acute care' and the care reported in this study. It seems likely that the debate about the boundary of acute care will continue at least until such time as health care providers understand the definition of an episode of care.

Acknowledgements

Thanks are due to the clinical staff who participated in the study as on-site coordinators and clinical raters.
References


Eagar K & Innes K 1992a, Creating a common language: the production and use of patient data in Australia, Commonwealth Department of Health, Housing and Community Services, Canberra.

Eagar K & Innes K 1992b, Standard definitions and source data items for Australian hospitals, Commonwealth Department of Health, Housing and Community Services, Canberra.


Appendix - the five Case Types

Palliative Care
An episode of care:
• provided for a person with an active, progressive, far advanced disease with little or no prospect of cure and
• for whom the primary treatment goal is quality of life
• which is evidenced by:
  + multidisciplinary assessment and/or management of the physical, psychological, emotional and spiritual needs of the person
  + a grief and bereavement process for the person and their carers/family

Inclusions:
A  palliative care provided in both community and hospital settings
B  grief and bereavement support services for the family and carers during the life of the person and continuing after death.

Rehabilitation
An episode of care:
• provided for a person with an impairment, disability or handicap and
• for whom the primary treatment goal is improvement in functional status
• which is evidenced by:
  + an individualised and documented initial and periodic assessment of functional ability by use of a recognised functional assessment measure.
  + an individualised multidisciplinary rehabilitation plan which includes negotiated rehabilitation goals and indicative time frames.

Inclusions:
A  Rehabilitation care provided in both community and hospital setting.

Psychogeriatric Care
An episode of care:
• provided for an elderly person with either an age-related organic brain impairment with significant behavioural disturbance or late onset psychiatric disturbance or a physical condition accompanied by severe psychiatric or behavioural disturbance and
• for whom the primary treatment goal is improvement in health, modification of symptoms and enhancement in function, behaviour or quality of life
• which is evidenced by:
  + multidisciplinary assessment and/or management of complex medical, psychiatric and functional conditions and needs
  + regular reassessments
+ working towards negotiated goals within an indicative time frame

Inclusions:
A psychogeriatric care provided in both community and hospital settings
B psychogeriatric care of younger adults with clinical conditions generally associated with old age
C psychogeriatric care of people with long term psychiatric disturbance and/or substance abuse

Geriatric Evaluation and Management (GEM)
An episode of care:
• provided for a person with complex multi-dimensional medical problems associated with disabilities and psychosocial problems, usually (but not always) an older person and
• for whom the primary treatment goal is maximising health status and/or optimising living arrangements
• which is evidenced by:
  + evaluation and formulation of a management plan for complex medical problems
  + multidisciplinary assessment and management of functional and psychosocial needs
  + regular assessments of current management plan working towards negotiated goals within indicative time frames

Inclusions
A geriatric evaluation and management provided in both community and hospital settings
B evaluation and management of younger adults with clinical problems generally associated with old age

Maintenance Care
An episode of care;
• provided for a person with a disability who, following assessment or treatment, does not require further complex assessment or stabilisation and
• for whom the primary treatment goal is the maintenance of function and current health status if possible
• which is evidenced by:
  + the provision of health and treatment services and psychosocial support

Types of maintenance care:
A maintenance care provided in both community and hospital settings
B care and support of a person in an inpatient setting whilst the patient is awaiting transfer to residential care or alternate support services or where there are factors in the home environment (physical, social, psychological) which make discharge to home inappropriate for the person in the short term
C ongoing care and support of a person in a residential setting
D patients in receipt of care where the sole reason for admitting the person
National Sub-Acute and Non-Acute Patient Classification Study

to hospital is that the care that is usually provided in another environment
eg at home, in a nursing home, by a relative or with a guardian, is
unavailable in the short-term

E care and support of a person with a functional impairment for whom there
is no multidisciplinary program aimed at improvement of functional
capacity

F patients classified as Nursing Home Type Patients ie when a patient has
been in hospital for a continuous period exceeding 35 days and does not
have a current acute care certificate
The Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Casemix Classification

Proceedings of the Ninth National Casemix Conference, Brisbane 1997
The Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Casemix Classification

Proceedings of the Ninth National Casemix Conference, Brisbane 1997

Introduction and Background

This paper presents an overview of the recently completed National Sub-Acute and Non-Acute Patient (SNAP) classification study and the resultant classification - the Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Version 1 classification. AN-SNAP is designed for the classification of sub-acute and non-acute care provided in both inpatient and ambulatory settings and is intended to be useful for both funding and clinical management purposes.

For the purposes of classification development, sub-acute care is care provided to a person who requires health services but whose principal medical diagnosis (modified for factors such as age and procedures) is not adequate in explaining the need for, or the cost of, the services that they receive. In sub-acute care, the predominant treatment goal is enhancement in quality of life and/or functional status. In non-acute care, the predominant goal is maintenance of current health and functional status if possible.

Several Australian studies had already been undertaken before the National Sub-Acute and Non-Acute Casemix Classification Study was established. These previous studies had demonstrated that the DRG system is not suitable for the classification of sub-acute and non-acute care. They had also demonstrated that a viable alternate classification could not be found simply by testing those data items already captured on a routine basis in national morbidity collections. Whilst the patient's principal diagnosis (suitably modified for factors such as complications and age) may be predictive of the cost of acute care, the patient's medical diagnosis is not a key cost driver for sub-acute and non-acute care.

In consequence, the development of a casemix classification for sub-acute and non-acute care has necessitated the testing and incorporation of variables that are not collected on a routine basis. One important implication is that the introduction of a new sub-acute and non-acute casemix classification system requires that new data be routinely collected. In turn, the collection of new patient information has implications in relation to training, information systems design and the development and application of standard national definitions. The development of the first version of the classification is thus the first step in an ongoing process of implementation and improvement over several years.
National Sub-Acute and Non-Acute Patient Classification Study

Scope

The study aimed to test several key ideas that had emerged from several previous Australian studies. The first is that, within sub-acute and non-acute care, there are five clinically distinct Case Types:

1. Palliative care
2. Rehabilitation
3. Psychogeriatric
4. Geriatric evaluation and management (GEM) and
5. Maintenance care.

Each Case Type is defined based on both the characteristics of the person and on the goal of intervention.

