Does the NAIP classification predict length of stay in rehabilitation, geriatrics and palliative care?

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ABSTRACT

The Australian National Non-Acute Inpatient Project (NAIP) reported its findings on casemix in rehabilitation and slow stream geriatric medicine in October 1992. It proposed a per diem NAIP classification of 19 classes using six major clinical groups and the resource utilisation groups version three activities of daily living index (RUG III ADL index). Weightings were determined based on time spent by clinical staff in treating these patients.

A quality management study was undertaken in the rehabilitation, geriatrics and palliative care wards of the Illawarra Area Health Service for three months in 1993, analysing length of stay and cost against the predictive weights of the NAIP classification. The study concluded that this classification was an acceptable predictor of per diem costs of care in these wards of the Illawarra but was not a good predictor of length of stay.

Background

In 1983 the United States Health Care Financing Administration determined that Medicare payments for hospital and other health care would be on a prospective payment system based on acute care diagnosis related groups (DRGs). At that time rehabilitation, psychiatric, children's and long-term care facilities were exempt. In its report to Congress in October 1987, *Developing a prospective payment system for excluded hospitals* (Batavia & DeJong 1988), the Department of Health and Human Services concluded that it was premature at that time for the department to propose legislation and regulations for a prospective payment system for medical

rehabilitation. It reiterated the comment that 'the DRG system was developed for short–term acute care general hospitals and as constructed did not adequately take into account special circumstances of diagnoses requiring long stays.' At present, exempt facilities are still reimbursed for reasonable costs per discharge subject to a maximum amount.

In spite of early work by the Rand Corporation (Kahn et al. 1990) indicating that there was no change in quality of care for stroke and hip fracture patients treated in 1982 and 1984 (before and after introduction of prospective payments), a number of studies have been published which demonstrate that, when rehabilitation medicine is funded under acute care DRG classifications, length of stay has reduced excessively, readmission rates have increased and the number of admissions to nursing homes has increased (Evans et al. 1990; Fitzgerald et al. 1987; Heinemann, Billeter & Betts 1988). Palliative medicine patients and those in psychogeriatric units have much longer lengths of stay than their DRGs would predict.

The factors contributing to successful outcomes for rehabilitation medicine have included patient characteristics such as functional dependence on admission, age, disease site, time from referral to beginning of program, co-morbidities such as cognitive function and depression, clinician practices and availability of resources (Carey & Posavac 1988; Rondinelli et al. 1991; Stineman & Escarce 1993). The factor which appears to be most predictive of cost and length of stay in rehabilitation medicine settings is functional status on admission – based on a measure of carer dependence (Rondinelli et al. 1991; Stineman & Escarce 1993).

Classification systems for rehabilitation medicine have been developing in the United States since 1983. The most widely used have been the California Long Term Care System and Resource Utilisation Groups (RUGs) for skilled nursing facilities (Hindle & Laffey 1989; Fries & Cooney 1985; Fries 1991). The other system which is gaining popularity in free-standing rehabilitation facilities is the FIM-function related group (or FIM-FRG) (Stineman et al. 1994). This adds the Functional Independence Measure (FIM) (Research Foundation State University of New York 1990) of the Uniform Data System to major impairment groupings (such as stroke, spinal cord injury, amputation) to provide 53 cost-homogeneous classes of episodes of care. The FIM is a profile of 18 patient items related to self-care, sphincter control, mobility/transfer, locomotion, communication and social cognition scored on a 7-level scale from total assistance required through to complete independence.

The NAIP classification

In Australia in 1990 the Commonwealth Department of Health, Housing and Community Services was inaugurating its Casemix Development Program. The Resident Classification Instrument for calculating nursing home subsidies had been in use for a short time. There had been no definitive work on funding systems for psychogeriatric care or palliative care. In 1991 the department funded a study at Queen Elizabeth Hospital, Adelaide (South Australia), Royal Perth Rehabilitation Hospital, Shenton Park (Western Australia) and Essendon Hospital, Melbourne (Victoria), in which 15 000 bed–days of data on functional capacity, staff time and staff costs were recorded on 786 patients from the rehabilitation and slow stream medical wards. This study has become known as the NAIP study (Non–Acute Inpatient Project) (Roberts et al. 1992; Roberts et al. 1993).

