CHAPTER 6

COSTING THE AMBULATORY EPISODE: IMPLICATIONS OF TOTAL OR PARTIAL SUBSTITUTION OF HOSPITAL CARE

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6.1 Introduction

The term "ambulatory care" has been applied to any health care that occurs anywhere other than a hospital bed. The service may range from a general practitioner visit or outpatient allied health intervention through to treatment by a multidisciplinary team which provides full or partial substitution for hospital care. The latter acute ambulatory episode, delivered in what has been called "hospital in the home", has been the subject of a number of studies and reviews [114, 74]. In spite of mostly positive outcomes for satisfaction and quality, there still exists some uncertainty regarding resource savings for this type of care [29].

A number of studies has found that, when patients are carefully selected, outpatient therapy is a cost effective, safe method of administering intravenous antibiotics [71]. Several clinical trials assessing the treatment of geriatric patients at home or in hospital for a variety of conditions have demonstrated savings of from 51% [115] to 24% [116]. It is only more recently that studies looking at selected diagnoses such as Chronic Obstructive Airways Disease (COAD) have provided cost comparisons for hospital versus ambulatory treatment [117]. The absence of a casemix classification system for outpatient services based on episodes of care contributes to the difficulty in determining and comparing costs [62]. The current focus on individual outpatient encounters (occasions of service) is not suitable for understanding outreach episodes of care [61].

The Macarthur Ambulatory Care Service (MACS) model was implemented in 2000 as an alternative means of providing safe, high-quality community health care in an environment of relatively low availability of acute hospital beds [118].

During the study period (2001-2002), the bed-to-population ratio for the Macarthur region may be estimated, from NSW Health and ABS data, to have been only approximately 1.2/1000 compared to a state average of around 2.3/1000. This situation of bed shortage provided an ideal environment to test this alternative model of care. The physical and conceptual design of the "acute" ambulatory care unit was integral to the redevelopment of Emergency Departments built at Camden and Campbelltown Hospitals during the period 2000-2003.

The National Health Act (1953) was amended in 2001 to enable private health insurers to fund acute outreach services in sites other than acute hospital beds [118]. Following this amendment, a system of Commonwealth accreditation of Private Sector Outreach Services was established. Macarthur Health Service (MHS) was the first Public Hospital in New South Wales to be accredited through this process, in March 2004. The Macarthur Health Service, in anticipation of this accreditation, established a virtual ward of 20 beds at Campbelltown Hospital and six beds at Camden Hospital in July 2001. This acute ambulatory outreach service fulfilled all the requirements for acute care of both public and private patients which included 24-hour, seven days per week medical cover. The admission, treatment and discharge processes were identical to those for other hospital patients, with the addition of a thorough staff and patient community risk assessment. The MACS service also treats day admissions, e.g. infusions and transfusions, and the hospital MACS site is used for outpatient multidisciplinary assessment. There is also support for day surgery with pre- and post-surgical care.

This service provides a unique setting to explore the costs distributed to episodes of care for a number of the most common conditions treated. The virtual ward structure appears equivalent to any other inpatient admission with respect to the patient administration systems (PAS). These data systems enable examination of whether the introduction of ambulatory care to the MHS reduced the health service cost of care for these selected patient groupings.

6.2 Methods

The relevant study population was all patients treated by MACS in the 2001-2002 financial year as well as all patients treated in MHS hospital wards during the same time period within selected Australian Refined Diagnostic Related Groupings (AR-DRG, hereafter referred to as DRG). In the first instance, potential DRGs for analysis were identified as being "ambulatory sensitive", defined as conditions commonly treated by MACS, where an infrastructure of treatment and care had been safely provided for patients presenting for acute care of those conditions. From the resulting list, the ten most common DRGs treated by MACS in 2001-02, all of which accounted for more than 20 separations, were identified and chosen for costing analysis. It was hypothesized that the level of cost savings available due to MACS, if any, would be positively related to the extent to which MACS services can be substituted for hospital ward care. Episodes were thus categorized for the chosen DRG conditions, using the South Western Sydney Area Health Service cost-of-care data reports, according to whether they were total substitution (entire episode coded to MACS) or partial substitution between hospital ward and MACS care (episode coded to other wards plus MACS). The third category contained those patients in the selected DRGs who were treated totally within a hospital ward.