The second key idea tested in the study is that the patient attributes which best predict resource consumption in the inpatient setting are also predictive of resource consumption in the ambulatory setting. The study thus included four different Episode Types:

1. Overnight episodes
2. Same day episodes
3. Outpatient episodes
4. Community episodes

Method

A total of 99 sites in all Australian States and Territories and 5 sites in New Zealand were selected for participation in the study. The 104 study sites represent:

- Public hospitals, including principal referral hospitals, major referral hospitals, major rural base hospitals, district hospitals, small community hospitals and designated hospices, rehabilitation centres and other sub-acute and non-acute hospitals
- Private hospitals, including designated hospices, rehabilitation centres and general hospitals
- Community health centres, domiciliary nursing services and other community care agencies

Between them, these sites collected a detailed clinical and service utilisation profile on 30,604 sub-acute and non-acute episodes over the data collection period. The data collection began at most sites on 1 July 1996 and continued for 3 months. Some sites began the collection in August and September. Certain specialist spinal injury and brain injury units continued the data collection up until Christmas 1996, making the maximum collection a period of 26 weeks.

The sample of episodes collected by the 104 sites is shown in Figure 1.

Figure 1 The Edited SNAP Episode Data Set
National Sub-Acute and Non-Acute Patient Classification Study

<table>
<thead>
<tr>
<th>CASE TYPE</th>
<th>EPISODE TYPE</th>
<th>Overnight patient</th>
<th>Same day patient</th>
<th>Outp't</th>
<th>Community client</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palliative care</td>
<td></td>
<td>1868</td>
<td>54</td>
<td>148</td>
<td>2526</td>
<td>4596</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td></td>
<td>7397</td>
<td>603</td>
<td>1704</td>
<td>741</td>
<td>10445</td>
</tr>
<tr>
<td>Psychogeriatric</td>
<td></td>
<td>479</td>
<td>13</td>
<td>102</td>
<td>363</td>
<td>957</td>
</tr>
<tr>
<td>Geriatric evaluation and management</td>
<td></td>
<td>1882</td>
<td>262</td>
<td>655</td>
<td>2437</td>
<td>5236</td>
</tr>
<tr>
<td>Maintenance care</td>
<td></td>
<td>1565</td>
<td>58</td>
<td>851</td>
<td>6896</td>
<td>9370</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>13191</td>
<td>990</td>
<td>3460</td>
<td>12963</td>
<td>30604</td>
</tr>
</tbody>
</table>

A clinical profile was collected on each patient at the beginning and end of their episode of care. This data set was designed by the SNAP study Clinical Project Team.

A common set of data items were collected for all five Case Types. This data set is shown in Figure 2 below.

Figure 2  Common Data Items for the five Case Types

<table>
<thead>
<tr>
<th>IDENTIFIERS</th>
<th>SOCIO-DEMOGRAPHIC</th>
<th>EPISODE DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient/client number</td>
<td>Date of birth</td>
<td>Episode type</td>
</tr>
<tr>
<td>Patient/client name (for site use only - deleted before data was sent to the study team)</td>
<td>Need for Interpreter service</td>
<td>Episode start date</td>
</tr>
<tr>
<td>Medicare number (for use as an identifier by study team only - deleted before de-identified data provided to health authorities)</td>
<td>Aboriginality</td>
<td>Reason for episode start</td>
</tr>
</tbody>
</table>

Data items were also collected that were specific to one or more Case Types. These items are shown in Figure 3.

Figure 3  Specific Data Items for each of the Five Case Types
<table>
<thead>
<tr>
<th>Palliative Care</th>
<th>Rehabilitation</th>
<th>Psychogeriatric Evaluation and Management</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode start RUG-ADL score</td>
<td>Episode start FIM score or Barthel score with RUG-ADL score</td>
<td>Episode start RUG-ADL score</td>
<td>Episode start RUG-ADL score</td>
</tr>
<tr>
<td>Palliative Care Phase (Stable, Unstable, Deteriorating, Terminal and Bereaved)</td>
<td>Impairment code</td>
<td>Psychogeriatric phase (Acute, Rehabilitation, Consolidation, Monitoring and follow-up)</td>
<td>Impairment code</td>
</tr>
<tr>
<td>Problem Severity Score (Pain, Other Symptom, Psychological/spiritual, Family/Carer)</td>
<td>Compensable status</td>
<td>Diagnosis, pick list of 9</td>
<td>Diagnosis, pick list of 10 (Victorian ACAT list)</td>
</tr>
<tr>
<td>Phase Change</td>
<td>Behaviour Scale</td>
<td>Behaviour Scale</td>
<td>Behaviour Scale</td>
</tr>
<tr>
<td>Episode end RUG-ADL score</td>
<td>Mini Mental State Examination (MMSE)</td>
<td>Mini Mental State Examination (MMSE)</td>
<td>Mini Mental State Examination (MMSE)</td>
</tr>
<tr>
<td></td>
<td>Episode end FIM score or Barthel score with RUG-ADL score</td>
<td>Health of the Nation Outcome Scale (HoNOS)</td>
<td>Episode end FIM score or Barthel score with RUG-ADL score</td>
</tr>
<tr>
<td></td>
<td>Episode end RUG-ADL score</td>
<td>Episode end RUG-ADL score</td>
<td>Episode end RUG-ADL score</td>
</tr>
</tbody>
</table>

Participating sites collected a comprehensive service utilisation profile of each episode and each episode was costed on a daily basis. The most intensive component of the collection was the capture of a daily log of time by 14,742 staff at participating sites.

In total, 2.156 million hours of staff time were recorded into the SNAP data base. Across all sites and all disciplines, this staff time had an average cost of 47 cents a minute ($28.20 per hour). After the allocation of salary related overhead costs, the average final cost was 62 cents per minute ($37.20 per hour). The study also captured the cost of goods and services, imaging, pathology, pharmacy and non-staff related overhead costs.

In addition to collecting patient-related staff time for both overnight and ambulatory episodes, the study also captured time spent on teaching and learning, research and health promotion.
commencement of the study and was still in care at study end. His cost profile is of interest on two accounts. The first is the ‘week-end effect’ which is due to the different level of therapies provided over the week-end periods. The second is the linear trendline showing the pattern of his costs over the period. Unlike most short duration acute care, his costs are not rapidly decreasing as his length of stay increases.

Results

Figure 6 shows the mix of overnight and ambulatory episodes for each Case Type. Ambulatory episodes include same day, outpatient and community episodes. There were significant differences between the Case Types. The majority of Rehabilitation episodes were overnight episodes. Psychogeriatric episodes occurred equally in overnight and ambulatory care. The majority of Palliative Care, GEM and Maintenance episodes were ambulatory.

Figure 7 shows the reasons why the overnight episodes started. Nearly half of all episodes began as an inter-hospital transfer, with a further 30% beginning as an admission from home. Only 5% of episodes began as a reclassification from acute care or from one of the other SNAP Case Types.

The reasons why the ambulatory episodes started is shown in Figure 8.
Consistent with the findings of other studies, only 15% began as a transfer from overnight care. The majority (70%) began as a direct referral (including self-referral) for ambulatory care.

