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Trend to better nutrition on Australian hospital menus 1986-2001 and the impact of cook-chill food service systems

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Abstract

Objective To assess trends in the nutritional quality of hospital menus and examine differences between menus used in hospitals with cook-chill or cook-fresh food services.

Design Standard patient menus were analysed against 28 criteria to assess nutritional standards and compared to results from similar studies in 1986 and 1993.

Setting Menus were collected from 80 hospitals in New South Wales, Australia, including 36 using cook-chill food service systems.

Statistical Analysis Chi-squared analysis was used to assess differences between the proportions of hospitals meeting the criteria in 2001 and 1993 and between different types of hospitals.

Results In 2001 compared to 1993 significantly more hospitals offered more than one hot choice at the evening meal, more low fat items were highlighted, and more calcium-rich foods were available. More than 90% of hospitals allowed patients to select their own menu choices, offered wholemeal breads and high fibre breakfast cereals, fresh fruit, polyunsaturated margarine, a milk dessert at least once a day and two or more hot options at the midday meal. Hospitals with cook-chill food services had menus that were more likely to meet nutritional recommendations, although they were less likely to offer a choice of serving size. A high proportion of unpopular choices were offered on menus, especially meat dishes and desserts.

Applications/Conclusion Since 1986 NSW hospital menus have improved to offer choices that conform better to dietary guidelines. Cook-chill food service may have positive and negative impacts on meal choices. The assessment criteria provide a useful way for hospitals to assess their menus.

Keywords

hospital menus, food service, cook-chill

Disciplines

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1 **Title:** **Trend to better nutrition on Australian hospital**
2 **menus 1986-2001 and the impact of cook-chill**
3 **food service systems**
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1 **Conflict of Interest**

2

3 There are no financial arrangements, organizational affiliations or other relationships

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5 manuscript

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19 conform better to dietary guidelines. Cook-chill food service may have positive and negative
20 impacts on meal choices. The assessment criteria provide a useful way for hospitals to assess their
21 menus.

1 **Introduction**

2 A recent Australian study reported that on average over one third of hospital patients
3 consumed only 50% of the total energy provided by the hospital meals, suggesting a
4 large proportion of the hospital patient population may not be meeting their nutritional
5 requirements (Kowanko *et al.*, 2001). A high level of food waste has been reported in
6 most studies of hospital meals, and is affected by many factors beyond simply the
7 food quality or acceptability of menu choices offered, including a patient's dietary
8 prescription, health state and the level of nursing assistance available at meal times
9 (Williams *et al.*, 2003). At the same time, many studies in hospitals throughout the
10 world have reported high rates of malnutrition in patient populations both on
11 admission and at discharge (Zador & Truswell, 1987; Coates *et al.*, 1993; Keller,
12 1993; McWhirter & Pennington, 1994; Gallagher-Allred *et al.*, 1996; Chima *et al.*,
13 1997; Thomas *et al.*, 2002). While it is critical that patient feeding be seen as an
14 integral and important component of patient care, yet "the patient's need to eat and
15 drink is so basic it is sometimes taken for granted" (Holmes & Holmes, 1981).
16 The first step to ensuring hospital patients are meeting their nutritional needs is to
17 provide a menu that is of high nutritional quality and which promotes healthy, well
18 balanced eating (British Association for Parenteral and Enteral Nutrition, 1999; Royal
19 College of Physicians, 2002).

20

21 Although there have been several studies that reported success in improving the
22 nutritional quality of patient menus (Anderson *et al.*, 1986; Collier, 1989; Morris *et*
23 *al.*, 1994), there have been few that have evaluated long term trends in the menu
24 choices available to patients. In Australia in 1986 Williams and Brand surveyed
25 menus from 128 hospitals in New South Wales (NSW), the largest of the Australian

1 States (Williams & Brand, 1989). Based on the findings, a series of criteria were
2 developed to evaluate menus and recommendations made to improve the choices
3 offered to patients. In 1993 Dunn and Williams repeated this study and found a
4 generally positive trend toward menus that reflected the earlier recommendations
5 although there were some changes that may have adversely affected patient nutrition
6 care: fewer hospitals in 1993 offered at least two hot options for the evening meal and
7 a nearly half of all hospitals had changed from a cooked breakfast to a simplified
8 continental style breakfast (Dunn & Williams, 1995).

9

10 Since the 1993 study, two factors are likely to have influenced Australian hospital
11 menus. Firstly two sets of authoritative guidelines and assessment tools for menus
12 have been released to help menu planners in hospitals - from the Institute of Hospital
13 Catering (Institute of Hospital Catering (NSW), 1997) and the NSW Department of
14 Health (NSW Department of Health, 1999). Both were designed to increase awareness
15 of the importance of healthy hospital menu choices and promote self assessment of
16 menus. A study conducted in the UK found that following the introduction of new
17 catering policies there the majority of hospitals modified their food services to
18 conform more closely with recommended menu guidelines (Clarkson & Nutbeam,
19 1991). It was anticipated that a similar effect might be seen in the Australian context.

