NEW MODELS OF

MULTIDISCIPLINARY COMMUNITY HEALTH CARE

STEPHEN FRANCIS WILSON

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School of Public Health
Faculty of Medicine
University of Sydney
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AUTHOR'S CONTRIBUTION

The concept and research methodology for this thesis are entirely my own work. Assistance was obtained for data entry and data presentation from a number of project officers. The interpretation of data and conclusions are my own.

My role as principal researcher is demonstrated by lead authorship on all refereed research papers published as a result of this course of study.

A number of co-researchers have been recorded as co-authors due to their participation in the projects and editing of final manuscripts. Their names appear within the appendices and below chapter headings.

PUBLICATIONS

The following papers have resulted from the research described in this thesis:

Wilson SF, Chapman M, Nancarrow L, Collins J. Macarthur Model for Ambulatory Services. *Australian Health Review.* 2001; 24: 187-192

Wilson SF, Ruscoe W, Chapman H, Miller R. General Practitioner – Hospital Communications: A Review of Discharge Summaries. *Journal of Quality in Clinical Practice*. 2001; 21: 104-108

Wilson SF, Miller R, Collins N, Comino E, Harris M. Factors associated with frequent admission to hospital for patients with chronic airflow limitation. *Australian Family Physician.* 2001; 30: 822-824

Wilson SF, Collins N. Ambulatory alternatives exist. Letter to the Editor. *British Medical Journal.* 2002; 325: 389

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Wilson S, Middleton J, King C, Cameron I. Rehabilitation of Trauma. In: Sherry E, ed. *Trauma*. New York: Oxford University Press. 2003; 678-707

Wilson SF, Eccleston M, Marks R, Isouard G. Evaluation of Domiciliary Services and Hospital Discharge for Older People with Chronic and Complex Conditions. *Geriaction Journal.* 2003; 21: 5-8

Wilson SF, Marks R, Donohoe S, Chapman M, Zwar N. General practitioner multidisciplinary skills for enhanced primary care. *Australian Family Physician.* 2004; 33: 479-480

Wilson S, Marks R, Collins N, Warner B, Frick L. Benefits of multidisciplinary case conferencing using audiovisual compared with telephone communication: a randomised controlled trial. *Journal of Telemedicine and Telecare.* 2004; 10: 351-354

Wilson SF, Shorten B, Marks R. Costing the Ambulatory Episode: Implications of total or partial substitution of hospital care. *Australian Health Review.* 2005; 29: 360-365

EXPLANATORY NOTES

Term	Abbreviation	Explanation
Activities of Daily Living	ADL	The usual functions performed by a person living in the community
Ambulatory Post-Acute Care	APAC	Continuation of outpatient care delivered after discharge from a hospital admission
Carrington Temporary Aged Care Project	CTACP	A programme providing domiciliary support services immediately following hospital discharge
Day of Surgery Admission	DOSA	Admission to and discharge from hospital on the same day as surgery
Enhanced Primary Care	EPC	A program to encourage GPs to achieve improved health outcomes for patients with chronic and complex care needs
Functional Independence Measure	FIM	A measure of activities of daily living
Hospital at Home	HAH	Often refers to complete substitution of hospital care
Home-Based Rehabilitation	HBR	Rehabilitation conducted by a multidisciplinary team in the patient's place of residence
Hospital in the Home	HITH	As above
In Reach	—	Services provided to a hospital by a community-based team or services, e.g. community nursing
Macarthur Ambulatory Care Service	MACS	Multidisciplinary acute outreach hospital in the home service
Macarthur Ambulatory Project	MAP	Multidisciplinary data collection system developed as a research and workforce management tool

Macarthur Health Service	MHS	Health sector of South West Sydney Area Health Service where acute, outpatient and maintenance care studies were conducted
Non-Admitted Patient Occasion Of Service	NAPOOS	A service which is usually "face to face" between a patient and health provider in any setting other than an admitted hospital bed
Outpatient Parenteral Antibiotic Therapy	OPAT	Usually intravenous antibiotic or chemotherapy administered in an outpatient setting or the patient's own home
Outpatient Intravenous Treatment	OPIT	Equivalent to OPAT
Outreach	—	Services provided in the community by a hospital-based team or service, e.g. post surgery
Post-Acute Care	PAC	Continuation of outpatient care delivered after discharge from a hospital admission
Post-Acute Treatment and Care In The Home	PATCH	Equivalent to HITH
Peripherally Inserted Central Venous Catheter	PICC	A form of intravenous access commonly used by ambulatory care services delivering OPIT
Quick Response Team	QRT	A service operating from or for an emergency department (ED) to facilitate discharge of patients from ED, which may be nursing alone or multidisciplinary
Royal North Shore Hospital	RNSH	Research on home-based rehabilitation conducted at this hospital
Transitional Care Program	TCP	Commonwealth program to assist older people after a hospital stay

THESIS ABSTRACT

Aims and Objectives: This thesis consists of a series of studies of new models of multidisciplinary community health care in four compartments. These compartments are acute, subacute, outpatient and maintenance care. The purpose of the individual studies is to demonstrate the benefits of multidisciplinary community health care in delivering alternatives to current practice by replacing hospital care or improving traditional community care (Figure A.1).

Methods: Four studies relevant to the acute care compartment were conducted. A new acute service delivery model, the Macarthur Ambulatory Care Service, was developed which applied multidisciplinary community care to patients who would otherwise have been treated in hospital as acute care cases. A communication system to enhance multidisciplinary care between two distant sites was studied by a randomised controlled trial (RCT) of 100 subjects designed to evaluate the benefits of audio versus audio-visual case conferencing. The cost benefits of ambulatory versus hospital-based care were studied by a retrospective cohort study of cost-of-care data. The outcomes for patients' safety and satisfaction with the new service were studied by description-of-quality indicators.

A RCT of multidisciplinary community care for people who would otherwise have had treatment in a subacute rehabilitation hospital recruited 31 residents from the lower North Shore of Sydney in cooperation with the Royal North Shore and Greenwich Hospitals. This study continued with a description of functional outcomes for a further 88 patients.