Figure 6

Overnight and Ambulatory Episodes x Case Type
The AN-SNAP Version 1 Classification

The AN-SNAP Version 1 casemix classification is designed to classify both overnight and ambulatory care. It has 134 classes and explains 57.99% of the variation in all episode costs. Of this 58%, 21% was contributed by Episode Type and 37% by the classes. The overnight branch has 66 classes and explains 47.29% of the variance in the cost of overnight care. The ambulatory branch has 68 classes and explains 28.11% of variance in the cost of ambulatory care.

The overall structure of the classification is shown in Figure 9. There are five branches, one for each of the five Case Types.

The structure of the overnight classification is shown in Figure 10 and the ambulatory classification in Figure 11.

The classification is designed to allow it to be used in several different ways:

- Each of the two major branches (overnight and ambulatory) can be employed on their own
- or in combination with another classification (such as DRGs) and/or
- The classes can be used on a 'mix and match' basis.

For example, an overnight rehabilitation class can be combined with an ambulatory rehabilitation class to form a total payment for care that crosses treatment settings or it may be possible that, with experience, each of the classes could be employed as a building block in the development of standard packages of care that encompass different treatment settings. The existing SNAP data set could be further analysed to assess the feasibility of moving from a classification
Figure 9

The All Episode AN-SNAP Version 1 Classification

All sub-acute and non-acute care

- Palliative Care
  - 11 classes for overnight care
  - 22 classes for ambulatory care

- Rehabilitation
  - 32 classes for overnight care
  - 15 classes for ambulatory care

- Psychogeriatric
  - 6 classes for overnight care
  - 7 classes for ambulatory care

- Geriatric Evaluation and Management
  - 6 classes for overnight care
  - 8 classes for ambulatory care

- Maintenance
  - 11 classes for overnight care
  - 16 classes for ambulatory care

of 'episodes of care' to a classification of 'episodes of illness'.
Figure 10

The AN-SNAP Version 1 Classification of Overnight Care

- **Palliative Care**
  - 11 classes split on Palliative Care Phase, the RUG-ADL at phase start and age (Classes 101 - 111)

- **Rehabilitation**
  - 32 classes split on Admit for assessment/treatment, Functional Impairment Codes, FIM Motor, FIM Cognition and age (Classes 201-232)

- **Psychogeriatric**
  - 6 classes split on short-term/ongoing, the HoNOS Total and HoNOS items (Classes 301-306)

- **Geriatric Evaluation and Management**
  - 6 classes split on FIM Cognition, FIM Motor and age (Classes 401-406)

- **Maintenance**
  - 11 classes split on short-term/ongoing, Type of Maintenance Care and the RUG-ADL (Classes 501-511)
Figure 11

The AN-SNAP Version 1 Classification of Ambulatory Care

- **Palliative Care**
  - 22 classes split on Provider Type, Phase, the RUG-ADL, Severity and age (Classes 151-172)

- **Rehabilitation**
  - 15 classes - 2 for assessment & 13 for treatment - split on Assessment/Treatment, Episode Type, Provider Type, Impairment Code & the FIM Motor score (Classes 351-365)

- **Psychogeriatric**
  - 7 classes - 2 for assessment & 5 for treatment - split on Assessment/Treatment, Episode Type, & the HoNOS (Classes 351-358)

- **Geriatric Evaluation and Management**
  - 8 classes - 3 for assessment & 5 for treatment - split on Assessment/Treatment, Episode Type, Provider Type, & the FIM Motor score (Classes 451-458)

- **Maintenance Care**
  - 16 classes - 6 for assessment & 10 for maintenance & support - split on Assessment/Maintenance & Support, Episode Type, Provider Type, Age & the RUG-ADL (Classes 551-566)
Major findings and implications

Diversity

A critical finding of this study is that there is significant diversity in the cost of sub-acute and non-acute care. There is a 30 fold variation in episode cost between the most expensive and the least expensive class in the AN-SNAP overnight classification and a 5 fold variation in per diem cost.

Likewise, there is significant diversity in the cost of ambulatory sub-acute and non-acute care. There is a 48 fold variation in episode cost and a 5 fold variation in per diem cost between the most expensive and the least expensive class in the ambulatory classification.

Episode Classification

The findings confirm that there is an underlying episode classification, not just in overnight care, but also in ambulatory care. It is possible to classify ambulatory episodes (outpatients and community health) on an episode basis and not just a per diem basis.

Cost Drivers

The variables driving costs in the inpatient setting are also important cost drivers in the ambulatory setting. However, there are other factors at play in the ambulatory setting. Community care is inherently more complex than institutional care. Common patient variables across institutional and community care are necessary but they are insufficient to adequately explain cost variation in ambulatory care.

The key cost drivers identified by the study have been used to create the classification and the data items that need to be collected are included as an attachment to this paper. They are:

- **Case Type** - characteristics of the person and the goal of treatment
- **function** (motor and cognition) - all Case Types
- **phase** (stage of illness) - palliative care
- **impairment** - rehabilitation
- **behaviour** - psychogeriatric
- **age** - palliative care, rehabilitation, GEM and maintenance

There are additional cost drivers in ambulatory care which have been incorporated in the ambulatory branches:

- **problem severity** - palliative care
- **phase** - psychogeriatric
- **usage of other health and community services**

In addition, it is likely that carer availability and functional ability in instrumental ADLs (eg. medication management; food preparation) are also important cost drivers in sub-acute and non-acute care. The study report recommends that these variables be tested for incorporation in future versions.

Opportunities for Service Substitution
The majority of patients being treated in the overnight setting were clinically different to those treated in the ambulatory setting. However, there was also a significant group of episodes that had a similar profile across both overnight and ambulatory care. The results suggest that there are opportunities, at least in some cases, to use the classification to promote service substitution between overnight care, institutional ambulatory care and community-based ambulatory care.

Information Collection

Many of the data items used in AN-SNAP are currently collected by individual service providers. But few are included in National and State data collections. This had been anticipated because it had already been demonstrated that a viable classification could not be found simply by employing those data items already captured on a routine basis. Any new classification would require the use of new variables.

There are obvious implications for service providers. For those already using the particular measurement instruments and collecting the required items on a routine basis, AN-SNAP poses no additional burden. For those already assessing the underlying attributes but by the use of different measurement instruments, implementation of AN-SNAP would require either a change in the instruments used or a successful mapping from one instrument to another. For those not assessing their patients with respect to attributes such as motor function, cognition and stage of illness, implementation of AN-SNAP would require additional work.

