2011

Exploring the rehabilitation patient journey

Christopher John Poulos

University of Wollongong

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Sydney Business School

Exploring the rehabilitation patient journey

Christopher John Poulos
MBBS (Hons) MSc FAFRM

This thesis is presented as the requirement for the award of the Degree of Doctor of Philosophy University of Wollongong

December 2011
ABSTRACT

Background

Rehabilitation services are a critical component of the Australian health care system. They improve outcomes for patients with disabling conditions resulting from serious illness or injury, free up acute hospital capacity and decrease the burden of disability. Yet health system redesign strategies in Australia have largely neglected both the interface between acute care and rehabilitation and the patient journey within rehabilitation. Improving the effectiveness and efficiency of the patient journey through the acute hospital and into and through the rehabilitation episode has the potential to enhance patient outcomes and increase hospital capacity.

Program of research

This program of research, presented as six publications, takes a health systems approach to the investigation of the rehabilitation patient journey. It focuses on the management of potential rehabilitation patients in acute care, the rehabilitation selection and transfer process, and the inpatient rehabilitation episode. The purpose of the research is to improve health service provision and utilisation for this cohort of patients and to suggest further areas for investigation.

Literature review

A literature review focusing on rehabilitation patient classification and the role of utilisation review in determining level of care appropriateness identified concurrent utilisation review as a suitable method to investigate the rehabilitation patient journey. The InterQual utilisation review tool was selected for piloting because it was the most contemporary and widely published tool and also contained specific criteria for rehabilitation and subacute level of care appropriateness. Following the pilot, two further studies were conducted, one in acute care and the other within rehabilitation facilities.
Case study of an information management system

A case study on the design, implementation and evaluation of a clinical information management system to improve the logistical aspects of the rehabilitation patient journey is also presented as part of this body of work. This system enables clinicians to manage and track patient referral, consultation outcomes and subsequent transfer to rehabilitation and subacute beds. Its introduction resulted in decreased time to consultation and transfer.

Utilisation review in acute care

In the acute hospital pilot study, patients with diagnoses of stroke, hip fracture or amputation, and other patients referred for rehabilitation assessment, were followed with concurrent utilisation review. Results on 242 acute episodes, representing 2698 bed days, showed that a high proportion (69%) of days of stay did not meet appropriateness for acute care. These findings were consistent with overseas studies. According to the InterQual tool, most patients were appropriate for transfer to rehabilitation much earlier than was current practice. The study found that the InterQual tool had utility in the Australian hospital setting.

In a second, larger acute hospital study, detailed reasons why utilisation review criteria were not met were obtained in addition to concurrent utilisation review findings. Clinical decision making differences between the acute care and rehabilitation teams over patient selection were also examined. Data on 694 acute episodes, (7189 bed days) showed that 56% of days (stroke, hip fracture and joint replacement patients) and 33% of days (other patients, from the time of referral) met acute level of care criteria. Forty five percent of inappropriate days of stay in acute care were due to delays in processes or scheduling within the acute hospital. Being more appropriate for rehabilitation or lower level of care accounted for a further 30% of inappropriate days. From referral, the acute care team and the utilisation review tool deemed patients ready for rehabilitation transfer earlier than did the rehabilitation team (1.4, 1.3 and 4.0 days, respectively). From when deemed medically stable for transfer by the acute care team, 28% of patients
subsequently became unstable. From when deemed stable by the rehabilitation team or the utilisation review tool, 9% and 11% of patients, respectively, subsequently became unstable.

**Utilisation review in the rehabilitation setting**

In a third study, concurrent utilisation review was conducted in inpatient rehabilitation facilities on 267 patient episodes, representing 7359 days of stay. Only 48% of days met appropriateness for a level of care consistent with rehabilitation. Receiving insufficient therapy was the main reason why utilisation review criteria were not met. Other reasons were that the patient was awaiting discharge to long term care or to home, or that they were more appropriate for acute level of care. Therapy time data, available on 208 episodes, showed that therapy was received on only 50% of calendar days, and for an average of 37 minutes per weekday (56 minutes for stroke).

**Overall findings**

Overall, the research findings suggest that a high proportion of patient days do not meet level of care appropriateness in either the acute or the rehabilitation settings. The acute care findings were consistent with the international utilisation review literature. As this was the first published study of concurrent utilisation review within the rehabilitation setting, comparative data in this context are not available. The reasons why level of care appropriateness were not met are discussed in detail in the respective papers.

The research revealed considerable variability between the acute care teams and the rehabilitation team in the determination of patient appropriateness for rehabilitation and readiness for transfer, and suggested that formal utilisation review could have a decision support role at the interface between acute care and rehabilitation. The findings also highlighted the fact that, for a variety of reasons, patients often remain in acute care when their need is for rehabilitation.
Future directions

Strategies to improve the selection and transfer process to rehabilitation will aid patient flow. Strategies include improved information and logistical management of patients who may be appropriate for rehabilitation, as well as support for clinical decision making. Models of care that provide rehabilitation in the acute setting will offer benefits for patients who remain in acute care when they have need for rehabilitation. Benefits include more effective use of hospital resources and the prevention of functional decline in patients. Funding models in Australia need to support the provision of rehabilitation in the acute setting.

The research findings also show a need to improve the efficiency of inpatient rehabilitation. The low levels of therapy patients received in these typical public rehabilitation units warrants further investigation, as it might be impacting on patient outcomes and the effectiveness of rehabilitation programs. Locating inpatient rehabilitation services in separate facilities, away from acute hospital support, may also have implications for the patient journey and requires further investigation.
ACKNOWLEDGEMENTS

First and foremost I wish to acknowledge the tremendous support, encouragement and guidance provided by my supervisor, Professor Kathy Eagar, from the Centre for Health Service Development at the University of Wollongong. Professor Eagar’s expertise in the areas of patient classification and health services research, her academic rigour and her ability to provide constructive advice and direction at critical points throughout the research has aided this work tremendously.

The staff of the Centre for Health Service Development have also provided me with excellent support, particularly Janette Green, who provided assistance and guidance with data linkage, as well as with data analysis in Microsoft Excel and Access.

Acknowledgment also needs to be made of the research staff at the Illawarra Area Health (and later South Eastern Sydney Illawarra Area Health) Service, who were employed to work on the three prospective cohort studies conducted during this program of research. Their dedication to the projects and attention to detail has contributed greatly to the success of the work. Particular thanks needs to go to Anne Lees and Jo Morrell. There are also a number of people who worked within the Information Services Department of the Health Service who have assisted over the years in the development, maintenance and later upgrading of the rehabilitation referral, consultation and bed management IT system. They too are to be thanked.

I would also like to acknowledge my co-authors, who have assisted me with the individual research projects and the publications which make up this body of work. They will not be named individually here, but their contributions are specified in the following section which outlines the Candidate’s role in the peer reviewed publications.

Finally, and certainly not least, I owe a great deal of gratitude and thanks to my wife Ros, and my children, all of whom have been patient and encouraging while this thesis has been undertaken.
CANDIDATE’S ROLE IN PUBLICATIONS

This thesis includes chapters (two through seven, refer below) that have been written for publication in the academic literature. These chapters are presented in an order that follows the logical progression of the research. The reader will note that this is different to the order in which they are published because external influences and opportunities arose which necessitated that dissemination occur in a different order. The Candidate’s role in these publications is shown in Table 1 (see over).


Table 1: Candidate’s role in publications

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<td>Ch. 2</td>
<td>Poulos undertook the literature review, drafted the manuscript and responded to editing suggestions made by Eagar. Poulos dealt with revisions suggested by the journal and prepared the final paper for submission.</td>
<td>Eagar provided critical editorial comment on the manuscript.</td>
</tr>
<tr>
<td>Ch. 3</td>
<td>Poulos devised the information management system, obtained funding to develop it, and oversaw the system’s upgrade. Poulos drafted the manuscript for publication, responded to editing suggestions made by co-authors and submitted the paper.</td>
<td>Gazibarich, an IT system project officer, was employed to manage the system. He provided input into the manuscript. Eagar provided editorial comment.</td>
</tr>
<tr>
<td>Ch. 4</td>
<td>Poulos initially designed the study which was the subject of this publication, obtained funding and undertook the research. Poulos undertook the data analysis, drafted the manuscript, dealt with editing suggestions made by co-authors and prepared the final paper for submission.</td>
<td>Eagar contributed to the study design and made editorial comment on the manuscript. Poulos (RG) provided assistance with the preparation and presentation of box plots, as well as editorial comment on the manuscript.</td>
</tr>
<tr>
<td>Ch. 5</td>
<td>Poulos designed the study, was Principal Investigator on the grant application, conducted the research, supervised the study personnel and undertook the majority of the data analysis. Poulos drafted the manuscript, responded to editing suggestions made by co-authors, prepared the manuscript for journal submission and responded to reviewer comments.</td>
<td>Magee assisted with data analysis. Bashford and Eagar contributed to the study design and provided editorial comment on the manuscript.</td>
</tr>
<tr>
<td>Ch. 6</td>
<td>Poulos designed the study, was Principal Investigator on the grant application, conducted the research, supervised the study personnel and undertook the majority of the data analysis. Poulos wrote and submitted the manuscript, and responded to reviewer comments.</td>
<td>There were no co-authors on this publication. Assistance with data analysis was provided by study personnel, but not of sufficient magnitude to warrant authorship.</td>
</tr>
<tr>
<td>Ch. 7</td>
<td>Poulos is not the first author on this publication. Author New originally submitted a ‘letter’ to the Medical Journal of Australia on the subject of rehabilitation medicine. The Journal requested that the ‘letter’ be expanded and written as a substantial article (a ‘Viewpoint’ article). Being familiar with Poulos’s research around utilisation review and rehabilitation, New contacted Poulos to invite him to co-author the ‘Viewpoint’ paper. Both New and Poulos provided the content of the paper, drafted the ‘Viewpoint’ article and dealt with the Editorial suggestions of the Journal.</td>
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CHAPTER 1: Synthesis

Thesis overview and scope

Preamble

This first chapter provides a synthesis of the integrated program of research represented by this thesis. It establishes the context for the body of work and outlines the objectives, methods and key findings. The chapters which follow are the six original publications in the peer-reviewed literature on which this thesis, presented as published works, is based. The last chapter, Chapter Eight, contains conclusions and recommendations arising from the body of work, along with a summary of why this work has made both a unique and significant contribution to knowledge. A discussion of the limitations of the work, as well as the potential implications for policy and practice and areas where the work has already had an impact on policy and practice, then follows. Chapter eight concludes with a section on areas for future research. A consolidated reference list is presented prior to a number of appendices that provide supporting documentation. These are outlined in the aforementioned Table of Contents.

What this thesis is about

The program of research presented through these publications takes a health systems perspective to the investigation of the rehabilitation patient journey. The thesis aims to present a coherent picture of the patient journey from acute care to rehabilitation, focusing on potential barriers and variability which impact on patient flow, thus making recommendations to improve health service provision and utilisation for this cohort of patients. The Candidate has adopted utilisation review as the common tool for the body of research, however other methods have also been employed, as will be described. The research has been centred within the public hospital system in a large regional area of New South Wales (NSW), Australia, with the expectation that the results and recommendations will be generalisable to the broader public hospital system in this country and perhaps elsewhere.
Why the rehabilitation patient journey was selected for this thesis

The acute hospital system in Australia, in keeping with those in many developed countries, is under increasing pressure from the combined effects of population aging, the increasing prevalence of chronic disease, and burgeoning health care costs from new technologies. Yet the answer to increasing demand is often not seen in more beds, but rather better management of existing capacity (Scott, 2010; Allder et al., 2010).

The rehabilitation patient journey was selected for this program of research because the effective and efficient identification of patients who might require rehabilitation, and the transit of these patients through acute care and into inpatient rehabilitation programs, can have a profound impact on patient outcomes as well as on access to acute care beds. Most Australian research on access to acute care beds has focused on the emergency department and the interface between the emergency department and the acute hospital, as well as on hospital admission avoidance strategies and effective models for timely community discharge. There has been scant research on the selection of patients for rehabilitation or on the effective movement of patients from acute care into inpatient rehabilitation (New, 2009; New and Poulos, 2008 [Ch7]).

In addition, inpatient rehabilitation services represent a sizeable number of hospital beds (rehabilitation beds approximate 30 per 100,000 population in NSW). The effective and efficient use of these beds will not only impact upon rehabilitation patient outcomes and resource utilisation, it will also have an ‘upstream’ impact on acute care bed capacity (New and Poulos, 2008 [Ch7]). If rehabilitation beds are not available when required, patients will have to wait longer in acute care. This will impact on patient flow out of acute care and thus access to acute care beds for other patients. It could also result in adverse patient outcomes through unnecessary exposure to iatrogenic risk if patients remain in an acute hospital for longer than is required. Lack of provision of timely rehabilitation services might also result in further deconditioning in patients, ultimately resulting in a longer rehabilitation length of stay.
The efficiency of the inpatient rehabilitation process itself is another area that has been poorly researched, especially in Australia, and this thesis also aims to address the knowledge gap in this area.

**Context for this body of work**

**What is rehabilitation?**

According to the Australasian Faculty of Rehabilitation Medicine (AFRM):

‘A rehabilitation medicine service aims to provide people with loss of function or ability due to injury or disease with the highest possible level of independence (physically, psychologically, socially and economically) following that incident. This is achieved through a combined and coordinated use of medical, nursing and allied health professional skills. It involves individual assessment, treatment, regular review, discharge planning, community integration and follow up of people referred to that service’ (Australasian Faculty of Rehabilitation Medicine, 2005).

The rehabilitation patient journey that is the focus of this thesis is that provided in the inpatient setting in public hospitals. It is therefore focused on patients who have suffered significant illness or injury and who are unable to have their initial rehabilitation in the community or outpatient setting. The predominant impairments\(^1\) of patients in Australia who require inpatient rehabilitation include (Simmonds and Stevermuer, 2008):

- stroke;
- other neurological impairments, including traumatic brain injury, spinal cord injury and degenerative neurological conditions;
- orthopaedic impairments, such as fractures and joint replacement;
- amputation;
- deconditioning following illness or injury;

---

\(^1\) The terms ‘impairment’ and ‘disability’ have been used in this thesis. These terms are used in the context of the World Health Organization definitions of these terms; found at: [http://www.who.int/topics/disabilities/en/](http://www.who.int/topics/disabilities/en/) (accessed 31/10/2011)
impairments requiring pain management;
other impairments, such as those requiring pulmonary or cardiac rehabilitation.

Inpatient rehabilitation services in Australia

Rehabilitation services in Australia are provided in both public and private hospitals. Episodes provided in public hospitals are generally of higher complexity with longer lengths of stay, and with patients being older on average, than those provided in the private hospital sector (Simmonds and Stevermuer, 2008). All specialist inpatient rehabilitation in Australia is medically directed by a physician with formal training and qualifications in rehabilitation medicine (Fellowship of the Australasian Faculty of Rehabilitation Medicine of the Royal Australasian College of Physicians [or equivalent]), or by a physician with training or special interest in rehabilitation. The services are also interdisciplinary and goal directed, and they have formal systems for assessing function and measuring outcomes (Australasian Faculty of Rehabilitation Medicine, 2006). The main functional outcome assessment tool used in Australian rehabilitation facilities is the FIM™ instrument (Uniform Data System for Medical Rehabilitation, 1997).

Within Australia there are recommended staffing levels for inpatient rehabilitation units for each of the clinical specialties (medical, allied health and nursing), but there are no standards which specify how much therapy an individual patient should receive (Australasian Faculty of Rehabilitation Medicine, 2005). This is in contrast to other jurisdictions, such as the United States (Medical Inpatient Rehabilitation Criteria Task Force, 2006). Some rehabilitation facilities within Australia are co-located within an acute hospital campus, while others are in standalone facilities, with varying medical, surgical and diagnostic support available.

The rehabilitation facilities included in this research are public hospital facilities, medically directed by qualified rehabilitation physicians and which provide services in accordance with the AFRM Service Standards for Medical Rehabilitation (Australasian Faculty of Rehabilitation Medicine, 2005). However, as discussed in the publication presented as Chapter Six of this thesis (Poulos, 2010), staffing levels within these
rehabilitation units were less than those recommended in the AFRM Service Standards document, but were consistent with similar public hospital rehabilitation units in Australia.

The typical rehabilitation patient journey

Within acute care

Patients who ultimately require an inpatient rehabilitation episode following serious illness or injury typically begin their hospital journey in acute care, under an acute care medical or surgical team. At some point in the acute episode a decision is made by the acute care team that the patient might require formal rehabilitation. This decision is primarily a clinical one, but it is often influenced by a range of factors, such as the adoption of clinical models which have protocols for early rehabilitation input (for example, the acute stroke unit model (Stroke Unit Trialists, 2007)), the degree of demand placed on acute care beds, the availability of inpatient rehabilitation services, and the availability of alternatives to inpatient rehabilitation.

Once the referral for inpatient rehabilitation is made to the rehabilitation service, the patient journey is further influenced by a number of other factors, including the rapidity of response of the rehabilitation provider to the request for consultation and the outcome of the rehabilitation consultation itself.

The way the referral and consultation process is managed (from a systems perspective) will also influence the efficiency of the referral and consultation process. The paper presented as Chapter Three of this thesis discusses the role of a computerised information system to address these processes (Poulos et al., 2007b [Ch3]).

Following consultation, patients may or may not be deemed suitable by the rehabilitation service for inpatient rehabilitation. They might be deemed to:

- require further acute care prior to rehabilitation;
- be in need of further investigations prior to rehabilitation transfer;
be more suitable for another service (for example, a geriatric service or a palliative care service);

- require residential (nursing home type) care, or;

- be able to be discharged directly home from acute care with community services.

Within Australia, it is generally the prerogative of the consulting team, in this case the rehabilitation team, to decide if and when a patient will access inpatient rehabilitation services.

If a patient is deemed suitable for inpatient rehabilitation, their journey is then influenced by the timing established by the rehabilitation service for when the patient should be transferred and the availability of a suitable rehabilitation bed.

One of the key determinants of whether a patient is suitable for transfer from acute care to inpatient rehabilitation (particularly to an off-site rehabilitation facility) is whether they are sufficiently medically stable (Poulos et al., 2011 [Ch5]). It is at this point that there is often a lack of clinical agreement between the acute care and the rehabilitation teams on the point at which the patient is suitably medically stable (Poulos et al., 2011 [Ch5]). The location of the rehabilitation facility (co-located with an acute facility or standalone) will have a large influence on determining what degree of medical stability is required.

As highlighted in the publication presented as Chapter Five of this thesis, patients who are deemed by their acute care team to no longer require acute care, but are still waiting to be deemed suitable for rehabilitation transfer, or are awaiting a rehabilitation bed, may not receive appropriate rehabilitation care during this portion of their stay in the acute hospital. Waiting in a state of ‘terra nullius’ (a ‘land belonging to no one’), represents an opportunity cost to the system and an unnecessary hiatus in the patient journey (Poulos et al., 2011 [Ch5]).
Within rehabilitation care

Once in an inpatient rehabilitation facility, the patient journey is then influenced by a number of other factors, including:

- the development of a clear rehabilitation management plan;
- the provision of appropriate and sufficient therapy;
- the availability of medical, surgical and diagnostic support within the rehabilitation facility, should it be required, and;
- the availability of appropriate discharge options following the conclusion of the inpatient rehabilitation episode.

To summarise

In summary, the patient journey, for those patients requiring inpatient rehabilitation, is a complex process with a number of variables and decision points which have an influence on the journey. The journey spans both acute care and inpatient rehabilitation. The interface between acute care and rehabilitation, commencing within acute care, is an important juncture that has, as yet, been poorly studied, especially from a health systems perspective. However, what happens within inpatient rehabilitation is also of great importance. This thesis, presented as the following six original publications, explores the rehabilitation patient journey in order to address these issues.

Figure 1 (on page 21) illustrates the rehabilitation patient journey, showing where in the journey the published works have their focus.
Figure 1: Published works in relation to the rehabilitation patient journey
Thesis objectives

This thesis has the following scope and objectives in relation to the examination of the rehabilitation patient journey:

1. To review the literature relevant to patient classification for rehabilitation and subacute care [Chapter 2].
2. To review the literature on the role of utilisation review methods in assisting in the determination of level of care appropriateness, including rehabilitation appropriateness [Chapter 2].
3. To review the literature on the use of utilisation review in Australia and its applicability to the rehabilitation patient journey in Australia [Chapters 2, 4, 5 and 6]
4. To evaluate the role, benefits and limitations of an information management system in facilitating the rehabilitation patient referral, consultation, selection and transfer process from the acute hospital setting [Chapter 3].
5. To determine whether an existing utilisation review tool might be appropriate for use in the Australian context, especially at the interface between acute care and rehabilitation, and to pilot such a tool to determine its utility in the Australian public hospital setting [Chapters 2 and 3].
6. To compare clinical decision making between acute care teams and the rehabilitation team around patient selection for rehabilitation within acute care, and transfer from acute care to inpatient rehabilitation [Chapter 5].
7. To examine the role of concurrent utilisation review as a potential decision support method to assist at the interface between acute care and rehabilitation [Chapter 5].
8. To examine the potential utility of concurrent utilisation review within the inpatient setting in public rehabilitation facilities in the Australian context [Chapter 6].
9. To explore the impact of therapy provision in inpatient public rehabilitation in Australia on utilisation review appropriateness [Chapter 6].
10. To make recommendations regarding new models of care which could improve the way the patient journey from acute care to rehabilitation is managed [Chapters 4, 5, 6 and 7].

**Methodological approach employed**

This thesis has adopted the following methods to research the objectives established for the investigation of the patient journey from acute care to rehabilitation. These methods are summarised below. They have been informed by reviews of the literature and are described more fully in the respective publications (Poulos, 2010 [Chapter 6]; Poulos and Eagar, 2007 [Chapter 2]; Poulos et al., 2007a [Chapter 4]; Poulos et al., 2007b [Chapter 3]; Poulos et al., 2011 [Chapter 5]).

Alternative research methodologies had been considered but were not deemed appropriate or feasible for the scope of the research. Retrospective case review has been used in previous studies employing utilisation review tools, but this method is not as robust as prospective review because the former relies on information in the medical record that may be missing or incomplete. In addition, retrospective case review does not allow clinical management to be clarified with treating clinicians. A randomised control trial would deliver the highest level of evidence for the utility of the InterQual tool used as an intervention, but the use of the tool as an intervention would have been premature and would require changes to clinical care. This methodology is a possible area for future research, discussed in Chapter 8.

**Pilot prospective study of a cohort of patients in acute care**

The first prospective study was used to test the utility of the InterQual utilisation review tool (Acute Adult Criteria) in the Australian context, as well as its suitability to exploring the interface between acute care and rehabilitation in the acute hospital setting (Poulos et al., 2007a [Ch4]). The pilot study was conducted in a large regional acute hospital in NSW, Australia, and it focused on patients with a high probability of requiring rehabilitation (those with diagnoses of stroke, hip fracture or amputation) as well as all other patients referred for rehabilitation assessment. Utilisation review was
conducted concurrently. This study was supported by funding from the Commonwealth Department of Health and Aged Care.

Having found that the InterQual tool could be easily adapted to the Australian hospital setting and delivered results consistent with the international experience, it was determined that the tool was suitable to be employed in two larger prospective cohort studies, one within acute care and the other within the inpatient rehabilitation setting.

**Prospective study of a cohort of patients in acute care**

The second prospective study was conducted in the same large regional acute hospital as the first (Poulos et al., 2011 [Ch5]). The study employed the InterQual utilisation review tool (Acute Adult Criteria) in a concurrent manner on patients with diagnoses of stroke and hip fracture (from acute admission) and on patients with joint replacement (from the time of surgery), as well as on all other patients referred for rehabilitation during the study period. In addition, detailed reasons why utilisation review criteria were not met were also obtained. These data were collected by trained reviewers using additional fields specially created within the InterQual software (*CareEnhance Review Manager 5.0*). This study was supported by funding from the HCF Health and Medical Research Foundation.

This second prospective study was broader in scope and more extensive than the pilot, and examined in greater detail the interface between acute care and rehabilitation by also comparing clinical decision making by the acute care and rehabilitation teams with the findings of utilisation review (Poulos et al., 2011 [Ch5]). Additional information was sought from the acute care and rehabilitation teams on their perceptions of patient appropriateness for rehabilitation and readiness for transfer.

**Prospective study of a cohort of patients in inpatient rehabilitation**

The third prospective study was conducted in two public inpatient rehabilitation facilities (encompassing three rehabilitation wards) and employed the InterQual utilisation review tool (Rehabilitation and Subacute Criteria) on all patients who had
been identified in the acute wards of the large regional acute hospital and were subsequently transferred to one of the study rehabilitation wards. In addition to the utilisation review findings, this study also documented reasons for variance against the InterQual criteria, as well as the actual therapy time patients received (Poulos, 2010 [Ch6]). This study was supported by funding from the HCF Health and Medical Research Foundation.