Multidisciplinary case conferencing and production of management plans was compared, by a RCT design, to the current practice of single discipline physiotherapy and occupational therapy assessment in the Campbelltown Hospital outpatients department.

Four studies relevant to the maintenance compartment of care were conducted. The discharge communication of hospital doctors with GPs was assessed by an audit of production, transfer, and receipt, of 481 discharge summaries. This was followed by another study which was a file review to determine factors contributing to patients' admission to hospital with chronic airflow limitation. A subsequent study of a new service to support patients with chronic illness, by adding personal care to existing multidisciplinary community care, was conducted on 35 patients following hospital discharge. The final study evaluated an education program to determine if multidisciplinary community care could be introduced to general practitioners for long-term maintenance care of chronic and complex conditions.

Results: Audiovisual (video) case conferences between distant sites resulted in a significant reduction of 41% ($p=0.025$) in length of treatment for multidisciplinary community care when compared to audio (telephone) conferences. Selected diagnostic groups, such as acute and chronic respiratory infections, tissue infections, infusions and transfusions, were associated with significant ($p<0.001$) mean savings of 58% when compared with traditional inpatient care. The acute community model displayed indicators of quality of care equivalent to or better than hospital care with a high level of patient satisfaction in 98.2% ($n=497$) of responses.

The RCT of home-based rehabilitation showed a significant improvement in the Functional Independence Measure (FIM) score for this intervention, which was achieved by community care in addition to inpatient care ($p=0.038$, difference 4.1, 95% CI 0.3 to 7.9). This intervention was associated with an increased cost of care compared to traditional care ($p=0.023$, difference $4299, 95% CI $533 to $8066).

The RCT of multidisciplinary case conferences and management plans demonstrated that significantly more issues ($p<0.001$) were raised for hospital outpatients which resulted in a greater proportion of referrals (21%) to other providers in the intervention group when compared to the control group (9%). This difference was not statistically significant ($p=0.117$).

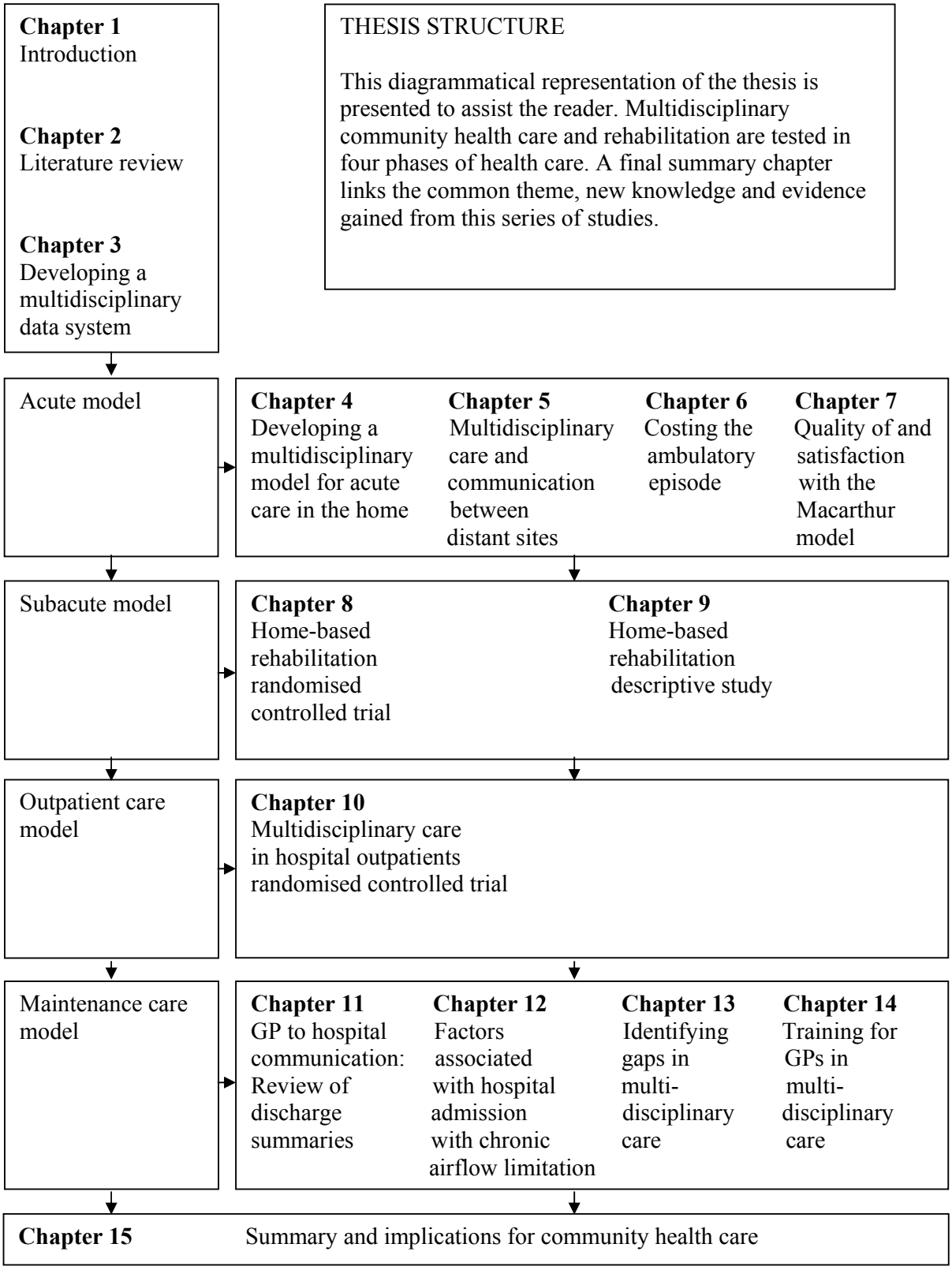
A review of hospital discharge summaries demonstrated a poor rate of receipt by GPs of 22%, of which 25% were of little value. Poor communication with GPs was also linked to factors in frequent hospital admissions of patients with chronic airflow limitation with follow up in only 54% of discharges. The delivery of personal care to people with acute exacerbations of chronic disease was piloted and found to be associated with significant benefits to the mental component score of the SF36 ($p=0.028$). The education of GPs in multidisciplinary case conferencing resulted in a significant ($p<0.004$) three-fold increase in uptake of this Medicare item when compared to national figures.