The project found that using RUG-III (Resource Utilisation Groups version 3) fully explained 44 per cent of the variance in cost for these patients. This was not, however, acceptable as a classification system to the clinicians consulted as its first decision point was on nursing dependency rather than a medical 'diagnostic' disorder. The concept of adding the activities of daily living score component of the RUG (RUG–ADL) to a major clinical grouping was tested and this explained 28 per cent of the variance in cost per day. The RUG-III ADL index is calculated by adding scores from 1 to 5 for each of toiletting, transfers and bed mobility and from 1 to 3 for eating to give a range of total RUG–ADL scores from 4 to 18 (Fries 1991). The final NAIP classification is detailed in table 1.

Table 1: The NAIP classification

Major clinical category	RUG-ADL score	NAIP code	NAIP weight
Orthopaedic	0–4	O1	0.81
Orthopaedic	5–8	O2	0.94
Orthopaedic	9–2	O3	1.19
Orthopaedic	13+	O4	1.50
Spinal	0–18	S	1.63
Pain	0–6	P1	0.76
Pain	7+	P2	0.89
Psychiatric	0–5	PS1	0.80
Psychiatric	6–7	PS2	0.97
Psychiatric	8–11	PS3	1.31
Psychiatric	12+	PS4	1.59
Nervous system	0–4	N1	0.71
Nervous system	5–7	N2	0.88
Nervous system	8–9	N3	1.04
Nervous system	10+	N4	1.28
Medical	0–4	M1	0.72
Medical	5–7	M2	0.91
Medical	8–15	M3	1.05
Medical	16+	M4	2.01

The recommendation was made that these groupings might be useful for all non–acute care, such as palliative care, psychogeriatrics, rehabilitation, geriatric assessment, maintenance and nursing home type care, and that they be 'further tested and refined' (Roberts et al. 1993).

The Illawarra Area Health Service had been actively involved in a number of casemix review activities for many years and the Rehabilitation and Geriatrics Service (which also had financial responsibility for palliative care) had followed the NAIP activity with interest. In a previous study it was determined that neither the RUG system alone nor the FIM alone were predictive of costs in Illawarra Area Health Service rehabilitation and geriatrics wards (Lee et al. 1994). So the NAIP classification, with its combination of clinical disorder with dependency score, promised potential as an explanation of variance among the sub–acute wards (Eagar & Innes 1992) of the Illawarra Area Health Service.

This paper reports the findings of a quality management study undertaken to test the NAIP classification's usefulness as a predictor of cost in a group of sub–acute settings and test its applicability for length of stay comparisons.

Aims of the project

The aims of this study were:

- to determine the NAIP code profile of patients in these sub–acute wards

- to test the predictive power of NAIP classes for lengths of stay across different settings

- to calculate the cost of running each unit on a per diem basis

- to establish the association between predicted and actual cost relativities for these units.

Method

Relevant staff were trained in RUG-ADL scoring, NAIP coding and FIM scoring. Data were collected on all discharges from Coledale Hospital (38 beds – rehabilitation and geriatrics), David Berry Hospital (9 beds – palliative care; 16 beds – rehabilitation and geriatrics), the palliative care ward at Bulli Hospital (12 beds) and the rehabilitation and geriatrics ward at the Illawarra Regional Hospital (IRH) (23 beds) for three months in 1993.

The age of the patients, the length of stay for the episode, the FIM impairment code and the FIM score were recorded. Occasions of service by physiotherapy, occupational therapy, social work, speech pathology and psychology staff were also collected.