Irrespective of the current practices of local providers, implementation of AN-SNAP has important implications for information systems, coding and data entry. If for no other reason, this implies the need for a gradual, planned approach to implementation. However, one important feature of the variables used in AN-SNAP is that many of them are not only driving costs, they are also key measures of health outcomes. The collection of the one source data set (that is designed specifically for this care) can be an efficient investment of resources that can produce information which is useful for funding, for clinical management and for measuring health outcomes.

The Future

The National Sub-Acute and Non-Acute Casemix Classification Committee has recently recommended that AN-SNAP be adopted as the first version of the national classification, noting that implementation is a matter for each jurisdiction and that the classification will require ongoing development over time.

There are three issues that now need to be addressed. The first is the interface between the various casemix classification systems that are now available or are developing. The second is the planning for the phased implementation of the classification in a way that takes account of the implications for training and information systems and the need to model the impact on providers. Implementation issues, including timing, policy, method and scope, are matters for each jurisdiction. The third is the ongoing improvement of the classification itself. The SNAP study has produced the first version of the classification.
Ongoing refinement (leading to Version 2) will be possible through further analysis of the existing data set in combination with analysis of the results of a carefully planned and phased implementation.

Conclusion

The national SNAP Study was an incredibly resource intensive project and required considerable effort by the national, state and local coordinators, the Clinical Project Team and the 15,000 health professionals who participated in the study.

The six relevant clinical bodies have endorsed the classification on the basis that it makes clinical sense and the statistical performance of AN-SNAP is more than adequate. However, AN-SNAP can be improved.

Further work is required, especially in the ambulatory classification, in the development of more sensitive measurement instruments and in funding system design. The most important result of the National SNAP Study is that it has developed a classification structure which provides the framework for progressive improvement over time.

Reference

Sub-Acute and Non-Acute Casemix in Australia

Lee L, Eagar K and Smith M

National Sub-Acute and Non-Acute Patient Classification Study

Sub-acute and non-acute casemix in Australia

Lynette A Lee, Kathy M Eagar and Michael C Smith
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Synopsis

- The costs of sub-acute care (palliative care, rehabilitation medicine, psychogeriatrics, and geriatric evaluation and management) and non-acute care (nursing home, convalescent and planned respite care) are not adequately described by existing casemix classifications.
- The predominant treatment goals in sub-acute care are enhancement of quality of life and/or improvement in functional status and, in non-acute care, maintenance of current health and functional status.
- A national classification system for this area has now been developed -- the Australian National Sub-Acute and Non-Acute Patient Classification System (AN-SNAP).
- The AN-SNAP system, based on analysis of over 30 000 episodes of care, defines four case types of sub-acute care (palliative care, rehabilitation, psychogeriatric care, and geriatric evaluation and management) and one case type of non-acute care (maintenance care), and classifies both overnight and ambulatory care.
- The AN-SNAP system reflects the goal of management -- a change in functional status or improvement in quality of life -- rather than the patient's diagnosis. It will complement the existing AN-DRG classification.

Introduction

The Australian healthcare system is about to implement a new casemix classification system for sub-acute and non-acute care, the costs of which are not adequately described by traditional diagnostic tools. Sub-acute care comprises palliative care, rehabilitation medicine, psychogeriatrics, and geriatric evaluation and management. Non-acute care includes nursing home, convalescent and planned respite care. The new casemix classification system, which includes hospital as well as community care, reflects the goal of management -- a change in functional status or improvement in quality of life -- rather than the underlying patient diagnosis.

Background

Sub-acute casemix has been evolving for 15 years. In 1983, when the United States Health Care Financing Administration decided that payments for hospital care would be on a prospective payment system, based on acute-care diagnosis-related groups (DRGs), rehabilitation, psychiatric, children's and long-term facilities were specifically excluded. It was recognised that these forms of care, although not acute, were still complex and expensive and required long hospital stays.

In 1987, a US Department of Health and Social Services report reiterated that their current DRG system did not adequately take into account the special
National Sub-Acute and Non-Acute Patient Classification Study

circumstances of patients requiring long hospital stays. Studies in the United States over the following few years not only confirmed that DRGs did not adequately describe costs in one of these areas of care (rehabilitation medicine), but that as a consequence quality of care had deteriorated, as measured by changed length of hospital stay, increased readmission rates and a rising number of nursing home admissions.

As casemix development progressed in Australia, Australian studies also expressed the need for a different approach for costing of rehabilitation, geriatric evaluation and management, palliative care and psychogeriatrics.

The term sub-acute care was coined in 1992 to describe "care which is provided for a person who requires health services but whose principal medical diagnosis (modified for factors such as age and procedures) is not adequate in explaining the need for, or the cost of, the services that s/he receives".

Goals of sub-acute and non-acute care

In sub-acute care the predominant goal is enhancement of a patient's quality of life and/or improvement in his or her functional status. In non-acute care the predominant goal is maintenance of a patient's current health and functional status. Because of this difference in goals, it was expected that factors other than diagnosis were more likely to explain the costs of these forms of care.

Rehabilitation: Factors contributing to the success of rehabilitation programs have included patient characteristics such as functional status on admission, age, disease site, time from referral to beginning of program, comorbidities such as cognitive function and depression, and availability of resources. The factor which appears in US and Australian studies to predict cost most accurately in these areas of care is a patient's functional status on admission.

Palliative care: Australian clinicians were instrumental in developing a casemix classification system with a primary approach from a clinical perspective. The development involved broad consultation and collaboration. The palliative care classification identified stage of illness or palliative care phase (eg, stable, deteriorating, terminal), symptom severity and acuity level (or nursing dependency) as the major factors explaining costs for this form of care.

Psychogeriatrics and other aged care: The goals of admission in aged care are improving health status, modifying symptoms and enhancing function, living conditions, behaviour and quality of life.
Sub-acute and non-acute care classifications

Several classification systems for sub-acute and non-acute episodes of care have been developed, including the Resource Utilisation Groups and the California Long Term Care System. The Resident Classification Index is an Australian classification system used in nursing homes to classify non-acute episodes of care. In the United States the FIM-FRG system (Functional Independence Measure- Function Related Groups) for rehabilitation medicine is the most developed.

Studies in Australia have continued to demonstrate that the best predictor of cost for sub-acute care is the goal of care. The most recent studies are the 1995 Victorian Rehabilitation Casemix Report and the 1996 NSW Sub-Acute Casemix Area Network Project.

AN-SNAP study

The Australian National Sub-Acute and Non-Acute Patient Casemix Study was conducted in 1996 in 99 hospital and community health sites in all Australian States and Territories and in five sites in New Zealand. Over 30,000 episodes of care were analysed, including overnight, same day, outpatient and community episodes of care.