Conclusions: Multidisciplinary community health care may substitute for hospital admission for selected acute diagnostic groups. This is associated with improved quality of care, patient satisfaction, and cost-of-care savings. Physical

recovery for inpatients referred for subacute hospital care improves following discharge from inpatient rehabilitation. The additional community care was delivered by a multidisciplinary team involving GPs. This study did not achieve substitution of hospital care. Multidisciplinary case conferencing had only modest affects on outcomes for patient care in hospital outpatients. The management of chronic and complex patients in the community can be supported with personal care that is started without delay when required. The uptake of GP multidisciplinary case conferencing for chronic-care patients increased with a multifaceted education program.

The studies in this thesis have influenced the delivery of community health care through the introduction of new models of multidisciplinary communication and care. The studies show that multiple components of community care can be investigated using robust methodologies, and the results can then be applied to the complex systems that support community care.

Figure A.1 **Reader's guide to thesis structure**



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CHAPTER 1

INTRODUCTION

Incorporating material from:

Wilson S, Middleton J, King C, Cameron I. Rehabilitation of Trauma. In: Sherry E, ed. *Trauma*. New York: Oxford University Press, 2003; 678-707

Disler PB, Cameron ID, Wilson SF. Rehabilitation Medicine. Editorial. *Medical Journal of Australia.* 2002; 177: 385-386

Wilson SF, Collins N. Ambulatory alternatives exist. Letter to the Editor. *British Medical Journal.* 2002; 390

1.1 Introduction

The quantity of medical care provided per patient in the management of illness or injury has grown over the last century with the availability of new treatments. The delivery of these pharmacological, surgical and physical therapy treatments now involves many specialist sub-groups. Three large groups are doctors, nurses, and allied health professionals. These groups are further divided into disciplines each with their own area of knowledge and expertise. Multidisciplinary teams are often the model of choice on acute medical and surgical wards [1]. The sharing of delivery of care by these disciplines with a single management plan and common goal for their patient is termed "multidisciplinary care".

The care of sick people in the community was the normal setting for health care until the advent of hospitals in the last millennium. Hippocrates referred in his oath only to a home visit rather than treatment in a temple or other institution: "whenever I go into a house, I will go to help the sick" [2]. One of the earliest hospital-like structures was the Roman "*valetudinarium*" which served the purpose of a surgical and rehabilitation centre for soldiers at war [3]. Its purpose was short lived and rarely survived as an institution beyond the particular period of war.

The development of the European hospital accompanied the growth of trading centres and towns [4]. It owes its conception to a range of factors and in particular to two historical events. The first was the religious Crusades commencing in the tenth century. The Hospitaller Knights of the Order of St. John from the tenth century helped to build stations for weary travellers and pilgrims which also became centres for medical care. There were 750 of these hospices in England by

the thirteenth century [5]. The second factor was the time period during which the plague and other infectious diseases ravaged Europe. This resulted in these and other hospices being established in the fourteenth and fifteenth centuries as places for the sick and dying. Renaissance medicine drove a proliferation of hospitals for general and special purposes in Europe, and this trend has continued ever since.

Hospitals were often built to increase social status of the funders rather than the needs of communities [4]. The experience of the renowned St Thomas' Hospital, London in the sixteenth century showed early evidence of the stresses and failures appearing in the hospital system. The Governors had identified a group of patients who did not recover within an expected period of time. These patients were described as "incurables" [6]. Fortunately for St Thomas' Hospital, a wealthy benefactor, Mr Thomas Guy, set about building a hospital for the incurables in close proximity to cater to this overflow of patients. There are many similarities between these hospitals for the incurables and subacute rehabilitation or palliative care hospitals of today. However, a more enlightened view may have been to develop a community-based health care system to cope with this demand.

1.2 Multidisciplinary care and rehabilitation

There is currently increasing pressure on hospital bed utilisation, with community services being suggested as an alternative to hospitalisation for acute care [7]. The integrated hospital and community health care system delivered by the Kaiser Permanente Health Company was recently compared to figures from the United Kingdom [8]. The group of patients in the USA chosen for study were those older people with eleven common conditions such as chronic airflow

limitation, cardiac failure, joint replacement and hip fracture over the age of 65. This study found that three-and-a-half times less bed-days were used (standardised) in the Kaiser Permanente system than in the NHS in Britain [8].

This thesis explores the contribution of an integrated multidisciplinary approach across the continuum of care from early acute management to later community reintegration and beyond to achieve the best patient outcome for quality of life and independence. A series of studies has been conducted within this thesis to investigate the benefits of the core components of multidisciplinary care and rehabilitation to the health system as a whole.

The continuum of health care for the purpose of this thesis has been divided into four overlapping compartments [9]. These compartments are listed in Table 1.1, and form the four sub-units of research activity using the common theme of multidisciplinary community health care and "rehabilitation".

1.3 Population and participants

There were different groups of patients recruited for this study in each of the four compartments of care which are defined for this thesis as: acute, subacute, community outpatient, and maintenance care.

The patients in the acute, outpatient, and maintenance compartments were drawn from members of the Macarthur community attending the public health facilities of Macarthur Health Service (MHS) and General Practitioners of the Macarthur Division of General Practice. The hospitals involved were Campbelltown and Camden Hospitals, which are the hospitals administered by MHS.