For all patients a total RUG-ADL score on admission was recorded and the NAIP code derived by adding the ADL score to the relevant clinical grouping – orthopaedic/surgical (O), spinal (S), pain (P), behavioural/psychiatric (PS), stroke/neurological (N) and medical/other (M). Agreement was reached that patients for respite or nursing home placement would be coded as 'medical'. It was also agreed to code all admissions to the palliative care units as 'medical'. The coders (who were nursing unit managers) assigned a patient to a major NAIP group

according to that which best explained resource use. So a new stroke having rehabilitation and all the therapy involved was coded 'neurological', but a patient with an old stroke who was being admitted to hospital purely for respite nursing care was coded as 'medical'.

NAIP weightings were allocated as depicted in table 1. For example, a stroke patient with a RUG–ADL score of 8 was coded as N3 (nervous system 3), with a cost weighting of 1.04; a patient with T4 paraplegia was coded as S (spinal), with a cost weighting of 1.63.

Aggregated expenditure for each ward for each month was calculated by referring to actual costs incurred in designated cost centres and estimates of overheads were added based on standardised allocation techniques such as rationing cleaning costs by proportion of floor space and catering by proportion of meals prepared.

Results

NAIP codes and average lengths of stay

There were 392 patients discharged from the three units over the three-month period. They had NAIP codes and average lengths of stay as outlined in table 2. Most of the rehabilitation and geriatrics patients fell into the nervous system and orthopaedic groups as would be expected, with a low number of people in the psychiatric/behavioural group. Inpatients with these problems are managed elsewhere in the Illawarra Area Health Service (in acute medicine and in psychiatry). The average age (table 3) was also lower than might generally be expected in these wards.

Table 2: Summary of frequency of NAIP codes

Code	IRH R&G	Coledale R&G	David Berry R&G	Bulli PC	David Berry PC	Total	Average LOS (days)
O1	10	5	0	0	0	15	13.4
O2	14	0	1	0	0	15	15.8
O3	3	9	6	0	0	18	20.8
O4	0	6	7	0	0	13	23.7
S	9	0	1	0	0	10	25
P1	15	7	0	0	0	22	15.2
P2	0	2	10	0	0	12	10.8
PS1	1	1	0	0	0	2	18.5
PS2	0	0	0	0	0	0	0
PS3	1	0	1	0	0	2	15.5
PS4	1	0	0	0	0	1	30
N1	13	2	2	0	0	11	14.4
N2	5	0	1	0	0	6	17.3
N3	6	1	1	0	0	8	22
N4	15	20	16	0	0	51	27
M1	1	12	9	14	6	42	13.4
M2	1	4	1	5	3	14	22.2
M3	2	16	23	30	23	94	17.03
M4	1	7	6	17	19	50	12.58
Total	**98**	**92**	**85**	**66**	**51**	**392**	**17.7**

R&G – rehabilitation and geriatrics; PC – palliative care; LOS – length of stay

Age, complexity and average length of stay

The average age, NAIP complexity/patient and lengths of stay for the five wards are summarised in table 3.

Table 3: Summary of rehabilitation and palliative care wards

Unit	Frequency	Average age	Average NAIP weight/patient	Average LOS (days)
Bulli PC	66	66	1.22	15
David Berry PC	51	65	1.36	14
David Berry R&G	85	73	1.15	14
IRH R&G	98	66	1.01	16
Coledale R&G	92	72	1.12	24

R&G – rehabilitation and geriatrics; PC – palliative care; LOS – length of stay

The correlation between NAIP weighting and length of stay for rehabilitation and geriatrics was weak (R = 0.20); it was weaker again for palliative care (R = 0.13) and was insignificant for all patients (R = 0.02). The correlation between some of the NAIP weightings within clinical groups and length of stay was better (R = 0.27 for nervous system; R = 0.36 for orthopaedic problems).

Rehabilitation and geriatrics wards

Illawarra Regional Hospital

The rehabilitation ward (23 beds) at the Illawarra Regional Hospital (Port Kembla campus of 150 beds) had 98 admissions in the three-month period and patients had an average length of stay of 16 days. The overall NAIP complexity per episode was 1.01 and average complexity per occupied bed–day was 1.07. The more dependent patients stayed longer. Table 4 describes the nervous system and orthopaedic patients.