20

21 The second factor is that there has been a significant trend to the adoption of cook-
22 chill food service systems in NSW hospitals, from 18% of hospitals in 1993 to 42% in
23 2001 (Mibey & Williams, 2002). This change was expected to have implications for
24 the types and numbers of food choices offered on the patient menus, since not all food
25 items can be successfully reheated with cook-chill systems and the technology

1 imposes some limitations on the serving sizes and methods of presentation employed
2 (Light & Walker, 1990).

3

4 The main aim of this study was to assess the general nutritional quality of patient
5 menus offered in NSW hospitals in 2001 and compare the results with those of similar
6 surveys conducted in 1993 and 1986. A second aim was to compare the menus from
7 those hospitals using cook-chill food services with those from hospitals with
8 conventional cook-serve systems.

9

1 **Methods**

2 In August 2001 a postal survey was sent to the food service departments in all 270
3 NSW hospitals listed in the Australian Hospitals Directory (ATA Professional
4 Services, 2000). All types of hospitals - public and private (surgical, medical and
5 psychiatric) - were included in the study, excluding only those that were day-only
6 surgeries and those exclusively for paediatric patients. Four weeks after mailing the
7 first survey, a second questionnaire and follow-up letter was sent to those hospitals
8 that had not responded. The questionnaire sought information on food service staffing,
9 food production systems, client types, meal times and menu types. Accompanying the
10 survey questionnaire was a request to return a complete set of the selective menus
11 used for patients on unrestricted diets. Results from the survey about systems and
12 staffing have been published elsewhere (Mibey & Williams, 2002).

13

14 The nutritional quality of the sample menus was assessed against criteria covering
15 seven broad areas (Table 1), related to recommendations in the Dietary Guidelines for
16 Australians (National Health and Medical Research Council, 1992). The criteria were
17 the same as those used in the 1993 survey, which have been described in detail
18 elsewhere (Dunn & Williams, 1995; Williams & Brand, 1989). Briefly, food items
19 were categorised against some of the key nutritional criteria as follows:

- 20 • *high in fat* if they were fried foods, pies, sausages, quiches or mornays
21 • *high in salt* if they contained ham, bacon, corned meat, sausages or smoked fish
22 • *source of calcium* if they were likely to provide at least 150mg per serve (eg tub
23 yoghurt, slice of cheese, custard based dessert)
24 • *source of haem-iron* if they were likely to provide at least 1.5mg per serve (eg, red
25 meat).

1

2 Two new criteria were included in this study to incorporate more recent local
3 authoritative recommendations:

4 1) Offer two hot choices, a salad and a sandwich at both main meals. This
5 criterion was a recommendation in both the Department of Health *Hospital Menu*
6 *Assessment Tool* (NSW Department of Health, 1999) and the Institute of Hospital
7 Catering *Food Service Guidelines for Healthcare* (Institute of Hospital Catering
8 (NSW), 1997).

9 2) Include beta-carotene vegetables at both main meals (eg, dark green, red and
10 yellow foods such as carrot, pumpkin, spinach). This was recommended by
11 Institute of Hospital Catering guidelines (Institute of Hospital Catering (NSW),
12 1997).

13

14 The popularity of the menu choices offered in four major food categories - soup,
15 meat, green vegetables and desserts - was also assessed, using the same methodology
16 employed in 1986 (Williams & Brand, 1989). This involved scoring the popularity of
17 the food choices offered, using quantitative data on patient food preferences measured
18 on a 9-point hedonic scale (1 strongly dislike; 9 strongly like). Results from a recent
19 survey of food preferences in one large NSW teaching hospital were used as the
20 reference standard (Kennewell & Kokkinakos, 2001). That survey reported the results
21 of a questionnaire that asked 524 inpatients to rate their normal preferences for 223
22 different food items. In this study of menus any food item that had a food preference
23 rating below the mean for that food group was considered to be unpopular, using the
24 following average ratings: soup: 6.1; meat: 6.8; green vegetables: 6.1; dessert: 6.5.

25

1 Only the choices from the first week of each menu cycle were analysed, in order to
2 standardise comparisons made between long and short menu cycles. This also allowed
3 direct comparisons to be made with results from the two previous studies. Chi-
4 squared analysis was used to assess the significance of differences between the
5 proportions of hospitals meeting the specific criteria in 2001 and 1993 and also
6 between different types of hospitals: whether public or private, by hospital size, or by
7 food service systems (ie cook-fresh or cook-chill).

8

1 **Results**

2 A total of 60 different menus were analysed in this study. Several of these were used
3 in more than one hospital and thus 80 hospitals were represented, covering 30% of all
4 the hospitals in NSW (Table 2). This sample of hospitals contained 50% of all the
5 26075 hospital beds in NSW (56% of all public hospital beds; and 33% of private
6 hospital beds). These proportions are similar to those reported in the 1986 and 1993
7 surveys (Williams & Brand, 1989; Dunn & Williams, 1995). Of the 80 hospitals, 44
8 used a cook-fresh food production system and 36 utilised a cook-chill system. Table 3
9 summaries the results of the assessment of the menus compared to those from the
10 earlier surveys.