Additionally, an analysis of Emergency Department triage data was performed for those of the selected DRGs (four in number) for which relevant data on triage level was available. These data were available for the 2003 calendar year from the Emergency Department Information System (EDIS). This enabled comparisons of triage ratings, as an acuity indicator for patients referred to a hospital ward versus MACS.

The data systems accessed for this study were:

1) The Macarthur Ambulatory Project modified Allied Health Information data system (MAP), which is a patient and service register used by the treating team in MACS, described in Chapter 3.
2) Emergency Department Information System (EDIS), which registers the diagnostic codes and triage outgoings of all emergency department presentations.
3) South West Sydney Area Health Service (SWSAHS) cost-of-care data reports 2001-2002, using N.S.W. Department of Health methodology [119]. Costs are allocated to individual patients for a range of services provided to inpatients, including ward medical, nursing, operating suite, pathology, imaging, emergency department, intensive care, allied health, pharmacy, and a range of goods and services. This results in estimates of cost of care for each patient, based on DRG.

The objective of the analysis was to identify, for the ten DRGs chosen, the level of cost savings, if any, in the MHS that could plausibly be attributed to MACS. The different groups were analysed to determine the mean difference in cost

between total or partial substitution of care, and hospital care. All results were analysed using a statistical software package (SPSS version 11.5). The groups were compared using a two tailed t-test for independent samples to determine the significance of any cost savings.

6.3 Results

Discussion with the nursing staff and reference to the free-text definitions of cases in the departmental MAP data system clarified the types of cases treated. Pulmonary embolus (E61B), Deep Venous Thrombosis (F63B) and chronic obstructive airways disease (COAD) with (E65A) or without complications (E65B) are self-explanatory. Respiratory infections (E62C) referred to cases of community-acquired pneumonia receiving intravenous antibiotics. The most frequently treated condition was cellulitis (J64B) which comprised cases of cutaneous infection treated with intravenous antibiotics. Kidney and urinary tract disorders (L67C) were predominantly cases of "trial of void" following urinary catheter removal. Red-cell disorders (Q61C) referred to blood transfusions, and Lymphoma (R61C) referred to platelet infusions. The remaining item (R63Z) comprised bladder infusions of chemotherapeutic agents. The top ten DRGs are listed with their costings in Tables 6.1 and 6.2.

The mean cost of the combined top ten diagnoses for total substitution was $1202, which was significantly less than the mean cost for inpatient care of $3267 (mean difference $2065; 95% C.I. $1643 to $2485; $p<0.01$). This equates to an overall saving of 63%. There were significant savings ($p<0.05$) for most individual DRGs in the total substitution group except for Pulmonary embolus (E61B) and COAD with complications (E65A).

Table 6.1 **Total and partial substitution cost of care compared to hospital cost of care**