The study established that there are five case types of sub-acute and non-acute care. Sub-acute care includes palliative care, rehabilitation, psychogeriatric care, and geriatric evaluation and management; and the final case type -- maintenance care -- is defined as non-acute care. Each of the five case types is defined according to the characteristics of the patient and the goal of care, and not the institution or service in which she or he is treated (e.g., a patient may receive geriatric evaluation and management in a hospice, or palliative care in a rehabilitation unit).

A critical finding of the study was that across the spectrum of case types and classes there is significant diversity in the cost of sub-acute and non-acute care for both overnight and ambulatory episodes. For example, there is a 30-fold variation in episode cost and a five-fold variation in per diem cost between the most expensive and the least expensive classes in the overnight classification, thus confirming the necessity for a classification in this area to allow for appropriate output-based funding.

AN-SNAP classification system

From the study, a national classification for sub-acute and non-acute care was developed -- the Australian National Sub-Acute and Non-Acute Patient Casemix Classification System, or AN-SNAP classification.

AN-SNAP version 1 (Box 1) classifies both overnight and ambulatory care. It has 134 classes and the classification explains 58% of the variation in all episode costs. Of this 58%, 21% is contributed by episode type and 37% by the classes. The overnight branch has 66 classes and the classification explains 47% of the variance in the cost of overnight care. The ambulatory branch has 68 classes and the classification explains 28% of the variance in the cost of ambulatory care. These results are an improvement on the performance achieved by acute-care DRGs.
Analysis of the decision trees for overnight and ambulatory care in Box 1 shows the factors which have been incorporated into the system as predictors of cost:

- Palliative care -- phase, functional dependence as measured by RUG-ADL (resource utilisation groups - activities of daily living),\textsuperscript{18} and age;
- Rehabilitation -- impairment groupings, functional status as measured by FIM (Functional Independence Measure),\textsuperscript{22} and age;
- Psychogeriatrics -- psychiatric symptom severity and functional status as measured by the HoNOS (Health of the Nation Outcome Scales),\textsuperscript{23}
- Geriatric evaluation and management -- cognitive status in addition to motor capacity and age; and
- Maintenance care -- functional status.
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All overnight subacute and non-acute care

Palliative Care
11 Classes
101-111
Classes split on:
• Palliative care phase
• RUG-ADL at phase start
• Age

Rehabilitation
32 Classes
201-232
Classes split on:
• Admit for assessment or treatment
• Functional impairment codes
• FIM motor score
• FIM cognition
• Age

Psychogeriatric Care
6 Classes
301-306
Classes split on:
• Short term / ongoing
• HoNOS total
• HoNOS items
• Cognition
• FIM motor score
• Age

Geriatric Evaluation and Management
6 Classes
401-406
Classes split on:
• Cognition
• FIM motor score
• Age

Maintenance Care
11 Classes
501-511
Classes split on:
• Short term / ongoing care
• Type of maintenance care
• RUG-ADL

All ambulatory subacute and non-acute care

Palliative Care
22 Classes
151-172
Classes split on:
• Provider type
• Phase
• RUG-ADL
• Severity
• Age

Rehabilitation
15 Classes
251-265
Classes split on:
• Assessment / treatment split on:
• Assessment / treatment
• Episode type
• Provider type
• Impairment code
• FIM motor score

Psychogeriatric Care
7 Classes
351-357
Classes split on:
• Assessment / treatment
• Episode type
• Phase
• HoNOS

Geriatric Evaluation and Management
8 Classes
451-459
Classes split on:
• Assessment / treatment
• Episode type
• Phase
• HoNOS

Maintenance Care
16 Classes
551-566
Classes split on:
• Assessment / treatment
• Episode type
• Provider type
• FIM motor score
• Age
• RUG-ADL

RUG-ADL = resource utilisation groups - activities of daily living. FIM = Functional Independence Measure. HoNOS = Health of the Nation Outcome Scale.

1: The Australian National Sub-Acute and Non-Acute Patient Casemix Classification System (version 1) (AN-SNAP).
The AN-SNAP study showed that the variables driving costs in the inpatient setting are also important cost drivers in the ambulatory setting. However, community care is inherently more complex than institutional care. Common variables across institutional and community care are necessary, but are insufficient in explaining cost variations. In consequence, the classification makes use of some community variables not required in institution care (e.g., provider type and assessment or treatment episode).

**Implications of AN-SNAP**

The implementation of this classification has important implications. Firstly, a number of classifications are now available in Australia and policy decisions on the interaction between these classifications are required. Secondly, data on many of the characteristics used in AN-SNAP are currently collected by individual service providers, but most are not routinely collected by existing hospital and community information systems.

AN-SNAP, along with its further development, has been endorsed by the Australian Casemix Clinical Committee for adoption as the national classification for sub- and non-acute care. Implementation remains a State and Territory issue which requires a planned, staged approach.

Already some States, including Queensland and New South Wales, are implementing AN-SNAP, and others have indicated their intention to do so in the near future. The adoption of the system will complement the existing DRG system, as illustrated in the New South Wales approach (Box 2).

<table>
<thead>
<tr>
<th>Setting/type of care</th>
<th>Primary and community care</th>
<th>Acute care</th>
<th>Subacute and non-acute care</th>
<th>Mental health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inpatient</td>
<td>Not applicable</td>
<td>Emergency Department</td>
<td>AN-DRGs</td>
<td>ICU Separate budget; possibly, a separate classification</td>
</tr>
<tr>
<td>Same day</td>
<td>Select/modify emergency department system</td>
<td>AN-DRGs with same-day weights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient</td>
<td></td>
<td>Select/modify available clinic based system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td></td>
<td>Progressive development of specific modules for primary and community care. Linkage with AN-SNAP and MH-CASC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2: Model of proposed New South Wales classification systems by setting and type of care.
References

- Hindle D. The Victorian Palliative Care casemix project: statistical analysis and funding recommendations. Wollongong: Centre for Health Service Development, University of Wollongong, 1995.
• Center for Functional Assessment Research, Uniform Data Set for Medical Rehabilitation. 1993 Guide to the Uniform Data Set for Medical Rehabilitation (Adult FIM), V4.0. Buffalo: State University of New York, Buffalo, 1993.
The Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Casemix Classification

The Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Casemix Classification


Abstract

The Australian National Sub-Acute and Non-Acute Patient (AN-SNAP) Version 1 casemix classification was completed in 1997. AN-SNAP is designed for the classification of sub-acute and non-acute care provided in both inpatient and ambulatory settings and is intended to be useful for both funding and clinical management purposes. The National Sub-Acute and Non-Acute Casemix Classification study has produced the first version of a national classification for sub-acute and non-acute care. Ongoing refinement (leading to Version 2) will be possible through further analysis of the existing data set in combination with analysis of the results of a carefully planned and phased implementation.