11

12 **Variety**

13 All hospitals surveyed reported using selective patient menus, an increase from the
14 93% reported in 1993. Table 4 compares length of menu cycles reported in 1986,
15 1993 and 2001. There were no significant differences between 1993 and 2001. The
16 most common cycle length was still 14 or 21 days, with a mean cycle length (± 1 SD)
17 of 16.1 ± 6.6 days.

18

19 Table 5 outlines the numbers of hot choices offered at each main meal. The proportion
20 of hospitals offering a continental breakfast (with no hot choices) declined slightly but
21 significantly from 47% in 1993 to 40.2% in 2001, but was still significantly higher
22 than the 4% reported in 1986 ($p < 0.001$). In 1993 all private hospitals offered their
23 patients a traditional breakfast with hot options, however in 2001 15% of private
24 hospitals offered a continental breakfast only. There was a slight decline in the

1 proportion of menus including a substantial cold protein source such as meat, cheese
2 or yoghurt with the continental breakfast: 23.4% in 2001 compared to 30% in 1993.

3

4 All hospital menus offered at least one hot choice at the midday meal. There was an
5 insignificant increase between 1993 and 2001 in the proportion of hospitals offering
6 two or more hot meals at the midday meal. Menus from smaller public hospitals
7 (<100 beds) were the only ones to offer only one hot choice at the midday meal. In
8 1993 only 39.5% of hospitals offered more than one hot choice at the evening meal; in
9 2001 86% of private hospitals, 54% of public hospitals and 62.4% of all hospitals did
10 so. This represents a significant increase of 22.9% ($p<0.001$) since 1993. However at
11 the same time the proportion of public hospitals offering no hot choice at the evening
12 meal was up from 5% in 1993 to 12% in 2001.

13

14 One of the recommendations from the 1986 survey was that nutrition education
15 messages should be incorporated onto menus and in 1993 24% were found to do so –
16 often on the reverse side of the printed menu. For the 2001 survey, because many
17 hospitals only sent single sided copies of their menus, it was possible to assess
18 messages on only 41 of the printed menus that were provided. Of these 29.4%
19 incorporated nutrition messages, not statistically significantly different from the
20 proportion in 1993.

21

22 In 2001 66.4% of hospital menus offered a choice of meal serving size, a significant
23 decrease from 84% in 1993 ($p<0.01$). Only 40% of cook-chill hospitals offered their
24 patients this choice, significantly lower than the 87.1% of cook-fresh hospitals
25 ($p<0.001$).

1

2 **Cereals, fruit and vegetables**

3 The proportion of menus offering bread at all three main meals increased from 60% in
4 1993 to 76% in 2001. Only 46% of small public hospitals (<100 beds) offered bread
5 at all meals, whereas 96% of larger public hospitals and 80% of all private hospitals
6 did so. High fibre breads and breakfast cereals were offered on all breakfast menus
7 irrespective of hospital type. High fibre breads were available on 71% of lunch and
8 88% of dinner menus.

9

10 Fresh fruit was available on 98.5% of all menus. All private hospitals offered fresh
11 fruit at breakfast and 83% of public hospitals did so. At lunch and dinner fruit was
12 generally incorporated as a dessert alternative.

13

14 The proportion of hospitals offering legumes at least once a week as a main menu
15 choice increased slightly from 60% in 1993 to 64.7% in 2001. Seventy-two percent of
16 private hospitals and 61% of public hospitals incorporated some legumes into their
17 menu. The average number of times per week that legume dishes were offered was
18 3.2 (\pm 4.7) with a range of 0-16.

19

20 The proportion of menus offering beta-carotene vegetables at both main meals was
21 61.5%. Seventy one percent of private and 57% of public hospital menus met this
22 criterion. The tendency to offer red and dark green vegetables increased with hospital
23 size, for both public and private hospitals: 83% of large hospitals (>100beds) met this
24 criterion compared to only 41% of smaller hospitals.

25

1

2 **Fat**

3 Figure 1 shows the distribution of the percentages of high fat main menu items
4 offered at main meals. The mean percentage of high fat main menu items significantly
5 increased from $15.8 \pm 8.5\%$ in 1993 to $19.8 \pm 8.4\%$ in 2001 ($p < 0.001$).

6 Correspondingly the proportion of menus reaching the recommended target of $\leq 15\%$
7 of main menu items being high in fat also declined slightly, although this decrease
8 was not significant (Table 3). Only 27.7% of private hospitals met this target
9 compared to 50% of public hospitals.

10

11 The proportion of hospitals offering polyunsaturated margarine fell insignificantly
12 from 98% in 1993 to 92.2% in 2001. However there was a highly significant increase
13 in the proportion of patient menus which indicated low fat choices to patients. In 1993
14 only 8% of hospitals indicated such healthier choices on the menu; this figure rose to
15 35.9% in this study ($p < 0.001$). The majority of private hospitals (72%) indicated low
16 fat choices on their menus, however only 23% of public hospitals did so. This move to
17 greater support for low fat eating was further shown by a continued increase in the
18 proportions of hospitals offering low fat milk for cereal and as a drink (Table 3).