DRG	Type of Care	Number of Episodes (%)	Mean Episode Cost $ (S.D.)	Mean difference to Hospital $ (p value)	Indicative Percent Saving
Pulmonary Embolism E61B	MACS Only	10 (23.8)	3,034 (1,574)	799 (0.53)	21
	Hospital/MACS	10 (23.8)	3,206 (997)	627 (0.67)	16
	Hospital Only	22 (52.4)	3,833 (2,312)		
Respiratory Infections E62C	MACS Only	26 (8.0)	1,662 (423)	1,024 (<0.001)	38
	Hospital/MACS	22 (6.8)	2,294 (1,280)	393 (0.34)	15
	Hospital Only	276 (85.2)	2,687 (1,304)		
COAD with Complications E65A	MACS Only	10 (4.3)	2,264 (3,674)	2,828 (0.19)	56
	Hospital/MACS	16 (6.8)	3,695 (3,187)	1,397 (0.52)	27
	Hospital Only	209 (88.9)	5,092 (5,108)		
COAD without Complications E65B	MACS Only	16 (6.6)	2,101 (608)	2,269 (0.01)	52
	Hospital/MACS	10 (4.1)	3,454 (1,289)	917 (0.60)	21
	Hospital Only	216 (89.3)	4,370 (3,089)		
Deep Venous Thrombosis F63B	MACS Only	24 (33.8)	915 (486)	2,521 (0.02)	73
	Hospital/MACS	29 (40.8)	1,247 (1,135)	2,190 (0.04)	64
	Hospital Only	18 (25.4)	3,437 (5,736)		
Cellulitis J64B	MACS Only	88 (23.2)	894 (881)	1,243 (<0.001)	58
	Hospital/MACS	74 (19.5)	965 (571)	1,173 (<0.001)	55
	Hospital Only	218 (57.4)	2,137 (2,131)		
Kidney, Urinary Tract L67C	MACS Only	17 (32.7)	166 (359)	658 (<0.001)	80
	Hospital/MACS	4 (7.7)	69 (69)	755 (0.01)	92
	Hospital Only	31 (59.6)	824 (547)		
Red Blood Cell Disorder Q61C	MACS Only	13 (14.1)	88 (86)	1,183 (<0.001)	93
	Hospital/MACS	8 (8.7)	73 (41)	1,198 (0.01)	94
	Hospital Only	71 (77.2)	1,271 (1,176)		
Lymphoma, Same Day R61C	MACS Only	22 (73.3)	1,716 (122)	642 (<0.001)	27
	Hospital/MACS	3 (10.0)	1,743 (107)	616 (<0.001)	26
	Hospital Only	5 (16.7)	2,358 (551)		
Chemotherapy R63Z	MACS Only	15 (55.6)	1,179 (93)	506 (<0.001)	30
	Hospital/MACS	8 (29.6)	1,203 (79)	482 (<0.001)	29
	Hospital Only	4 (14.8)	1,685 (97)		
Total	MACS Only	241 (16.1)	1202 (1,196)	2065 (<0.001)	63
	Hospital/MACS	184 (12.3)	1627 (1,610)	1640 (<0.001)	50
	Hospital Only	1070 (71.6)	3267 (3,284)		

Table 6.2 **Combined total of inpatient vs MACS and partial MACS care**

ARDRG4	$ Inpatient (SD)	$ MACS (SD)	Mean Diff (% Total Cost)	95% Confidence Interval	p value
E6IB Pulmonary Embolus	3833	3120 (1285)	713 (19%)	-470 to 1873	0.230
E62C Resp. Infection	2686	1952 (963)	734 (27%)	347 to 1122	<0.001
E65A COAD (with comp.)	5092	3144 (3385)	1948 (38%)	-81 to 3976	0.060
E65B COAD (without comp.)	4370	2621 (1127)	1749 (40%)	544 to 2953	0.005
F63B Deep Vein Thrombosis	3437	1096 (908)	2341 (68%)	732 to 3948	0.005
J64B Cellulitis	2137	926 (753)	1121 (57%)	866 to 1555	<0.001
L67C Kidney Urine Tract	824	147 (324)	677 (82%)	410 to 944	<0.001
Q61C Red Cell (without comp.)	1270	82 (71)	1188 (93%)	676 to 1701	<0.001
R61C Lymphoma	2358	1720 (118)	638 (27%)	402 to 875	<0.001
R63Z Chemotherapy	1684	1187 (87)	497 (30%)	398 to 596	<0.001
ALL	**3267 (3284) n=1070**	**1386 (1404) n=425**	**1881 (58%)**	**1557 to 2204**	**<0.001**

The mean cost of the combined top ten diagnoses for partial substitution was $1627, which was significantly less than the mean cost of inpatient care $3267 (mean difference $1640; 95% C.I. $1155 to $2124; $p<0.01$). This suggests resource savings of the order of 50%. There were savings for all diagnoses, although Pulmonary Embolus (E61B), Respiratory Infection (E62C) and COAD with complications (E65A) did not demonstrate statistical significance.

Table 6.3 summarizes an analysis of triage ratings of selected EDIS registered diagnoses in the 2003 calendar year. Results indicate a trend for slightly higher mean triage ratings (i.e. less acute patients) in the cases referred to MACS compared to those referred for hospital admission. However, the differences appear to be quantitatively modest and were only statistically significant ($p <$

0.01) in the case of cellulitis. This suggests that differences in within-DRG acuity are unlikely to explain much of the substantial cost differences reported in the (Summary) Table 6.1.