Introduction and Background

The use of casemix classifications is now routine in Australian hospitals. This began with the development and use of the AN-DRG casemix classification system from the mid 1980's. The DRG system is designed to classify acute inpatient hospital episodes. However, sub-acute and non-acute episodes are not adequately classified by DRGs and it is now accepted that sub-acute and non-acute care requires a different classification approach.

The limitation of the DRG system was recognised from the early 1990's and was reflected in the five year strategic plan for the National Casemix Development Program that was endorsed by the Australian Health Ministers Advisory Council in 1993. This plan established three priority areas - classification, costing and payments - and identified a series of required strategies including:

- determination of classification systems for rehabilitation, geriatric medicine, palliative care and psychiatric episodes;
- the development of associated cost weights; and
- the encouragement of clinicians, managers and industrial groups to link casemix accounting, information collection and budgeting to clinical management practices.

For the purposes of classification development, sub-acute care is care provided to a person who requires health services but whose principal medical diagnosis (modified for factors such as age and procedures) is not adequate in explaining the need for, or the cost of, the services that they receive. In sub-acute care, the predominant treatment goal is enhancement in quality of life and/or functional status. In non-acute care, the predominant goal is maintenance of current health and functional status if possible.

In 1995, the Commonwealth convened the first meeting of the National Sub-Acute and Non-Acute Casemix Committee whose role was to achieve national agreement on the development of a classification for sub-acute and non-acute care. The National Steering Committee resolved that a study should proceed...
National Sub-Acute and Non-Acute Patient Classification Study

(the National Sub-Acute and Non-Acute Casemix Classification Study) with the goal of establishing an agreed national classification (Version 1) for use by 1997-1998. Its scope was to include rehabilitation, geriatric medicine, palliative care and geriatric psychiatry episodes.

The NSW Health Department agreed to act as the lead agency and the project was commissioned through the Casemix Area Network (CAN) and the Centre for Health Service Development, University of Wollongong. A National Steering Committee was formed to oversee the project. A National Clinical Project Team and a parallel Costing Project Team were also established to assist the research team develop the detailed study methodology.

Several Australian studies had already been undertaken before the National Sub-Acute and Non-Acute Casemix Classification Study was established2,3,4,5,6,7,8,9,10,11. These previous studies had demonstrated that the DRG system is not suitable for the classification of sub-acute and non-acute care. They had also demonstrated that a viable alternate classification could not be found simply by testing those data items already captured on a routine basis in national morbidity collections. While the patient’s principal diagnosis (suitably modified for factors such as complications and age) may predict the cost of acute care, the patient’s medical diagnosis is not a key cost driver for sub-acute and non-acute care.

The development of a casemix classification for sub-acute and non-acute care has necessitated the testing and incorporation of variables that are not collected on a routine basis. One important implication is that the introduction of a new sub-acute and non-acute casemix classification system requires that new data be routinely collected. In turn, the collection of new patient information has implications in relation to training, information systems design and the development and application of standard national definitions. The development of the first version of the classification is thus the first step in an ongoing process of implementation and improvement over several years.

Scope

The study aimed to test several key ideas that had emerged from several previous Australian studies. The first is that, within sub-acute and non-acute care, there are five clinically distinct Case Types12:

1. Palliative care
2. Rehabilitation
3. Psychogeriatric
4. Geriatric evaluation and management (GEM) and
5. Maintenance care.

Each Case Type is defined based on both the characteristics of the patient and on the goal of intervention.

The second key idea tested in the study is that the patient attributes which best predict resource consumption in the inpatient setting are also predictive of resource consumption in the ambulatory setting. The study thus included four different Episode Types:

1. Overnight episodes
National Sub-Acute and Non-Acute Patient Classification Study

2 Same day episodes
3 Outpatient episodes
4 Community episodes

Method

A total of 99 sites in all Australian States and Territories and 5 sites in New Zealand were selected for participation in the study. The 104 study sites represent:

• Public hospitals, including principal referral hospitals, major referral hospitals, major rural base hospitals, district hospitals, small community hospitals and designated hospices, rehabilitation centres and other sub-acute and non-acute hospitals
• Private hospitals, including designated hospices, rehabilitation centres and general hospitals
• Community health centres, domiciliary nursing services and other community care agencies.

Between them, these sites collected a detailed clinical and service utilisation profile on 30,604 sub-acute and non-acute episodes over the data collection period. The data collection began at most sites on 1 July 1996 and continued for 3 months. Some sites began the collection in August and September. Certain specialist spinal injury and brain injury units continued the data collection up until Christmas 1996, making the maximum collection period 26 weeks.

A clinical profile was collected on each patient at the beginning and end of their episode of care. This data set was designed by the SNAP study Clinical Project Team.

A common set of data items (shown in Table 1) was collected for all five Case Types.
Table 1: Common Data Items for the five Case Types

<table>
<thead>
<tr>
<th>IDENTIFIERS</th>
<th>SOCIO-DEMOGRAPHIC</th>
<th>EPISODE DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient/client number</td>
<td>Date of birth</td>
<td>Episode type</td>
</tr>
<tr>
<td>Patient/client name</td>
<td>Need for Interpreter service</td>
<td>Episode start date</td>
</tr>
<tr>
<td>(for site use only -</td>
<td>Aboriginality</td>
<td>Assessment only</td>
</tr>
<tr>
<td>deleted before</td>
<td></td>
<td>Reason for episode start</td>
</tr>
<tr>
<td>data was sent to the</td>
<td></td>
<td>Leave days (admitted patients only).</td>
</tr>
<tr>
<td>study team)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare number</td>
<td></td>
<td>Sole Practitioner Intervention</td>
</tr>
<tr>
<td>(for use as an</td>
<td></td>
<td>Episode end date</td>
</tr>
<tr>
<td>identifier by study</td>
<td></td>
<td>Reason for episode end</td>
</tr>
<tr>
<td>team only - deleted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>before de-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>identified data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>provided to health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>authorities)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data items were also collected that were specific to one or more Case Types. These items are shown in Table 2.