19

20 **Salt**

21 There was an increase in the proportion of hospitals reaching the recommended target
22 of $\leq 10\%$ main menu items high in salt (from 48% in 1993 to 58.9% in 2001),
23 although this was not statistically significant. Figure 2 shows the distribution of the
24 percentage of high salt main choices on the menus. The mean percentage of high salt
25 items in 2001 was $10.8 \pm 8.9\%$, virtually unchanged from the value in 1993.

1

2 Optional selection of salt as a condiment was available on 30.9% of all hospital
3 patient menus. This had increased significantly since 1993 when only 14% of menus
4 offered this option. Again this choice was more common in the public hospitals
5 (41.7%) than the private hospitals (5.5%). However, there was a significant decrease
6 in the proportion of menus offering the choice of whether to have sauce or gravy
7 served to accompany the main meat choice, from 68% in 1993 to 52.5% in 2001
8 ($p < 0.05$).

9

10 **Alcohol**

11 No public hospitals offered alcoholic beverages on their menus. The proportion of
12 private hospitals that did so rose from 29% in 1993 to 60% in 2001. In all cases the
13 hospital offered a choice of red or white wine and full or light strength beer.

14

15 **Calcium**

16 The average number of serves of calcium-rich foods offered each day rose from 5.0 in
17 1993 to 6.5 (± 2.2) in 2001, representing an increase of approximately 365mg of
18 calcium per day. The proportion of menus that offered less than three serves per day
19 declined to only 3% in 2001. All private hospitals offered patients more than three
20 serves of calcium-rich foods per day.

21

22 Milk based desserts were featured at least once a day on 92.3% of all menus. This is
23 slightly more than the level reported in 1993, though not significantly so. However the
24 availability of milk as a drink at all three main meals significantly increased from
25 39% in 1993 to 77.6% in 2001 ($p < 0.001$).

1

2 **Iron**

3 The number of menus meeting the recommendation that $\geq 50\%$ main meal items be
4 good sources of haem-iron decreased significantly from 48% in 1993 to 19.2% in
5 2001 ($p < 0.001$). The mean percentage of main menus high in haem-iron was 40.8%,
6 compared to 50.8% in 1993. Due to the high availability of fresh fruit on the menu, all
7 hospital main meals were accompanied with a good source of Vitamin C, which can
8 assist iron absorption.

9

10 **Popularity of food items**

11 The proportions of unpopular food items on the menus are outlined in Table 6. The
12 popularity of the soups offered declined somewhat between 1993 and 2001 with a
13 significant increase in the proportion of menus with 20-29% of soup choices rated in
14 the unpopular category, from 20% in 1993 to 43% in 2001 ($p < 0.01$). The popularity
15 of the meat choices offered fell significantly over the eight years between the two
16 surveys. The proportion of menus with fewer than 19% of items rated unpopular
17 declined significantly from 80% in 1986 to 12% in 2001 ($p < 0.001$), and the
18 proportion of menus with the highest percentages of unpopular meat choices (30+%)
19 increased significantly ($p < 0.001$). The proportion of menus with less than 10% green
20 vegetable choices rated as unpopular significantly increased from 32% in 1986 up to
21 87% in 2001 ($p < 0.001$), indicating a substantial improvement in the likely
22 acceptability of these choices. In contrast the appeal of the dessert offerings seems to
23 have worsened, with the proportion of menus with highly unpopular dessert choices
24 (30+% choices) increased from 17% in 1986 up to 53% in 2001 ($p < 0.001$).

25

1 Overall the mean percentages of unpopular items in each category (compared to 1986)
2 were: soup $18.0 \pm 13.7\%$ ($11.7 \pm 11.1\%$); meat $32.7 \pm 12.0\%$ ($13.9 \pm 7.3\%$); green
3 vegetables $3.73 \pm 5.6\%$ ($15.7 \pm 11.1\%$) and dessert $32.3 \pm 10.5\%$ ($21.3 \pm 10.1\%$).

4

5 **Effect of food service system**

6 In a number of ways the menus from cook-chill hospitals had significantly better
7 assessments than those from hospitals with conventional cook-fresh food service
8 systems (Table 3). Eighty-one percent of hospitals using a cook-chill system offered
9 more than one hot choice at the evening meal, which was significantly higher
10 ($p < 0.01$) than those using a cook-fresh system (47.5%). Eighty one percent of cook-
11 chill hospitals also offered a sandwich, salad and two hot choices at the midday meal,
12 significantly higher than the 43.2% of cook-fresh hospitals that did so ($p < 0.001$). Of
13 cook-chill hospitals 77.7% offered this combination at the evening meal, significantly
14 higher than the 43.2% of cook-fresh hospitals that met this criterion ($p < 0.01$).