Table 4: Rehabilitation and geriatrics ward at Illawarra Regional Hospital – nervous system and orthopaedic patients

Category	Number	Average age	Average LOS (days)
Nervous system			
N1	13	76	12
N2	5	67	19
N3	6	71	24
N4	15	67	23
All	*39*	*71*	*19*
Orthopaedics			
O1	10	72	13.5
O2	14	74	16.5
O3	3	68	31
All	*27*	*72*	*17*

LOS – length of stay

Coledale Hospital

At Coledale Hospital (38-beds in free-standing hospital) the number of admissions was 92, the average length of stay was 24 days, the NAIP complexity per episode was 1.12 and 1.17 per occupied bed-day. One of the features of Coledale Hospital is its role in accommodating patients awaiting nursing home transfer. These patients have high nursing dependency needs but are not receiving rehabilitation programs. For the period under study there were 23 such patients, who were classified as M3 or M4; compared with three at the Illawarra Regional Hospital. Coledale is also the site for brain injury rehabilitation and may therefore have very long-stay patients in the nervous system group. In this period there were three brain injury patients with an average length of stay of 72 days. Coledale's results for nervous system and orthopaedic patients are described in table 5.

Table 5: Coledale Hospital – nervous system and orthopaedic patients

Category	Number	Average age	Average LOS (days)
Nervous system			
N1	2	76	36
N3	1	65	16
N4	20	67	37
All	*23*	*75*	*36*
Orthopaedics			
O1	5	73	13
O3	9	76	23
O4	6	78	24
All	*20*	*76*	*21*

LOS – length of stay

David Berry Hospital

The rehabilitation and geriatrics ward at David Berry Hospital (16 beds in free-standing small hospital) had 85 discharges with an average length of stay of 14 days. Its NAIP complexity was 1.15 per episode and 1.21 per occupied bed-day. It also has a role in accommodating people awaiting nursing home transfer and in this period had 29 patients in this group.

Table 6: David Berry Hospital rehabilitation and geriatrics ward – nervous system and orthopaedic patients

Category	Number	Average age	Average LOS (days)
Nervous system			
N1	2	72	6
N2	1	90	8
N3	1	70	15
N4	16	76	18
All	*20*	*76*	*16.5*
Orthopaedics			
O2	1	79	7
O3	6	86	13
O4	7	73	24
All	*14*	*79*	*18*

LOS – length of stay

Dependency levels and length of stay in rehabilitation and geriatrics

Use of the NAIP classification presents a picture of a spread of the number of people in each dependency group among the nervous system and orthopaedic patients in the Illawarra Regional Hospital ward, with a higher number of people more dependent on admission in these categories at Coledale and David Berry Hospitals. This profile is confirmed by comparison with the average total FIM scores in each unit for these groups. (The lower the total FIM score, the more dependent the patient.)

As would be expected, most patients' total FIM score improves in a rehabilitation program, averaging a 15 to 25–point increases. There was a small number of patients returned to acute care because of significant deterioration in their conditions. There were no deaths in these patients in that period. There is a variation in the level of dependency at discharge across the units.

Table 7: Spread of total FIM scores

Hospital	NAIP code	Number	Average total admission FIM	Average total discharge FIM
IRH	N1	13	103	114
	N2	5	84	114
	N3	6	77	104
	N4	15	62	100
Coledale	N1	2	108	119
	N2	0	na*	na
	N3	1	95	99
	N4	20	66	88
David Berry	N1	2	97	106
	N2	1	81	76
	N3	1	82	111
	N4	16	52	68
IRH	O1	10	105	115
	O2	14	91	103
	O3	3	88	104
	O4	0	na	na
Coledale	O1	5	84	97
	O2	0	na	na
	O3	9	96	101
	O4	6	76	88
David Berry	O1	0	na	na
	O2	1	115	115
	O3	6	93	108
	O4	7	81	95

*na – not applicable

Comparative lengths of stay in rehabilitation and geriatrics

A comparison of the lengths of stay for the most common groups, detailed in table 8, showed little consistency for any of the nervous system or orthopaedic groups.