Each of the prospective cohort studies required data linkage for the analysis of study findings. The data linkage was between the InterQual database (CareEnhance Review Manager), the patient administration system of the respective hospitals, and the rehabilitation information management system which was the subject of the case study below (Poulos et al., 2007a [Ch4]). Data linkage was made by unique patient identifier (the medical record number).

Case study

The case study described the development and implementation of the clinical information management system that the Candidate had developed as part of this program of research to address the management of the referral, consultation and transfer process within acute care for patients referred for rehabilitation medical assessment (Poulos et al., 2007a [Ch4]).

Key findings from the body of work

Findings from the literature - rehabilitation as a subacute care type

Rehabilitation care plays an important role in the Australian healthcare system. It is essential for the flow of patients from acute care and it provides a valuable contribution to patient outcomes (Bennett, 2009; Poulos and Eagar, 2007 [Ch2]). In Australia, rehabilitation is regarded as a type of subacute care. Unlike acute care, the need for health care for subacute patients is better predicted by their functional status than by their principal medical diagnosis (Eagar and Innes, 1992). Also, according to the
Australian National Subacute and Non-Acute Patient (AN-SNAP) classification system, the primary treatment goal of a rehabilitation episode of care is improvement of functional status, with the rehabilitation episode being evidenced by an individualised multidisciplinary rehabilitation program with negotiated rehabilitation goals and indicative timeframes (Eagar et al., 1997).

However, while the definition that exists in Australia for rehabilitation may be useful for casemix purposes, it is not as helpful in trying to prospectively identify patients who may be appropriate for rehabilitation, or for determining when rehabilitation should commence (Poulos and Eagar, 2007 [Ch2]). In 2001, a Victorian Government (Australia) report into the interface between acute care and subacute care noted that there was a 'lack of focus and co-ordination in referral to, and provision of, subacute services, which affects throughput and efficiency' (Victorian Department of Human Services, 2001). The report also raised the issue of how the timing of patient transfer between acute and subacute services impacts on both the acute and subacute episode. However, there were no recommendations in the report pertaining to the potential use of more transparent and validated patient selection methods for rehabilitation. One of the aims of this thesis was to address this area.

Findings from the literature - selection of patients for rehabilitation

Broadly speaking, rehabilitation medicine services accept patients for inpatient rehabilitation programs if they meet the following general criteria: there is the potential for the patient to functionally improve with rehabilitative therapy; the patient has capacity to participate in a rehabilitation program, and; the patient is sufficiently medically stable (Medical Inpatient Rehabilitation Criteria Task Force, 2006; Poulos and Eagar, 2007 [Ch2]). These criteria are very much open to the clinical judgement of the assessing rehabilitation team, and their ‘threshold’ for accepting patients is likely to be influenced by other factors such as the location of the rehabilitation bed, the availability of substitutable community-based rehabilitation services, the degree of pressure being placed upon them by the acute hospital sector to accept patients, and by rehabilitation bed capacity (Poulos and Eagar, 2007 [Ch2]).
Transferring patients from acute care to rehabilitation at the optimal time benefits patients as well as flow through the health care system (Allder et al., 2010; Victorian Department of Human Services, 2001). Transferring patients too early, for example when they are not sufficiently medically stable, could render the rehabilitation process less effective and could place the patient at unnecessary risk and result in further health care costs if they have to be transferred back to acute care for investigation or treatment (Poulos, 2010 [Ch6]; Poulos and Eagar, 2007 [Ch2]; Poulos et al., 2011 [Ch5]). Transferring patients too late will result in inappropriate acute care bed use and might also be detrimental to the patient through exposure to further iatrogenic risk and deconditioning (Deshpande et al., 1998; Ingold et al., 2000; Mayo et al., 1997; Poulos and Eagar, 2007 [Ch2]; Poulos et al., 2011 [Ch5]).

Much of the literature on selection criteria for rehabilitation services focuses on patients for whom a good outcome is anticipated. The problem with this approach is that many patients who might benefit from rehabilitation could miss out (Wade, 2003). Also, the literature on patient factors that predict a good outcome from rehabilitation tends to focus on specific diagnoses such as stroke or orthopaedic conditions. Defining selection criteria for rehabilitation becomes more difficult when patients have multiple co-morbidities or general debility – an increasing trend in public rehabilitation units in Australia (Simmonds and Stevermuer, 2008; Poulos and Eagar, 2007 [Ch2]). More objective criteria for selecting patients for rehabilitation and for determining the optimal time of transfer might help acute care clinicians make more informed decisions about patient flow and discharge planning (Unsworth, 2001).

The influence of funding models on the rehabilitation patient journey

In Australia, most inpatients requiring rehabilitation receive a ‘two-stage’ model of care: an acute episode in an acute hospital, followed by transfer to a rehabilitation facility. The rehabilitation facility is either a part of the acute hospital campus or in a standalone facility, away from an acute hospital (Poulos et al., 2011 [Ch5]). The latter is a recent trend in Australia (New and Poulos, 2008 [Ch7]). The integrated stroke unit is an

2 “Debility” is a term used to denote a state of general weakness or feebleness. It is also an impairment category used within the Australasian Rehabilitation Outcomes Centre dataset.
exception to this two-stage model of care, by providing early rehabilitation in acute care as part of the overall management of patients with stroke (Ang et al., 2003; Dewey et al., 2007; Lorenzano et al., 2006; Stroke Unit Trialists, 2007). This model works well with stroke patients for those hospitals that have acute stroke units, but stroke represents less than 10% of inpatient rehabilitation episodes in Australia (Simmonds and Stevermuer, 2008).

The current funding model for inpatient care in Australia also reinforces this two-stage approach to care by providing separate payments for the acute episode (under the Diagnosis Related Group (DRG) system), and for the rehabilitation episode (under the AN-SNAP system) (Eagar, 1999; Eagar, 2010a; Eagar, 2010c; Eagar, 2010b; Green and Gordon, 2007). There is currently no casemix, or activity-based, funding model in Australia to provide a payment for rehabilitation occurring in parallel to acute care in the acute care setting (Poulos et al., 2011 [Ch5]; Eager, 2010a; Eager, 2010b).

Managing the process of referral, selection and transfer to rehabilitation

Reports in the literature suggest that the adoption of information management systems to assist clinicians, particularly in the area of patient flow, remains poor and that the successful implementation of such systems in health care is often more a business process issue than a technology issue (Poulos et al., 2007b [Ch3]; Proudlove and Boaden, 2005). Social, cultural and organisational factors are all important, but ultimate acceptance of information systems in health care depends, to a large extent, on their degree of usability (Delpierre et al., 2004; Kushniruk et al., 1997).

A component of the program of research presented as this thesis is the design, implementation and evaluation of an information system to manage the referral, consultation and transfer process for potential rehabilitation patients in acute care. An analysis of this work is presented more fully in Chapter Three of this thesis, as the paper Supporting work practices, improving patient flow and monitoring performance using a clinical information management system (Poulos et al., 2007b [Ch3]).
The hospital network where the system was developed consisted of five hospitals providing acute services, as well as four inpatient rehabilitation facilities (three of which were standalone). Prior to the development of this system, the waiting time for access to a rehabilitation bed for patients in acute care was in the order of seven days and there was no formal system for monitoring waiting times for rehabilitation consultation. In assessing the need for such a system, there were numerous anecdotal reports from rehabilitation clinicians that it was difficult to manage consultations and patient flow across such a large number of sites, especially as patients often moved from one ward to another within an acute hospital, or from one acute hospital to another, as their acuity changed. Also, there were seven rehabilitation physicians and four registrars involved in undertaking inpatient assessments within acute care, and the rehabilitation service was receiving requests for approximately 1250 new referrals from the acute hospitals per year (Poulos et al., 2007b [Ch3]).

The re-engineering process which led to the development of the system contained a number of key steps shown to be important in the successful implementation of IT systems in the health care setting (Rahimi et al., 2008). Consultation with all stakeholders occurred early, and resulted in re-engineering of the business processes for referral, consultation and patient flow to rehabilitation. Part of this re-engineering was the centralising of the lodgment of referrals, as well as seeking agreement from all the rehabilitation facilities that the rehabilitation ‘bed base’ would be managed as one. Information management system design ensued, with the aim being to develop a simple, intuitive user interface and to integrate as much data from existing IT systems as possible, on a real-time basis wherever that could be accomplished.

Also key to the integrity of the IT system was allowing the staff in the acute care wards (those who made the referrals and the acute care bed managers) access to the data contained in the system on a ‘read-only’ basis (Poulos et al., 2007b [Ch3]). This meant that the status of the referral and consultation process was transparent and able to be verified by them. It also established a dialogue between acute care teams and the rehabilitation team on the issue of patient readiness for transfer. The ongoing dialogue on this issue was one of the factors which led the Candidate to explore further this
aspect of the rehabilitation patient journey, as there were many instances of
disagreement between teams over when a patient was suitable for rehabilitation transfer.

In the first two years following implementation of the IT system there were 2514
rehabilitation consultations conducted in the acute hospitals, with an average wait for
consultation of 0.83 working days. Eighty two percent of patients were seen within two
days of referral, and the average time for transfer to a rehabilitation bed was 1.2 days
(Poulos et al., 2007b [Ch3]). The system was upgraded in 2006 to offer greater usability.
These aspects are detailed further in Chapter Three.

The development and implementation of this information management system has
provided data on key points at the interface between acute care and rehabilitation (i.e.,
the time of the rehabilitation referral, consultation and transfer), as well as data on the
consultation outcome and the number of reviews conducted. This unique dataset
provided information not available in the existing hospital patient administration
systems, or in the utilisation review information management system. These data were
also essential for the subsequent data linkage required to address the objectives and
research questions posed by this thesis.

The international literature on utilisation review tools – a brief summary

Utilisation review, in the context used in this thesis, is a method that assesses the
appropriateness of the care setting to the patients’ requirement for clinical care. Early
attempts at providing utilisation review relied on the opinion of clinician, usually
physician, reviewers. However, when the inter-rater reliability of physician assessment
was found to be lacking, attention was placed on the development of specific criteria,
with one of the most widely used and public domain instruments being the
Appropriateness Evaluation Protocol (AEP), by Gertman and Restuccia (Gertman and
Restuccia, 1981; Poulos and Eagar, 2007 [Ch2]; Poulos et al., 2007a [Ch4]; Restuccia,
1995).
Due to the complexity and the changing nature of hospital interventions, the cost involved in updating tools to meet changing health care standards, and the development of alternatives to providing care in acute hospitals, the contemporary utilisation review tools that are now in common usage are all proprietary. The AEP itself was developed into a proprietary tool (the Managed Care Appropriateness Protocol – the OAK Group). The other two utilisation review tools investigated as part of this thesis were the Milliman Care Guidelines and the InterQual Criteria. These tools were investigated as they reported to include criteria for rehabilitation selection and appropriateness. Of these three tools, the InterQual Criteria were the most widely used and published, with about 25 publications identified in Medline (Poulos and Eagar, 2007 [Ch2]).

**Utilisation review in Australia**

The literature review undertaken for this thesis revealed only two reported instances of utilisation review being used in Australia prior to this program of research being undertaken, and both of these studies were dated around 1990. In the first, the AEP was trialed in an acute hospital in Australia to audit admission appropriateness, finding that it was both efficient and clinically valid for use in Australian hospitals, with only minor modifications required (O'Donnell et al., 1990). In the second study the AEP was also employed in acute care, finding that 15.2% of admission days and 28.7% of days of stay were ‘non-acute’. The authors concluded that inpatient treatment in acute hospitals in Australia may not be as rigidly controlled as in the US, where the tool was developed (South Australian Health Commission, 1991).

However, the high levels of inappropriate admission days and days of stay in acute care reported in this early Australian work were consistent with the international research using the AEP as well as other utilisation review tools. This finding, together with the finding that the AEP was deemed to be valid for use in Australia, indicated a potential role for utilisation review in Australia (Poulos and Eagar, 2007 [Ch2]).
Selection of the InterQual Criteria as applicable to the Australian setting

The AEP is no longer a utilisation review tool in widespread usage in the USA or the United Kingdom, although there are still reports of its use in some European and Middle Eastern countries. The AEP was developed into the proprietary ‘Managed Care Appropriateness Protocol’ (MCAP) in the late 1980s due to the practice changes that were occurring in the USA (Restuccia, 1995). The MCAP has not reportedly been used in Australia and the tool does not purport to contain specific criteria for rehabilitation appropriateness and use within the rehabilitation setting.

The other utilisation tool considered, the ‘Milliman Care Guidelines’, has been used on only a limited basis in Australia in the community setting (no published data available). Post-dating the literature review undertaken for this body of work was also one reported reference to the use of the Milliman guidelines in the development of a care pathway for maternity patients (Hatten-Masterson and Griffiths, 2009).

In contrast, use of the InterQual utilisation review tool had been cited in published works originating from the USA, as well as in Canada and the United Kingdom (Bruce et al., 2002; Bruce et al., 2001; Cardiff et al., 1995; Coast et al., 1995; Coast et al., 1996; DeCoster et al., 1997; Flintoft et al., 1998; Inglis et al., 1995; Irvin et al., 2000a; Irvin et al., 2000b; Kalant et al., 2000; McDonagh et al., 2000; Paranjpe et al., 1989; Strumwasser et al., 1989; Strumwasser et al., 1990; Tourangeau et al., 1999; Trerise et al., 2001; Weaver et al., 1998). In these latter countries, the tool was found to have high reliability and validity. However, for it to be used for its intended purpose its validity was subject to there being available the range of care settings contained within the Criteria (Kalant et al., 2000).

Of relevance to this research, the InterQual tool also has specific criteria for determining admission and continuing stay appropriateness within the rehabilitation and subacute settings, in addition to criteria for use in acute settings. The tool also has pre-admission screening criteria for use in acute care to determine if rehabilitation may be appropriate, and to aid in the determination of the ‘level’ of rehabilitation (or subacute) services required. In addition, the InterQual tool has discharge appropriateness criteria for both
acute and subacute levels of care. These contain a checklist for determining medical stability and suitability for discharge, either to a lower level of care or to home.

One question faced in this program of research was whether there was an existing tool that would suit the purposes of the work, or whether a tool would need to be adapted or developed. An important consideration when contemplating the use of an existing utilisation review tool in Australia, especially one of the proprietary tools, is to ensure that the purpose for which the tool was originally designed – i.e., being primarily a tool of payers to justify payment at a particular level of medical care – makes it suitable for the purposes of this study. The use of utilisation review outside of the US has shown the tools to have utility in helping to determine the most appropriate care setting for a patient, thus assisting in patient flow, in identifying potential inefficiencies in the processes of care, and as a planning tool to identify gaps in the availability of certain care settings (Poulos and Eagar, 2007 [Ch2]).

On the basis that the InterQual tool had been used in countries outside of the USA with health systems similar to Australia (the United Kingdom and Canada) and that it appeared to have ‘face validity’ (because it has specific criteria for rehabilitation and subacute care), it was decided that the InterQual tool might be applicable to the Australian setting. The tool was thus selected for the pilot study which was to be based within an acute hospital in NSW, Australia.

**Description of the InterQual Criteria**

The InterQual Level of Care Criteria were originally developed in 1978. Now under the ownership of the US-based McKesson Corporation, the Criteria are reported to be updated annually based on changes to clinical practice, the medical literature and user feedback (Mitus, 2008). Data collection can be via a paper-based system or through custom software, known as ‘CareEnhance Review Manager’.

The InterQual Acute (Adult) Criteria set include separate criteria for ‘admission’, ‘continued stay’ and ‘discharge review’, each intended to demonstrate appropriateness at a given level of care based on the patient’s clinical status and services that are being
provided. The InterQual Criteria do not prescribe or determine the medical or clinical care provided to a patient. Rather, their purpose is to assess the patient’s clinical condition and services received against the various levels of care being tested. If the patient’s condition and the services they are receiving do not meet appropriateness for a given level of care, there is capacity within the Criteria to test appropriateness against an alternative level of care (Flintoff et al., 1998; Poulos, 2010 [Ch6]; Poulos et al., 2007a [Ch4]; Poulos et al., 2011 [Ch5]).

A more complete description of the InterQual Criteria, and how they were used in this program of research, can be found in each of the publications which have arisen from this body of work (Chapters Two, Four, Five and Six). A description of the InterQual Criteria is also contained in Appendix 1 of this thesis.

**Piloting of the InterQual tool in Australia**

In a study developed and led by the Candidate, the InterQual tool was piloted in a large regional acute public hospital in NSW, Australia. This study is detailed in Chapter Four of this thesis (Poulos et al., 2007a [Ch4]). The aim of the pilot was to determine the tool’s utility in the Australian context and also to pilot its use at the interface between acute care and rehabilitation, comparing the results of concurrent utilisation review with the current ‘gold standard’ of physician assessment for rehabilitation selection. This usage of the tool had not previously been reported in the scientific literature, despite the question of selection and transfer to rehabilitation being key in exploring the rehabilitation patient journey.

In the pilot study, concurrent utilisation review was conducted on patients with diagnoses of stroke, hip fracture or amputation, as these patients had a high likelihood of requiring rehabilitation, thus allowing utilisation review data to be collected from the date of admission (or amputation) until rehabilitation transfer. All other patients referred for rehabilitation medical assessment were also followed with concurrent utilisation review (Poulos et al., 2007a [Ch4]).
The study included 242 patient episodes (ie patient stay in hospital from admission to discharge), representing 2698 days of stay in acute care. The proportion of admissions resulting in rehabilitation consultation was 55% for stroke, 54% for hip fracture and 74% for amputation patients, justifying the selection of this group of patients for review from early in their acute episode of care. Patients with these diagnostic groups represented 117 of the 242 episodes (60 stroke, 46 hip fracture and 11 amputation), with 125 episodes being for all other patients referred for rehabilitation during the study period.

The study found that a high number of days of stay in acute care did not meet the utilisation review tool’s’ criteria for acute level of care. From admission, 56% of hip fracture patient days and only 34% of stroke patient days met criteria for acute level care. The figure for patients with amputation was 31% of days (from the date of amputation) and for the remaining group, only 12% of patient days met criteria for acute level of care. However, this latter group only had utilisation review conducted from the time of referral for rehabilitation.

These findings are consistent with the international research. However, for consistency, comparison could only be made for the patient groups followed with utilisation review from the time of admission (Poulos et al., 2007a [Ch4]). The results for the stroke patients in this study are very similar to the findings from a large Canadian study that reviewed 1596 stroke patient episodes (a retrospective review using the InterQual Criteria). That study reported that 72.7% of acute care days of stay for stroke patients did not meet acute level of care criteria (Flintoft et al., 1998).

The pilot study also found that there was a large discrepancy between when the rehabilitation team deemed the patient ready for transfer to rehabilitation and when the InterQual Criteria deemed patients ready for rehabilitation or other subacute care (Poulos et al., 2007a [Ch4]). It should be noted that the methodology of the study meant that the rehabilitation team were blinded to the InterQual assessments, as rehabilitation consultation data were recorded on the separate rehabilitation information management system and data linkage occurred only at the conclusion of the study.
According to the InterQual tool, almost all patients were deemed appropriate for transfer to rehabilitation much earlier than was current practice and these data were consistent across the diagnostic groups. For the patients with stroke, the rehabilitation team did not deem patients ready for rehabilitation transfer until well after the initial consultation, and a median of 6 days after the InterQual Criteria for acute care were no longer met. For the patients with hip fracture the figure was a median of 3 days, and for the ‘other rehabilitation’ patients it was a median of 4 days. Data were similar for patients with amputation but the numbers were too small for them to be presented as a separate group (Poulos et al., 2007a [Ch4]). One of the limitations of this work is that the ‘other rehabilitation’ group was only followed from the time of referral and it is possible that patients may not have met acute level of care criteria prior to the rehabilitation referral being made.

In the paper describing the results of this study (Chapter Four), there are a number of box plots which graphically show the above data, as well as the number of days to rehabilitation referral, rehabilitation consultation and rehabilitation transfer (Poulos et al., 2007a [Ch4]). These data are consistent across all of the patient groups and show that there was minimal delay in the rehabilitation consultation occurring following referral, and minimal delay in the patient being transferred to rehabilitation once deemed ready by the rehabilitation service.

Further data analysis from the pilot study showed a high rate of concordance (92% for stroke, 91% for hip fracture and 87% for ‘other rehabilitation’ patients) between current practice and the recommended InterQual level of care when it came to the selection of patients for rehabilitation. For patients who were actually transferred to rehabilitation, the alternative ‘InterQual’ level of care deemed appropriate (at the time acute level of care criteria were no longer met) was for a level of care consistent with Australian rehabilitation practice (i.e., acute or subacute rehabilitation, or a level of subacute care with a therapy component). These high rates of concordance suggest that the InterQual tool may be valid in the Australian context at the interface between acute care and rehabilitation, and possibly also within the rehabilitation setting.
Another indicator that the InterQual Criteria might have validity in Australia was the finding that 82% of the patients who were deemed appropriate for discharge home when acute level of care criteria were not met were actually discharged home directly from acute care by their team. Further, 29 of the 31 patients who went home had no further ‘acute days’ from the time they were deemed appropriate for discharge by the InterQual tool. These patients remained in hospital an average of almost 5 days after being deemed ready for discharge home by the tool (Poulos et al., 2007a [Ch4]). The rate of inappropriate hospital days of stay in acute care was similar between patients transferred to rehabilitation versus those who went directly home from acute care, suggesting that inappropriate acute hospital use was not confined to those patients requiring inpatient rehabilitation, and that inappropriate acute bed days might be a more general problem (Poulos et al., 2007a [Ch4]).

Summary of outcomes and conclusions from the pilot study

The key outcomes of this pilot study are summarised as follows:

- The InterQual tool was straightforward to apply in the hospital and the concepts, clinical measures and terminology used were applicable to Australian practice.
- The use of ‘secondary review’ and / or ‘secondary medical review’ when the criteria were inconclusive (an accepted component of the tool’s usage) readily resolved the situation with respect to whether the day of stay met appropriateness criteria or not.
- The average time taken for each review across the duration of the study was less than 12 minutes.
- The tool appeared to be valid in the Australian setting, evidenced by consistent findings between this study and those of international studies when it came to inappropriate acute bed use. Further evidence of validity came from results showing that there was general agreement (within the limitations of study) between current practice and the tool when it came to appropriateness of patient selection for rehabilitation or for discharge home.
- The pilot study confirmed the selection of the InterQual tool as an appropriate instrument for use in the subsequent research.
The key conclusions from the pilot study are summarised as follows:

- The high rate of inappropriate bed use in acute care for this patient cohort warranted further investigation.
- Inappropriate bed use might reflect inefficiencies within the processes of care in the acute hospital which are impacting upon the rehabilitation patient journey.
- While details of the reasons for these potential inefficiencies were not part of the scope of the pilot study, the data suggested that lack of available rehabilitation beds, or inefficiency in obtaining the rehabilitation consultation, did not appear to be the dominant factors.
- The large discrepancy between when the InterQual Criteria deemed patients appropriate for rehabilitation transfer compared with the current clinical practice warranted further investigation.

Reasons for inappropriate bed use within acute care

Chapter Five of this thesis details the second study employing utilisation review in the acute hospital, also on a cohort of patients who might require rehabilitation (Poulos et al., 2011 [Ch5]). The primary purpose of this study was to provide information on the reasons why acute level of care criteria are not met, and to explore the differences in decision making between the acute care and the rehabilitation teams around patient appropriateness and readiness for transfer. The utility of a utilisation review tool used in a decision support capacity in this context is also explored in this study.

The methodology employed for this study, conducted in 2007 / 2008, is provided in detail in the publication which is Chapter Five of this study (Poulos et al., 2011 [Ch5]). In summary, the patients included in the cohort were those with a diagnosis of stroke or hip fracture (followed with utilisation review from admission), those with joint replacement (followed from the time of surgery) and all other patients in the acute care hospital referred for rehabilitation during the study period (followed from the time of referral). Patients with amputation were not followed as a separate group in this study due to likely low numbers.
For a smaller cohort of patients (a convenience sample, based on reviewer availability, of patients referred for rehabilitation between the dates of 14/8/2007 and 17/11/2007), additional information was sought on the decisions of the acute care and rehabilitation teams about patient appropriateness for rehabilitation, and readiness for transfer. Data on the dates that the acute care and the rehabilitation teams deemed patients ready for rehabilitation transfer, the reasons why the rehabilitation team did not deem patients appropriate or ready for rehabilitation, and appropriateness for a rehabilitation alternative level of care according to utilization review, were collected by the utilization reviewers from information available in the medical record, the electronic data systems and from direct discussion with acute care and rehabilitation team clinicians.