Table 2: Specific Data Items for each of the Five Case Types

<table>
<thead>
<tr>
<th>Palliative Care</th>
<th>Rehabilitation</th>
<th>Psychogeriatric</th>
<th>Geriatric Evaluation and Management</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode start</td>
<td>Episode start FIM score or Barthel score with RUG-ADL score</td>
<td>Episode start RUG-ADL score</td>
<td>Episode start FIM score or Barthel score with RUG-ADL score</td>
<td>Episode start RUG-ADL score</td>
</tr>
<tr>
<td>RUG-ADL score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palliative Care</td>
<td>Impairment code</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase (Stable,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable, Deteriorating, Terminal and Bereaved)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem Severity Score (Pain, Other Symptom, Psychological/spiritual, Family/Carer)</td>
<td>Compensable status</td>
<td>Diagnosis, pick list of 9</td>
<td>Diagnosis, pick list of 10 (Victorian ACAT list)</td>
<td>Diagnosis, pick list of 9 (Victorian ACAT list)</td>
</tr>
<tr>
<td>Phase Change</td>
<td>Behaviour Scale</td>
<td>Behaviour Scale</td>
<td>Behaviour Scale</td>
<td>Behaviour Scale</td>
</tr>
</tbody>
</table>

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The study adopted the following instruments to measure and code its results:

- the Functional Independence Measure (FIM)\(^{13}\) and the Resource Utilisation Groups Activities of Daily Living scale (RUG-ADL)\(^{14}\) and the paediatric version of the FIM (the WeeFIM)\(^{15}\) to measure function;
- the Folstein Mini Mental State Examination (MMSE)\(^{16}\) to measure cognition;
- the three behaviour items from the Resident Classification Instrument (RCI)\(^{17}\) to measure behaviour;
- the AAHPC Palliative Care Phase and the AAHPC Severity Score\(^{18}\) to measure palliative care stage and severity;
- the Health of the Nation Outcome Scales (HoNOS)\(^{19}\) to measure psychogeriatric severity and function;
- the UDS Functional Impairment Codes Version 4.0\(^{20}\) to code impairment.

No consensus could be reached during the study design phase on a standard measure of function to be used for Rehabilitation and Geriatric Evaluation and Management but it was agreed that the FIM would be the preferred tool for the study. However, sites already using the Barthel Index (another commonly used measure of motor function) were given the option of using a combination of the Barthel Index and the RUG-ADL instead of the FIM. In these cases, sites were required to record both the patient score and the maximum possible score for the particular version in use. Barthel scores were converted to percentages to allow comparison across different versions of the Barthel instrument.

Participating sites collected a comprehensive service utilisation profile of each episode and each episode was costed on a daily basis. The most intensive component of the collection was the capture of a daily log of time by the 14,742 participating staff.
Results

The sample of episodes collected by the 104 sites is shown in Table 3.

### Table 3  The Edited SNAP Episode Data Set

<table>
<thead>
<tr>
<th>CASE TYPE</th>
<th>EPISODE TYPE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overnight patient</td>
<td></td>
</tr>
<tr>
<td>Palliative care</td>
<td>1868</td>
<td>4596</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>7397</td>
<td>10445</td>
</tr>
<tr>
<td>Psychogeriatric care</td>
<td>479</td>
<td>957</td>
</tr>
<tr>
<td>Geriatric evaluation and manag</td>
<td>1882</td>
<td>5236</td>
</tr>
<tr>
<td>Maintenance care</td>
<td>1565</td>
<td>9370</td>
</tr>
<tr>
<td></td>
<td>13191</td>
<td>30604</td>
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<td></td>
<td>Same day patient</td>
<td></td>
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<td></td>
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<td>3460</td>
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<td></td>
<td>Community client</td>
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<td></td>
<td>741</td>
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<td>6896</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12963</td>
<td></td>
</tr>
</tbody>
</table>

In total, 2.156 million hours of staff time were recorded into the SNAP data base. Across all sites and all disciplines, this staff time had an average cost of 47 cents a minute ($28.20 per hour). After the allocation of salary related overhead costs, the average final cost was 62 cents per minute ($37.20 per hour). The study also captured the cost of goods and services, imaging, pathology, pharmacy and non-staff related overhead costs. In addition to collecting patient-related staff time for both overnight and ambulatory episodes, the study also captured time spent on teaching and learning, research and health promotion.

Figure 1 shows the mix of overnight and ambulatory episodes for each Case Type. Ambulatory episodes include same day, outpatient and community episodes. There were significant differences between the Case Types. The majority of Rehabilitation episodes were overnight episodes. Psychogeriatric episodes occurred equally in overnight and ambulatory care. The majority of Palliative Care, GEM and Maintenance episodes were ambulatory.

Figure 2 shows the reasons why the overnight episodes started. Nearly half of all episodes began as an inter-hospital transfer, with a further 30% beginning as an admission from home. Only 5% of episodes began as a reclassification from
Figure 1

Overnight and Ambulatory Episodes x Case Type

The reasons why the ambulatory episodes started is shown in Figure 3. Consistent with the findings of other studies, only 15% began as a transfer from overnight care. The majority (70%) began as a direct referral (including self-referral) for ambulatory care.
Reason for start - ambulatory episodes

- First contact: 70%
- Transfer from overnight care: 15%
- Case Type change: 15%

The AN-SNAP Version 1 Classification

A casemix classification, termed the AN-SNAP Version 1 casemix classification, was developed. It is designed to classify both overnight and ambulatory care.

The overall structure of the classification is shown in Figure 4. There are five branches, one for each of the five Case Types. The structure of the overnight classification is shown in Figure 5 and the ambulatory classification in Figure 6.

AN-SNAP has 134 classes and explains 57.99% of the variation in all episode costs. Of this 58%, 21% was contributed by Episode Type and 37% by the classes. The overnight branch has 66 classes and explains 47.29% of the variation in the cost of overnight care. The ambulatory branch has 68 classes and explains 28.11% of variation in the cost of ambulatory care.
The AN-SNAP Version 1 Classification of Overnight Care

- **Palliative Care**
  - 11 classes split on Palliative Care Phase, the RUG-ADL at phase start and age (Classes 101 - 111)

- **Rehabilitation**
  - 32 classes split on Admit for assessment/treatment, Functional Impairment Codes, FIM Motor, FIM Cognition and age (Classes 201-232)

- **Psychogeriatric**
  - 6 classes split on short-term/ongoing, the HoNOS Total and HoNOS items (Classes 301-306)

- **Geriatric Evaluation and Management**
  - 6 classes split on FIM Cognition, FIM Motor and age (Classes 401-406)

- **Maintenance**
  - 11 classes split on short-term/ongoing, Type of Maintenance Care and the RUG-ADL (Classes 501-511)
Discussion

The results suggest that there is an underlying episode classification, not just in overnight care, but also in ambulatory care. It is possible to classify both inpatient and ambulatory episodes (outpatients and community health) on an episode basis and not just a per diem basis. The statistical results for the overnight care branch compare well with the reported performance of the AN-DRG classification in explaining variance in length of stay of overnight medical episodes (35.4%)\(^\text{21}\). The statistical results for the ambulatory branch suggests that it provides a viable structure for further development.