15

16 Menus from cook-chill hospitals also had a greater proportion of lower fat and lower
17 salt main menu items ($p < 0.001$), were significantly more likely to offer bread at all
18 three main meals ($p < 0.001$), to include vegetables that were a good source of beta-
19 carotene ($p < 0.01$), and to offer legumes at least once a week as a main course dish
20 ($p < 0.05$). There was no difference in the proportion of unpopular menu items offered
21 between the cook-chill and cook-fresh hospitals.

22

23 However, in relation to a few other criteria, the menus from cook-fresh hospitals rated
24 better. None of cook-chill hospitals included nutrition education messages on their
25 menus, whereas 40% of the cook-fresh hospitals did so. Cook-fresh hospitals were

1 much more likely to offer a choice of serving size ($p < 0.001$) and provided more good
2 sources of haem-iron ($p < 0.05$). They also tended to be more likely to offer the option
3 of sauce or gravy served with the main meat choice.

4

1 **Discussion**

2 The sample of hospitals in the survey was not representative of all the hospitals in
3 NSW (Table 2). As in the two previous surveys there was a strong positive correlation
4 between bed numbers and the proportion of hospitals responding ($r = 0.95$). In other
5 words, the sample over represents the larger hospitals. However, the two earlier
6 studies had a similarly biased sample. Thus while it is likely that the results provide a
7 good picture of the trends that have occurred in hospital menus over time, the absolute
8 values may not reflect the situation in the whole hospital population in NSW or
9 Australian hospitals overall.

10

11 In general the findings show there have been many improvements in the menus
12 provided in NSW hospital over the past 15 years, indicating a continuing trend
13 towards healthier menus. One of the most significant improvements in menu quality
14 since previous survey was the higher proportion of hospitals offering at least two hot
15 choices at the evening meal 2001. This was a key recommendation of both previous
16 studies and more recent menu planning guidelines and standards (Dunn & Williams,
17 1995; Institute of Hospital Catering (NSW), 1997; NSW Department of Health,
18 1999). While hot choices are not necessarily healthier options than cold alternatives,
19 providing a greater number of choices is in line with dietary guidelines that support
20 increased variety in the diet and is likely to make it easier for patients to choose a dish
21 they find appealing. The significant trend to the use of cook-chill operations in
22 hospital systems is likely to have been a factor in this increase. Cook-chill food
23 service allows food to be prepared ahead of meal times, so hot entrée dishes for both
24 main meals can be produced during a single working shift by production staff, thereby
25 reducing labour costs.

1

2 There has been a considerable amount of research on the impact of cook-chill food
3 service on the nutritional quality of hospital food (Williams, 1996) and service
4 satisfaction (Nettles & Gregoire, 1996). However there has been little attention given
5 to the more subtle impacts the system may have on the choices of food provided on
6 the menu. In this survey, cook-chill production was associated with generally lower
7 fat and lower salt menu choices. This could be due to changes in the menu offerings to
8 include a greater proportion of wet dishes such as casseroles that reheat more
9 satisfactorily. Many higher fat foods, such as pastry-based dishes and fried food do
10 not retain their texture well in cook-chill systems. Thus this limitation of the
11 technology may be driving changes that improve the nutritional profile of the dishes
12 offered. Further research on the reasons for these differences would be useful.

13

14 By contrast, the cook-chill system was associated with other differences that are less
15 desirable. In particular fewer of the cook-chill hospitals provided a choice of serving
16 sizes. There are probably two reasons for this. Firstly, in cook-chill systems, meals are
17 often plated well ahead of the time of patient menu selection, so it is not possible to
18 take into account individual patient preferences about the amount of food required.
19 Secondly, to ensure the final temperature standards of meals are met when all meals in
20 a delivery cart are reheated for the same length of time, there needs to be
21 approximately the same volume of food served on each plate. This could adversely
22 affect the nutritional intake of patients. It has been suggested that some patients
23 (particularly the elderly) are likely to consume more of their meal and waste less if the
24 meal is of smaller quantity (Barton *et al.*, 2000), although not all research supports
25 this (Clusky & Dunton, 1999).

1

2 There was also a tendency for fewer menus from cook-chill hospitals to offer optional
3 sauces or gravy served with meats. This is probably because it is usually important to
4 cover plain roast or grilled meats with sauce to prevent them drying and toughening
5 during the reheating of pre-plated individual meals. Since sauces and gravies are often
6 high in salt, this practice could make it more difficult for those wanting to limit their
7 sodium intake while in hospital. Bulk reheating of chilled food does not require that
8 that food be served with a sauce or gravy, and may thereby allow greater service
9 flexibility to meet the individual nutritional needs of patients. Service of meals from
10 bulk trolleys may also result in less waste and significantly improve patient intakes of
11 energy and protein, compared with a centrally plated system (Shatenstein & Ferland,
12 2000; Wilson *et al*, 2001) .

13

14 The proportion of menus highlighting low fat options on their menus significantly
15 increased over the past eight years. This was also supported by a slight increase in the
16 proportion of hospitals including nutrition education messages on their printed menus.
17 One Australian study reported significant increases in the selection of healthier main
18 meals and dessert items when low fat choices were highlighted on patient menus
19 (Morris *et al.*, 1994), and such guidance to better menu choices is an inexpensive and
20 effective way of enhancing the nutritional quality of patient menus.