The study reported data on 694 patient episodes in acute care, representing 7189 bed days. For the three patient types followed from acute admission or surgery, an average of 56% of days in the acute hospital met InterQual criteria for acute level of care. The figure was 49% for stroke patients, 55% for hip fracture patients and 71% for joint replacement patients. For those patients followed from the time of rehabilitation referral, 33% of days met criteria for acute care (from the time of referral) (Poulos et al., 2011 [Ch5]).

Reasons for inappropriate acute bed use in this study were able to be grouped into two dominant categories: delays in processes or scheduling, and being more appropriate for rehabilitation or a lower level of care. Delays in processes or scheduling accounted for 45% of inappropriate days (comprising delays in medical or other health professional consultations [17.9%]; an investigation or procedure delay [15.5%]; or delay in obtaining the rehabilitation initial consultation or subsequent review [11.7%]). Being more appropriate for rehabilitation or a lower level of care, including home, accounted for about 30% inappropriate days (comprising patients awaiting a rehabilitation bed [12.6%]; patients awaiting transfer to another, lower, level of care [12.3%]; or delays in patients being discharged home [5.3%]).

A further 12.9% of potentially ‘inappropriate’ acute bed days were recorded when patients were accepted by the rehabilitation team, but were not yet deemed ready by the rehabilitation team for rehabilitation transfer. This aspect of the rehabilitation patient
journey is discussed further in the section below. The remaining reasons for inappropriate acute bed use are detailed in the publication of this work, in Chapter Five of this thesis (Poulos et al., 2011 [Ch5]).

In summary, this second study, consistent with the pilot, reported high rates of inappropriate acute hospital bed days. The study also found that inefficiencies in scheduling and processes occurring within acute care were the dominant reasons why utilisation review criteria were not met. The inability of the acute hospital to either access a rehabilitation bed or a bed in another lower level of care, or for patients to be discharged home, also occurred commonly.

The implications of these findings are that increased capacity within the acute hospital setting for patients who may be journeying towards inpatient rehabilitation could be created by improving the processes of care (i.e. the logistics management of the acute hospital), such as the scheduling of investigations or procedures or instituting systems or benchmarks to improve the timeliness of clinical consultation provision. Acute capacity could also be improved by focusing on the availability of rehabilitation and other levels of subacute care, as well as on improving the provision of the discharge planning and post discharge services required to facilitate prompt patient discharge home.

A third study, presented in Chapter Six (Poulos, 2010), explored the patient journey within inpatient rehabilitation. The findings from that work have implications for patient care and capacity within inpatient rehabilitation, as well as on the availability of rehabilitation beds for acute care patients who require a subsequent inpatient rehabilitation episode.

Clinical decision making about patient selection – findings from the research

The second primary purpose of this second study using the InterQual tool in the acute hospital was to explore differences in decision making between the acute care and the rehabilitation teams around patient appropriateness and readiness for transfer, as well as
to investigate a possible role for utilisation review in a decision support capacity at the acute care / rehabilitation interface.

Data on 123 patient episodes are included in this analysis. Details of the findings are found in Chapter Five of this thesis (Poulos et al., 2011 [Ch5]).

One of the findings from this work was that in only 82 (67%) of the 123 episodes where patients were referred for rehabilitation was the patient actually transferred to rehabilitation. The reasons why acceptance or transfer to rehabilitation did not occur are presented in Chapter Five (see ‘Figure 1’, contained within the paper, on page 11 of the paper), but this finding highlights the fact that in a large number of cases there was a lack of agreement between the acute care and the rehabilitation teams on initial patient selection (for example, due to lack of agreement around medical stability or the need for additional investigations). It should be noted that guidelines were in place at the time of the study (reproduced as Appendix 2 of this thesis) to help acute care teams understand the types of patients who might be suitable for inpatient rehabilitation. However, consistent with research on the adherence to clinical guidelines, the data from this study suggest that the availability of guidelines may do little to influence practice (Cabana et al., 1999).

At the time the study was undertaken, the rehabilitation service did not have access to community-based alternatives to inpatient rehabilitation that were able to be substituted for inpatient care and so access to these alternatives was not a reason for referral to the rehabilitation service. The referral to the rehabilitation service was therefore almost always for consideration of a rehabilitation bed.

Another finding of the study was that, of the 82 patients who were transferred to inpatient rehabilitation from acute care, the acute care team deemed the patient suitable for transfer a mean of 1.4 days from the day of rehabilitation referral. The rehabilitation team, however, deemed patients suitable for transfer a mean of 4.0 days from the day of referral. Using the InterQual tool (and recording when the patient no longer met criteria for acute care and was suitable for rehabilitation transfer), the time from rehabilitation referral was a mean of 1.3 days (Poulos et al., 2011 [Ch5]). These data are consistent
with those from the pilot study (Poulos et al., 2007a [Ch4]), and also show that the acute care team is referring patients around the time (within 1.4 days on average) that they think the patient is actually ready for rehabilitation transfer.

The initial rehabilitation consultation occurred within a relatively short period of time (mean of 0.8 days from the day of referral), but rehabilitation transfer did not occur until a mean of 5.7 days after the date of referral. The wait for access to the rehabilitation bed once the patient was deemed ready by the rehabilitation team was therefore almost an additional 2 days on average. This is longer than that found in the pilot study, but consistent with data from the full cohort from this second study which showed that 12.6% of inappropriate days of stay in acute care were due to patients awaiting access to a rehabilitation bed once deemed ready by the rehabilitation team.

The greatest time period in the ‘referral to transfer-to-rehabilitation’ process remains the interval between initial rehabilitation consultation and the day that the rehabilitation team deems the patient ready for rehabilitation transfer. The acute care team and the InterQual tool had deemed patients ready for transfer more than 2 days earlier on average than did the rehabilitation team. Once again, these data are consistent with that from the full cohort that showed that, according to the InterQual tool, the additional wait for the patient to be deemed ready for transfer by the rehabilitation team accounted for 12.9% of inappropriate bed days in acute care.

To address the question of whether the rehabilitation team is justified in this delay (compared to the acute care team or the InterQual tool), an analysis of medical stability in the patient was undertaken. Given the reported validity of the InterQual tool as a measure of the requirement for acute level of care (DeCoster et al., 1997), if a patient day met the InterQual Criteria for acute level of care, then this was taken as the patient being medically ‘unstable’, or inappropriate for rehabilitation.

The analysis showed that, for the 82 patients transferred to rehabilitation, 23 (28%) met the InterQual requirement for acute level of care from the date the acute care team deemed them stable. This compared with only 7 (9%) patients meeting acute level of care criteria from the date the rehabilitation team deemed them stable. Nine (11%)
patients met the requirement for acute level of care from the time the InterQual tool deemed them ready for transfer (Poulos et al., 2011 [Ch5]).

These findings suggest that, even though the acute care team and the InterQual tool both deemed patients ready for rehabilitation transfer at about the same time on average for the cohort, the InterQual tool was a much better ‘predictor’ than the acute care team of ongoing medical stability in individual patients. The rehabilitation team was a marginally better predictor of ongoing medical stability in individual patients than the InterQual tool (9% versus 11% becoming unstable), but at the cost of more than 2 days additional stay in acute care.

The findings also highlight the fact that clinical opinion regarding medical stability is not consistent between the acute care teams and the rehabilitation team, and that a utilisation review tool such as the InterQual Criteria may be able to play a decision support role. To further support this conclusion, the InterQual tool appeared to have a predictive role in determining when the rehabilitation team was likely to deem a patient medically stable. The study found that, if the InterQual tool deemed the patient stable and ready for transfer on the day of the initial rehabilitation consultation, then the rehabilitation team deemed the patient ready for transfer an average of 1.5 days after consultation. However, if the patient was not deemed stable by the InterQual tool on the day of initial rehabilitation consultation, then the rehabilitation team did not deem them ready for transfer until an average of 6 days after the consultation (Poulos et al., 2011 [Ch5]). The rehabilitation team and the acute care team were blinded to the results of concurrent utilisation review.

Utilisation review in the inpatient rehabilitation setting - a first reported study

The final phase of the program of research submitted as this thesis is that of the patient journey within the inpatient rehabilitation setting. Details of this work are presented in Chapter Six (Poulos, 2010).

Inpatient rehabilitation services are widely available in Australia and there is a national approach to the collection of rehabilitation outcome data (New and Poulos, 2008 [Ch7]:
Simmonds and Stevermuer, 2008). There are also service standards for specialist rehabilitation services which include recommended staffing numbers at the level of the rehabilitation facility (Allied Health in Rehabilitation Consultative Committee, 2007; Australasian Faculty of Rehabilitation Medicine, 2005). However these recommended staffing levels do not translate into a quantum of therapy that an individual patient should receive while in rehabilitation. This is in contrast to the USA, where patients in inpatient rehabilitation facilities are mandated to receive a minimum of 3 hours of therapy per day over at least 5 days per week (Medical Inpatient Rehabilitation Criteria Task Force, 2006). The recommended staffing levels for therapists in Australian rehabilitation facilities also do not take into account the full range of tasks that therapists are required to do, which in turn reduces the amount of time that they can devote to delivering therapy to patients (Poulos, 2010 [Ch6]).

The primary aim of this third study within the overall body of research was to examine the appropriateness of the rehabilitation patient journey by employing concurrent utilisation review using a tool that purports to include criteria for inpatient rehabilitation appropriateness. This study is the first reported in the international literature on the use of formal utilisation review in the rehabilitation setting.

A description of the InterQual Criteria is contained elsewhere in this thesis (in Chapters Two, Four and Six, and Appendix 1). The InterQual (Adult) Rehabilitation and Subacute Criteria are consistent with rehabilitation practice in Australia in terms of patient selection for rehabilitation. They are also consistent with the patient selection guidelines in use by the rehabilitation service in the study hospitals (and reproduced as Appendix 2). However, there is not consistency between the way InterQual defines ‘levels’ of rehabilitation and subacute care and the way public rehabilitation facilities in Australia operate.

The InterQual levels of rehabilitation and subacute care are described in detail in Chapter Six (Poulos, 2010) and Appendix 1, but can be summarised as ‘Acute Rehabilitation’, ‘Subacute Rehabilitation’, ‘Subacute Care’ and ‘Skilled Nursing Care’ (2006 InterQual Criteria). These levels of rehabilitation and subacute care differ in terms of the patient’s requirement for, and ability to tolerate, therapy as well as the
quantum of therapy that must be provided (ranging from three or more hours per day in ‘Acute Rehabilitation’ to less than one hour per day in ‘Skilled Nursing’). There are also other differences between the levels, such as the availability of medical and nursing support, staff expertise and equipment, which are detailed in Chapter Six, but all levels require that the patient has potential for functional improvement, with the improvement of function being a major treatment aim.

On reviewing the suitability of the InterQual Criteria for use in this study, it became apparent that all four InterQual rehabilitation and subacute levels could describe patients undergoing public inpatient rehabilitation in facilities in Australia, and may therefore be used to describe ‘appropriate’ rehabilitation care in the Australian context. Also, apart from the amount of therapy routinely available, the rehabilitation facilities used in this study met the requirements for the most intensive rehabilitation level of care (‘Acute Rehabilitation’). This meant that the facility itself was not going to be a limiting factor in patients meeting InterQual Criteria for up to the most intense level of rehabilitation or subacute care.

In determining which InterQual rehabilitation or subacute level of care the patient day was assessed against, reviewers in this study looked at:

- patient factors (i.e. diagnosis and impairment, goals, patient’s motivation, number of therapy types required, ability to participate in the program and tolerance of therapy);
- the recommended appropriate amount of therapy for the patient (based on information provided by the treating therapists), and;
- the amount of therapy that patients actually received.

Reviewers deemed a day of stay as meeting the utilisation review criteria if the patient factors and the amount of therapy (both that deemed appropriate and that received), met one of the InterQual rehabilitation or subacute levels of care. When criteria were not met, the reason, along with the most appropriate alternative level of care, was recorded. For example, if the patient factors and the amount of therapy deemed appropriate met the ‘Acute Rehabilitation’ level of care criteria, but the patient did not receive enough therapy for that category, then that day was classified as not meeting the criteria for
‘Acute Rehabilitation’, with the variance reason being ‘insufficient therapy time’. (Poulos, 2010 [Ch6]).

The study found that, applied as above, the InterQual tool had good utility in the Australian context. Also, the review process was not costly because patient reviews in the rehabilitation and subacute settings are only required once or twice per week.

Findings from the study of utilisation review in inpatient rehabilitation

The study followed 267 rehabilitation patient episodes, representing 7359 days of stay. Overall, only 48% of days of stay in inpatient rehabilitation met criteria for appropriate care. These are days in which the patient was both clinically appropriate for one of the InterQual levels of care and received sufficient therapy for the level to which they had been classified. The figure was highest for hip fracture patients (58%) (Poulos, 2010 [Ch6]).

Of the days that met appropriateness for one of the rehabilitation or subacute levels of care, the majority were only at the ‘Skilled Nursing’ level (61%), followed by ‘Subacute Care’ (33%). Only 1% and 5%, respectively, of days of stay met criteria for ‘Acute’ or ‘Subacute’ Rehabilitation.

The study also examined the reasons why days of stay did not meet utilisation review criteria. Overall, receiving insufficient therapy was the most common reason, accounting for 27% of inappropriate days of stay. Waiting for long term placement was the second most common reason (26%), followed by the patient being more appropriate for discharge home, and being more appropriate for acute or subacute medical care (both at 17%). A range of reasons made up the remaining 13% (and included patients not being able to tolerate therapy on those days or the lack of an identifiable management plan).

There were some differences between the diagnostic groups in terms of the reasons why rehabilitation or subacute level of care criteria were not met – for example, receiving insufficient therapy accounted for 42% and 50%, respectively, of inappropriate days of
stay for stroke and joint replacement patients, while the most common reason for the hip fracture and the ‘other’ rehabilitation patient group was awaiting long term care (Poulos, 2010 [Ch6]).

**Therapy levels and staffing within inpatient rehabilitation**

This study also collected data on the actual therapy patients received while in the inpatient rehabilitation facilities. These data are available for 208 patient episodes. The data showed that patients received therapy of any nature or duration on only 50% of the calendar days that they were admitted. No therapy was received on weekends or public holidays. The mean amount of therapy patients received per weekday was only 37 minutes, with stroke patients receiving the highest mean amount (56 minutes). If days of stay which did not meet appropriateness are excluded from this analysis (except where the reason was ‘insufficient therapy’), the mean amount of therapy received per weekday increases to 48 minutes on average, and 69 minutes for stroke patients (Poulos, 2010 [Ch6]).

Further analysis conducted for this study examined the allied health staffing levels (specifically physiotherapy, occupational therapy and speech therapy) of the facilities, and made comparisons against the AFRM Service Standards and the amount of therapy time available for patients. The study showed that allied health staffing levels were below the AFRM Standards (adjusted for casemix for the facilities). Physiotherapy was at 1.14 FTE per 10 beds compared to a recommended 1.3; occupational therapy was at 0.81 FTE compared to 1.0; and speech therapy was at 0.17 FTE compared to a recommended 0.35 (Poulos, 2010 [Ch6]). However, as noted in the publication resulting from this work, recommended allied health staffing levels are casemix dependent and therefore can vary over time as casemix varies.

On average, about 75% of a therapist’s time should be ‘patient attributable’\(^3\) (Poulos, 2010 [Ch6]). ‘Patient attributable’ time includes not only direct therapy delivery, but also other tasks, such as attending case and family conferences and ward rounds,

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\(^3\) Personal communication with Ms Wendy Hubbard, Chair of the Allied Health in Rehabilitation Consultative Committee, 5 February 2009.
documenting in the medical record, travelling for home visits and writing reports. The study found that only 68% of a physiotherapist’s ‘patient attributable time’ was devoted to actual patient therapy, with the figure for speech pathologists being only 48% and for occupational therapists a very low 24%. These findings suggest that these other tasks are utilising much of the therapists’ time and are perhaps taking them away from the provision of direct patient therapy (Poulos, 2010 [Ch6]).
CHAPTER 2: Determining appropriateness for rehabilitation or other subacute care: is there a role for utilization review?

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Determining appropriateness for rehabilitation or other subacute care: is there a role for utilisation review?  
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Abstract

Background: Rehabilitation and other forms of subacute care play an important role in the Australian health care system, yet there is ambiguity around clinical definitions of subacute care, how it differs from acute care, where it is best done and what resources are required. This leads to inconsistent and often poorly defined patient selection criteria as well as a lack of research into efficient models of care.

Methods: A literature review on the potential role of utilisation review in defining levels of care and in facilitating appropriate care, with a focus on the interface between acute care and rehabilitation.

Results: In studies using standardised utilisation review tools there is consistent reporting of high levels of ‘inappropriate’ bed days in acute care settings. These inappropriate bed days include both inappropriate admissions to acute care and inappropriate continuing days of stay. While predominantly an instrument of payers in the United States, concurrent utilisation review programs have also been used outside of the US, where they help in the facilitation of appropriate care. Some utilisation review tools also have specific criteria for determining patient appropriateness for rehabilitation and other subacute care.

Conclusion: The high levels of ‘inappropriate’ care demonstrated repeatedly in international studies using formal programs of utilisation review should not be ignored in Australia. Utilisation review tools, while predominantly developed in the US, may complement other Australian patient flow initiatives to improve efficiency while maintaining patient safety. They could also play a role in the identification of patients who may benefit from transfer from acute care to another type of care and thus be an adjunct to physician assessment. Testing of the available utilisation review tools in the Australian context is now required.
Subacute care and rehabilitation

Eagar and Innes introduced the term ‘subacute’ into Australia in 1992 to describe patients whose need for health care is predicted by their functional status, rather than their principal medical diagnosis [1]. Other definitions of subacute care also exist. Common to all is that there is a group of patients who no longer meet criteria for classification as ‘acute’, but who still require care in a hospital setting, with the care required being more clinically intense and goal directed than is long term care [2-5]. The issue becomes more difficult when trying to define the actual boundary between acute care and subacute care, with the situation in Australia being one where, according to Eagar and Innes, our ‘acute’ hospitals “treat a diverse population of patients, many of whom would not meet criteria for classification as acute” [1]. In a later paper, Eagar then discusses the boundaries between acute care and other forms of care, and the development of the subacute and non-acute patient casemix classification system [6].

In Australia, rehabilitation is classified, for casemix purposes, as a distinct form of subacute care [7]. The AN-SNAP (Australian National Sub-acute and Non-Acute Patient) classification system, developed in 1997, defined four types of subacute care (Rehabilitation, Geriatric Evaluation and Management, Psychogeriatric and Palliative Care), as well as non-acute (Maintenance) care, with these definitions being subsequently incorporated into the National Minimum Data Set for Admitted Patient Care [8]. Within AN-SNAP, a rehabilitation episode of care is one that is: ‘provided for a person with an impairment, disability or handicap’ and; ‘for whom the primary treatment goal is improvement in functional status’ and; ‘which is evidenced by an individualised and documented initial and periodic assessment of functional ability by the use of a recognised functional assessment measure’ and; ‘an individualised multidisciplinary rehabilitation plan which includes negotiated rehabilitation goals and indicative time frames’ [9].

While the current Australian definitions that exist for subacute care, including rehabilitation, may be useful for casemix purposes and to describe the general characteristics of this patient population, they are not as helpful when trying to prospectively identify patients who may be appropriate for such care or for determining when it should commence. This, in turn, leads to an inability to examine different models of care for such patients. Eagar (1999) notes that the boundary between acute care and rehabilitation needs to be more clearly defined now that there is a classification system for rehabilitation and subacute care [7].

A 2001 Victorian Department of Human Services report into the interface between subacute and acute care [10] noted that there was a ‘lack of focus and coordination in referral to, and provision of, subacute services, which affects throughput and efficiency’. The report raised the issue of the timing of patient transfer between acute and subacute services, and the impact that may have on both the acute and subacute episode. While the report details strategies to address some of these issues, the use of more transparent and validated patient selection criteria for rehabilitation and other subacute care was not mentioned.

The interface between acute care and rehabilitation

Rehabilitation medicine services within Australia generally have guidelines, either implicit or explicit, that broadly define the types of patients that they will accept for an inpatient rehabilitation program. These guidelines will usually include clinical factors, such as the potential for the patient to functionally improve with rehabilitative therapy, the capacity of the patient to participate in a rehabilitation program and the degree to which the patient is medically stable. Other factors may include specific goals of the patient and/or carers and the patient’s premorbid level of functioning.

In practice, while the decision about if, and when, to transfer a patient to a rehabilitation bed is largely based on the clinical judgement of the assessing rehabilitation physician or registrar, the threshold for accepting a patient for rehabilitation is often influenced by a number of system factors. These may include the degree of ‘bed pressure’
in acute care, the availability of the rehabilitation bed, access to diagnostic investigations and/or ongoing medical or surgical care or review in the rehabilitation facility, and the availability of substitutable ambulatory rehabilitation programs.

Transferring patients from acute care to rehabilitation or other subacute level of care at the optimal time may have significant benefits, both for the patient, as well as for the health system [10]. Outcomes for patients may be improved if they are able to commence formal rehabilitation earlier and there may also be improvements in overall hospital length of stay and cost of care. In addition, the problem of 'access block' may be helped by the more timely transfer of patients from acute care beds to rehabilitation. Conversely, there may be adverse outcomes if patients are transferred too early. For example, patients who remain medically unstable may not be able to be safely managed in the rehabilitation facility, unstable medically conditions could render the rehabilitation process less effective, and undue time could be wasted if the patient has to be transferred back to the acute care facility, or other centre, for diagnostic or medical evaluation.

Selection for a formal rehabilitation program is relatively clear-cut when patients have the new onset of defined impairments that are likely to be responsive to rehabilitation. The situation is less clear when patients have multiple morbidities or general debility and this group, which is typically older patients, is increasingly occupying acute care wards as the population ages. These patients will often have completed an acute episode, are no longer deemed to require acute care by their medical or surgical teams, but are not able to be discharged. They often require a period of restorative care and/or complex discharging planning, with the question often becoming whether transfer to a formal rehabilitation or subacute/post-acute program is the best option, or whether the patient is more efficiently managed by remaining in the acute care ward until ready for discharge.

One way of more clearly defining the boundary between acute care and rehabilitation or other subacute care is to develop specific criteria for the identification of patients who no longer meet criteria for classification as 'acute', as well as selection criteria and processes for rehabilitation transfer. This suggests a role for utilisation review.

**Methods**

A Medline search was conducted via Ovid to examine the literature on selection for rehabilitation or other subacute care and the role of utilisation review in these situations. Key words searched included utilisation review, rehabilitation, physical medicine, subacute care, and patient selection. These returns were screened by title, initially for relevance to "rehabilitation" or "sub-acute care" and "utilization review" or "patient selection". Those not evident from the title were reviewed at abstract level for relevance. The references from each of the chosen papers were then reviewed to find other contributory papers. A general Internet search was also conducted, in addition to use of unpublished data from the Australian Rehabilitation Outcomes Centre (AROC), University of Wollongong, Australia.

**Results**

**Selection Criteria for Rehabilitation**

There is a growing literature on the predictors of rehabilitation outcomes, but selection criteria based only on those for whom a 'good' outcome can be anticipated will deny many patients the opportunity to achieve worthwhile functional recovery. Wade (2003) notes that purchasers of health care services often ask service providers to produce selection criteria. These are meant to ensure that only patients likely to benefit from an intervention are referred and accepted, and that all applicable patients are referred. However, in the rehabilitation context, Wade argues that the question of potential benefit is not always clear cut, with the situation being more a case of patients varying along two continua – the likelihood of benefit and the extent of benefit. He cautions against the use of public selection criteria, due to the lack of good evidence on who is responsive to rehabilitation and the danger of asking untrained staff to apply clinical criteria [11].

Much of the literature on patient factors that predict a good rehabilitation outcome centres on specific diagnostic groups, such as stroke or orthopaedic conditions [12,13], but selection for rehabilitation becomes less clear when patients have multiple morbidities or general debility [14]. This would seem to be an increasing trend in Australia, as unpublished AROC data show that up to 25% of rehabilitation episodes in public hospitals are now for patients with more general debility or multiple impairments. But there is also anecdotal evidence to suggest that, even with relatively straightforward conditions such as elective joint replacement, the utilisation of formal rehabilitation programs varies widely between the states and between the public and private sectors. If this is the case, a lack of uniform patient selection criteria may be a factor.