Table 1.1 **Compartments of health care**

Compartment 1: **Acute**	Stabilization of illness or injury with medical and surgical management, early rehabilitative measures to prevent secondary impairments and initial remobilisation. (This is almost entirely conducted in an acute hospital bed.)
Compartment 2: **Subacute**	Comprehensive assessment and intensive inpatient rehabilitation to enhance level of functional independence and psychological adjustment, prescribe appropriate prostheses, orthoses, aids and equipment, and assess necessary home modifications in anticipation of discharge. (Usually admitted to a subacute bed in a rehabilitation centre.)
Compartment 3: **Community Outpatient**	Resettlement into a safe independent living environment with continuation of therapeutic input as an outpatient to achieve patient's optimum recovery and potential. This also covers further education and retraining if required and return to work and leisure pursuits. Treatment is delivered as day therapy, day hospital, and/or outpatient therapy.
Compartment 4: **Maintenance**	Ongoing management of chronic disease and disability with maintenance of support network. Treatment is delivered by a GP, a specialist and/or an outpatient clinic.

The sample population for the subacute phase of the study was drawn from older patients attending Royal North Shore Hospital, Greenwich Hospital and General Practitioners of the Northern Sydney Division of General Practice.

1.4 Clinical governance and multidisciplinary community health care

The term "clinical governance" has been introduced into all medical practice since Scally and Donaldson explained the responsibilities of leadership and shared accountability for patient care of all members of the health care team [10]. The components of a clinical governance structure are easily identified in the practice of multidisciplinary care, which has a culture of teamwork where the goals of the patient team and organisation are aligned. The multidisciplinary model used in Rehabilitation Medicine is different from many other medical specialties. It uses data to monitor patient functional outcomes and learn from failures. Risks to patients and staff are minimised through policies and procedures, and monitoring of adverse events. Two examples are environmental checklists for staff safety when home-visiting patients, and home visits for patient safety prior to hospital discharge [11]. The use of communication systems and information systems promotes optimal performance.

The features of clinical governance are complementary to the infrastructure of rehabilitation medicine tested in part of this thesis. These features are not evident in the traditional processes of care that may be loosely referred to as rehabilitation. There are many examples in acute hospital care where team members may never meet or plan patient care until the point of patient discharge. The subacute phase may be well planned. However, longer-term care in the community is often poorly integrated. The author's observation from

administrative duties in both a teaching hospital and a metropolitan hospital is that outpatient treatments have the least developed governance structure, with poor communication, if any, between individual team members such as therapists and general practitioners.

The term "Multidisciplinary Community Health Care" as used in this thesis refers to the presence of a multidisciplinary care team and a patient management plan. The governance structure which relies on quality systems is dependent on accurate data. The relationship of data and best practice is addressed within the study of acute multidisciplinary community care in Chapter 7. Accountability and responsibility are integral to an infrastructure of care with documented treatment plans and identified patient goals and outcomes. This aspect is monitored through a data system developed as part of this thesis (Chapter 3).

1.5 Traditional community health care

The alternative to the intervention of multidisciplinary care, planning, and measurement, is the application of traditional medical care. This traditional care is characterized by individual disciplines working alone and distant from the full range of formal health care providers. Informal providers such as patients and their families assume a passive role, accepting care though not involved in decisions regarding treatment.

The involvement in patient care of general practitioners (GPs) and community health services varies progressively across the four compartments. It is greatest for the maintenance compartment of care (low-acuity), and lowest for the acute compartment of care (high-acuity). GPs or families are not always invited into

decisions regarding management of patients in acute or subacute hospital beds. Outpatient care is usually delivered by a single therapist. Maintenance care is frequently the sole domain of the GP.

1.6 Hypotheses tested in this thesis

They are:

Hypothesis I: Multidisciplinary community health care as a model of health service delivery can be implemented as an alternative to existing systems of acute hospital, subacute hospital, community outpatient, and maintenance care.

Hypothesis II: Multidisciplinary community health care provides better quality of care than existing systems of acute hospital, subacute hospital, community outpatient, and maintenance care.

Hypothesis III: Multidisciplinary community health care provides improved resource utilisation compared with existing systems of acute hospital, subacute hospital, community outpatient, and maintenance care.

CHAPTER 2

LITERATURE REVIEW

2.1 Literature review

This literature review was performed to search for evidence of success or failure of existing models of multidisciplinary care. The term "multidisciplinary" was not as useful as first expected in determining the ingredients of a successful multidisciplinary team. An example is the wealth of evidence in favour of multidisciplinary stroke units [13,14]. It is clear that stroke units are associated with good outcomes through multidisciplinary care, although the components that contribute to those outcomes are still regarded as a "black box" [15,16]. The effectiveness of care is often reported as either resource savings, recovery of function or satisfaction with an intervention. This review was intended to look globally at physical, psycho-social and resource issues in multidisciplinary and community care.

Articles were collected using Medline and CINAHL databases and the author's personal collection. Key words for the search were: Informatics and Quality; Outcomes; Allied Health; Physiotherapy; Speech Pathology; Occupational Therapy; Casemix; Ambulatory Care; Hospital in the Home; and Outpatients. One hundred and fourteen articles were realised from this search. Twelve were rejected as they added little value to the study. Ninety-four articles were used as well as two textbooks. This chapter cites 56 of these, and the remainder are cited within introductions to appropriate chapters.

A variety of methods of reviewing the literature were considered, including the NHMRC guide to designation of levels of evidence [17]. This system was considered inappropriate as initial literature review revealed little in the way of original research through refereed journals or clinical trials. The Physiotherapist

Evidence Database (PEDro) [18], which has a less rigorous approach, was also explored. Papers and content data were reviewed listing themes (informatics, quality, outcomes, resources and other) and the type of paper (research, review, editorial, letter or other). Review notes were prepared on every paper, and papers were either accepted or excluded from the review process.

The distribution of articles according to the type of evidence available in the literature was explored. The articles were classified as either research-based, editorial, reviews or "other". The articles classified as "other" included such things as letters to the editor. As less than half of the articles were classified as research-based, no attempt has been made to categorise the research articles according to levels of evidence. It appears that the lack of research-based literature collected is a reflection of the lack of evaluation that has been undertaken in the allied health disciplines which contribute to multidisciplinary care.