Table 6.3 Triage levels for selected DRGs, patients admitted through ED to MHS in 2003

	Cellulitis*		COPD		DVT		Pneumonia	
Triage	Hospital Episodes (%)	MACS Episodes (%)	Hospital Episodes (%)	MACS Episodes (%)	Hospital Episodes (%)	MACS Episodes (%)	Hospital Episodes (%)	MACS Episodes (%)
1	0 (0.0)	0 (0.0)	4 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
2	2 (2.0)	0 (0.0)	28 (25.7)	3 (18.8)	0 (0.0)	0 (0.0)	12 (16.4)	0 (0.0)
3	48 (48.0)	22 (27.8)	67 (61.5)	12 (75.0)	13 (68.4)	19 (51.4)	55 (75.3)	13 (86.7)
4	47 (47.0)	54 (68.4)	8 (7.3)	0 (0.0)	6 (31.6)	18 (48.6)	6 (8.2)	2 (13.3)
5	3 (3.0)	3 (3.8)	2 (1.8)	1 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	100 (100.0)	79 (100.0)	109 (100.0)	16 (100.0)	19 (100.0)	37 (100.0)	73 (100.0)	15 (100.0)
Average	3.51[a]	3.76[a]	2.78	2.94	3.32	3.49	2.92	3.13

* Distributions statistically different at $p<0.05$ according to Pearson χ^2 statistic.
[a] Average triage ratings statistically different at $p<0.01$ according to t test for two independent samples

6.4 Discussion and conclusions

These data support the hypothesis that savings are likely to be greater if total substitution of acute care from hospital to ambulatory care occurs when compared to hospital care. However, substantial resource savings appear to be available to ambulatory care, whether substitution of care is total or only partial ($p<0.01$). Substantial savings were demonstrated for all ten diagnoses most commonly treated by MACS, although these savings tended to be somewhat lower and not always statistically significant for higher intensity and high-risk conditions such as pulmonary embolus and COAD with complications. Predictable and low-risk conditions such as elective transfusions, infusions, deep

venous thrombosis and cellulitis demonstrated significant savings for either partial or total substitution of care, and could be considered as ambulatory sensitive diagnoses for most cases presenting for admission to hospital or emergency departments.

The audit of EDIS data, although not contemporaneous with the costing study, indicates only a slight trend for less acute cases to be referred to ambulatory care. Cases were accepted from triage levels 2 to 5 with most in the 3 and 4 triage level for both hospital and ambulatory cases. This suggests that other factors may influence referral to ambulatory care. These may include patient or physician choice, lack of awareness of the new service, or time of day of patient presentation. Further consideration and investigation of these factors is required, particularly given the substantial resource savings which this paper has documented for ambulatory care.

The chronic and complex care of COAD has been identified by the N.S.W. Department of Health as one of the areas that would benefit from improved community services to relieve the pressure on hospital beds. A randomised controlled trial conducted in the Liverpool and MHS region has shown post-acute nursing care of patients with COAD has not significantly reduced readmission rates to hospital [120]. This current study has demonstrated that patients with COAD presenting with triage level 2 or 3 have been treated by MACS, and there appear to be significant savings (52%, p=0.01) for total substitution of care in this group (E65B). This suggests that delivery of acute care in an ambulatory setting should be considered for inclusion in chronic and complex programs for patients with exacerbations of COAD without

complications.

Debate will always occur regarding the absolute cost of care, and episode costs are subject to the various inaccuracies of inputs of data and historical weightings. The strength of this study is that the same cost of care methodology has been performed on both groups studied and, irrespective of whether inaccuracies exist in the assessment of absolute costs, the magnitude of differences found in both relative costs and potential percent savings have relevance for health planning. The evidence presented in this paper suggest a compelling case for the desirability of identifying the full range of hospital inpatient activities which could be treated more cost-effectively by ambulatory models of care, and implementing the structural changes required to realise the available resource savings.