Table 8: Lengths of stay in rehabilitation and geriatrics

Category	Average LOS Coledale (days)	Average LOS IRH (days)	Average LOS David Berry (days)
N1	36	12	6
N2	0	19	8
N3	16	24	15
N4	37	23	18
O1	13	13.5	0
O2	0	16.5	7
O3	23	31	13
O4	24	0	24

LOS – length of stay

On review it was noted that the N4 group was mainly composed of people admitted for their first course of rehabilitation following stroke; some were people whose hospitalisation reason became nursing home care following a period of rehabilitation. The other neurological groups had other diagnoses and many were readmissions following failed trials at home or the development of an intercurrent illness, or they were in transit. Although the numbers are small it was noted that eight readmissions had an average length of stay of 14 days.

Allied health professionals' occasions of service in rehabilitation and geriatrics

The recording of allied health professionals' activity was not consistent across the disciplines or across the units. However, there was a trend of some IRH patients receiving almost twice as much therapy as similar patients at either Coledale or David Berry Hospitals.

Palliative care wards

The 12-bed palliative care unit at Bulli Hospital had an average length of stay of 15 days and the nine-bed palliative care unit at David Berry Hospital had an average length of stay of 14 days. There was no consistency, however, between the wards for length of stay for each NAIP group; the NAIP weighting explained only 1 per cent of the variance in length of stay for these patients. The NAIP complexity for David Berry Hospital's ward was 1.36 per episode and 1.37 per occupied bed-day. For Bulli Hospital's ward it was 1.22 per episode and 1.07 per occupied bed-day. The results are described in tables 9 and 10.

Table 9: Bulli Hospital palliative care ward

Code	Number	Average age	Average LOS (days)
Medical 1	14	62	19
Medical 2	5	72	12
Medical 3	30	67	19
Medical 4	17	68	7
Medical	66	66.5	15

LOS – length of stay

Table 10: David Berry Hospital palliative care ward

Code	Number	Average age	Average LOS (days)
Medical 1	6	56	7
Medical 2	3	55	28
Medical 3	23	67	14
Medical 4	19	68	14
Medical	51	65	14

LOS – length of stay

NAIP weighting and costs

The direct service costs for all units for the three-month period were divided by the number of available bed-days to gain an average cost per bed-day of $195 (average cost per occupied bed-day was $215–$293 across the units). The overall average NAIP complexity per day was 1.16 (the NAIP complexity per patient was 1.14) for all wards for 392 episodes of care, based on admission NAIP codes; this gives an expenditure per 'one NAIP' (occupied) bed-day of $226 for this group of patients at that time.

Table 11: NAIP weightings and cost of care

Unit	Number	Average NAIP weight/patient	Average NAIP weight/bed-day	Average cost/ bed-day
Bulli PC	66	1.22	1.07	$200
Berry PC	51	1.36	1.37	$248
David Berry R&G	85	1.15	1.21	$182
IRH R&G	98	1.01	1.08	$195
Coledale R&G	92	1.12	1.17	$187

PC – palliative care; R&G – rehabilitation and geriatrics

The data outlined in table 11 were used to assess the relativities of the costs across each unit. The relationship between average cost per bed-day and NAIP weightings per bed-day across the five units under study was quite high at 0.71 (p >0.05), with 51 per cent of the variance in cost explained by the NAIP complexity. The correlation between NAIP weight per episode and average bed-day cost was 0.79 (p >0.05)

Discussion

The NAIP study recommended a casemix classification system for use in sub-acute care; its applicability to a group of patients in the palliative care, rehabilitation and geriatrics wards in the Illawarra Area Health Service has been tested. In this setting the NAIP classification system provided a good explanation of the aggregated costs of care but it was a poor predictor of length of stay.