21

22 Milk and other calcium rich-foods appear to have gained attention over the past eight
23 years. The proportion of hospitals offering a glass of milk at all main meals increased
24 and the number of calcium-rich choices has increased. One recent study suggested
25 that breakfast typically contains most of the calcium offered on the patient menu but

1 that half of the patients consumed less than 50% of the calcium offered (Kowanko *et*
2 *al.*, 2001). However in this survey, calcium-rich foods were evenly spread throughout
3 the whole day with an average of 2.2 serves/meal.

4

5 The proportion of menus with $\geq 50\%$ main menu items being good sources of haem-
6 iron has declined significantly. However, as the number of hot choices on the menu
7 increases, the variety also increases. Most daily menus typically contained a
8 beef/lamb, chicken, fish and vegetarian choice (two at midday and two in the
9 evening), so while red meat dishes were still available, they made up a smaller
10 proportion of the menu options as the number of choices increased. Gazibarich
11 (Gazibarich, 1997) has argued there is no need to set a benchmark for the level of
12 haem-iron provided by a hospital menu. However, iron is recognised as one of the
13 more at risk nutrients in the Australian food supply, with more than 25% of the adult
14 population consuming less than 12mg per day in the 1995 National Nutrition Survey
15 (McLennan & Podger, 1998), and the iron status of institutionalised populations can
16 be affected by meal time food choices (Razagui *et al.*, 1991). Further research would
17 be useful to study the relationship between the iron content the food choices offered
18 on menus and the ability of patients to meet their needs, especially those who have
19 longer lengths of stay.

20

21 While a high proportion of hospitals continued to offer a continental breakfast,
22 presumably in order to achieve cost savings, few of these provided a substantial
23 protein source at this meal, as has been recommended (NSW Department of Health,
24 1999). This trend remains a concern when there is evidence that patients may have

1 poorer nutrient intakes when a hot breakfast is not available (Coote & Williams,
2 1993).

3

4 Only a minority of menus offered alcohol on their menus, and then only in private
5 hospitals that often aim to provide a hotel-type service to their clients. However
6 offering wine before meals can improve the appetite of cancer patients (Roberts,
7 1982), so perhaps there is some value in providing greater availability to some
8 patients with poor energy intakes, where their medical condition permits.

9

10 It is not appropriate to judge the appeal of a menu solely by reference to the food
11 preference ratings of the choices offered. Factors such as the number of alternatives
12 available, the quality of the food preparation, and the age, ethnicity and health of the
13 clients all influence the acceptability of a menu. Nonetheless, a menu with a high
14 proportion of unpopular items is unlikely to be a good menu. The results presented
15 here show that the proportions of popular menu choices on hospital menus appear to
16 have fallen since 1993, especially in the categories of meat and desserts. The
17 popularity of soups on the menu also appears to have declined. A large number of the
18 meat choices were casseroles and other wet dishes, which are generally reported to be
19 less popular than roast and grilled meat (Williams, 1988; Kennewell & Kokkinakos,
20 2001). However, the increased use of cook-chill systems do not explain this change;
21 the meat choices on cook-chill menus had exactly the same popularity rating as those
22 from cook-fresh hospitals. Hospital menus are likely to be improved if planners
23 attempt to gather and use more objective data on their patients' food preferences.

24

1 Most of the trends found in the NSW hospital menus over the past 15 years were
2 positive and incorporated changes that reflect national dietary guidelines - with more
3 variety, lower fat and salt levels, and increased provision of wholegrain and calcium-
4 rich choices. It is likely that new menu guidelines and regular assessment and
5 monitoring of trends have supported the development of healthier menus. The
6 increasing use of cook-chill technology may be influencing some of the changes in
7 food options provided on menus, although not all of these changes necessarily support
8 improved dietary intake by patients.

9

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Table 1
Factors used in this study to assess menus ^a

Variety

Selective cycle menu used
Number of hot meal choices at the 3 main meals
Substantial cold protein source with continental breakfasts
Use of nutrition education messages
Optional meal serving sizes
Offer salad, sandwich and 2 hot choices at both main meals ^b

Cereal, fruit and vegetables

Availability of fresh fruit with all main meals
Availability of bread at all 3 main meals
Availability of wholemeal/wholegrain breads
Availability of high fibre breakfast cereals
Legume-based dish offered at least weekly on menu
Offer beta-carotene vegetables (dark green, yellow or red) at both main meals ^b

Fat

Offer polyunsaturated spreads
Low fat items indicated on the menu
Availability of low fat milk products at meals
Proportion of high fat main menu items

Alcohol

Availability and type of alcoholic beverages offered

Salt

Proportion of high salt main menu items
Optional salt offered
Optional sauce/gravy can be ordered with main meat dish

Calcium

Average number of calcium serves (>150mg) per day
Availability of milk based desserts
Availability of milk beverages

Iron

Proportion of main menu items that are good haem-iron sources (>1.5mg/serve)
Availability of good vitamin C source with main meal