There is very little in the literature on formal criteria or procedures for patient selection for rehabilitation and little evidence to guide the development of such criteria. This deficit has been recognised, with Unsworth (2001) [12] noting that objective criteria for the selection of patients for rehabilitation may help acute care clinicians make more informed discharge planning decisions.
Alternatives to physician assessment alone for selection for rehabilitation have been explored. For example, members of the multidisciplinary rehabilitation team could be involved in the selection process. One US study showed that rehabilitation outcomes for stroke patients were the same if patients were selected by a physiatrist (rehabilitation physician) alone, or by the physiatrist basing their decision to accept a patient on a nurse practitioner’s assessment [15]. However, the reliability of the clinical judgement of different members of the multidisciplinary rehabilitation team in determining the rehabilitation potential of patients has been questioned, with the suggestion that, in the case of older patients, it may be preferable to use a standardised assessment in the initial decision regarding patient selection [14]. Other suggestions include scoring systems to determine the site of rehabilitation (home versus post-acute facility) for patients following total hip replacement [16], or nurse to nurse referral for rehabilitation in community hospitals in the United Kingdom [17].

The issue of selection criteria for other ‘subacute’ care is less clear than for rehabilitation, probably because definitions of what constitutes subacute care vary [18].

Utilisation Review – a brief description

Utilisation review is a method that assesses the appropriateness of the medical or clinical care provided to a patient, including the appropriateness of the care setting and the duration of care [19]. Inappropriate hospital utilisation includes both over- and under-utilisation. Over-utilisation includes the admission to hospital of patients who could have been managed, from a clinical perspective, in a less intensive care setting, or patients who remain in a more acute setting for longer than required [20]. Under-utilisation occurs when patients do not receive the intensity of care required.

Utilisation review information is derived from the patient’s medical record, their treating clinical team, or a combination of these sources. Concurrent utilisation review is the most common, as well as the most useful, as it allows for corrective action to be taken, such as discharge planning or finding a more appropriate care setting for the patient. Retrospective reviews are likely to reveal higher rates of inappropriate utilisation than concurrent reviews, but this is usually due to information justifying a level of care being missing or unavailable [21].

The utilisation review literature consistently demonstrates high levels of inappropriate hospital bed days for patients in acute care, with a large percentage of these days being for patients who should, according to the review criteria, be in a lower level of care. The reported rate of inappropriate days of stay in acute care ranges from around 19% to 60%, while between 18% and 48% of admissions to acute care have been reported as inappropriate [5]. Causes of inappropriate days of stay include delays in the discharge process, lack of appropriate post acute care services, delays in diagnostic tests, and delays in medical and other specialised consultations [22]. Utilisation review tools may also highlight situations when the patient remains in acute care when the need is for rehabilitation or other sub-acute level of care.

There can also be significant rates of under-utilisation of acute care, although there are fewer studies available that specifically examine under-utilisation. The amount of inappropriate under-utilisation is reported as being much smaller (less than 4 %) than that for inappropriate over-utilisation [23]. Detecting under-utilisation may assist in maintaining clinical quality by the monitoring of premature discharge, or care in a sub-optimal setting (for example, when patients should be in critical care rather than on a general ward, or the premature transfer to rehabilitation of patients who are medically unstable).

Utilisation review became widespread in the United States following the introduction of Medicare and Medicaid [19]. Utilisation review programs have since been adopted in Canada, the United Kingdom, and Europe, but less so in Australia [24,25]. In the US, formal utilisation review programs have primarily become a tool of payers of health care services to better manage costs. However, another cited reason for detecting over-utilisation is to help reduce the iatrogenic risk associated with hospitalisation [19]. Done concurrently, utilisation review in the United States is regarded by managed care organisations as being both a cost containment strategy and a quality improvement tool [26]. However, outside of the United States, utilisation review tools are seen more as an aid to facilitate appropriate care, rather than a mechanism for approving or denying care, or the payment for care, for individual patients [27].

When utilisation review was introduced, appropriateness was based primarily on the reviewer’s judgement. However, when inter-rater reliability was found to be inadequate, even when using physicians who had been selected based on their expertise, attention was placed on the development of specific criteria. The Appropriateness Evaluation Protocol (AEP) by Gertman and Restuccia [28] was the most widely used tool initially developed. The AEP contained a list of medical and nursing/life services that were judged to be only available at an acute hospital and a list of patient condition factors that were thought to require the resources of an acute hospital. A patient day was considered appropriate if any one of the services or conditions was present [19].
While utilisation review may be able to detect 'inappropriate' days of stay in acute care, it remains only an assumption that patients will be more appropriately managed in a less acute setting [29]. Further, there is evidence that only about 50% of unnecessary days in acute care can be avoided without additional resources being required, and that the 'inappropriate' days are less resource intensive and thus less costly [30]. This needs to be considered when determining the cost effectiveness and clinical appropriateness of utilisation review interventions. In addition, because overall hospital length of stay in acute care has fallen, it is possible that there may not be as many inappropriate days of stay now, compared to the findings of earlier studies.

Utilisation review has not been widely reported as a tool to assist in the determination of the appropriateness for, and timing of, transfer to rehabilitation or subacute care. While a number of utilisation review tools are reported in the literature, very few tools report specific criteria for determining appropriateness for rehabilitation and subacute care. The three tools reported to include selection criteria for rehabilitation or sub-acute care are all proprietary products. These are the InterQual Criteria (McKesson Corporation), the Managed Care Appropriateness Protocol – MCAP – which is based on the AEP (The Oak Group), and the Milliman Care Guidelines (Milliman USA). Being proprietary, access is not freely available, and there is only limited information available on them in the peer reviewed literature. Of these three, the InterQual Criteria is the most widely reported, with about 25 papers or citations in Medline.

The InterQual Criteria – a utilisation review tool

The InterQual Criteria is a proprietary utilisation review tool developed in the United States. It has been cited in published work originating from both the US and outside the US [5,23,24,27,29,31-46]. For example, one US study (a retrospective chart review of 858 admissions) used the InterQual subacute criteria to determine the prevalence of subacute patients in acute care beds in 43 Veterans Affairs Hospitals in the US. This study showed that over one third of patients (38%) had at least one subacute day during their acute admission, with subacute days occurring more frequently for medical (42%) than for surgical admissions (33%). For those admissions which had any subacute days, 54% of the days in acute care were classified as subacute by the InterQual Criteria [31]. This was equivalent to almost 7 bed days per admission. This study also found that patients experiencing subacute days were likely to be older and sicker. The authors suggest that future studies focus on developing targeting criteria that enable clinicians to prospectively identify patients with subacute care needs. The authors also note that the purpose of subacute care is not just to move patients from one setting to another, but to provide more appropriate care.

Published papers outside of the United States indicate that the InterQual Criteria have been predominantly used in Canada and the United Kingdom [5,23,29,32,33,39,40,42,46,47]. DeCoster et al (1997), in a retrospective chart review of 3,904 patients in Canada, found that, after one week, 53.2% of patients assessed as needing acute care on admission no longer required acute care. Patients 75 years of age accounted for more than 50% of bed days, but 74.8% of these bed days were regarded as being inappropriate for acute care. The authors noted that the InterQual Criteria have the advantage of being diagnosis independent (thus being unaffected by diagnostic errors), they are broadly accepted by physicians as being a reasonable measure of the need for acute care, and they have been externally validated[33].

In another large Canadian study involving 189 acute care hospitals and 13,242 patient discharges, Flintoff et al (1998) used the InterQual (Adult Acute) criteria to determine the level of care most appropriate for admission and subsequent days of stay [5]. They found that, for all admissions, 62.2% were judged by the criteria to be acute, 19.7% subacute and 18.1% non-acute. Following admission, acute care was needed on only 27.5% of subsequent days, subacute care on 40.2% of days and non-acute care on 32.3% of days. Inter-rater reliability in this study was found to be high (kappa ranged from 0.71 to 1.00).

When used in the United Kingdom, the InterQual Criteria were found to have high reliability and to be valid when there was a presumption that the full range of alternative levels of care was available. There were limits to their validity in the UK National Health Service when the alternatives were not available [40], leading to the criticism that, if the alternatives are not available, then utilisation review is not achieving its aims [48]. However, it is also suggested that health services planners could use the information supplied by the utilisation review process to then evaluate the benefits of developing those services which are not available [47].

Utilisation review, and the various review tools, are not without their critics, with concerns raised about the validity of the criteria being used [29,36,37,49,50]. The InterQual tool, along with the AEP, was shown to have moderate validity and reliability in the United States in a study done by Straumwasser in 1990, leading the authors to conclude that payment should not be denied based on the instrument alone, but only if the decision is confirmed by a physician [41]. Even though criteria such as InterQual have been validated against expert panels, the question arises as to how valid they remain with subsequent
revisions and with changes in clinical practice. Also, validity may vary between institutions, depending upon the services available [34]. It should be noted, however, that administered concurrently, the InterQual Criteria allow for physician over-ride to the outcome of the review if there are clinical reasons for doing so.

**Applicability of utilisation review tools in Australia**

While the concept of utilisation review is likely to be as applicable in Australia as it is in other developed countries, the applicability of the specific tools requires formal testing. The AEP has been trialled in an Australian study that assessed admission appropriateness to an acute hospital, finding that it was both efficient and clinically valid for use in Australian hospitals, with only minor modifications required [25]. A further study, also using the AEP, found that 15.2% of admission days and 28.7% of days of stay were non-acute. The authors concluded that the AEP was a useful tool for assessing non-acute days of stay, but that inpatient treatment in acute care facilities in Australia may not be as rigidly controlled as in the US, where the tool was developed [51]. Despite these studies, adoption of the AEP in Australia as a utilisation review tool does not appear to have occurred.

One of the criticisms of the InterQual Criteria is its reduced suitability outside of the United States due to the existence of fewer alternatives to acute care available in other health systems [24]. Also, what constitutes ‘acute care’ may also differ, with the US appearing to have tighter definitions than in Australia as to what comprises acute care, with these definitions both shaping, as well as being shaped by, utilisation review tools.

**Conclusion**

Tools to inform patient selection decisions, and which help to validate care within settings, are of relevance to clinicians, administrators and policy makers. While subacute care is an accepted and important component of the Australian health care system, it remains poorly defined from a clinical perspective. This lack of clinical definition impedes research into models of subacute care, including how it should best interface with acute care and when and how it should occur outside of the acute care setting.

Rehabilitation is a type of subacute care with firmly established models of clinical practice and good evidence of efficacy in a range of impairments. Yet patient selection for rehabilitation remains variable, relying predominantly on clinical judgement and being influenced by system factors such as rehabilitation bed availability and pressure on acute care. It is the challenge of our health care system to ensure that the potential gains to be made from multidisciplinary, goal directed, rehabilitation interventions are afforded to all patients likely to benefit.

This leads to a possible role for utilisation review. The high levels of ‘inappropriate’ care demonstrated repeatedly in international studies using a variety of tools, as well as the limited Australian work available, should not be ignored in Australia, especially as we grapple with issues of efficiency and patient safety. Yet formal utilisation review has not been embraced. Practiced overseas, utilisation review has a role in clinically determining the most appropriate level of care for an individual patient, with some tools also having specific criteria for selection for rehabilitation or other subacute level of care. As well as being potentially useful at the interface between acute care and other types of care, utilisation review has the potential to provide a mechanism by which the processes of acute care could be improved. It could also assist health service planners in determining acute and subacute capacity.

In the absence of well-validated, contemporary, public domain tools, there appears little choice but to consider proprietary utilisation review tools. The companies promoting them claim that the tools enhance efficiency and patient safety through having evidence-based checklists that support the safe transit of patients through different levels of care and care settings. However, the tools also have their critics and need to be tested against current Australian practice. Their applicability in the Australian context, where there are less alternate care settings than are available in the US, and where clinical terminology differs from the US, also needs to be tested.

Even if the tools are shown to be applicable in Australia, it would still need to be shown whether the establishment of formal utilisation review programs is cost effective, and whether these US-based systems are transferrable to Australia without major modifications to the criteria and supporting software. The degree of physician acceptance is another very important issue. These are important research questions that need to be tested and which could have significant health policy implications for Australia.

**Competing interests**

The author(s) declare that they have no competing interests.

**Authors’ contributions**

CP undertook the literature review. Both authors drafted the manuscript and approved the final manuscript.
References


CHAPTER 3: Supporting work practices, improving patient flow and monitoring performance using a clinical information management system.

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CHAPTER 4: Managing the interface between acute care and rehabilitation – can utilization review assist?

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CHAPTER 5: Determining level of care appropriateness in the patient journey from acute care to rehabilitation

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http://www.biomedcentral.com/content/pdf/1472-6963-11-291.pdf
Determining level of care appropriateness in the patient journey from acute care to rehabilitation

Christopher J Poulos¹,²*, Christopher Magee¹, Guy Bashford² and Kathy Eagar¹

Abstract

Background: The selection of patients for rehabilitation, and the timing of transfer from acute care, are important clinical decisions that impact on care quality and patient flow. This paper reports utilization review data on inpatients in acute care with stroke, hip fracture or elective joint replacement, and other inpatients referred for rehabilitation. It examines reasons why acute level of care criteria are not met and explores differences in decision making between acute care and rehabilitation teams around patient appropriateness and readiness for transfer.

Methods: Cohort study of patients in a large acute referral hospital in Australia followed with the InterQual utilization review tool, modified to also include reasons why utilization criteria are not met. Additional data on team decision making about appropriateness for rehabilitation, and readiness for transfer, were collected on a subset of patients.

Results: There were 696 episodes of care (7189 bed days). Days meeting acute level of care criteria were 56% (stroke, hip fracture and joint replacement patients) and 33% (other patients, from the time of referral). Most inappropriate days in acute care were due to delays in processes/scheduling (45%) or being more appropriate for rehabilitation or lower level of care (30%). On the subset of patients, the acute care team and the utilization review tool deemed patients ready for rehabilitation transfer earlier than the rehabilitation team (means of 1.4, 1.3 and 4.0 days from the date of referral, respectively). From when deemed medically stable for transfer by the acute care team, 28% of patients became unstable. From when deemed stable by the rehabilitation team or utilization review, 9% and 11%, respectively, became unstable.

Conclusions: A high proportion of patient days did not meet acute level of care criteria, due predominantly to inefficiencies in care processes, or to patients being more appropriate for an alternative level of care, including rehabilitation. The rehabilitation team was the most accurate in determining ongoing medical stability, but at the cost of a longer acute stay. To avoid inpatients remaining in acute care in a state of ‘terra nullius’, clinical models which provide rehabilitation within acute care, and more efficient movement to a rehabilitation setting, is required. Utilization review could have a decision support role in the determination of medical stability.

Keywords: acute care, subacute care, rehabilitation, utilization review, casemix, patient selection, InterQual

Background

Changes to traditional models of care will be required if health systems are to manage the increasing demand that will be placed on hospitals as a result of an aging population [1-3]. One area where change may be necessary is the interface between acute care and rehabilitation. The selection of inpatients for rehabilitation, and the timing of transfer from acute care, are important clinical decisions that impact on quality of care and patient flow [4-6]. Inpatient rehabilitation is provided in almost equal quantities in the public and private sectors in Australia. Private sector rehabilitation is funded through a variety of private health insurance and accident compensation...
schemes. Public sector rehabilitation is funded by the states and territories with the funding including federal health grants. Most inpatients requiring rehabilitation receive a ‘two-stage’ model of care: acute care in an acute hospital followed by transfer for rehabilitation. Variables affecting the timing of transfer include the timing of the referral, the efficiency of the rehabilitation assessment process, patient stability and the degree of ‘bed pressure’ in both the acute and rehabilitation facilities. Whether the rehabilitation facility is co-located within the acute hospital, or ‘stand-alone’ in an off-site facility, also influences clinical decision making around patient selection and transfer [4,6].

The trend in Australia has been to locate inpatient rehabilitation services away from acute hospital campuses into small community hospitals when the latter can no longer provide safe, contemporary and efficient acute care [7]. While this has provided new roles for these hospitals, a downside is that patients may require a greater degree of medical stability prior to transfer due to the lack of acute and diagnostic support available. This may result in them remaining longer in acute care than might be the case if the rehabilitation facility were co-located with the acute hospital [5,6].

An exception to this two-stage model of care is the integrated stroke unit, a more contemporary clinical model that provides early rehabilitation for stroke patients, commencing in the acute hospital [8-11]. Patients requiring longer-term rehabilitation can then be transferred to a more suitable facility, while those able to be discharged directly from the stroke unit can receive ambulatory rehabilitation if required. However, not all acute hospitals have integrated stroke units and stroke represents less than 10% of inpatient rehabilitation episodes in Australia [12]. Further, it is not feasible to establish integrated acute/rehabilitation units for each of the myriad of impairments that patients receive rehabilitation for. Nor may it be necessary.

The two stage model is also reinforced by casemix (or activity-based) funding rules, which provide separate payments for the acute and the subacute episodes [13-17]. There is currently no casemix model in Australia that provides a payment for rehabilitation occurring in parallel with acute care, even though this may be the most appropriate clinical course. Examples where rehabilitation should ideally occur within acute care include times when the patient is able to participate in formal rehabilitation but is not medically stable enough to be transferred off-site, when the patient has to remain in acute care to undergo further investigations or procedures, or when there is a delay in accessing a rehabilitation bed.

During these periods the patient could be described as being in a state of *terra nullius* (‘land belonging to no one’), often designated by the acute care team as ‘awaiting rehabilitation’, with the team’s attention diverted to higher acuity patients or to those who require therapy in connection with discharge directly home. Patients ‘awaiting rehabilitation’ often remain on the acute ward with minimal or no therapy [6,7]. Not only is this an unnecessary use of acute capacity, it may also contribute to further deconditioning and functional decline and prolong the subsequent rehabilitation episode.

Previous international and Australian research employing utilization review methodologies has shown that many acute hospital bed days do not meet the criteria for acute level of care, with many patients being deemed more appropriate for transfer to an alternate level of care instead [6,18,19]. Further, an Australian study which followed patients in acute care showed that utilization review criteria deemed patients ‘appropriate’ for rehabilitation or subacute care much earlier than did the rehabilitation service [6].

These findings raise questions about the nature of patients remaining in acute care when their need may be for rehabilitation, and about current models of care and payment models which allow this situation to arise. The optimal time for a patient to be transferred to rehabilitation the implications of locating rehabilitation facilities away from acute hospital campuses need to be considered [4].

**Purpose of this paper**

This paper reports utilization review data (using the InterQual® utilization review tool) on a cohort of patients in a large regional acute referral hospital with a diagnosis of stroke, hip fracture or elective joint replacement, as well as other patients referred for rehabilitation transfer. It examines reasons why acute level of care criteria are not met for this cohort and, for a smaller cohort of patients, it also explores the differences in decision making between the acute care and rehabilitation teams around patient appropriateness and readiness for transfer. The utility of using a utilization review tool in a decision support capacity in this context is explored.

**The InterQual Criteria**

The InterQual Level of Care Criteria is a proprietary product of the McKesson Corporation. They contain admission, continuing stay and discharge review criteria that match a patient’s clinical status and services being received to levels of hospital care, including acute care and rehabilitation and subacute care, or to suitability for discharge home. The Adult (acute) Criteria contain clinical subsets grouped by body system or broad clinical categories, with each subset containing severity of illness, intensity of service and discharge review criteria. To
meet appropriateness for admission, patients must meet severity of illness and intensity of service criteria. To meet appropriateness for continuing stay, only intensity of service criteria need to be met. When the patient is still in acute care, appropriateness for rehabilitation or subacute level of care is tested via preadmission review for these levels of care. To meet preadmission eligibility for a rehabilitation level of care, patients must satisfy criteria from five categories, with the content of the categories varying according to each clinical subset. The categories include criteria for: having had an illness, injury, surgery or exacerbation; having impairments requiring assistance; meeting clinical stability; having an ability to tolerate a rehabilitation program; and, not being able to be managed in a lower level of care than the one being tested. Further details of the content and application of the InterQual criteria can be found elsewhere [5,6,20,21].

Methods
Participants and procedure
All patients admitted in the acute hospital during the study period (30/4/2007 until 29/11/2007) with a diagnosis of stroke, hip fracture or joint replacement had InterQual utilization review criteria applied from admission (or surgery, in the case of joint replacement patients). These diagnoses were selected due to the higher likelihood that the patient would be referred for inpatient rehabilitation, thus allowing the capture of utilization review data from admission or surgery. All other patients in the acute care hospital referred for rehabilitation during the study period were also the subject of utilization review, but only from the date of rehabilitation referral.

The InterQual Adult (2006) (Acute and Rehabilitation/Subacute) Criteria were applied by clinical staff trained in its use and in the associated software (CareEnhance Review Manager - version 5.0). Patients with stroke, hip fracture or joint replacement were followed concurrently using the InterQual Adult (Acute) Criteria (‘admission’ then ‘continuing stay’ criteria). All other patients referred for rehabilitation consultation were followed concurrently with the InterQual Adult (Acute) ‘continuing stay’ criteria. The InterQual Criteria were applied on a daily basis until the patient no longer met criteria for continuing stay in acute care, at which point the ‘discharge’ criteria were applied and the alternative level of care noted. If the patient met criteria for rehabilitation or other subacute level of care, ‘preadmission’ criteria to confirm the level of care were applied. Patients continued to have ‘continuing stay’ criteria applied on a daily basis until they were discharged home from the acute care hospital, transferred to rehabilitation, other hospital or aged care facility, or died. Reviewers applied the InterQual Criteria via daily review (or as otherwise specified within the Criteria) of the patient’s medical record and observation and treatment charts, as well as by conferring with treating clinical teams when information was not readily available.

When criteria for acute level of care were not met, the reason was recorded. This was done via additional fields being created within the software. Throughout the study the rehabilitation service continued to use its in-house information management system, which recorded data relevant to the rehabilitation referral and consultation, including the dates of referral and consultation, consultation outcome, date ready for rehabilitation transfer and actual transfer date [22].

For a smaller cohort of patients (a convenience sample, based on reviewer availability, of patients referred for rehabilitation between the dates of 14/8/2007 and 17/11/2007), additional information was sought on the decisions of the acute care and rehabilitation teams about patient appropriateness for rehabilitation, and readiness for transfer. Data on the dates that the acute care and the rehabilitation teams deemed patients ready for rehabilitation transfer, the reasons why the rehabilitation team did not deem patients appropriate or ready for rehabilitation, and appropriateness for a rehabilitation alternative level of care according to utilization review, were collected by the utilization reviewers from information available in the medical record, the electronic data systems and from direct discussion with acute care and rehabilitation team clinicians.

Data analysis
Data were extracted from the InterQual database and linked by patient medical record number with data from the hospital patient administration system and the rehabilitation service information system [22]. Linked data were analysed using Microsoft Excel (Microsoft Corporation, Redmond, Wash, USA), using descriptive statistics.

Ethical approval for the study was obtained from the Human Research and Ethics Committee of the University of Wollongong.

Results
Results on all patients to whom utilization review was applied
There were 696 acute care patient episodes representing a total of 7189 days in acute care. As shown in Table 1, the majority of patient episodes were the ‘other rehabilitation’ referrals (39.5%) followed by patients with stroke (20.8%), hip fracture (20.4%) and joint replacement (19.3%). Table 1 also provides information on gender and age.
For the three patient types followed from acute admission or surgery, 56% of patient days in the acute hospital met InterQual criteria for acute level of care (see Table 2). The majority of hip fracture (55%) and joint replacement (71%) patient days of stay met criteria for acute level of care. For the ‘other rehabilitation’ group, 33% of days of stay met criteria for acute level of care from the time of rehabilitation referral.

When a day of stay did not meet InterQual Criteria for acute level of care, the main reason was identified. These data are shown in Table 3. Across all diagnostic groups, a delay in medical or other health professional consultation (17.9%) and an investigation or procedure delay (15.5%) were the most common reasons, followed by: patients being accepted, but not yet deemed ready by the rehabilitation team for rehabilitation transfer (12.9%); patients ready for transfer but awaiting a rehabilitation bed (12.6%); or patients awaiting transfer to an alternate level of care - ALOC - (12.3%).

There are some differences in the ordering of these reasons for each of the diagnostic groups. Delay in obtaining an investigation or procedure was the most common reason that stroke patient days did not meet criteria for acute care (34.8%), while for joint replacement patients the most common reason was a delay in obtaining medical or allied health review (34.1% of days). For the ‘other rehabilitation’ patients the most common reason was being accepted for rehabilitation, but not yet ready for transfer to an off-site facility (20.5%).

Results on the subset of patients on whom additional information was collected

One hundred and twenty three patient episodes were included in this analysis. The mean age (76 years) and gender distribution (61% female) of these patients was similar to those rehabilitation referrals not included in the subset (mean age 76 years; 58% female). The diagnostic groups represented, and the outcomes following rehabilitation referral, are shown in Figure 1. Following the consultation/review process, 92 (75%) of the 123 patients who were referred for rehabilitation were, or would have been, accepted by the rehabilitation team. Eighty two patients (67%) were transferred. Reasons why patients were either not accepted for rehabilitation, or transferred, are shown in Figure 1.