2.2 Quality and health care

A Framework for Managing the Quality of Health Services in New South Wales identifies six dimensions of quality as follows [19]:

1) Safety: The safe progress of patients/consumers through all sections of the health service.
2) Effectiveness: The treatments received are likely to produce a measurable benefit to the consumer.
3) Appropriateness: Using evidence to deliver the correct intervention to the right person in a timely manner.

4) Consumer participation: Participation by consumers in the decision making processes should ensure service acceptability by the broader community that exceeds their expectations.
5) Access: Access to services is based on consumer need.
6) Efficiency: Resources are used carefully to achieve value for money.

The New South Wales Department of Health underpins this structure with five cross dimensions related to the quality of health care services [19]. These are:

1) Competence of providers of health care, achieved through various mechanisms including peer review, selection processes and ongoing training.
2) Continuity of care, which includes outpatient services and General Practitioners.
3) Information management to improve the quality and availability of information to health staff.
4) Education and Training for quality, the provision of ongoing training for all staff.
5) Accreditation where an external body can assess and determine compliance with agreed standards.

The NSW Department of Health asserts that these dimensions form the basis of a quality system of health care. This framework exhorts the value of information to assess the quality of services. It further suggests that the data that is gathered must be used for planning and resource allocation as improvement of care is dependent, in part, upon the exchange of data about the quality of care provided.

The NSW Department of Health and Smith both stress the importance of innovation, communication, teamwork, research and evaluation, consumer participation and appropriate service delivery to provide a quality service[20].

Smith supports this approach to the provision of quality health services[20]. In a discussion with other health professionals, he asserts that reconfiguring health services should be driven by the need to improve quality, while conceding that it is probably often driven by the need to reduce costs. He also identifies eight principles that need to be employed to reorientate health services to providing a quality service:

1) Local decision makers need to feel able to resolve their own problems.
2) A wholistic approach to service delivery.
3) Hospitals should not be expected to provide all services, dependent on population size.
4) Services need to be located close to home without compromising quality.
5) No physician (or therapist) should work in isolation, but rather as a member of a team.
6) Research and evaluation should be encouraged to facilitate sound decision making.
7) Think differently.
8) The public/consumer must always be involved in the decision making process.

The descriptions of adverse events reported in the Quality in Australian Health Care Study (QAHC) by Wilson *et al* were able to categorise human error and explore prevention strategies to minimise such errors[21,22]. They reported that hospital care may be associated with a high level of adverse events, with 16.6% of hospital admissions resulting in an iatrogenic patient injury[21].

The indicators that were used in this QAHC audit were:

1) Human error: This dealt with lack of training or expertise of health staff.
2) Delay: It is recognised that timeliness is a hallmark of a quality and effective health care service. This indicator reported on those occasions when the health care provided was not performed in a timely manner.
3) Treatment: This represented no, inadequate, wrong or inappropriate treatments.
4) Investigation: This was where there was no or inappropriate investigation of the problem.

There are no such data currently available on the full range of ambulatory care services, although the indicators used in the QAHC audit could be adapted. The Australian Council of Healthcare Standards has developed two indicators for "Hospital in the Home" (HITH)[23]. The first indicator is "patient safety and selection". This is measured by the number of patients making one or more unexpected telephone calls or one or more unscheduled staff call-outs, during the patient's HITH admission. The second indicator is "program interruption". This is measured by the number of patients who have an unplanned return to hospital.

This also includes those who do and those who do not return to the HITH program during the current admission. These indicators only relate to HITH services and not broader ambulatory services delivered on an outpatient basis, which to date appear to have been ignored in quality audits.

It is a widely-held opinion that there is a link between a quality service and evidence-based practice[25]. This opinion and concept is still debated, as doubts still exist on the reliabilty of RCTs and meta-analysis as "gold standards" [26]. Goode and Peidalue developed a model called the "Evidence-Based Multidisciplinary Practice Model" to evaluate the strength of evidence [24]. The model is centred on valid and current research. Feeding into this core of research are other areas where evidence can be found such as infection control and benchmarking data. Best-practice guidelines can be developed and implemented at the clinical level from this evidence.

The pressure to demonstrate effectiveness and outcomes can lead to problems. This pressure to gather evidence to "prove that it works" can lead to the temptation to be less rigorous in the evaluation. Salzer *et al* in a review of studies of health outcomes suggests that the rush to demonstrate the value of services creates an opening for over-interpretation of research results, and it is possible that these outcome-study approaches may lead to maintenance of programs that are minimally or not at all effective [27]. Some clinicians believe that they do not have the time to evaluate effectively their work to provide evidence for service provision. Supporters of evidence-based medicine (EBM) argue however, that a clinician who has taken the time to develop an EBM approach may actually save

time by decreasing the number of interventions that need to be carried out for the patient [24].

Consumer satisfaction is increasingly regarded as an important indicator to assess the quality of health services and assist in planning service development. It is well accepted that perceptions of quality can differ between consumers and service providers and it is no longer appropriate for providers to assess services without input from consumers, both patients and carers. Consumer satisfaction is closely linked to their expectations. Anand and Myles discuss the usefulness of patient satisfaction surveys, and state that those who are concerned that these measures are ineffectual will find that the fault lies with their measurement tools and interpretation [28].

The participants in two RCTs of HITH rated their satisfaction with the service as "good" and "excellent" [29,30]. However, it was noted that, for patients who were randomized to hospital care, their levels of satisfaction increased relative to that of HITH patients after three months' post-intervention. Patient and carer satisfaction was higher in the HITH group than the hospital-treated group in the RCT conducted by Caplan *et al* [29]. General Practitioners too, reported equal satisfaction by home and hospital treatment despite their increased workload. Caplan *et al* believe that increased satisfaction with HITH may be because patients are in their familiar environment, their privacy is protected, their sleep less interrupted, and they can eat their usual food [30].