2 ^a Criteria defined and used in the 1986 and 1993 surveys (Williams & Brand, 1989;
3 Dunn & Williams, 1995)

4 ^b Signifies new criterion used in 2001 survey

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Table 2
Hospital sample

Beds	Percentage of all NSW hospitals in sample and total number of hospitals included in the 1993 and 2001 surveys			
	1993		2001	
	% Total	No.	% Total	No.
0-24	16	8	18	6
25-49	25	21	22	19
50-99	34	30	27	20
100-249	52	24	36	20
250+	69	25	68	15
Total	35	108	30	80

1

Table 3

Percentages of hospitals meeting menu assessment criteria

	1986 n=244	1993 n=153	2001^a n=80	Cook-fresh n=44	Cook-chill^a n=36
Variety					
Selective patient menu	89	93	100*	100	100
Offer 2+ hot choices at midday meal	80.5	83	91.2	86.4	97.3
Offer 2+ hot choices at evening meal	58	39.5	62.4***	47.5	81.0*
Continental breakfast only	4	47	40.2	41.4	36
Cold protein source with continental breakfast	-	30	23.4	22.4	36.4
Nutrition education message on menu	14	24	29.4	40.0	0.0*
Choice of serving sizes	72	84	66.4**	87.1	40.0***
Sandwich, salad and 2 hot choices at midday meal	-	-	60.0	43.2	81.0***
Sandwich, salad and 2 hot choices at evening meal	-	-	58.7	43.2	77.7**
Cereals, fruit and vegetables					
Bread available at all meals	-	60	76.0	59.6	96.6***
Wholemeal/wholegrain breads available	88	98	100	100	100
High fibre breakfast cereals	94	95	100	100	100
Fresh fruit available daily	97	92.5	98.5	93.1	100
Legumes offered at least once/week	-	60	64.7	51.3	78.8*
Beta-carotene vegetable at both main meals	-	-	61.5	47.0	78.2**
Fat					
<15% main menu items high in fat	36	52.5	44.5	21.7	69.7***
Polyunsaturated margarine offered	66	98	92.2*	83.1	100
Low fat food items indicated on menu	-	8	35.9***	36.9	38
Low fat milk available for cereal	25	74	84.5	77.9	89.7
Low fat milk available as a drink	25	41	63.0**	49.9	82.7**
Salt					
<10% main menu items high in salt	32	48	58.9	39.7	85.1***
Optional sauce or gravy with meats	-	68	52.5*	52.5	44.7
Optional salt as a condiment	-	14	30.9**	15.9	50.1**
Alcohol					
Offer alcohol beverages	-	6	15.7*	32.8	5.7**
Calcium					
Milk drinks offered at least 3 times per day	-	39	77.6***	64.0	79.4
Milk dessert offered at least once per day	-	88	92.3	94.9	97.3
Iron					
>50% main items good sources of haem-iron	-	48	19.2***	32.8	3.0*

2 ^a Chi-square comparisons of menus in 2001 vs 1993; menus from cook-fresh vs cook-chill hospitals in 2001

3 * p≤0.05, ** p≤0.01, *** p≤0.001

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	Percentage of hospitals		
	1986 (n=244)	1993 (n=153)	2001 (n=80)
0-13 days	14	6.5	15
14 days	40	42.5	58
15-20 days	5.5	5	1
21 days	20	27.5	14
22-27 days	1	0.5	0
28+ days	19.5	18	12
	100	100	100

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Table 5

Percentage of hospitals offering hot choices at each main meal (n=80)

Number of hot choices	Breakfast	Midday Meal	Evening Meal
0	41	0	9
1	6	9	30
2	27	55	27
3	14	26	24
4	4	1	7
5+	8	9	3
	100	100	100