Table 4 presents data on the 82 patients who were transferred to rehabilitation. It shows that, on average, the acute care team and the InterQual tool deemed the patient ready for rehabilitation transfer soon after referral (1.4 and 1.3 days, respectively), but that the rehabilitation team did not deem patients ready for transfer until some days later (mean of 4.0 days). The initial rehabilitation consultation occurred soon after referral (mean of 0.8 days), but there was a delay in effecting

<table>
<thead>
<tr>
<th>Diagnostic group</th>
<th>No. of Patient Episodes</th>
<th>Days meeting criteria for acute level of care (no. [%])</th>
<th>Days not meeting criteria for acute level of care (no. [%])</th>
<th>Total days in acute care</th>
<th>Mean days in acute care</th>
<th>Mean days of stay not meeting acute level of care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>145</td>
<td>794 (49%)</td>
<td>843 (51%)</td>
<td>1637</td>
<td>11.3 (6.9)</td>
<td>5.8 (5.4)</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>142</td>
<td>1011 (55%)</td>
<td>834 (45%)</td>
<td>1845</td>
<td>13.0 (8.5)</td>
<td>5.9 (6.6)</td>
</tr>
<tr>
<td>Joints</td>
<td>134</td>
<td>727 (71%)</td>
<td>299 (29%)</td>
<td>1026</td>
<td>7.7 (4.3)</td>
<td>2.2 (2.8)</td>
</tr>
<tr>
<td>Sub-total</td>
<td>421</td>
<td>2532 (56%)</td>
<td>1976 (44%)</td>
<td>4508</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other rehabilitation referrals</td>
<td>275</td>
<td>897 (33%)</td>
<td>1784 (67%)</td>
<td>2681</td>
<td>N/A³</td>
<td>6.5 (7.1)</td>
</tr>
<tr>
<td>Total</td>
<td>696</td>
<td>3429</td>
<td>3760</td>
<td>7189</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Standard deviations provided in parentheses
² Mean days in acute care from the day of surgery
³No mean given as patients only followed from day of rehabilitation referral
the rehabilitation transfer once the patient was deemed ready by the rehabilitation team.

**Medical stability**

Using the InterQual Criteria as the standard measure of medical stability, the data were analysed to determine whether the patient subsequently became unstable in acute care after being deemed stable enough for rehabilitation transfer. Of the 82 patients transferred to rehabilitation 23 (28%) patients became unstable from the date the acute care team deemed them stable, compared with 7 (9%) who became unstable from the date the

<table>
<thead>
<tr>
<th>Reason</th>
<th>Stroke No. (%)</th>
<th>Hip # No. (%)</th>
<th>Joint repl. No. (%)</th>
<th>Other Rehab No. (%)</th>
<th>All Patient Days No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay: medical/allied health review</td>
<td>158 (18.7)</td>
<td>173 (20.7)</td>
<td>102 (34.1)</td>
<td>239 (13.4)</td>
<td>672 (17.9)</td>
</tr>
<tr>
<td>Delay: investigation/procedure</td>
<td>293 (34.8)</td>
<td>133 (16.0)</td>
<td>33 (11.0)</td>
<td>123 (6.9)</td>
<td>582 (15.5)</td>
</tr>
<tr>
<td>Accepted but not ready for rehabilitation</td>
<td>48 (5.7)</td>
<td>50 (6.0)</td>
<td>20 (6.7)</td>
<td>365 (20.5)</td>
<td>485 (12.9)</td>
</tr>
<tr>
<td>Awaiting ALOC: rehabilitation bed</td>
<td>56 (6.6)</td>
<td>117 (14.0)</td>
<td>28 (9.4)</td>
<td>272 (15.3)</td>
<td>473 (12.6)</td>
</tr>
<tr>
<td>Awaiting ALOC: other</td>
<td>88 (10.4)</td>
<td>151 (18.1)</td>
<td>4 (1.3)</td>
<td>218 (12.2)</td>
<td>461 (12.3)</td>
</tr>
<tr>
<td>Delay: rehabilitation consult or review</td>
<td>46 (5.5)</td>
<td>82 (9.8)</td>
<td>30 (10.0)</td>
<td>280 (15.7)</td>
<td>438 (11.7)</td>
</tr>
<tr>
<td>Unclear management plan</td>
<td>51 (6.1)</td>
<td>38 (4.6)</td>
<td>6 (2.0)</td>
<td>106 (5.9)</td>
<td>201 (5.4)</td>
</tr>
<tr>
<td>Delay in discharge home</td>
<td>25 (3.0)</td>
<td>21 (2.5)</td>
<td>35 (11.7)</td>
<td>119 (6.7)</td>
<td>200 (5.3)</td>
</tr>
<tr>
<td>No criteria/reasons outside of criteria</td>
<td>57 (6.3)</td>
<td>63 (7.6)</td>
<td>26 (8.7)</td>
<td>53 (3.0)</td>
<td>195 (5.2)</td>
</tr>
<tr>
<td>No reason identified</td>
<td>25 (3.0)</td>
<td>6 (0.7)</td>
<td>15 (5.0)</td>
<td>9 (0.5)</td>
<td>55 (1.5)</td>
</tr>
<tr>
<td>Total</td>
<td>843 (100)</td>
<td>834 (100)</td>
<td>299 (100)</td>
<td>1784 (100)</td>
<td>3760 (100)</td>
</tr>
</tbody>
</table>

**Figure 1** Outcome of the 123 patient episodes referred for rehabilitation assessment

*180 patients were seen only once by the rehabilitation team, 35 had only one review, seven had 2 reviews and one patient required 3 reviews. Of patients requiring one or more further reviews, the mean time between initial consultation and the last review was 6.3 days (median of 5 days). *Outcome of the re-review was that of the last re-review.*

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Table 4 Subgroup analysis on patients transferred to rehabilitation (n = 82)

<table>
<thead>
<tr>
<th>Period from rehabilitation referral until:</th>
<th>Mean (days)[SD]</th>
<th>Median (days)</th>
<th>Range (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The acute care team deemed patient ready for rehabilitation transfer</td>
<td>1.4 [3.1]</td>
<td>0</td>
<td>0 - 15</td>
</tr>
<tr>
<td>The InterQual tool deemed patient ready for rehabilitation transfer</td>
<td>1.3 [2.0]</td>
<td>0</td>
<td>0 - 9</td>
</tr>
<tr>
<td>The initial rehabilitation consultation occurred</td>
<td>0.8 [1.1]</td>
<td>0</td>
<td>0 - 7</td>
</tr>
<tr>
<td>The rehabilitation team deemed patient ready for rehabilitation transfer</td>
<td>4.0 [4.7]</td>
<td>2.0</td>
<td>0 - 28</td>
</tr>
<tr>
<td>The rehabilitation transfer actually occurred</td>
<td>5.7 [5.2]</td>
<td>4.0</td>
<td>0 - 28</td>
</tr>
</tbody>
</table>

rehabilitation team deemed them stable. Nine (11%) patients became unstable from the time the InterQual tool deemed them ready for transfer.

Further, for patients deemed stable and ready for subacute care by InterQual on the day of initial rehabilitation consultation (n = 51), the rehabilitation team deemed those patients ready for transfer a mean 1.5 days (SD 2.6) after consultation (median 0 days, range: 0 to 12 days). However, for patients not deemed stable by the InterQual tool on the day of initial rehabilitation consultation (n = 31), then the rehabilitation team deemed those patients ready for transfer 6.0 days (SD 5.8) after consultation (median 5 days, range 0 to 27 days).

Discussion

These data support previous findings from Australian and international studies showing that a large proportion of days of stay in acute hospitals do not meet utilization review criteria for acute level of care [5,6,19]. Patients with elective joint replacement had the lowest proportion of days not meeting acute criteria (29%), possibly reflecting the more predictable clinical pathway for this group. As might be expected, the ‘other rehabilitation’ group had the highest proportion of days not meeting acute criteria, having only been followed from the date of rehabilitation referral. They also had the highest average number of days per episode not meeting acute criteria.

The study adds to previous work reporting reasons for acute level of care criteria not being met. A Swiss study reported that delays in discharge processes accounted for 49% of inappropriate bed days, followed by delays in investigations, medical decision making and specialised consultations[23]. However, that study did not focus on patients who might be in need of rehabilitation. For the cohort of patients in the present study, the main reasons identified related to delays in processes and scheduling (waiting for clinical reviews, investigations or procedures) occurring within the acute hospital. Together, these accounted for about 45% of the inappropriate acute bed days and indicate that ‘logistics’ issues were a major impediment to patient flow.

Being more appropriate for transfer to rehabilitation or other lower level of care, or discharge home, were other key reasons why acute criteria were not met. Combined, these reasons accounted for about 30% of inappropriate bed days and indicate that patient flow from acute care may have been impeded by a lack of available alternate care settings and/or delays in facilitating transfer or discharge.

Not being ready for transfer to a rehabilitation facility, although accepted for rehabilitation, accounted for 12.9% of the inappropriate bed days. These days of stay did not meet utilization review criteria for acute level of care, and represent the discrepancy between the rehabilitation team and the utilization review tool in the determination of patient stability and readiness for transfer. This finding is consistent with prior research that found that patients wait a period of time in acute care when their need may be more appropriate for rehabilitation [6]. This issue was explored further in the second component of this study, and is discussed below.

The remainder of the inappropriate days of stay in acute care were due to a variety of reasons, broadly grouped as either an unclear management plan documented in the medical record or not having criteria available with which to approve the acute day. It is possible that some of these days might have been approved if the medical record was more comprehensive. Hospitals which depend on utilization review for funding decisions are reliant on the medical record providing sufficient clinical information for criteria to be met [24]. This is not the case in Australia, where formal utilization review is not conducted.

The second objective of this paper was to compare more closely, using a smaller cohort, the views of the referring acute care and rehabilitation teams on patient appropriateness for rehabilitation and the timing of transfer. The study found that there was not complete agreement between the teams on patient selection for rehabilitation. Clearer guidelines around the selection of patients will assist in patient flow and has the potential to improve patient outcomes [4,5].

Previous work using the InterQual tool has shown that the greatest time period in the ‘referral-to-transfer-
to-rehabilitation’ process is that between the initial rehabilitation consultation and the day that the rehabilitation team deems the patient ready for rehabilitation transfer [6]. Consistent with these findings, the rehabilitation team in this study did not deem patients ready for transfer until some days after both the acute care team and the InterQual tool deemed patients stable for transfer (reported in Table 4). There was then a further delay in accessing the rehabilitation bed.

Determining medical stability for transfer to an off-site rehabilitation facility is an important aspect of patient care, for both patient safety and efficiency reasons. Transferring patients back to acute care from rehabilitation if they become unstable causes interruption to treatment programs, costs money in transportation and staffing, and adds to overall length of stay[20]. However, having patients wait for excessive periods in acute care until certain that they are stable can result in patients remaining in an acute bed when the more appropriate clinical need is rehabilitation [6,25].

An indicator of whether a patient was stable is to look at whether they become unstable after being deemed stable. In this study we used InterQual as an objective measure of medical stability to assess how the acute care team and the rehabilitation team compared in their determination of ongoing stability [18]. On this measure, the rehabilitation team performed better than the acute care team (9% versus 28% becoming unstable), however at the cost of much longer acute length of stay.

Despite the fact that the InterQual tool determined medical stability at about the same average time from referral as the acute team, but much earlier than the rehabilitation team, only 11% subsequently became unstable after InterQual determined readiness for transfer. This finding suggests that a utilization review tool such as InterQual could provide a more structured way for clinical staff to assess medical stability. This also seems logical, given that the tool provides a checklist of physiological and clinical indicators that must be met prior to recommending readiness for a lower level of care [5,6].

A decision support role for utilization review is also suggested by the finding that patients who were InterQual stable at initial rehabilitation consultation were deemed by the rehabilitation team to be ready for transfer earlier compared to those who were not InterQual stable at initial rehabilitation consultation (1.5 versus 6 days). The tool might therefore be helpful in identifying patients likely to be able to go to rehabilitation sooner, thereby assisting in planning patient flow. Future research could explore the role of utilization review in a decision support capacity to determine whether patients can be safely and appropriately identified and transferred for rehabilitation earlier in their acute course.

This study has a number of limitations. One of the limitations, in terms of generalizability, is that the rehabilitation facilities were all standalone, and therefore the requirement for medical stability prior to transfer will be greater than for facilities co-located within an acute hospital campus. However, this is a common scenario in Australia, and with health costs and pressures on acute hospitals rising, it is unlikely that there will be major changes to the location of rehabilitation facilities in the near future. Also, the study was conducted in a single large regional hospital, and so might not be generalizable to other institutions. The fact that the ‘other rehabilitation’ patients were only followed with concurrent utilization review from the time of rehabilitation referral limits the ability to compare this group with the groups followed from the time of admission or surgery. For this reason, the data from each of the diagnostic groups have been presented separately in the tables. However, the finding that the ‘other rehabilitation’ group still had the largest number of days of stay not meet utilization review appropriateness for acute care despite only being followed from referral suggests that this group needs to be examined further. Future research could follow a broader range of diagnostic groups with concurrent (or retrospective) utilization review from the time of admission, until rehabilitation transfer.

A further limitation of the study is that it has only served to identify and quantify the causes of inappropriate bed use. Future research could employ process analysis to further explore the underlying reasons why inappropriate bed use occurs and to test the effectiveness of process improvement techniques in reducing inappropriate bed use in acute care. Utilization review methods could then be used to verify the effectiveness of these interventions.

To overcome the problem of patients remaining in acute care in a state of terra nullius, other strategies need to be considered to ensure that they receive appropriate clinical care until ready and able to be transferred to rehabilitation [7,25]. Even if patients are not medically stable enough for off-site transfer, they may well be able to participate in rehabilitation. Early rehabilitation will help minimise the development of deconditioning and prevent the complications of bed rest, as well as allowing the planning necessary for complex patient discharge. Rehabilitation teams located in acute care are already in place in a pilot capacity in a few major acute hospitals in Sydney, Australia, funded under a new National government program [26]. To be sustainable, activity based funding models within Australia will need to be developed which allow for parallel rehabilitation care in the acute setting. However, if rehabilitation is commenced in acute care this could result in a longer wait for transfer to the actual rehabilitation unit for
those patients, if they are not regarded as patients with the highest priority [27].

Conclusions
In conclusion, this study supports the findings of previous research using concurrent utilization review to highlight potentially inappropriate acute care utilization. The study also found that, for this cohort, the main reasons for inappropriate acute care utilization were process inefficiencies within the acute hospital and delays in patients being deemed ready for, and then accessing, rehabilitation or other lower levels of care. It also found that there was a lack of agreement between the acute care and the rehabilitation teams in the determination of medical stability sufficient for transfer to an off-site rehabilitation facility, and that the use of a utilization review tool could potentially improve the accuracy and timeliness of determining medical stability, thereby being useful in a decision support capacity.

Acknowledgements and Funding
A licence to use the InterQual product was purchased from McKesson (Australia). The licence arrangement included installation and training, local modifications to the software to allow customization of variance reasons and assistance with data extraction. McKesson has played no role in the analysis, interpretation or reporting of findings. This work was supported by a grant from the HCF Health and Medical Research Foundation.

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Authors’ contributions
CP made the major contribution to the study in the form of conception and design, acquisition of data and supervision of the research team, analysis and interpretation of data and drafting of the manuscript. CM made a substantial contribution to the analysis of data and providing critical comment on the manuscript. KM made a substantial contribution to the conception and design of the study and provided critical comment on the manuscript. All authors read and approved the final manuscript.

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CP and GB are both senior rehabilitation physicians in hospital practice and clinical academics with the University of Wollongong, Australia. During the time of the study CM was a research assistant with the Centre for Health Service Development, University of Wollongong. KE is Professor and Director of the Centre for Health Service Development, University of Wollongong. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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CHAPTER 6: Evaluating inpatient public rehabilitation in Australia using a utilization review tool developed in North America.

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EVALUATING INPATIENT PUBLIC REHABILITATION IN AUSTRALIA USING A UTILIZATION REVIEW TOOL DEVELOPED IN NORTH AMERICA

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Objective: To evaluate inpatient rehabilitation in public facilities in Australia against a utilization review tool used in the USA.

Design: Prospective cohort study.

Subjects: Patients identified in the acute wards of a regional referral hospital and subsequently transferred to a public inpatient rehabilitation facility.

Methods: The InterQual utilization review criteria were applied to days of stay in the rehabilitation wards. Reasons for variance and actual therapy time were recorded.

Results: Data on 267 patient episodes (7359 days) are available. Only 48% of patient days met utilization review criteria, with reasons for variance including insufficient therapy, awaiting discharge to long-term care or to home and being more appropriate for acute medical care. Therapy time data (available on 208 patient episodes) show that therapy was received on 50% of calendar days and for an average of 37 min per weekday (56 min for stroke patients). Allied health staffing levels were below recommended levels, but consistent with other Australian public hospital rehabilitation facilities.

Conclusion: Patients in these facilities seem to be receiving less therapy than their American counterparts; however, therapists often viewed their rehabilitation as appropriate. Findings also suggest inefficiencies in care delivery. Utilization review may help in the assessment of level of care appropriateness in the rehabilitation setting.

Key words: rehabilitation; inpatient; utilization review; therapy; intensity; efficiency.

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INTRODUCTION

Considerable effort has gone into redesigning healthcare in Australia over the past decade and more, with the focus being on acute care, access to emergency departments and chronic care (1, 2). Little attention has been paid to the role that rehabilitation has on access to acute care or the reduction in disability following illness or injury, and little emphasis has been placed on ensuring that the process of public rehabilitation in Australia is as effective and efficient as possible (3).

Even though inpatient rehabilitation services in Australian public hospitals are widely available, especially within the states of New South Wales (NSW) and Victoria (3), and there is a national approach to the collection of rehabilitation outcome data (4), there are no standards to govern the amount of therapy patients should receive. While there are recommended staffing levels for inpatient rehabilitation services (5, 6), it is widely acknowledged within the public rehabilitation sector that these levels are often not achieved in practice and they do not take into account the non-clinical job demands placed on therapists, or the need for replacement during leave. Also, these recommended staffing levels are aimed at the unit level, and do not translate into an amount of therapy that individual patients should receive. This is in stark contrast to the situation that exists in the USA, where Federal regulation has mandated that patients in inpatient rehabilitation facilities should receive a minimum of 3 h of therapy per day for at least 5 days of the week (7).

Also, the staffing standards for rehabilitation facilities published by the Australian-based “Allied Health in Rehabilitation Consultative Committee” (6) do not include recommendations on the amount of a therapist’s time that should be devoted to actual face-to-face treatment. The Committee does suggest that “patient attributable” time should range from 20% of employed hours for an allied health manager, to 80% of employed hours for a grade 1 therapist, and somewhere in between for grades higher than grade 1. “Patient attributable” time includes activities such as time spent writing in the medical record, attending case and family conferences and ward rounds, travelling for home visits and writing reports, as well as time spent in face-to-face therapy.

Utilization review is the process of assessing the appropriateness of a patient, given their clinical condition and services actually received, for a specific level of care (reflective of the health system where the utilization review tool was developed). The InterQual Level of Care Criteria² is a utilization review tool commonly used in the USA, where it was developed and

¹Personal communication with Ms Wendy Hubbard, Chair of the Allied Health in Rehabilitation Consultative Committee, 5 February 2009.
²InterQual and CareEnhance are registered trademarks of McKesson Health Solutions LLC.
is used as an instrument of funders to justify payment. More recently it has been used in Canada and the UK, predominantly for the purpose of assessing inappropriate bed usage and to help facilitate care in the most appropriate setting (8). The InterQual Criteria are available for use in the acute care setting as well as in the rehabilitation and subacute settings.

Purpose of this study

Previous international studies using the InterQual Acute Adult Criteria have shown that a high proportion of patient days do not meet the criteria for acute care (9, 10). Similar results were demonstrated using the InterQual Criteria in acute care in Australia (11). However, there is no published work on the use of the InterQual Criteria in the rehabilitation or subacute settings, either internationally or within Australia. In this study the InterQual Level of Care Criteria (Rehabilitation and Subacute subset) is applied to a cohort of patients undergoing inpatient rehabilitation in public facilities in Australia, with the following aims:

• to contrast the care these patients receive against this utilization review tool;
• to examine reasons why utilization review criteria are not met, including the impact that the amount of therapy received has on the outcome of utilization review;
• to explore the utility of the InterQual tool in the rehabilitation setting in Australia.

The InterQual Level of Care Criteria in the rehabilitation and subacute settings

The InterQual Criteria were selected for use in this study because the research group had previously used the Adult Acute subset and found that they could be easily applied in the Australian setting (11). Furthermore, the InterQual Rehabilitation and Subacute subset provides a standardized means of evaluating rehabilitation and subacute care and the tool is used in the USA, potentially allowing insights to be gained into how public rehabilitation in Australia might contrast with practice in the USA.

A description of the InterQual Acute Adult and Rehabilitation and Subacute Level of Care Criteria can be found elsewhere (11). An important difference between the Acute Criteria and the Rehabilitation and Subacute Criteria is that the latter are more subjective, relying to a greater extent on the judgement of reviewers (for example, in determining how much therapy a particular patient needs and would benefit from) than on the objective measures (physiological and diagnostic findings and actual medical treatment received) found in the Acute Criteria. This is likely to have some impact on its application.

The InterQual Criteria contain algorithms to determine admission appropriateness, continuing stay appropriateness and discharge appropriateness, and for recommending the most appropriate alternate level of care. To meet appropriateness for admission to a rehabilitation or subacute level of care, patients must meet criteria within 5 categories:

• They must have an illness, injury, surgery or exacerbation.
• They must have had an illness, injury, surgery or exacerbation, and the patient must have rehabilitation potential with the expectation of clinical/functional improvement and can tolerate and needs to receive at least 3 h of therapy per day.
• They must meet clinical stability criteria.
• They must be able to tolerate the rehabilitation programme or therapy.
• Treatment must be precluded at a lower level of care due to clinical complexity.

Within the InterQual 2006 Criteria there are 2 “levels” of rehabilitation (“Acute Rehabilitation” and “Subacute Rehabilitation”) and 3 levels of “subacute” care (“Skilled Nursing”, “Subacute Care” and “Complex Care”). It was decided that both of the rehabilitation levels of care as well as the “skilled nursing” and the “subacute (with therapy)” levels of care were applicable to the rehabilitation facilities in this study. Differences between these levels of care reflect the characteristics of the patient (including their impairment/diagnosis) and the characteristics of the facility. Some of the main differences are outlined below:

• Acute Rehabilitation – physician assessment/intervention is required at least 3 times per week; rehabilitation nursing is available 24 h per day; specialized rehabilitation equipment and therapy expertise is required; at least 2 therapy types are required; the patient has rehabilitation potential and is able to participate in the programme and can tolerate and needs to receive at least 3 h of therapy per day.
• Subacute Rehabilitation – skilled nursing services available daily; medical specialty consultative, pharmacy and diagnostic services are available; at least 2 therapy types are required; the patient has rehabilitation potential and is able to participate in the programme and can tolerate and needs to receive at least 2 h of therapy per day.
• Subacute Care – nursing of at least 4 h per day is required; the patient must have rehabilitation potential with the expectation of clinical/functional improvement and can tolerate and needs to receive 1–2 h of therapy per day.
• Skilled Nursing Care – nursing is required at least daily; the patient must have rehabilitation potential with the expectation of clinical/functional improvement and can tolerate and needs to receive at least 1 h of therapy per day.

In Australian public rehabilitation hospitals all 4 of these InterQual levels of care are likely to be deemed “rehabilitation”, as minimum therapy standards for rehabilitation do not exist.

METHODS

Utilization review, using the InterQual 2006 (Adult) Rehabilitation and Subacute Criteria, was conducted on patients identified in a regional acute referral hospital as requiring rehabilitation and who were subsequently transferred to 1 of the study rehabilitation wards (3 general rehabilitation wards of 20, 21 and 23 beds, respectively, in 2 stand-
alone rehabilitation/subacute hospitals). Patients were grouped into those with stroke, hip fracture, joint replacement, or other impairments. Patients with amputation, acute traumatic spinal cord injury and severe traumatic brain injury were excluded from the study because patient numbers are typically too small for meaningful analysis.

Prior to applying the InterQual Criteria, clinical reviewers (experienced nurses, a physiotherapist and medical officers) were trained in their use by a trainer from the USA. The computerized version of the InterQual Criteria was used (CareEnhance Review Manager 5.0). Reviewers used the clinical record and discussion with treating staff in order to gain sufficient information to complete reviews. However, reviewers were not involved in treatment decisions and the reviews were not used to alter management. Likewise, the treating therapists were not involved in the utilization review assessments.

Once systems were in place for the recording of accurate therapy time data, treating therapists (physiotherapists, occupational therapists and speech pathologists) recorded the amount of time that they spent in therapy with individual patients. Therapy time included that provided by therapy aids and during home visits, but did not include “therapy” with individual patients. Therapy time included that provided by the treating therapists), and;

• the amount of therapy that patients actually received.