An important question that should not be minimised is whether the care or intervention makes a difference to the patient. Clinical assessment of

improvement is an important dimension of this statement. However, the importance of incorporating patient assessment of outcomes and their perception of change in their health should not be undervalued. One way of incorporating this in practice is to develop contracts with patients such as negotiated goals and use the patients' perception of improvement to assess the achievement of outcomes [31].

Accreditation is identified as a key aspect in monitoring quality health service delivery [19]. The International Organisation for Standardisation (ISO) is an internationally adopted system for monitoring quality assurance. ISO was used at Macarthur Health Service during the period of this study. The aim of ISO is to achieve customer satisfaction by adherence to stated quality protocols (Australian & New Zealand Standard, 1994) [32]. The emphasis of this approach is on process rather than outcomes.

2.3 Measuring outcomes in health care

The incorporation of outcomes in the assessment of health care delivery has been identified as important in order to determine the effectiveness of interventions, especially as a routine method to monitor quality of care. Any measure of health outcomes must identify changes in the health of an individual that are either directly or indirectly attributable to the intervention, or series of interventions performed. This focus on the measurement of health outcomes has, in many ways, been driven by the way health services are provided, financial constraints, accreditation processes, and a shift in patient/carer expectations of health services [24]. The profile of ambulatory and outpatient care is currently of great interest to health planners because medical care is shifting from hospital to

outpatient settings. Berlowitz *et al* note in reference to this shift of care that the demand will be for outcome measures that may be used in profiling care [33].

Vandenberghe highlights the importance of incorporating the capture of outcome information during routine treatment activities, in order to achieve quality improvement in general practice [34]. Many published studies employ a research assistant to collect and analyse outcome information. However, most services are not in a position to employ extra staff to capture this information, and need to look at opportunities to gather this information at the same time as providing care. The challenge for health care providers is to develop efficient systems to identify and capture outcomes.

Individual allied health disciplines have developed outcome measures. For instance, physiotherapists use a "Mobility Scale" for stroke patients [35]. Other measures of mobility are chosen such as walking speed and "Timed Up and Go" test [36] which forms part of falls and mobility clinic activities. Occupational therapists use the activity of daily living scales, the most common being the Barthel Index [37]. Many of the simple activities of daily living measurements have been superseded by the "Functional Independence Measure" (FIM) [38], which forms part of the Australian National Subacute and Non-Acute Patient Classification (AN-SNAP) rehabilitation casemix classification system. Dietetics uses the "Body Mass Index" and skin fold test for nutritional assessment [39]. A variety of health professionals may be involved in the assessment of pain, and use pain scales such as the "Visual Analogue Scale" (VAS) and "McGill Pain Questionnaire" [40].

Although these measurements are widely used and validated, some are discipline specific and not all relate to a whole-of-patient outcome. The only measure which is close to being multidimensional is the FIM, which includes social cognition and motor scores. The only limitations to the FIM measurements are that they are time consuming to complete and analyse, and therefore usually inappropriate for short-course therapies in outpatient settings.

Traditional methods of evaluating health outcomes, through adverse events, clinical improvement, mortality and morbidity are proving to be increasingly limited[41]. Relying only on clinical outcome measures such as these ignores the psychological and social consequences of care. Clinicians and managers alike require new tools to effectively measure the impact of their service. It is recognized that the assessment of clinical outcomes is no longer sufficient, with increasing needs for indicators that incorporate patient concerns, including how individuals feel[42].

This change in measuring health outcomes has seen the emergence of quality of life as a more wholistic and inclusive measurement of health outcomes[43]. However, quality of life as a health outcome can be difficult to assess due to the complexity of the concept and also because of difficulties in the use of measurement tools. Current measures such as the "Sickness Impact Profile" (SIP)[44] and the "Short Form 36" (SF36)[45] are time consuming and difficult to implement for short-term therapies such as those applied during the ambulatory episode. Simpler measures are the patient generated index[46], and the pictorial Dartmouth charts[47]. These shorter measures may be more useful for patient management and outcomes and less useful for research purposes.

The literature reminds us that quality of life, by definition, is a broad, all-encompassing concept. Anderson and Burckhardt observe that there is no consensus in the health sciences on the definition of quality of life, or on its measurement [48]. They suggest that no concept or variable generates as much confusion and controversy as does quality of life [48]. Cheater endorses this view when she describes quality of life trying to be all things to all people [41]. A common definition is difficult, as quality of life is a vague term that has been interpreted in different ways by different people [41].

There is little agreement in the literature on the precise definition of quality of life, because it is a subjective phenomenon, although definite themes encompassing quality of life have emerged. It is generally understood that quality of life is a unique concept that comprises a number of common domains found in all people, whether sick or well. Health is seen to be only one of these domains and the importance of the health dimension tends to gather more importance the older a person becomes. Medical researchers use the term "Health Related Quality of Life" (HRQL) to increase the focus on the health perspective [49].

Not only are there problems of precisely defining quality of life, but also difficulties in measuring quality of life. There are many quality-of-life measurement tools, and concerns are raised in relation to their validity and reliability. Do they achieve what they set out to achieve? Cheater, in an evaluation of over 200 quality of life measurement tools, raises the concern that only a few were designed from an end-user perspective [41]. She advises that most of the quality-of-life measures come from a practitioner's view of quality of life, that the patient can more accurately assess their own quality of life, and often

practitioners' expectations are at odds with their patients. Cheater reveals from her analysis that only a few quality of life measures have been developed based on what patients, users of the service, or the public identify as relevant domains of health [41].

The call is for reliable and valid tools to measure quality of life. Guyatt *et al* describe the ongoing use of a measurement tool as ongoing validation: "Validation does not end when the first study with data concerning validity is published, but continues with repeated use of the instrument." [49]. The literature encourages researchers to apply stringent procedures to ensure the data collected are valid and reliable. Several papers list in detail the essential characteristics of a good measure. These include validity, reliability, sensitivity, acceptability and appropriateness [41,42,50].