The AN-SNAP study findings are diverse. Major findings emerging from the study cover diversity, cost drivers, opportunities for service substitution and information collection.

Diversity

A critical finding of this study is that there is significant diversity in the cost of sub-acute and non-acute care. There is a 30 fold variation in episode cost between the most expensive and the least expensive class in the AN-SNAP overnight classification and a 5 fold variation in per diem cost.

Likewise, there is significant diversity in the cost of ambulatory sub-acute and non-acute care. There is a 48 fold variation in episode cost and a 5 fold variation in per diem cost between the most expensive and the least expensive class in the ambulatory classification.

Cost Drivers
The variables driving costs in the inpatient setting are also important cost drivers in the ambulatory setting. However, there are other factors at work in the ambulatory setting. Community care is inherently more complex than institutional care. Common patient variables across institutional and community care are necessary but they are insufficient to adequately explain cost variation in ambulatory care.

The key cost drivers identified by the study have been used to create the classification. They are:
- **Case Type** - characteristics of the person and the goal of treatment
- **function** (motor and cognition) - all Case Types
- **phase** (stage of illness) - palliative care
- **impairment** - rehabilitation
- **behaviour** - psychogeriatric
- **age** - palliative care, rehabilitation, GEM and maintenance.

There are additional cost drivers in ambulatory care which have been incorporated in the ambulatory branches:
- **problem severity** - palliative care
- **phase** - psychogeriatric
- **usage of other health and community services**.

In addition, it is likely that carer availability and functional ability in domestic or instrumental activities of daily living (eg. medication management; food preparation) are also important cost drivers in sub-acute and non-acute care. The study report recommends that these variables be tested for incorporation in future versions.

Opportunities for Service Substitution

The majority of patients being treated in the overnight setting were clinically different to those treated in the ambulatory setting. However, there was also a significant group of episodes that had a similar profile across both overnight and ambulatory care. The results suggest that there are opportunities, at least in some cases, to use the classification to promote service substitution between overnight care, institutional ambulatory care and community-based ambulatory care.

Information Collection

Many of the data items used in AN-SNAP are currently collected by individual service providers. But few are included in National and State data collections. This had been anticipated because it had already been demonstrated that a viable classification could not be found simply by employing those data items already captured on a routine basis. Any new classification would require the use of new variables.

There are obvious implications for service providers. For those already using the particular measurement instruments and collecting the required items on a routine basis, AN-SNAP poses no additional burden. For those already assessing the underlying attributes but by the use of different measurement instruments, implementation of AN-SNAP would require either a change in the instruments used or a successful mapping from one instrument to another.
those not assessing their patients with respect to attributes such as motor function, cognition and stage of illness, implementation of AN-SNAP will require additional work.

Irrespective of the current practices of local providers, implementation of AN-SNAP has important implications for information systems, coding and data entry. If for no other reason, this implies the need for a gradual, planned approach to implementation.

However, one important feature of the variables used in AN-SNAP is that many of them are not only driving costs, they are also key measures of health outcomes. The collection of the one source data set (that is designed specifically for this care) can be an efficient investment of resources that can produce information which is useful:

- for funding,
- for clinical management and
- for measuring health outcomes.

Implementation issues

The AN-SNAP classification is designed to allow it to be used in several different ways:

- Each of the two major branches (overnight and ambulatory) can be employed on their own or in combination with another classification (such as DRGs) and/or
- The classes can be used on a ‘mix and match’ basis. For example, an overnight rehabilitation class can be combined with an ambulatory rehabilitation class to form a total payment for care that crosses treatment settings or
- It may be possible that, with experience, each of the classes could be employed as a building block in the development of standard packages of care that encompass different treatment settings. The existing SNAP data set could be further analysed to assess the feasibility of moving from a classification of ‘episodes of care’ to a classification of ‘episodes of illness’.

A range of issues will need to be addressed as the AN-SNAP classification is progressively implemented. AN-SNAP has been recommended as the first version of the national classification and, as such, will run in parallel with the DRG system. As with DRGs, implementation is a matter for each jurisdiction. Implementation commenced in 1998 in New South Wales, South Australia and Queensland and work to explore its applicability has commenced in Tasmania, Western Australia and the Northern Territory. Likewise, private hospitals are seeking creation of a mechanism to support the introduction of AN-SNAP or a suitable modification.

A key issue to be resolved is the interface between the various casemix classification systems that are now available or are being developed. One consequence of developing a separate classification for sub-acute and non-acute care is that it requires the boundary with acute care to be more clearly defined.
A fundamental issue to be resolved is whether, for casemix purposes, the unique feature of acute care is the 'acuity' of the patient or rather the presence of a clearly identified principal diagnosis that can be used to assign a patient to a "diagnosis related group". Once that issue is resolved, it will be possible to test the boundary between 'acute care' and the care reported in this study. It will also be necessary to resolve the treatment of Psychogeriatric episodes as this care is also included in the classification developed in the recently completed Mental Health Classification and Service Cost study.

A further issue is that this care is provided both by designated services (such as palliative care and rehabilitation teams) and also by non-designated services (such as geriatric medicine, general medicine, rural hospitals, and generalist community health services). The question of how to both identify and capture data on sub-acute and non-acute care episodes that occur other than in designated units is yet to be resolved.

A range of issues will need to be addressed in the planning for the phased implementation of the classification in a way that takes account of the implications for training and information systems and the need to model the impact on providers. The dilemma is that the data that are currently collected on a routine basis do not explain the need for, or the cost of, care for these patients. However, collecting new data has significant implications for training, data collection and data entry. Implementation issues, including timing, policy, method and scope, are matters for each jurisdiction.

The final issue is the ongoing improvement of the classification itself. The SNAP study has produced the first version of the classification. Ongoing refinement (leading to Version 2) will be possible through further analysis of the existing data set in combination with analysis of the results of a carefully planned and phased implementation. Future versions could incorporate new clinical measures as better measurement instruments become available. They could also more specifically address the needs of special needs groups, including Aboriginal and Torres Strait Islander patients.

Conclusion

The national SNAP study was a resource intensive project and required considerable effort by the national, state and local coordinators, the Clinical Project Team and the 15,000 health professionals who participated in the study. The relevant clinical bodies have endorsed the classification on the basis that it makes clinical sense and the statistical performance of AN-SNAP is more than adequate. However, AN-SNAP can be improved.

Further work is required, especially in the ambulatory classification, in the development of more sensitive measurement instruments and in funding system design. The most important result of the National SNAP Study is that it has developed a classification structure which provides the framework for progressive improvement over time.
References


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