Reviewers deemed a day of stay as meeting the utilization review criteria if the patient factors and the amount of therapy (both that deemed appropriate and that received), met one of the InterQual rehabilitation or subacute levels of care. When criteria were not met, the reason, along with the most appropriate alternative level of care, was recorded. For example, if the patient factors and the amount of therapy deemed appropriate, met the “acute” rehabilitation level of care criteria, but the patient did not receive enough therapy for that category, then that day was classified as not meeting the criteria for “acute rehabilitation”, with the variance reason being “insufficient therapy time”. Where applicable, the most appropriate alternative care setting was also noted. If the reviewer was unsure how to record the day of stay, they referred the patient for a secondary review by another reviewer.

RESULTS

Reviewers reported that the InterQual tool was straightforward to apply. One full-time equivalent reviewer was able to cover all 64 rehabilitation beds in the study, resulting in a cost of approximately 5 Australian dollars per bed day, excluding product licensing costs.

Tables I–IV show results on the full cohort to which utilization review was applied (patients identified in the acute hospital and then admitted into 1 of the 3 rehabilitation wards between 4 May 2007 and 19 November 2007 (n = 267)). Tables V–VII show results on the subgroup for whom complete therapy time data are available (n = 208), which was between June and November 2007. An additional 13 patients (representing only 160 days of stay, or less than 2.5% of the 6428 days of stay included in the therapy time subgroup analysis) were excluded from the subgroup analysis as they had incomplete data. Table VIII compares the staffing levels in these wards with Australasian Faculty of Rehabilitation Medicine (AFRM) standards (5).

### Table I. Age and gender for all patient episodes followed in the rehabilitation hospital between May 2007 and December 2007

<table>
<thead>
<tr>
<th>Impairment group</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>24</td>
<td>21</td>
<td>45</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>9</td>
<td>32</td>
<td>41</td>
</tr>
<tr>
<td>Joint replacement</td>
<td>8</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Other rehabilitation</td>
<td>62</td>
<td>99</td>
<td>161</td>
</tr>
</tbody>
</table>

### Table II. Overall patient days in the rehabilitation hospital meeting InterQual Criteria

<table>
<thead>
<tr>
<th>Impairment group</th>
<th>No. of patient episodes</th>
<th>Days meeting criteria for a rehabilitation/subacute level of care n (%)</th>
<th>Days not meeting criteria n (%)</th>
<th>Total days in rehabilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>45</td>
<td>695 (46)</td>
<td>832 (54)</td>
<td>1527</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>41</td>
<td>756 (58)</td>
<td>557 (42)</td>
<td>1313</td>
</tr>
<tr>
<td>Joint replacement</td>
<td>20</td>
<td>171 (52)</td>
<td>155 (48)</td>
<td>326</td>
</tr>
<tr>
<td>Other rehabilitation</td>
<td>161</td>
<td>1911 (46)</td>
<td>2282 (54)</td>
<td>4193</td>
</tr>
<tr>
<td>Total</td>
<td>267</td>
<td>3533(48)</td>
<td>3826 (52)</td>
<td>7359</td>
</tr>
</tbody>
</table>

---

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There were a total of 267 patient episodes followed in the 3 rehabilitation wards during the study period, representing a total of 7359 patient days. The age and gender of these patients are profiled in Table I. A total of 45 patient episodes were for stroke, 41 for hip fracture, 20 followed joint replacement and there were 161 episodes for other rehabilitation conditions (e.g. other disabling impairments and debility and other orthopaedic and neurological conditions).

Overall patient days meeting InterQual Criteria for rehabilitation care
Forty-eight percent of the 7359 days reviewed in the rehabilitation wards met InterQual Criteria for 1 of the 4 levels of care accepted in this study as representing “rehabilitation”. These are days in which the patient was both clinically appropriate for one of the levels of care and received sufficient therapy for the level to which they had been classified. Table II outlines the number of days meeting and not meeting the Criteria, according to each diagnostic group. Hip fracture patients had the highest proportion of days meeting InterQual Criteria (58%), followed by joint replacement patients (52%) and stroke and other rehabilitation patients (both at 46%).

InterQual rehabilitation/subacute level of care for patient days meeting criteria
Of the 3533 patient days meeting InterQual criteria for a rehabilitation/subacute level of care, the majority only met the criteria for the equivalent therapy level of a Skilled Nursing Facility in the USA (i.e. less than 1 hour of therapy per day). Only 1% and 5%, respectively, of days met criteria for Acute and Subacute Rehabilitation, with the remaining 33% meeting criteria for a level of care with between 1–2 h of therapy per day (Subacute Care) (Table III).

Reasons for InterQual Criteria not being met
When patients did not meet the InterQual Criteria for a rehabilitation/subacute level of care, the reviewer noted the reason. The principal reason is shown in Table IV for all episodes, as well as by episode type. Overall, insufficient therapy time was the most common reason that utilization review criteria were not met, accounting for 27% of all days not meeting criteria. This was followed by waiting for long-term placement (26%), being appropriate for discharge home (17%), and the patient being more appropriate for acute or subacute medical care than for rehabilitation (17%). Other reasons recorded, representing 13% in total, were the patient not being able to tolerate therapy on those days; the lack of an identifiable management plan and the patient remaining on trial discharge leave and not discharged.

There was some variation between diagnostic groups in reasons why criteria were not met. Insufficient therapy time was the most common reason in stroke and joint replacement patients (42% and 50% of days, respectively), while awaiting long-term care was the most common reason for hip fracture and other rehabilitation episodes (38% and 25%, respectively).

Days that therapy was received in the rehabilitation wards
Complete therapy data are available for 208 patient episodes. The mean length of stay (LOS) and days therapy was received for these patient episodes are presented in Table V. Overall, therapy of any nature or duration was received on only 50% of calendar days that patients were in the rehabilitation ward. No therapy occurred on weekends or public holidays.

<table>
<thead>
<tr>
<th>Main reason</th>
<th>Impairment group</th>
<th>Stroke n (%)</th>
<th>Hip fracture n (%)</th>
<th>Joint replacement n (%)</th>
<th>Other rehabilitation n (%)</th>
<th>All impairments n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient therapy time provided</td>
<td>Stroke</td>
<td>353 (42)</td>
<td>141 (25)</td>
<td>78 (50)</td>
<td>453 (20)</td>
<td>1025 (27)</td>
</tr>
<tr>
<td>Awaiting long-term care</td>
<td>Stroke</td>
<td>188 (23)</td>
<td>209 (38)</td>
<td>17 (11)</td>
<td>564 (25)</td>
<td>978 (26)</td>
</tr>
<tr>
<td>Appropriate for discharge home</td>
<td>Stroke</td>
<td>135 (16)</td>
<td>60 (11)</td>
<td>19 (12)</td>
<td>437 (19)</td>
<td>651 (17)</td>
</tr>
<tr>
<td>Requires acute or subacute medical care</td>
<td>Stroke</td>
<td>84 (10)</td>
<td>55 (10)</td>
<td>18 (12)</td>
<td>505 (22)</td>
<td>662 (17)</td>
</tr>
<tr>
<td>Not able to tolerate therapy</td>
<td>Stroke</td>
<td>32 (4)</td>
<td>67 (12)</td>
<td>8 (5)</td>
<td>127 (6)</td>
<td>234 (6)</td>
</tr>
<tr>
<td>Unclear management plan</td>
<td>Stroke</td>
<td>31 (4)</td>
<td>17 (3)</td>
<td>5 (3)</td>
<td>159 (7)</td>
<td>212 (6)</td>
</tr>
<tr>
<td>Patient remaining on trial discharge leave</td>
<td>Stroke</td>
<td>7 (1)</td>
<td>6 (1)</td>
<td>9 (6)</td>
<td>29 (1)</td>
<td>51 (1)</td>
</tr>
<tr>
<td>Missing data</td>
<td>Stroke</td>
<td>2 (0)</td>
<td>2 (0)</td>
<td>1 (1)</td>
<td>8 (0)</td>
<td>13 (0)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>832 (100)</td>
<td>557 (100)</td>
<td>155 (100)</td>
<td>2282 (100)</td>
<td>3826 (100)</td>
</tr>
</tbody>
</table>

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Calculations should only be viewed as a guide and are based on the amount of available "patient attributable" therapy time. Note that these are estimations of the amount of available "patient attributable" time in the study wards (actual vs those based on AFRM recommendations). Also shown are estimations for 3 rehabilitation wards for the study period is shown in Table VIII, along with the AFRM staffing standards (5). Also shown are estimations of the amount of available "patient attributable" time in the study wards (actual vs those based on AFRM recommended staffing levels) and a calculation of the percentage of actual therapy patients received against the calculated available "patient attributable" therapy time. Note that these calculations should only be viewed as a guide and are based on a number of assumptions.

Comparison of allied health staffing to recommended levels

The actual numbers of allied health staff available for these rehabilitation wards for the study period is shown in Table VIII, along with the AFRM staffing standards (5). Also shown are estimations of the amount of available "patient attributable" time in the study wards (actual vs those based on AFRM staffing levels) and a calculation of the percentage of actual therapy patients received against the calculated available "patient attributable" therapy time. Note that these calculations should only be viewed as a guide and are based on a number of assumptions.

### Table V. Summary of patient length of stay (LOS) (days) and number of days that therapy was received

<table>
<thead>
<tr>
<th>Impairment group</th>
<th>Mean LOS* (days range)</th>
<th>Number of calendar days per admission that therapy was received, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke (n=34)</td>
<td>31.6 (2–82)</td>
<td>17.3 (54.7)</td>
</tr>
<tr>
<td>Hip fracture (n=35)</td>
<td>33.1 (4–135)</td>
<td>18.5 (55.9)</td>
</tr>
<tr>
<td>Joint replacement (n=16)</td>
<td>15.8 (2–39)</td>
<td>7.9 (50)</td>
</tr>
<tr>
<td>Other rehabilitation (n=123)</td>
<td>29.5 (2–110)</td>
<td>13.9 (47.1)</td>
</tr>
<tr>
<td>Total (n=208)</td>
<td>29.4 (2–135)</td>
<td>14.7 (50.0)</td>
</tr>
</tbody>
</table>

*Length of stay includes the day of admission and the day of discharge.

Amount of therapy actually received during weekdays

The mean amount of therapy received per weekday is presented in Table VI and is broken down by diagnostic group and therapy type. On average, patients received only 37 min of therapy per weekday, with stroke patients receiving considerably more (mean of 56 min per weekday).

Table VII shows the same data as presented in Table VI, but only for those patient days that were deemed clinically appropriate for a rehabilitation/subacute level of care, regardless of the level of therapy actually received. By excluding patient days that did not meet appropriateness due to other reasons (see Table IV, above), the amount of therapy received per weekday rose to a mean of 48 min per day (69 min for stroke).

Comparison of allied health staffing to recommended levels

The actual numbers of allied health staff available for these rehabilitation wards for the study period is shown in Table VIII, along with the AFRM staffing standards (5). Also shown are estimations of the amount of available “patient attributable” time in the study wards (actual vs those based on AFRM staffing levels) and a calculation of the percentage of actual therapy patients received against the calculated available “patient attributable” therapy time. Note that these calculations should only be viewed as a guide and are based on a number of assumptions.

### Table VI. Therapy received per weekday for all patients with therapy data available, by type and total therapy

<table>
<thead>
<tr>
<th>Impairment group</th>
<th>Mean PT per weekday (min)</th>
<th>Mean OT per weekday (min)</th>
<th>Mean speech therapy per weekday (min)</th>
<th>Mean total therapy per weekday (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>38</td>
<td>10</td>
<td>9</td>
<td>56</td>
</tr>
<tr>
<td>Hip fracture</td>
<td>29</td>
<td>6</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>Joint Replacement</td>
<td>27</td>
<td>8</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td>Other rehabilitation</td>
<td>25</td>
<td>6</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>7</td>
<td>3</td>
<td>37</td>
</tr>
</tbody>
</table>

PT: physiotherapy; OT: occupational therapy.

DISCUSSION

The major study findings are that, when tested against an inpatient utilization review tool used in the USA, only 48% of bed days in these Australian public rehabilitation wards met the tool’s rehabilitation/subacute criteria. The vast majority (94%) of days that did meet the criteria did so only at the “subacute” or “skilled nursing” level of care. While the main reason why utilization review criteria were not met was insufficient therapy time (27%), there were a number of other reasons, such as awaiting long-term care (26%), being appropriate for discharge home (17%) and being more appropriate for a medical level of care (17%).

Patients received therapy on only 50% of admitted days and, on average, only 37 min of therapy was received per weekday. This rises to an average of 48 min per weekday, when all bed days that did not meet utilization criteria (except for “insufficient therapy”) are excluded. The figures for stroke are higher (56 and 69 min per weekday, respectively). No therapy at all was received on weekends or public holidays.

The InterQual tool was chosen because of its structured approach to measuring hospital utilization and its potential to provide insights into how public rehabilitation in Australia might contrast with rehabilitation practice in the USA. While the InterQual Criteria may be viewed as reflective of rehabilitation practice in the USA, they are not necessarily generalizable to all rehabilitation/subacute practice in the USA. Indeed, the American Academy of Physical Medicine and Rehabilitation (AAPM&R) notes that there is lack of agreement between criteria such as InterQual and prevailing clinical practice. (7) Nevertheless, the characteristics of rehabilitation patients and rehabilitation hospitals/units described by the AAPM&R...
Table VIII. Comparison of actual staffing to Australasian Faculty of Rehabilitation Medicine (AFRM) standards for the study wards and calculations of actual face-to-face therapy vs available therapist time

<table>
<thead>
<tr>
<th>Therapy type</th>
<th>FTE positions available per 10 beds in the study wards</th>
<th>Estimated AFRM standard therapy staffing per 10 beds for the study wards (FTE) (range)¹</th>
<th>Maximum actual “patient attributable” therapy time available per patient per weekday in study wards (min)#</th>
<th>Estimated maximum amount of patient attributable therapy time per patient per weekday based on AFRM staffing (min)‡</th>
<th>Actual face-to-face therapy time achieved in study wards (min)</th>
<th>Percentage of estimated available “patient attributable” time recorded as actual face-to-face therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiotherapy</td>
<td>1.14</td>
<td>1.3 (1.25–1.5)‡</td>
<td>41</td>
<td>47</td>
<td>28</td>
<td>68%</td>
</tr>
<tr>
<td>Occupational therapy</td>
<td>0.81</td>
<td>1.0 (0.8–1.5)§</td>
<td>29</td>
<td>36</td>
<td>7</td>
<td>24%</td>
</tr>
<tr>
<td>Speech therapy</td>
<td>0.17</td>
<td>0.35–0.1.5¶</td>
<td>6</td>
<td>13</td>
<td>3</td>
<td>48%</td>
</tr>
</tbody>
</table>

¹Depends on impairment group.
²Ranges from 1.25 for “debility” and “orthopaedic” to 1.5 for “neurology”.
³Ranges from 0.8 for “orthopaedic”, 1.0 for “debility” to 1.5 for “neurology”.
⁴Ranges from 1.25 for “debility” and “orthopaedic” to 1.5 for “neurology”.
⁵Assumes a 38 hour week, full leave relief and based on 75% patient attributable time.

are similar to those contained in the InterQual Criteria for the “Acute Rehabilitation” level of care.

The fact that only 6% of patient days in this study met the InterQual acute or subacute rehabilitation criteria (characterized by 3 or more, or 2 or more, hours of therapy per day, respectively), suggests that patients in these Australian public hospital rehabilitation facilities receive considerably less therapy than their counterparts in the USA, in terms of the amount of therapy received per day and the number of days per week that therapy is received. This is despite the fact that, in other respects, these Australian facilities, with the range of equipment, therapist expertise and rehabilitation medical and nursing support available, meet utilization review criteria for the acute rehabilitation level of care.

Two aspects of these findings warrant discussion. The first is the issue of why such a high proportion of bed days with low levels of therapy were still deemed to have met utilization review criteria, and the second is the impact of these low therapy levels on the outcomes of rehabilitation.

The decision about how much therapy a particular patient needs and can tolerate is, to some extent, subjective and open to the interpretation of the reviewer and treating therapists. The InterQual criteria provide some guidance, by linking specific diagnostic categories and impairments with certain levels of rehabilitation care, and by asking questions about the patient’s cognitive and physical abilities and need for various therapy types. However, the way that a reviewer responds to these questions is likely to be influenced by their prior experiences and training. While trained in the use of the tool itself, reviewers had not worked in the USA or been exposed to rehabilitation environments with higher expectations placed on facilities for the provision of therapy, or on patients for participation in rehabilitation programmes (7, 13). Reviewers and treating therapists may have regarded the therapy levels available as the accepted norm, and therefore appropriate. Further work examining therapists’ reasoning behind their decision-making about patient requirements for, or ability to tolerate, therapy is required.

It is also possible that patients in this study were different to those in rehabilitation facilities in the USA, with patients in the present study being less in need of, and/or less tolerant of, therapy. However, against this argument is the fact that the 3 rehabilitation wards in the study serve a defined catchment population, with very little outflow to rehabilitation facilities outside of the catchment. While there is some private inpatient rehabilitation capacity in the area, the private beds represent only approximately 25% of the area’s total inpatient rehabilitation bed capacity, and access to private rehabilitation is limited to those who hold private health insurance.

While there is a growing body of research that suggests that increasing the intensity of therapy achieves better rehabilitation outcomes, this is predominantly available for stroke and other neurological impairments (14–22). However, Chen et al. (23) found that functional gains in all of the 3 impairment groups of stroke, orthopaedics and debility were weakly, although significantly, related to therapy intensity. High-quality evidence relating therapy intensity to outcome is not available for many of the impairments that patients receive rehabilitation for, and further research into the types of therapy most efficacious, as well as the intensity of therapy (both the duration of therapy and the amount of effort required of the patient), is required (24, 25).

Even though not receiving sufficient therapy represented the main reason that utilization review criteria were not met, this reason only accounted for 27% of the bed days that criteria were not met. The fact that delays in discharging patients to alternative care settings (either to long-term care or to home) accounted for 43% of these bed days suggests that efficiencies could be gained if these delays could be overcome. Reasons for these delays were not explored in this study, but are likely to have included: delays in the approval process for, and access to, long-term care; delays in obtaining home modifications and discharge equipment, and; delays by the team and patient/family in determining readiness for discharge. Even though representing only 6% of the bed days that utilization review criteria were not met, the reviewer’s determination that there
was insufficient evidence of a clear management plan to satisfy review criteria, warrants further investigation. In the Australian context this finding might reflect the fact that the health system is not attuned to having to ensure that documentation meets the requirements of an external utilization review process.

The finding that 17% of bed days did not meet criteria due to the patient being more appropriate for acute or subacute medical care suggests that this is a group of patients whose medical status fluctuates. Interestingly, the rate was lower in stroke, hip fracture and joint replacement patients (10%, 10% and 12%, respectively) than in the “other rehabilitation” group (22%), with the latter consisting of more patients with multiple morbidities and debility and likely to be medically less stable. This finding has implications for the public rehabilitation sector in Australia, as this patient group is becoming more prevalent in the public units. Growth in the private rehabilitation hospital sector in the past decade in Australia has allowed private facilities to target the less medically complex patients, resulting in proportionately more patients with multiple morbidities and general debility being managed in public hospital rehabilitation units (3). Standalone rehabilitation facilities (as were the study wards) will often be called upon to manage medically unstable patients, and this has implications for the resources they require, their relationship with acute medical facilities and their ability to accept patients who may become medically unstable.

Further work on how much of a therapist’s time should be devoted to actual patient therapy (and not just the broader concept of “patient attributable” time) is also required. Allied health professionals are a limited resource in Australia and models of care that make the most efficient use of this resource are required, such as exploring the role of therapy aids or providing allied health staff with administrative support, thereby freeing up their time for therapy. Even at the recommended AFRM staffing levels, the amount of therapy available in these wards would fall well short of that provided in acute and subacute rehabilitation facilities in the USA. A better way of determining allied health staffing may be to base it on the therapy requirements for individual patients, rather than at the unit level.

As for the utility of the InterQual tool, it was found to be easy to apply and offered a structured way of assessing rehabilitation care. Excluding licensing costs, the tool was not found to be prohibitively expensive, with a labour cost in the order of 5 Australian dollars per day to apply. The largely subjective nature of certain of the criteria in the InterQual Rehabilitation and Subacute subset, such as the patient’s requirement for and ability to tolerate therapy, needs to be further defined if the tool is to be used to assist in “prescribing” therapy intensity for individual patients and selecting patients for care settings (e.g., fully staffed and equipped rehabilitation wards vs other subacute facilities). However, even in its present form the InterQual tool may provide a useful means to help identify when the key elements of a rehabilitation programme are not being met, thereby allowing an opportunity for action by the treating team. It could also provide a structure for benchmarking and service planning, and it may have a role in helping to identify patients in an acute care setting who would benefit from rehabilitation, in determining the timing of transfer to rehabilitation and in flagging when a move to an alternative care setting, or discharge home, is appropriate (8, 11). However, to test its utility in these domains would require a prospective study where the InterQual tool was used as an aid to facilitating care.

While having a number of limitations, this study does provide useful information about the nature of public rehabilitation in Australia and, through the use of a utilization review tool developed in the USA, offers some insights into how Australian rehabilitation practice might contrast to that in the USA. However, direct comparisons between rehabilitation outcomes in Australia and the USA are not readily possible due to a lack of recently published aggregate American data. The study findings are likely to be broadly generalizable to other Australian public rehabilitation facilities, as the study wards were catchment-based and the allied health staffing levels in these wards, even though less than those recommended by the AFRM, were consistent with staffing levels in similar public units.

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CHAPTER 7: Functional improvement of the Australian health care system - can rehabilitation assist?

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amagement of demand for services in public hospitals is a key challenge for the health care system. The situation will intensify with the ageing of Australia’s population and increases in the prevalence of chronic disease and disability. Strategies to date have focused on the acute care sector, reducing hospital attendances, post-acute support, and management of chronic disease in the community. The rehabilitation sector is generally seen as separate from the acute care system, and there is relatively little focus on patient flow into and through rehabilitation, or on the secondary and tertiary prevention strategies that optimal rehabilitation intervention can offer. We feel that the lack of focus on rehabilitation is detrimental to our health care system.

Twenty per cent of Australians have a disability, and more than 6% of the population has a profound or severe core-activity limitation. With an increasing proportion of older people living alone, the ability to keep living in the community is often more dependent on functional independence than on medical factors, suggesting a role for rehabilitation.

Rehabilitation has been defined as “a health strategy ... that aims to enable people with ... disability to achieve and maintain optimal functioning in interaction with the environment”. In the context of this article, rehabilitation refers to the provision of multidisciplinary, medically directed services that aim to improve the functioning of an individual after illness or injury and that are evidenced by comprehensive assessment of function and realistic and negotiated goals.

Here, we provide an overview of public rehabilitation services in the two most populous Australian states, New South Wales and Victoria, but many of the issues raised are likely to apply to the rest of the country. We highlight preventable systems factors that contribute to access block “upstream” in the acute care sector and exit block “downstream” in rehabilitation, and present possible solutions. The issues identified relate to people of all ages with disabilities.

Current rehabilitation services in NSW and Victoria

Data on over 53,000 inpatient rehabilitation episodes in Australia for 2006 were recently reported. Most of these (39,168 [77.5%]) were in NSW and Victoria (Frances Simmonds, Manager, Australasian Rehabilitation Outcomes Centre, personal communication). Patients were mostly aged over 70 years, but about a fifth were aged under 65 years. More episodes from private hospitals were reported, but patients treated in the public sector tended to be more disabled. Most patients returned to living in the community after discharge. Rehabilitation has been described as the “glue” between the acute care and community sectors.

Victoria and NSW are generally well served in the availability of public rehabilitation beds and rehabilitation physicians (1 per 62,000 and 1 per 46,000 people, respectively, at June 2008 [Rebecca Forbes, Senior Executive Officer, Australasian Faculty of Rehabilitation Medicine, personal communication] and calculated using Australian Bureau of Statistics estimates). In Victoria, most public rehabilitation beds are in stand-alone facilities, while in NSW, co-location with acute care facilities occurs more frequently.

The trend over recent decades has been to re-allocate the role of small hospitals to that of subacute care, including rehabilitation, in an effort to satisfy the political imperative of keeping these hospitals open, while acknowledging that the provision of acute care in small facilities is no longer appropriate.

Ambulatory rehabilitation is generally more widely available in Victoria than in NSW, with the former offering comprehensive outpatient public rehabilitation programs and the availability of home-based rehabilitation, typically for 2–6 weeks.

Problems with the current organisation and delivery of rehabilitation services

System issues, funding and workforce constraints, and conflict between federal and state responsibilities all contribute to reducing the positive potential of rehabilitation in the acute care hospital and community sectors. Critical factors are outlined below.