2

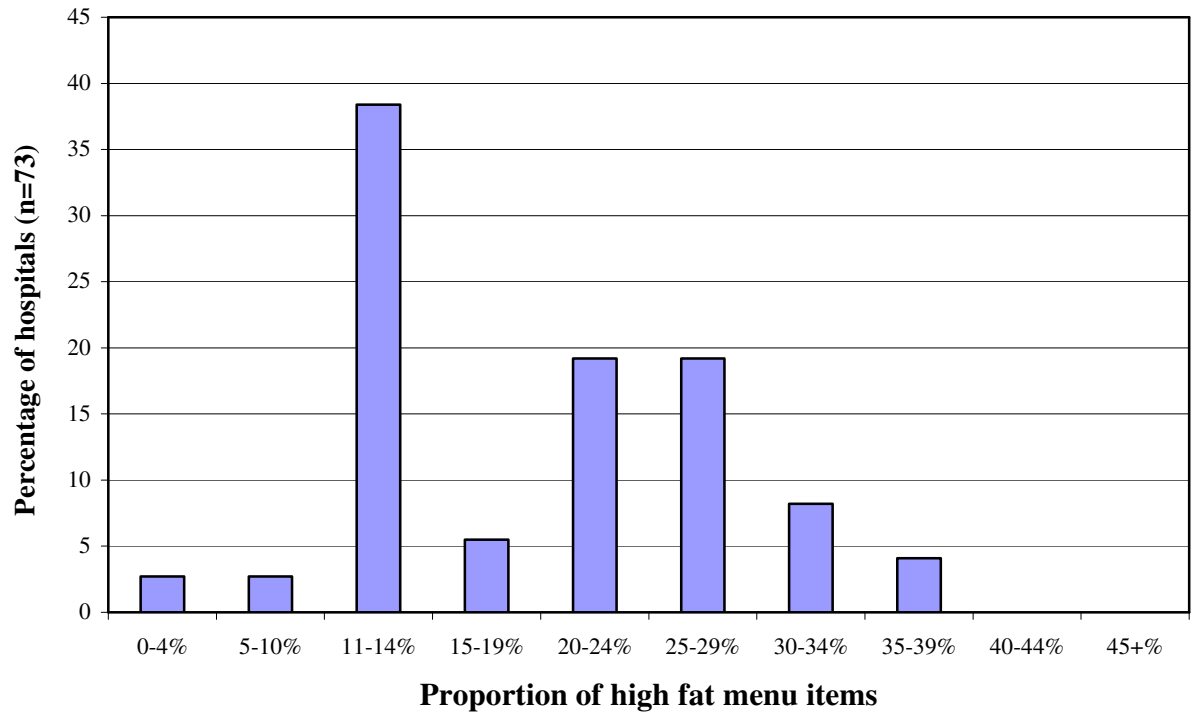
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Table 6
Percentage of hospital menus including unpopular items

% of unpopular items offered on menu	Soup		Meat		Green vegetables		Dessert	
	1986	2001 ^a	1986	2001 ^a	1986	2001 ^a	1986	2001 ^a
0-9 %	50	30*	27	3***	32	87***	13	4
10-19 %	25	17	53	9***	31	11***	30	4***
20-29 %	20	43**	17	31*	28	2***	40	39
30+ %	5	10	3	57***	9	0*	17	53***
n =	72	57	126	70	85	54	125	69

2 ^a Significant difference 2001 vs 1986: * p<0.05, ** p<0.01, *** p<0.001

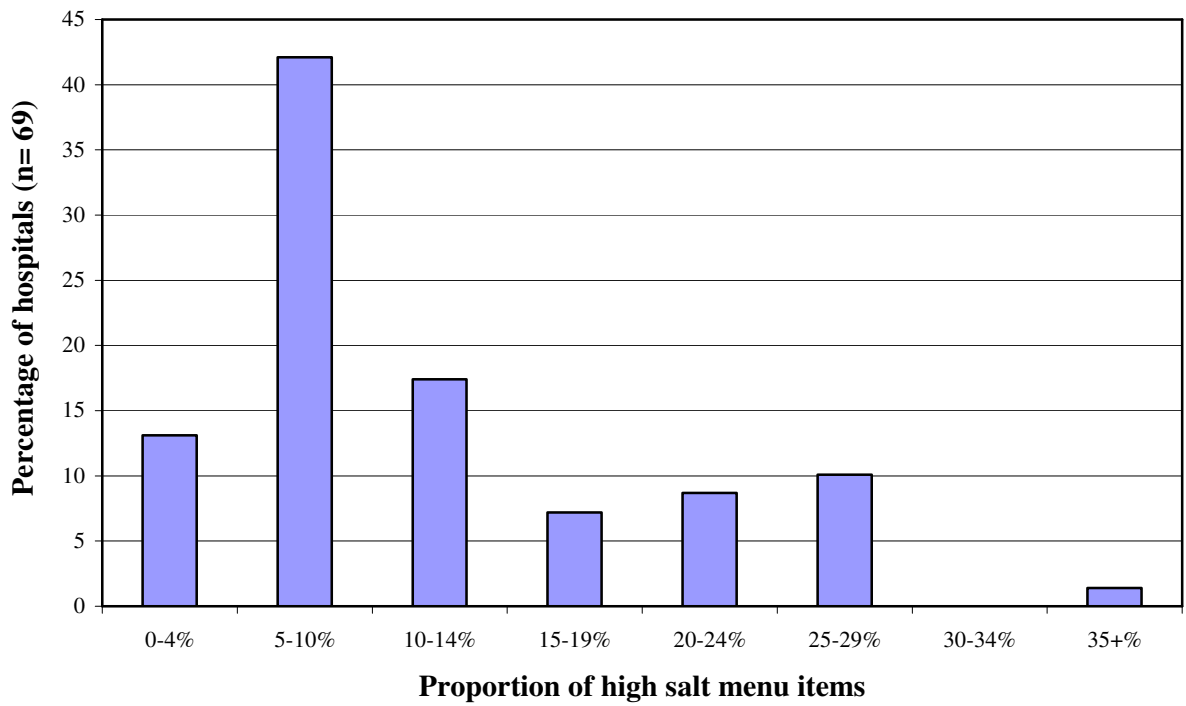
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FIG 1 Proportion of main menu items high in fat

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FIG 2 Proportion of high main menu items high in salt

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