In casemix costing studies published in the United States, classification systems for rehabilitation medicine which use a functional status measure in addition to an impairment code are effective in predicting costs of care

and length of stay (Rondinelli et al. 1991; Stineman & Escarce 1993). One of the reasons for this consistency, however, may be the 'three-hour rule'. Since 1982 a Health Care Financing Authority regulation has required three hours of physical or occupational therapy per day for rehabilitation patients (Johnston & Miller 1986). It is estimated that in the United States only 17 per cent of people who have a stroke are involved in inpatient rehabilitation programs and 23 per cent are treated in a skilled nursing facility (Agency for Health Care Policy and Research 1994). In Australia the practice is to offer rehabilitation programs to almost all stroke patients but not all would be receiving three hours of therapy per day. In an earlier study at the Illawarra Regional Hospital (Lee et al. 1994), the patients in the rehabilitation ward were receiving an average of two hours per day.

The average age of patients in this study was quite low compared with the NAIP study group in which age was not a predictor of cost or length of stay (Roberts 1993). In this project the correlation for average age and average cost per day for these wards was 0.7 and for average length of stay 0.45. In the FIM-FRG classification there is a split for stroke at age 75 years.

Other explanations for length of stay differences may have been the treatment program in which the patient was involved – many patients in the rehabilitation and geriatrics wards were not receiving therapy because they were acutely ill or because they were in some form of maintenance care such as respite or nursing home type care and this may have influenced staffing levels. The groups therefore were not homogeneous and it is not known how similar they were to the study groups which contributed data to the development of the NAIP groups. The impairments of patients within the broad clinical groups may also have been influencing the resource consumption because of the particular characteristics of the therapy programs required. This is certainly true of the classes in the FIM-FRG system which separate stroke rehabilitation from amputee rehabilitation, fracture rehabilitation, joint replacement and so on (Stineman et al. 1994).

It was noted that there was a trend to shorter lengths of stay for all groups if this were a readmission for a particular impairment, rather than the first episode for rehabilitation or palliative care. This was particularly notable for spinal cord injury and stroke. In the development of the FIM-FRG classification, readmissions were excluded (Stineman & Escarce 1993). It may be appropriate to make this distinction in future system development in Australia also.

The NAIP classification was not correlated with length of stay in the palliative care wards for this three-month period. It is possible that patients may be most dependent in their last few days of life and length of stay is irrelevant. Other factors such as responsiveness to radiation therapy, stage of illness, cognitive status and severity of symptoms may be more predictive of staff input and length of stay.

As a tool for classification for quality management, the NAIP classification did highlight possible areas for review of outcome (such as dependency levels on discharge, lower levels of staffing in some units) but it could not be used to compare lengths of stay. There is obvious variation in costs between the units which may be reflective of the casemix in the wards, the resources allocated to those wards or to clinician practices. These characteristics all varied in each unit.

Conclusions

This study has enabled the following conclusions.

- NAIP classification weightings were predictive of differences in direct service per diem costs in the sub-acute wards in this area health service.

- The NAIP classification system was useful as an instrument for quality management because it was able to highlight areas for review.

- NAIP classification codes were not predictive of inpatient length of stay.

- Further refinements of sub-acute classification systems might consider the program of care in which the patient is involved, readmission status, phase of illness, age of the patient and possibly severity of the clinical disorder.

In 1994 the New South Wales Casemix Area Network embarked upon a project across approximately 35 rehabilitation, geriatric, psychogeriatric and palliative care units gathering casemix data to refine the NAIP classification and progress study of sub-acute care. This study in the Illawarra Area Health Service contributed some understanding of the problems to be addressed in terms of methodology and modelling of the results. It is hoped that an acceptable classification system will be developed for future funding models for sub-acute care which will also be useful for standardisation of quality and outcome review.

Acknowledgement

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