Provision of hospital-based care

Functional decline in patients secondary to inactivity is ubiquitous in acute care hospitals, resulting in prolonged recovery times. Systems are generally not in place to minimise this. Preventable complications, such as pressure ulcers, falls, malnutrition and contractures also affect outcomes and increase length of stay.

In acute care hospitals, rehabilitation services are often not engaged early enough to help prevent functional decline and...
complications. Delays in obtaining rehabilitation assessments in acute care are common, due to delays in referral or in availability or responsiveness of the rehabilitation team. Under-resourcing of allied health staff in some acute care hospitals results in patients receiving minimal therapy and discharge planning once they have been identified for rehabilitation or other subacute care. This contributes to functional decline and increases subsequent length of stay in subacute care.

As private rehabilitation capacity has expanded to target patients with predominantly single-system impairments (eg, elective orthopaedic conditions and milder strokes), the nature of public hospital rehabilitation has moved towards the management of older patients with multiple morbidities and general debility, often requiring ongoing interaction with the acute care system.

We question the appropriateness of providing inpatient rehabilitation services that are isolated from the back-up of an acute care facility — for efficiency, safety and workforce reasons. Acute care patients in need of rehabilitation must wait till they are medically stable before they can be transferred to a stand-alone rehabilitation facility, creating a hiatus in their care (both acute care and rehabilitation). When acute care and rehabilitation hospitals are not collocated, the elective transfer of patients from acute care to rehabilitation often takes place later in the day — effectively wasting a day by the time the admission process is completed. Interruptions to rehabilitation then occur if patients are transferred back to acute facilities for medical review or investigations. In stand-alone facilities, on-site after-hours medical rostering in an environment of workforce shortage is problematic and costly.

For some patients (eg, those who are non-weight-bearing for prolonged periods after lower-limb fractures or those awaiting home modifications), there is a lack of alternative care settings. This results in inappropriate admissions to rehabilitation or longer stays there.

Community-based rehabilitation

In NSW, the provision of public hospital outpatient and domiciliary allied health has not kept pace with the demands of an ageing population. While the Medicare system has expanded to cover community allied health (ordered by a general practitioner for eligible patients), rehabilitation providers cannot access these services even though they are in an ideal position to prescribe and coordinate such care.

Inpatient rehabilitation exit block for younger people

Little has been done to provide sufficient high-level care for younger people with severe, persistent, acquired disabilities (eg, acquired brain injury or spinal cord injury or damage) who no longer require rehabilitation and are not covered by compensation. There is a lack of options under state programs to accommodate these people, and the restrictions imposed by the federal government on younger people accessing residential aged care compound the problem. Therefore, these patients often wait in rehabilitation for many months until a suitable community solution can be brokered, or for placement — often, in spite of the government restrictions, in a residential aged care facility, after all other options have been exhausted. In NSW, the new lifetime Care and Support Scheme (http://www.lifetimecare.nsw.gov.au) is seen as a positive step, but this is only available for people with catastrophic injury as a result of a motor vehicle accident.

The lack of funding for paid carers and the bureaucratic processes that restrict and delay the provision of home-based care result in patients being generally limited to 5–7 hours per week of personal care assistance at home. This results in stress to the family providing care and significant out-of-pocket expense. Once determined appropriate, the wait for packages that can provide a greater number of hours of care can take months. In Victoria, the Disability Support Register provides younger patients with access to a package of services to avoid admission to residential aged care via the “my future my choice” program (http://www.dhs.vic.gov.au/disability/improving_supports/my_future_my_choice). However, access to such services can take 4 to 8 months to implement.

Provision of aids, equipment and home modifications

In both NSW and Victoria, the system for supplying aids, equipment or home modifications to patients not covered by compensation is inadequate. There are long waiting periods and variation in supply between jurisdictions.

While the acute care sector demands and often gets the immediate supply of costly equipment, supply of orthoses (to allow mobility, for example) or of preventive footwear (for at-risk
diabetic feet) can take up to a year. This is in contrast to the
artificial limb schemes, which are administered under different
funding programs and, in both states, are equitable and responsive
and operate within a capped budget.

There are also delays in funding the home modifications
required for a safe home environment. Patients can wait in hospital
for months, even though the cost of modifications is much less
than the prolonged hospitalisation. For example, in Victoria, a
single one-off contribution of $4000 per patient is available.
However, the cost of home access or bathroom modifications can
reach $15 000–$20 000 each, while the estimated weekly cost of
caring for a patient in hospital is about $3500.

Interface with aged care services
Improvements in aged care service provision have focused on care
and support rather than on the minimisation and reversal of
disability. The federal government’s recently established Transition
Care Program offers 8–12 weeks of support with limited therapy to
improve the functioning of patients at risk of residential aged care
facility admission. However, this program is available only to
patients aged over 65 years. It is also more akin to restorative care,
with the expectation of slow gains over time with good supportive
care and minimal therapy, than to intensive specialist rehabilita-
tion. A recent article in the Journal highlighted concerns about the
cost-effectiveness of this program compared with alternatives,
including rehabilitation.

Proposals to improve the organisation and delivery of
rehabilitation services
There are a number of strategies that can improve service delivery,
potentially improving patient flow and outcomes in both acute
care and rehabilitation. Implementing these improvements will
require cooperation between state and federal governments and
greater flexibility by health departments and hospitals as to how
rehabilitation services are organised.

Furthermore, a national rehabilitation strategy should be estab-
lished, as recently proposed by the Australasian Faculty of Rehabil-
itation Medicine (http://afrm.racp.edu.au/index.cfm?objectid=0F7AE593-9D8B-CDD1-A2096977C34069AA). This would,
among other things, improve national rehabilitation policy, planning,
service provision, research and workforce development.

In addition to the changes suggested here, there are likely to be
other ways in which the acute–subacute–community interface can be
improved. The clinical redesign principles described in a recent
supplement to the Journal provide a useful framework for process-
ing this process. It is also important to have cooperation and
 collaboration between rehabilitation and aged care services, to
avoid duplication of similar services and to limit delays caused by
parallel assessment processes, while at the same time preserving
the important differences that each of these fields of expertise
offers.

Minimise preventable disability and complications
Rehabilitation can play a major role in minimising preventable
disability and complications in hospitalised patients. There is a
need for programs to increase activity levels to prevent unneces-
sary functional decline in patients in both acute and subacute
care, along with early referral to rehabilitation services for
patients with significant disability who are likely to require
multidisciplinary care. Commencing a multidisciplinary rehabili-
tation program at an early stage, even while still in acute care, can
improve outcomes and patient flow by reducing length of stay
in rehabilitation or avoiding a rehabilitation admission entirely if
adequate ambulatory care programs are available.

Use should be made of systems for the early identification and
referral of patients appropriate for rehabilitation.

Relocate rehabilitation facilities
Health planners should consider the efficiency, patient safety and
workforce benefits of relocating stand-alone inpatient rehabilita-
tion facilities back to acute care hospital campuses.

Redesign rehabilitation
There is growing evidence suggesting that increasing the intensity
of rehabilitation therapy may lead to improved efficiency and
patient outcomes in some types of impairment. The best evidence
exists for stroke, but it is quite likely that patients with other
impairments would also benefit from an increased intensity of
therapy.

Improve ambulatory rehabilitation care
Significant increases in community rehabilitation are required to
minimise preventable disability as the population ages. State and
federal governments need to work together to develop ways to
make sufficient community allied health interventions available
to rehabilitation services, given that the latter are ideally placed to
select appropriate patients and monitor outcomes.

Improve systems for supply of aids, equipment and home
modifications
Funding for aids, equipment and home modifications for people
with disabilities of all ages needs to be streamlined and made more
accessible and equitable. There are economic and quality-of-life
benefits to be gained from rapid supply of these items. It is not
unreasonable for patients to be supplied with orthoses and
appliances in a timely fashion, in the order of 4–6 weeks.

Support younger people with severe disability
A range of suitable and accessible care options for younger adults
requiring high-level care is needed. Options include smaller group
residential homes, adequate funding for home-based carers, and
programs similar to the existing Transition Care Program, but with
a greater intensity of allied health intervention, if required.

Develop a broader range of inpatient rehabilitation and
other subacute care services
Inpatient rehabilitation and other subacute care would probably be
more efficient and effective if they were stratified into “acute,
intensive” rehabilitation and “less intensive, more supportive” care,
based on patient need. This is in contrast to the usual situation in
Australia (outside the specialised spinal and brain injury units) of a
“one size fits all” approach to rehabilitation. Such models exist
overseas, with individual patient factors determining the intensity
of rehabilitation or subacute service provision required.

While the new Transition Care Program provides longer-term
restorative-type care for older patients, there are strict admission
criteria and approval processes. There are currently limited options
for other elderly or young patients with the same care needs, including those awaiting home modifications or who are non-weight-bearing after sustaining fractures.

Conclusion

To make the best use of the current wave of hospital and community health system reforms, a focus on the rehabilitation sector is essential. Recent government initiatives, while addressing some of the issues raised, have concentrated on the aged care domain and not on rehabilitation.28,29 Addressing the issues outlined in this article will require a whole-of-government approach, as well as involvement of regional health authorities and local personnel. We feel that the effectiveness of the health care system would be considerably enhanced by these changes, which would help to increase access to inpatient beds (in both the acute and subacute sectors), improve patient outcomes and reduce costs.

Competing interests

None identified.

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CHAPTER 8: Conclusions and Recommendations

Conclusions and recommendations arising from the body of work

This thesis presents an exploration of the rehabilitation patient journey from acute care to inpatient rehabilitation, and each publication contains conclusions and recommendations relating to each phase of the work.

Overall, the research has demonstrated that in the acute care hospital and the rehabilitation hospitals studied, there appear to be considerable inefficiencies with regards to the processes of care. Capacity could be improved in acute care and in rehabilitation if these process inefficiencies are addressed.

The research has also demonstrated that, according to utilisation review, there is a need for a greater focus on improving the movement of patients into alternative levels of care – i.e. alternatives to acute care as well as alternatives to rehabilitation care. This is not necessarily a new fact for health service administrators, as ‘bed block’ due to the unavailability of rehabilitation or subacute care, or long term care or community support, has been well described.

However, what is new and important for the Australian health care system is the way that this research has demonstrated the application of utilisation review in providing a standardised methodology for determining level of care appropriateness across both acute and rehabilitation settings, and for determining reasons for inappropriate days of stay. With the capacity for replication, utilisation review methodology could be used as a quality tool to assess the impact of programs which aim to address inefficiencies and to assist health service planners to determine the correct mix of bed types.

The research has also shown that the InterQual utilisation review tool has utility in Australia, albeit with some re-interpretation of how the tool’s predominantly US levels of care translate to care levels in Australia. This was mainly an issue for the InterQual rehabilitation and subacute levels of care, where the latter could all be used to describe
Australian public hospital rehabilitation patients. Concurrent utilisation review was shown to be straightforward to apply when reviewers were skilled and trained in the use of the tool. The cost of a proprietary tool may be a barrier, but licensing arrangements and cost were not within the scope of this research. However, the alternative, of developing a new utilisation review tool for use in acute care and rehabilitation, and validating and updating such a tool, would be a very costly process.

The demonstration of differences in clinical decision making between acute care teams and the rehabilitation team over patient selection and readiness for rehabilitation is an important finding that has a number of implications for the rehabilitation patient journey. The finding that the rehabilitation team appears to be adopting a ‘conservative’ approach to patient readiness for rehabilitation transfer warrants further investigation. The data showed that the main reason given by the rehabilitation team was that patients were not sufficiently medically stable, although the need for patients to undergo further investigation in the acute hospital was also a reason, and this might be linked to medical stability. The utilisation review tool appeared to be able to determine medical stability earlier than the rehabilitation team, and with almost as great ‘accuracy’, suggesting that the structured approach of utilisation review to questions of stability and readiness for transfer could possibly be used as an aid to clinical decision making in this context. This needs to be tested.

The hiatus in care, described as ‘terra nullius’ in Chapter Five, that is often created when the patient has completed acute care and is either waiting to become sufficiently medically stable or complete investigations prior to being transferred to rehabilitation, or is waiting for a rehabilitation bed, needs to be addressed. During these days the acute care team often regards the patient as having completed acute care, and their attention is often diverted towards patients of higher acuity or to those able to be discharged directly home from acute care. The rehabilitation team however may not have resources available in the acute care setting to commence rehabilitation and, as discussed earlier, current activity-based funding models in Australia do not support the provision of rehabilitation in parallel with acute care. Clinical and funding models are needed to support rehabilitation within the acute care setting, with the aim being to make the best
use of hospital resources during this time of relative patient inactivity. (Poulos et al., 2011 [Ch5]; Ward et al., 2010)

Another recommendation which arises from these findings is the need to examine the impact that placing rehabilitation facilities away from acute hospital campuses has on patient flow from acute care. It may be possible for patients to be accepted earlier into facilities that are co-located with acute facilities. However, the finding that 17% of the inappropriate bed days in the rehabilitation facilities studies were due to the patient being more appropriate for acute or subacute medical care, shows that it cannot be expected that patients will remain stable once transferred. As noted in the publication from this phase of the work, this is a reflection of the nature of patients in public rehabilitation units in Australia – i.e. that they are generally older patients with multiple morbidities who are likely to become medically unstable (Poulos, 2010 [Ch6]).

The finding that these rehabilitation facilities provided very little therapy compared to standards mandated in the USA for inpatient rehabilitation facilities, and that only 6% of patient days met criteria for ‘Acute’ or ‘Subacute’ (InterQual) Rehabilitation, has a number of important implications for practice in Australia (Medical Inpatient Rehabilitation Criteria Task Force, 2006; Poulos, 2010 [Ch6]). Given the growing body of research evidence that suggests that therapy intensity is directly linked to rehabilitation outcome, it is possible that the low therapy levels in Australian public rehabilitation units might be resulting in less efficient and less effective rehabilitation (Chen et al., 2002; Cifu et al., 2003; DeJong et al., 2009; Jette et al., 2005; Kwakkel, 2006; Kwakkel et al., 2004; Shiel et al., 2001; Slade et al., 2002; Teasell et al., 2005; Zhu et al., 2007; New and Poulos, 2008 [Ch7]).

The cost of therapy represents a relatively small component of the total cost of inpatient rehabilitation and so inadequate therapy provision, if it does have a significant impact on outcome and efficiency, may at the very least be a poor economic decision. Research on the cost benefit of providing increased therapy intensity within Australian rehabilitation facilities is required.
The findings on therapy provision also highlight the fact that these public rehabilitation facilities seem to be catering to a wide range of patients, with varying requirements for therapy. While it is important to note that inadequate therapy provision was the most common reason why days were deemed ‘not appropriate’ for inpatient rehabilitation, there were many patient days which did meet appropriateness despite low levels of therapy. This suggests that therapy provision may need to be stratified according to patient need, and that allied health staffing standards should be based on therapy provision at the individual patient level, rather than at the unit level, as is currently the case. Also, as suggested in the publication from this work (Chapter Six), the reason why the reviewers and therapists deemed such low levels of therapy to be ‘appropriate’ rehabilitation warrants further investigation. It needs to be determined whether the patients were actually receiving optimal therapy, or whether the reviewers and therapists regarded the current low levels of therapy as the ‘norm’, having not worked in health systems that had a stronger rehabilitation therapy focus (Poulos, 2010 [Ch6]).

A unique contribution to knowledge

It is suggested that the following aspects of the body of work have provided a significant and unique contribution to knowledge. These aspects are broken down into the components of the rehabilitation patient journey (see also Figure 1 on page 19, which places the publications from the work within the context of the patient journey).

The rehabilitation patient journey in acute care

This body of work presents the first study of the rehabilitation patient journey from a health systems perspective in Australia. While it focuses on public hospital care, the findings may be applicable to the private rehabilitation sector in Australia as well as to other countries with similar health care systems. The work is the first to employ and publish the findings from concurrent utilisation review in the acute hospital setting in Australia focusing on patients who might require rehabilitation.
The work also presents the first use of the InterQual utilisation review tool in Australia, including the testing of the utility of the tool in the Australian context. In addition, the work extends the scope of prior published international research using the InterQual tool in acute care by detailing reasons for inappropriate utilisation and by highlighting potential inefficiencies in the processes of acute care which may be impacting on patient flow and thus acute care capacity. While some previous work has reported reasons for acute level of care criteria not being met (Chopard et al., 1998), this is the first study to add customised reasons for variance to the InterQual dataset and to focus on this particular cohort of patients.

The rehabilitation patient journey at the interface between acute care and rehabilitation

The work is the first to apply concurrent utilisation review methodology to the examination of the interface between acute care and rehabilitation, either within Australia or internationally. The work is also the first published research, either in Australia or internationally, on the differences in the outcomes of clinical decision making between acute care and rehabilitation teams on patient selection and transfer to rehabilitation, and to compare clinical decision making outcomes at the interface between acute care and rehabilitation against that of a widely used utilisation review tool.

Improving the patient journey through information management

This body of work is the first to describe the development, implementation and outcomes achieved by the use of an information management system specifically designed to better manage the rehabilitation patient journey from acute care to rehabilitation.

The rehabilitation patient journey in inpatient rehabilitation

The work presents the first Australian or international research reporting the use of concurrent utilisation review within inpatient rehabilitation settings and to compare
rehabilitation in Australia against the criteria contained within a tool originally designed for use in the USA. It is also the only known published work from Australia to examine inappropriate bed use in public rehabilitation facilities in Australia and to relate appropriateness of rehabilitation and staffing levels to therapy provision.

A significant contribution to knowledge

Aspects of this body of work that are suggested to offer a significant contribution to knowledge are as follows, once again broken down into components of the rehabilitation patient journey.

Improving patient flow and capacity in acute care

The work on potential inefficiencies in the processes of acute care for the cohort of patients who were the subject of this research provides clinicians and health service managers with information to assist in the identification and development of measures to overcome process inefficiencies. If process inefficiencies can be overcome, patient flow within acute care could be improved, with a benefit being increased acute care capacity. Even though this research focused on the patients who may be destined for rehabilitation, the findings on potential process inefficiencies within acute care are likely to be relevant to other patient groups.

Demonstrating that concurrent utilisation review using an already available tool has utility in the Australian context provides health service researchers with a methodology to compare level of care appropriateness and to evaluate the outcome of measures employed to address process inefficiencies in acute care. Also, the demonstration of the utility of concurrent utilisation review in Australia, including the applicability of the rehabilitation and subacute care levels of care described within the InterQual tool (albeit with interpretation suitable to the Australian context), potentially provides health service planners with a tool to assess deficits in the availability of alternatives to acute care.
At the interface between acute care and rehabilitation

The work on the implementation and benefits of an information system which addresses the processes of patient referral, consultation and subsequent review, consultation outcome, and patient acceptance and movement from acute care into rehabilitation, can be potentially applied in other hospitals. Evidence for this already occurring is presented in the section (below) on translation of this research into policy and practice. The system itself has been shown to be transferrable to hospitals with the same IT infrastructure (common across most of NSW, Australia), or, with modification, the system could be transferable to other clinical specialties which operate on a ‘referral-consultation-acceptance-transfer’ basis. The features of the system could also be integrated into other information management systems used in healthcare. The description of the development of the system may be of value to others.

The study findings on the differences between clinical decision making between the acute care teams and the rehabilitation team over patient selection decisions also provides a significant contribution to knowledge. They show that acute care clinicians and rehabilitation clinicians vary in their opinions of patient suitability for rehabilitation (despite the availability of guidelines developed by the rehabilitation team) and in their opinions of patient readiness for transfer. These findings may be generalisable to other settings.

The finding that a utilisation review tool (or perhaps another structured approach to addressing clinical decision making) could have a decision support role in patient selection and in the determination of the optimal timing of transfer has widespread implications for the rehabilitation patient journey. The research suggests that the utilisation review tool may be more ‘accurate’ in determining ongoing medical stability than the acute care team, thus being able to better target patients who are ready to move out of acute care. If the tool is shown to be about as accurate as the rehabilitation team in the determination of ongoing medical stability, then this has significant implications for patient length of stay in acute care. Shortening length of stay by 2 or more days for patients destined for rehabilitation (as suggested by the findings from this research) will free up considerable capacity in acute care, as well as reduce iatrogenic risk in patients.
However, further research is required, with the next stage possibly being a prospective randomised trial to examine utilisation review in a decision support capacity.

**Improving the inpatient rehabilitation journey**

The finding of a high level of inappropriate bed use in these public rehabilitation facilities, despite the fact that all four InterQual rehabilitation and subacute levels of care could have been considered appropriate, is of significance to clinicians, health services administrators and policy makers. It has implications for patient flow, efficiency within inpatient rehabilitation, and possibly for rehabilitation outcomes.

Cameron has stated that the publication by the Candidate (Poulos, 2010 [Ch6]) “raises important issues relating to the efficiency and appropriateness of rehabilitation” (Cameron, 2010). Cameron’s commentary on the Candidate’s paper (reproduced with permission in Appendix 3), then discusses the relevance of the findings presented in the paper and concludes by stating that “The balance between efficiency and equity in relation to rehabilitation services should be the subject of further discussion in the Journal of Rehabilitation Medicine” (Cameron, 2010).

Establishing the link between staffing levels and therapy provision, and relating these to utilisation review findings is also an important contribution to knowledge.

**Key limitations of this work**

This work has a number of limitations. The limitations of each phase of the research are described more fully in the associated publications, and are summarised below.

Some publications into the use of utilisation review may have been omitted by the Candidate, although the search methodology did include searches of the grey literature as well as the mainstream medical and health services scientific databases. Also, there is less publically available information on proprietary utilisation review tools compared to their public domain counterparts.
Even though the InterQual tool was found to be readily adaptable to the inpatient setting in Australia, and delivered results in the acute care hospital that were consistent with the international experience, it has not been formally validated in Australia. It was beyond the scope of this thesis to develop a new utilisation review tool, both in terms of the research aims and in terms of cost and resources available. However, there are good indicators that the tool was sufficiently valid for the purposes of this exploratory work. Should this not be the case in the Australian context, then the interpretation of data on level of care appropriateness could be brought into question as the tool may lack both content and construct validity. The lack of an available objective and repeatable gold standard for determining level of care appropriateness in the studies may also impact upon the tool’s predictive validity (further discussion above the predictive value of the tool is contained in the section on ‘Areas for future research’ (below)).

The application of the InterQual Rehabilitation and Subacute Criteria are more subjective than their ‘Acute’ Criteria counterparts. This means that the application of the former may be more open to the interpretation of the reviewer, and this could affect their validity as well as inter-rater reliability. However, as this is a first study reported in the international literature to use the Criteria in the rehabilitation setting there is no literature on the experiences of others. The reviewers, all experienced rehabilitation practitioners, felt that the Criteria, as applied in this study, had good face validity.

In terms of drawing conclusions about the practice of rehabilitation in Australia compared to the USA (where InterQual was developed) and the impact of the way differences in practice (for example, the amount of therapy delivered) might affect outcome, this is not readily possible because direct comparisons between rehabilitation outcomes in Australia and the USA are not possible due to a lack of contemporary published aggregate American data. This means that, even though the rehabilitation literature is strongly suggestive that the quantum of therapy delivered is related to rehabilitation outcome and efficiency, it is not possible to formally test whether outcomes and efficiency in the USA are better than in Australia by using published data.
The work on ‘staff attributable’ time and the relationship to actual therapy provision needs to be viewed as rudimentary only and further investigation of this issue is required to better understand the staffing models required to deliver efficient rehabilitation programs.

Overall, while it is likely that the findings of this work would be generalisable to other public acute and rehabilitation hospitals and facilities in Australia, one of the key limitations of this work is the fact that the study facilities were all located within the one NSW Area Health Service. The generalisability of the findings to other Australian settings is yet to be tested. The work is also less likely to be generalisable to the private rehabilitation hospital sector as casemix and staffing may be different.

**Translation of this work into policy and practice**

This body of work has already had an impact on policy and practice within NSW, Australia. The Candidate’s publications have been cited in two important recent government reports (Commonwealth of Australia, 2009; NSW Health, 2010).

The final report of the National Health and Hospitals Reform Commission was published by the Australian Government to inform the major health reform debate that is currently occurring in this country (Commonwealth of Australia, 2009). An outcome of this National health reform has been a considerably enhanced focus on the role of rehabilitation and subacute care within the Australian healthcare system. While no direct link can be established between the Candidate’s work and the enhanced focus on rehabilitation care at the National level, at the very least the work can be regarded as timely and of assistance in informing the policy debate. One of the Candidate’s publications has been cited in this report (Poulos & Eagar, 2007).