2.4 Information management in community and ambulatory care

Information technology can be found at all levels of health services. Informatics plays a vital role in the delivery of effective health services. Health informatics has been described by Graham as an evolving scientific discipline that deals with the collection, storage, retrieval, communication and optimal use of health related data, information and knowledge [51].

The growth of technological advances in health care is well documented. However, focus is now being directed to using information management and technology to better understand and interpret data to inform better decision-making. Palmer, Kent *et al* argue that, just as clinical decisions should be based in evidence, so too should management decisions [52,53]. Armstrong and Kricker

report on linking existing health related databases in Western Australia in an attempt to produce better and more efficient routine measures of the performance of health services[54]. They highlight five reasons as to why the linking of the databases was eventually successful. These include:

1) The will or desire to ensure the project worked.
2) The availability of software for the project to be able to occur.
3) Better and cheaper computer technology.
4) Co-operation with key stakeholders.
5) Funding.

This is only as good as, and made possible through, reliable data entry and the development of an appropriate data set.

Holman, Bass, Rouse and Hobbs agree with Armstrong and Kricker in their support for studies of systematic linkage of health outcomes[55]. Such studies are needed to provide a comprehensive assessment of the performance and safety of a health care system.

Since the development of The Casemix Development Program in Australia over 16 years ago, there has been little work done on classifying and costing ambulatory services. Two major projects were conducted looking into this issue, although they were primarily designed to test some overseas classifications. They did, however, identify issues for future ambulatory classification projects. Cleary *et al* emphasize the need to establish a standard classification for ambulatory

patients if equity in funding is to be achieved in respect of this type of patient profile [56].

Tenan *et al* also acknowledge the importance of finding a standard classification system for ambulatory care, but warn that ambulatory care practice is extremely resistant to codification [57]. They also recognise that this is in part due to the diversity that characterises ambulatory service delivery arrangements. Berlowitz *et al* support this view, noting that the most striking feature of ambulatory care is the variety of different providers and settings in which it is practised [58].

Attempting to transfer inpatient classifications across to ambulatory care has proven to be unsuccessful, primarily for the reasons outlined above. Lee, Eager and Smith acknowledge this in part when they describe a similarity between inpatient and outpatient cost drivers, but admit that ambulatory and community care is inherently more complex than institutional care [59]. In spite of difficulties with classification, there is a need to see casemix extended into areas beyond the hospital, into ambulatory care and HITH [60]. According to Duckett and Jackson, this needs to be done in parallel with new arrangements in inpatient classifications [61].

Cleary *et al* strongly support the need for a standard classification system for ambulatory care [62]. They recommend that patient based classification is the preferred method of classification as it better reflects the clinical condition of the patient and the subsequent services required.

Another approach to classification has been functional related groups such as the Australian subacute, non-acute casemix system (AN-SNAP). This system relies on a functional, motor and cognitive score linked to the diagnostic/impairment grouping for rehabilitation. AN-SNAP shifts the focus from patient diagnosis to a change in functional status or improvement in quality of life [59]. This is because medical diagnosis has proven to be inadequate in explaining why the patient is accessing the service [63]. Lee, Eager and Smith have explained that studies in Australia have continued to demonstrate that the best predictor of cost for subacute care is the goal of care. Therefore rather than using medical diagnosis, AN-SNAP uses Case Type. Each patient must be allocated to only one Case Type. These include palliative care, rehabilitation, psycho-geriatric care, geriatric evaluation and management, and maintenance care.

2.5 Resources in community and ambulatory health care

Cost factors and efficiencies are also important quality measures. However, cost comparison alone should not be undertaken unless the effectiveness of various approaches to be compared is known. Effective outcome measures are important to achieve appropriate comparison of efficiency. Berlowitz, Rosen and Moskowitz remind us that all stakeholders in the health care setting, from consumers to providers, have a vested interest in the efficient delivery of ambulatory care services [64].

Accurate costing of health service delivery is a challenge for health service managers, especially in allied health and ambulatory care settings. In New South Wales, allied health services are traditionally block funded, based on occasions of service targets and historical budgets. These block grants do not recognise the

service specific differences in the episodes of care provided, and can result in inequities in funding. As well, it has been noted that under such funding arrangements there is little incentive for quality service delivery or attainment of the best outcome for all stakeholders [65].

Grimmer and Bowman identified that, in order to accurately cost physiotherapy service, an episode of care needs to be considered, not just occasions of service [65]. This was based on the evidence that physiotherapy requires an ongoing therapeutic approach, not just one-off interventions. Duckett and Jackson support the view that occasions of service are inadequate in measuring ambulatory care services [61]. They state that using occasions of service promotes and rewards recorded activity when there has been no actual increase in the effectiveness of services provided. They suggest that removing the emphasis from individual occasions of service encourages hospitals to monitor the individual inputs to care and manage them more efficiently. This approach also promotes improved continuity of care, both between outpatient and related inpatient activity, and also, importantly, in the care of the care of patients with chronic diseases [61].

In comparison to allied health, more work has been done on reviewing resource utilisation for HITH as an alternative to inpatient care. Hensher, Fulop, Hood and Ujah focussed their study on the cost effectiveness of HITH in relation to orthopaedic episodes [66]. The study noted that the costs for this care were lower per day than those of inpatient care, but HITH seemed to lengthen the total duration of orthopaedic episodes. As a result, the average cost per episode was higher. The authors drew the conclusion that although early discharge may offer a cost-effective alternative to inpatient treatment, it will need to provide costs of

episodes that are lower than those of inpatient care by reducing the length of stay in HITH settings.

In an earlier population-based study by Hollingworth, Todd and Parker, however, it was found that the cost of HITH was substantially less than inpatient hospital care [67]. This study focussed primarily on early discharge for hip-fracture patients. The authors measured direct costs incurred, and found that those who accessed treatment at home were less of a financial burden than those who remained as inpatients. It was noted, however that higher readmission rates were recorded for those patients receiving HITH.