In 2009/10 the Candidate, then Area Director of Rehabilitation for one of the large metropolitan health services in Sydney, NSW, successfully advocated for funding under a new Australian Government initiative for subacute services (Council of Australian Governments, 2008). Funding was received to enhance rehabilitation services across the
10 inpatient rehabilitation units within the Candidate’s health service. The first project was the provision of one hour of additional therapy (physiotherapy, occupational therapy and speech therapy) per day over 5 days per week for approximately 40% of rehabilitation beds. Funding of approximately 6 million dollars over 4 years was made available for this initiative, commencing in 2009/10.

In 2010/11, a second project was commenced. This project is the establishment of up to seven ‘Acute Care Rehabilitation Teams’ to provide early rehabilitation in the acute hospital in parallel with acute care, across the 7 largest acute care hospitals in the health service. Funding of approximately 6.5 million dollars over 3 years has been allocated to this project. The application for funding for both the above projects was, to a large extent, based on findings from the Candidate’s work into the rehabilitation patient journey, presented as this thesis.

In 2010 the NSW Department of Health engaged external consultants to undertake a large project called the ‘Rehabilitation Redesign Project’. This project reviewed existing rehabilitation models of care and practice across Australia’s most populous state (NSW), as well as practice models nationally and internationally. The final report of that project was released in February 2011, and the report has cited a number of the Candidate’s publications (Chapters Two, Three, Four, Six and Seven). The potential impact of low levels of therapy on the patient journey has been highlighted in the report, along with the importance of providing rehabilitation early, in the acute setting. The Candidate’s work in establishing the two projects, mentioned in the two paragraphs above, were used as case studies in the report. The report also examined the information management system described in Chapter Three, concluding that the system “…….. has functionalities that would benefit other Local Hospital Networks in the future” (page 82 of the report) (NSW Health, 2010).

Finally, the Candidate’s work has been cited in a number of publications in the academic literature, as well as in another NSW Department of Health commissioned report (Projecting demand for subacute inpatient activity, Final Report, Health Policy Analysis, 2010). This latter report is not publicly available.
Areas for future research

The research presented in this thesis should be seen as exploratory in nature. It has shown that the InterQual tool appears suitable in the Australian context for both acute care and within rehabilitation, including at the interface between acute care and rehabilitation. This thesis has also presented a number of reasons why the InterQual tool had utility in the hospitals studied. These reasons include the fact that the InterQual Criteria are used in a number of countries outside of the US with similar health care systems to Australia’s and the levels of care contained within the Criteria can be mapped to those in Australia. Utility is also suggested by the fact that the results from the studies presented in this thesis are consistent with the international experience. The tool also appears to have face validity in that it appears to measure what it intends (i.e., patient appropriateness for acute care and rehabilitation and subacute care).

However, further testing of the utility and validity of the tool in Australia is warranted, and there are a number of options available for future research. These include: further testing of the validity of the tool against Australian conditions; appropriate modification of the tool, if necessary, to improve validity; and, intervention studies using the tool. As there is no ‘gold standard’ for assessing the appropriateness of the level of care to which patients are admitted, apart from clinician opinion, the tool’s criteria could be reviewed by a range of independent clinicians and health service administrators as a means of further validation in the Australian setting. The tool could then be employed, either prospectively or retrospectively, in other acute and rehabilitation hospitals. This would also improve the generalisability of the results. Modification to the tool’s supporting software may be costly and would need to be done with the approval of McKesson Corporation.

If the tool can be shown to be valid in the Australian setting, the opportunity for intervention studies arises. Intervention studies could include the following:

- the use of the InterQual Criteria in a decision support capacity to facilitate patient movement to the most appropriate level of care;
the use of the information derived from utilisation review data to target inefficiencies in the processes of care that could be overcome through the application of process re-engineering methodologies. Utilisation review could then be employed again to judge the effectiveness of the process re-engineering;

the predictive ability of the InterQual tool in determining the point at which patients become medically stable, and then remain medically stable, should be tested further. If it can be shown that a utilisation review tool such as the InterQual Criteria, when used in a decision capacity, has predictive ability in this regard then it could be a valuable aid to both patient flow and patient safety. The best level of evidence from an intervention study comes through the use of a randomised control trial, and this methodology could be suitable to a study on the predictive ability of the tool.

A cost-benefit study could be undertaken using the InterQual Criteria in a decision support capacity against usual care. All costs associated with the employment of the tool (e.g. licensing, training, IT, staff time) could be compared against the costs of usual care. Savings (if any) in terms of reduced overall length of hospital stay could be calculated. Other cost savings or increased costs in terms of the processes of care would also need to be included in a cost-benefit study, as would a measure of patient safety and readmission.

Conclusion

In conclusion, this integrated program of research into the rehabilitation patient journey suggests that considerable inefficiency exists within these acute and rehabilitation hospitals, due in part to process inefficiencies and also to a lack of availability of alternative care settings. There was also variability in clinical decision making between acute care and rehabilitation teams regarding patient selection for rehabilitation and timing of transfer. While patients received very little therapy in these public rehabilitation hospitals in comparison to their North American counterparts, therapists often viewed their rehabilitation as appropriate. Utilisation review, using the InterQual
tool, was found to be an appropriate method to investigate the rehabilitation patient journey and it appears to have utility in the Australian acute and rehabilitation hospital settings. It might also have utility in a decision support capacity. Improving the rehabilitation patient journey will result in benefits for patients with disability as a result of serious illness or injury and will also have a positive impact on patient flow and the efficiency and the effectiveness of both acute and rehabilitation inpatient care.
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Cameron ID. 2010. Commentary on "Evaluating inpatient public rehabilitation in Australia using a utilization review tool developed in North America". Journal of Rehabilitation Medicine, 42, 282-3.


Uniform Data System for Medical Rehabilitation 1997. Guide for the Uniform Data Set for Medical Rehabilitation (Adult FIM™) version 5.1. Buffalo, NY.


APPENDIX 1: Description of the InterQual (Adult) Criteria

Within the acute adult criteria there are four levels of care, as follows:

- Observation — this level covers “observation units” or “rapid treatment units”, where patients are observed for 6–24 hours.

- Critical care — this level refers to intensive care units and coronary care units.

- Intermediate care – this level refers to “step-down” units.

- Acute care — this level refers to typical acute medical and surgical units.

Within each of these levels of care there are subsets, grouped by body systems or broad clinical groupings such as “cardiovascular/peripheral vascular” or “infectious disease”. Each subset then contains the following components, each individually tailored to the subset:

- Severity of illness (SI) criteria. These are objective clinical indicators of illness. For example, severity of illness criteria include vital signs (eg, heart rate, blood pressure, temperature), and laboratory findings (eg, arterial blood gas measures).

- Intensity of service (IS) criteria. These consist of monitoring and therapeutic services, singularly or in combination, which can only be administered at a specific level of care.

- Discharge screens. These look at the clinical indicators of patient stability and recommended alternate levels of care.
The “appropriate” level of care is therefore based on:

- The severity of illness exhibited by the patient.
- The intensity of service provided to the patient.
- Discharge screens that indicate readiness for discharge home or for transfer to an alternate level of care.

To meet appropriateness for admission, the patient must satisfy severity of illness criteria and intensity of service criteria. Approval is given once any of the severity of illness and intensity of service criteria points (or groups of criteria) are met. This means that the tool becomes much quicker to apply once the reviewer is trained in its use, as he/she will be able to select only the criteria that are most applicable to the particular patient. The criteria will also, depending on the patient’s clinical condition and treatment provided, approve a number of subsequent days in acute care (usually 1–3). The patient will then have a subsequent review scheduled to determine if he/she still meets criteria for continued stay in acute care, or whether discharge, or transfer to a lower level of care, is more appropriate.

The subsequent reviews in acute care are known as “continued stay” reviews. To meet criteria for continued stay in acute care the patient has only to meet the intensity of service criteria. Intensity of service criteria are categorised into two types: those where only one criteria point (or group of criteria) is required to be met (one IS), and another type that requires three criteria to be met, but which then requires a discharge review of the patient (three IS and discharge review).

When a patient does not meet criteria for continued stay in acute care he/she will then have a discharge review. The logic in conducting a discharge review is to start with the least intensive level of care and then apply the discharge criteria sequentially until the lowest appropriate alternate level of care is matched. Once again, with knowledge of the criteria, an experienced reviewer will be able to determine the likely alternative level of care and start from that point, working up or down. The InterQual acute adult criteria
also allow for a 24-hour “grace period” if intensity of service and discharge screens criteria are not met and the reviewer can refer the patient to a secondary reviewer, or a secondary medical reviewer for physician override, should there be uncertainty.

**InterQual Rehabilitation and Subacute (Adult) Criteria**

Patients within acute care who do not meet criteria for discharge home (with or without services) may meet criteria for rehabilitation or other subacute level of care. This can be confirmed with a preadmission review for one of the InterQual rehabilitation or subacute levels of care. To meet preadmission eligibility for these levels of care, patients must satisfy criteria from five categories. As with the acute adult criteria, the content within these categories varies according to clinical subsets. The five categories are:

- The patient must meet criteria for having had an illness, injury, surgery or exacerbation.
- The patient must have an impairment/s requiring at least minimal assistance.
- The patient must meet clinical stability criteria.
- The patient must have an ability to tolerate a rehabilitation program.
- Treatment must be precluded in a lower level of care, such as home care, due to clinical complexity.

As with the InterQual Acute Adult dataset, the Rehabilitation and Subacute criteria then have criteria for admission, continuing stay and discharge appropriateness.

An important difference between the Acute Criteria and the Rehabilitation and Subacute Criteria is that the latter are more subjective, relying to a greater extent on the judgement of reviewers (for example, in determining how much therapy a particular patient needs and would benefit from) than on the objective measures (physiological and diagnostic findings and actual medical treatment received) found in the Acute Criteria. This is likely to have some impact on the application of the tool.
Within the InterQual 2006 Criteria there are 2 “levels” of rehabilitation (“Acute Rehabilitation” and “Subacute Rehabilitation”) and 3 levels of “subacute” care (“Skilled Nursing”, “Subacute Care” and “Complex Care”). One of the main distinctions between the levels of care that contain therapy is the amount of therapy that can be tolerated by the patient, varying from three or more hours of therapy per day for at least five days per week for “acute rehabilitation” to one hour of therapy per day, as well as a “restorative” nursing program, for the “skilled nursing / therapy” level of care. Differences between these levels of care reflect the characteristics of the patient (including their impairment/diagnosis) and the characteristics of the facility. Some of the main differences are outlined below:

- **Acute Rehabilitation** – physician assessment/intervention is required at least 3 times per week; rehabilitation nursing is available 24 h per day; specialized rehabilitation equipment and therapy expertise is required; at least 2 therapy types are required; the patient has rehabilitation potential and is able to participate in the program and can tolerate and needs to receive at least 3 h of therapy per day.

- **Subacute Rehabilitation** – skilled nursing services available daily; medical specialty consultative, pharmacy and diagnostic services are available; at least 2 therapy types are required; the patient has rehabilitation potential and is able to participate in the program and can tolerate and needs to receive at least 2 h of therapy per day.

- **Subacute Care** – nursing of at least 4 h per day is required; the patient must have rehabilitation potential with the expectation of clinical/functional improvement and can tolerate and needs to receive 1–2 h of therapy per day.

- **Skilled Nursing Care** – nursing is required at least daily; the patient must have rehabilitation potential with the expectation of clinical/functional improvement and can tolerate and needs to receive less than 1 h of therapy per day.
In Australian public rehabilitation hospitals, all four of these InterQual levels of care are likely to be deemed “rehabilitation”, as minimum therapy standards for rehabilitation do not exist.
APPENDIX 2: Guidelines for patient selection for rehabilitation

The following policy guidelines are aimed at assisting junior medical officers in the selection of patients who are appropriate for referral to the Rehabilitation Service and to advise on the referral process.

What is Rehabilitation?
Rehabilitation is multidisciplinary care, where the primary treatment goal is to improve the functional status of patients who have suffered significant illness or injury.

Where is it provided?
Inpatient rehabilitation beds are provided at Hospital A, Hospital B, Hospital C and Hospital D. These beds can only be accessed via a medical referral to the Rehabilitation Service and acceptance by a Rehabilitation Consultant. Outpatient and community-based rehabilitation for appropriate patients is also available.

Which patients should be referred to the Rehabilitation Service?
Appropriate patients are those:

1. With recent impairment of functional ability due to illness or injury.
   - This may be due to diagnoses such as hip fracture, stroke, multi-trauma, brain injury, spinal cord impairment or amputation, OR
   - It may be the result of deconditioning and general debility following prolonged medical illness or after surgery, OR
   - It may be associated with co-morbid conditions such as degenerative neurological or musculoskeletal disease, vascular disease, diabetes, renal failure etc. AND
2. Who have prospects for functional gain within a reasonable time frame. AND
3. Who are able to participate in a rehabilitation program AND
4. Who are sufficiently medically stable to be managed in the rehabilitation setting
Notes about other patients

- Older patients with dementia / delirium and an inability to participate in, and benefit from, a rehabilitation program, and those with multiple, active medical issues, may be more appropriately referred to the Geriatric Medical Service.

- Where there is no reasonable prospect of functional gain, but the patient and family are requesting discharge home, referral to the Rehabilitation Service may be appropriate so that the patient and family can be advised on the best means of managing the patient’s disability.

- Patients who would normally be discharged home from acute wards given adequate discharge planning and simple allied health interventions (such as an occupational therapy home visit or mobilisation with the ward physiotherapist), generally do not require specialised rehabilitation.

How to obtain a Rehabilitation consultation?

- Obtain the permission of the patient’s Attending Medical Officer (if they are not the ones initiating the referral).

- Complete a request for Medical Consultation Form, addressed to the Rehabilitation Consultant.

- Phone through the consultation, to ### ###. You will need the patient’s name and MRN.

What happens after the Rehabilitation consultation has occurred?

Read the outcome of the consultation in the patient’s medical record or on the Medical Consultation form. Note that the Rehabilitation Consultant may request that certain investigations be performed, or other medical opinions sought, prior to acceptance for a Rehabilitation bed. Please ensure that these are attended to, to avoid unnecessary delays.

If the patient is not deemed to be suitable for a rehabilitation bed at the time of consultation, the Rehabilitation Consultant (or Registrar) may either close the consultation, or advise that they will return to review the patient at a later date. This should be recorded on the Consultation form or in the Medical Record.
If you have any questions about any aspect of the Rehabilitation Consultation, including the patient’s suitability for rehabilitation, contact the Rehabilitation Consultant or Registrar who consulted on the patient. If that proves difficult, then please contact the Rehabilitation Service administration, on ### ###.

Checking the status of the Rehabilitation Consultation
This can be done at any time by accessing the Rehabilitation Service’s Computerised Bed Management System. This will show the following useful information:

- When the patient was referred for Rehabilitation consultation.
- When the patient was seen in Consultation.
- Whether the patient was accepted for a Rehabilitation bed, or are on the ‘review’ list.
- The preferred location of the Rehabilitation bed if they have been accepted.

Patients returning to acute care from a Rehabilitation ward
In situations when a patient has required transfer back to Wollongong hospital from a rehabilitation ward, a NEW REFERRAL for a Rehabilitation consultation will be required if the acute team wants the patient transferred back to the Rehabilitation ward. This is because the patient’s clinical condition and prospects for Rehabilitation may have changed, and because it is difficult for the Rehabilitation Service to track patients when they are back in acute care.

Rehabilitation Consultants in the northern Illawarra
- Drs A,B,C,D,E,F,G,H

Further Questions?
If you require further information or feel that you are having problems either obtaining consultation, or patient transfer once accepted for rehabilitation, please contact the Rehabilitation Service administration on ### ###.
APPENDIX 3: Commentary by Cameron on ‘Evaluating inpatient public rehabilitation in Australia using a utilization review tool developed in North America’

COMMENTARY ON “EVALUATING INPATIENT PUBLIC REHABILITATION IN AUSTRALIA USING A UTILIZATION REVIEW TOOL DEVELOPED IN NORTH AMERICA”

The article by Poulos in this issue (1) is a utilization analysis of 3 Australian public hospital rehabilitation wards using a commercial review tool developed in the USA. The key findings are that only approximately half of the patient days met utilization review criteria for appropriate “rehabilitation” service provision and, for those that did, 60% of the provision was at “skilled nursing facility level” rather than a more intensive level. Therapy time was for an average of only 37 min per weekday. Thus, the paper raises important issues relating to efficiency and appropriateness of inpatient rehabilitation.

In Australia there is a universal health insurance system (Medicare Australia) that ensures that all the population can access public hospital services, including rehabilitation services, without direct payment. In the Australian state in which the study was conducted (New South Wales) case-mix based funding for inpatient rehabilitation services will soon commence (2). This will provide an incentive to increase efficiency and to reduce the length of inpatient stays in rehabilitation wards. Poulos’ data suggests that there is substantial scope to increase the efficiency of the rehabilitation wards that he studied.

Australian citizens can supplement the health services they receive by taking out additional private health insurance that provides access with no or limited payment to private hospital services including rehabilitation services. Patients in private rehabilitation wards in Australia tend to have fewer functional limitations at admission and are more likely to have had an elective arthroplasty as the health condition responsible for their admission compared with public hospital rehabilitation facilities (3). Thus, Poulos’ findings are likely to be generalizable to all Australian public hospital rehabilitation services, but probably not to the relatively large private inpatient rehabilitation ward sector in Australia.

The utilization review tool that has been applied in the study is InterQual Rehabilitation and Subacute. This is a proprietary instrument with some evidence of validity and reliability (1). Poulos considered that 4 of the 5 levels of service provision in the utilization tool were indicative of a rehabilitation service. In this analysis only 48% of total rehabilitation bed days satisfied these criteria, mostly (61%) at the “lowest” level, which is a skilled nursing facility.

The review showed no difference in appropriateness of rehabilitation service provision in different diagnostic groups. The large percentage (60%) of episodes in the “other rehabilitation” diagnostic group reflects the increasingly older population with multiple health conditions contributing to limited functioning. This points to the importance of availability of general rehabilitation services and not rehabilitation catering only for specific diagnostic groups.

There is evidence that dose of therapy has an influence on outcome in rehabilitation programmes (4) and that patients in rehabilitation wards have surprisingly limited amounts of activity each day. This study confirms this and also shows that tolerating more therapy is not a significant problem. Rather the major reasons for the rehabilitation/subacute service criteria not being met were insufficient therapy being available (27% of bed days in which rehabilitation/subacute level of care was not met), waiting for transfer to a residential aged care facility (26%), being appropriate for discharge home (17%), and needing acute or subacute medical care (17%).

How can efficiencies be achieved? Most obviously this can occur by provision of more therapy, particularly on weekend days. Poulos quotes Australian rehabilitation staffing standards that are consensus-based (5). His data suggest that there are significant non-patient-related duties that occupy therapy time, particularly for occupational therapists, and the redefining of therapists’ duties to include less administrative time is likely to improve efficiency. There are also other activities not captured in the current study that may be increased, for example more incidental functional activity, or nurse-initiated and supervised “therapy”. The provision of rehabilitation in other settings, particularly ambulatory settings, should also improve efficiency.

Whether to transfer out rehabilitation patients requiring acute care is a difficult issue due to the opportunity cost with reference to health services overall and the crisis in acute care in Australian hospitals. Australia has fewer acute hospital beds than the Organisation for Economic Co-operation and Development (OECD) average (6) and the better solution might be for case-mix-based funding to fund acute care for selected patients for short periods in rehabilitation wards.

Reducing the time spent waiting for other care (particularly residential aged care facility beds) is another potential target. However, it can be argued that a reasonable amount of time is required to make this major life decision. Also, in Australia there is a compulsory assessment regarding suitability for residential care and this cannot occur until the patient is considered to have reached their rehabilitation potential (7). There is also great variation in the provision and availability of residential aged care across Australia (8).

Efficiency and appropriateness of provision of rehabilitation services is not the only issue to consider. Equity of access to rehabilitation is a relevant competing principle. This is best exemplified in the USA, where 15% of the population have no health insurance and essentially no access to rehabilitation services (9). There is marked geographical variation in availability of rehabilitation wards in Australia (8), which therefore
influences equity of access. In addition, in Australia, if a person has private health insurance it is much easier for them to obtain inpatient rehabilitation (3).

The balance between efficiency and equity in relation to rehabilitation services should be the subject of further discussion in the *Journal of Rehabilitation Medicine*.

**REFERENCES**


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### APPENDIX 4: Presentations at national and international conferences relevant to this body of work

**Table 2: Presentations at national and international conferences relevant to this body of work**

<table>
<thead>
<tr>
<th>Title</th>
<th>Conference / location</th>
<th>Author/s (presenter)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>What does utilization review tell us about our rehabilitation wards and the intensity of therapy available?</td>
<td>17th Annual Scientific Meeting of the Australasian Faculty of Rehabilitation Medicine, Queenstown, New Zealand</td>
<td>Poulos CJ</td>
<td>Jul 2009</td>
</tr>
<tr>
<td>Patient selection and transfer for rehabilitation in the acute care setting.</td>
<td>17th Annual Scientific Meeting of the Australasian Faculty of Rehabilitation Medicine, Queenstown, New Zealand</td>
<td>Poulos CJ Bashford G</td>
<td>Jul 2009</td>
</tr>
<tr>
<td>Concurrent utilization review to facilitate the earlier rehabilitation of older patients. (Poster).</td>
<td>19th World Congress of Gerontology and Geriatrics, Paris, France.</td>
<td>Poulos CJ</td>
<td>Jul 2009</td>
</tr>
<tr>
<td>Utilization review as a means of measuring the content of inpatient rehabilitation in Australia, and comparison with a North American standard.</td>
<td>5th World Congress of the International Society of Physical and Rehabilitation Medicine, Istanbul</td>
<td>Poulos CJ Magee C Poulos RG</td>
<td>Jun 2009</td>
</tr>
<tr>
<td>Supporting work practices and bed management in a rehabilitation service using an information management system.</td>
<td>15th ASM of the Australasian Faculty of Rehabilitation Medicine, Sydney, Australia.</td>
<td>Poulos CJ Gazibarich B Eagar K</td>
<td>May 2007</td>
</tr>
<tr>
<td>Utilization review as a tool to aid in patient selection for rehabilitation.</td>
<td>15th Annual Scientific Meeting of the Australasian Faculty of Rehabilitation Medicine, Sydney, Australia.</td>
<td>Poulos CJ Eagar K Poulos RG</td>
<td>May 2007</td>
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APPENDIX 5: Other acknowledgements

Acknowledgement of research funding gained to support this work

The Candidate wishes to acknowledge the following research and project grants which were awarded to the Candidate to enable this program of work to be pursued:

– Funding of approximately $30,000 was received by the Candidate from the Illawarra Area Health Service in 1997/98 for initial database design and programming for the referral, consultation and bed management information system. The system was originally developed on a VAX platform.

– Funding of $20,000 was received in 2004 / 2005 by the Candidate from the Australian Government (Commonwealth Department of Health and Aged Care) under the Pathways Home Programme. This grant allowed the pilot study of concurrent utilisation review in the regional acute hospital.

– Funding of $180,000 was received in 2005 from the Australian Government (Commonwealth Department of Health and Aged Care) under the Pathways Home Programme for the further development of the referral, consultation and bed management information system. This project allowed the system to be expanded, with improved functionality and to be migrated to a more contemporary IT platform.

– Following a competitive, peer reviewed, application process the Candidate received funding of $326,506 from the HCF Health and Medical Research Foundation in 2007 / 2008 for the conduct of the second and third prospective cohort studies (within acute care and inpatient rehabilitation, respectively). The candidate was the lead investigator on this grant application.

– The candidate also received funding of $276,745 from the NSW Department of Health and South Eastern Sydney Illawarra Area Health Service in 2007 / 2008 to widen the scope of the second cohort study to also test the utility of utilisation
review in a group of general medical patients and to trial a new model of nurse care facilitation in acute care, using utilisation review in a decision support role. The widened scope of the second prospective study is not included in this thesis as it is not within the thesis’s program of research, however the funding source is acknowledged as it contributed to the overall resources available for studies two and three.

The role of McKesson (Australia) in this body of work

The Candidate wishes to acknowledge the support provided by McKesson (Australia), and their Co-Vice President, Dr Andrew Wilson. After having been approached by the Candidate, McKesson (Australia) agreed to provide use of the InterQual tool, as well as staff training and assistance with data extraction in a form suitable for later data linkage, at no cost for the pilot prospective study. This was in recognition of the project’s unique application of the tool, both in the Australian context and also to explore its utility at the interface between acute care and rehabilitation. For the second and third prospective studies a licence to use the InterQual tool was purchased from McKesson, along with the required training and IT support (including modification of the InterQual database to include variance reasons applicable to the Australian context and data extraction).

Apart from offering constructive input into the mapping of certain of the InterQual Criteria to the Australian context, and also assisting with the formatting of Australian ‘variance’ reasons within the database, McKesson has on no occasion attempted to influence the design of any of the three studies, the collection or analysis of data, or the content of any of the publications resulting from any of the research in which the InterQual product has been used.