It is recognised that costing HITH services compared with inpatient hospital services is difficult. Montalto cites significant savings to be made in nursing, catering and laundry for HITH [68,69]. More important is the potential to recover further funding by the availability of more hospital beds, especially in a casemix funded environment.

In an Australian study, Vinen reports reduced costs for ambulatory care in comparison to hospital-based care [70]. In looking at the benefits of Outpatient Parenteral Antimicrobial Therapy (OPAT), Vinen reports that not only was there lower cost per treatment, but there were other patient-related benefits. These included avoiding the hazards of hospitalisation, improved patient productivity, at work, at school, and an increase in patient satisfaction.

A review of outpatient HITH treatment with parenteral antibiotics by Balinsky and Nesbitt concluded that, while the studies did show a cost reduction compared

with hospital based care, more attention needs to be put on indirect cost [71]. These indirect costs are more difficult to quantify, but include things such as disruption to the family routine, reduction in time travelling to and from the hospital for carers and disruption to work and school life. These indirect costs have more of an impact on the quality of life of the patient and family. It is interesting to note that Balinsky and Nesbitt reported that the literature they reviewed focussed on the cost, but failed to adequately measure health outcomes, quality of care and patient preference issues [71].

Savings from a patient perspective was explored by Eisenberg and Kitz when they measured time spent away from work [72]. Vinen warns, however, that this approach to patient care also presents several challenges such as ensuring appropriate patient selection and close patient monitoring [70].

A review of resource allocation alone would be inappropriate for outreach services to be embraced as an alternative to hospital-based services. There are also considerable data measuring the health outcomes of HITH [73]. In a systematic review of randomised controlled trials of HITH, it was concluded that there was no difference in patient outcomes [74,75]. Hensher *et al* identified three subsequent studies, which also reported no difference in patient outcomes between HITH or acute hospital settings [76].

Dale *et al* undertook an observation of costs for emergency presentations managed by general practitioners and compared them to management by senior house doctors or registrars [77]. The results indicated that the management of this

type of patient by general practitioners was at a lower cost per patient than by other types of doctor, with no detrimental effect on outcome.

Davis studied peoples' preference to visit an emergency department rather than their own general practitioner during what they perceived to be an emergency [78]. The study concluded that more than half of the emergency presentations could have been handled in a general practice environment. Patients reported that they did not want to bother their general practitioner, or they felt their condition was beyond their practitioner's skill level. Davis concluded that patient care would be improved and the expenditure on accident and emergency services reduced by attempting to change perceptions [78].

The physician has an influential role in resource utilisation, according to Fine *et al* [79]. Their paper points out that, if we had an understanding of the clinical and psychosocial factors that practitioners used to make their decisions, this could lead to a more efficient use of the hospital. This study identified that, while practitioners rely heavily on clinical factors to make hospital admissions, often they would overestimate the seriousness and morbidity, whereby also influencing their decision to hospitalise.

Physicians' training and work location can also have an impact on a more efficient use of resources. In a United Kingdom study, the use of resources in diagnosis during triage in an accident and emergency room in a large hospital was measured for staff doctors and locum general practitioners [80]. The study concluded that general practitioners were generally less likely to order tests or interventions than hospital-based doctors. The general practitioners' approach

greatly reduced the cost of admission. This paper highlights the need for more defined triage criteria to bridge the gap between those cases that are borderline accident and emergency and primary health care patients. They also reported no difference in the perceived or actual patient care/satisfaction between the services they received.

The technological advancement in health care provision has seen a dramatic change in how people are cared for. This technological improvement has supported more home-based care. For example, interventions such as renal dialysis which once of necessity took place in a hospital setting can now occur easily and efficiently at home. However, the key to better health resource management is more complex than transferring health care services from the hospital to the home. A costly characteristic of the health care system is the inappropriate admission to hospital. Hensher *et al* discussed the efficiencies to be gained by preventing presentation in the first instance through primary health care strategies such as health promotion, to the redirection of presentations to facilities and services better equipped to deal with the problem [76].

A more co-ordinated approach to patient care has also been identified as an effective resource management tool to achieve improved efficiency. Gow noted that co-ordinating service delivery allowed services to be accessed more easily, preventing unnecessary use of health services and also facilitating better communication between the various health disciplines [81]. The study reported a decrease in inpatient costs especially in high-risk intervention groups because of shorter length of stay.

Palmer challenges the health service sector to base resource management on evidence, just as clinicians are expected to base their medical practice on evidence-based medicine [52]. Massel supports this view, suggesting that health practitioners should also use evidence-based budgeting as a basis for the delivery of health services [82].

The "Activity-Based Costing" (ABC) model is a "bottom up" approach to service costing which provides managers with evidence on which to base clinical costing. The ABC model identifies the causal relationships of cost drivers to activities [83], and measures the cost and performance of activities, resources, and "cost objects".

The "Yale Cost Model" takes the opposite approach, and uses a "top down" approach [84]. The main difference in this approach is how costs are attributed. In the ABC model, costs are based on activities undertaken. The more traditional approach relies on allocating indirect costs to individual services or products. This allows for cross subsidisation between services and products, making the actual cost of the service or product unclear. The Yale approach also uses the costs incurred as derived from the hospital's central accounts. There is some concern about its accuracy. Activity Based Costing can provide a more strategic view of the information useful for making business decisions in comparison to traditional approaches. It offers a framework which identifies costs more accurately, and which lays the foundation for analysing the performance of a business unit by determining whether the activities undertaken to achieve a stated outcome are actually adding value to the accomplishment of that outcome. This approach has potential for allied health care service delivery. By attributing cost

to interventions and activities performed, senior managers may have more information on which to base their resource management decisions.

Grimmer and Bowman undertook a study to identify cost drivers in physiotherapy services[65]. Their focus was to cost an episode of physiotherapy care, from admission to discharge. The duration of the therapy constituted one episode of care. The analysis focussed on using the data routinely collected by the physiotherapist including: start and end dates of the episode of care, the number of occasions of service, and the attributable time per occasion of service, diagnosis, outcome of care, and consumables. On completion, and after analysing over 1000 episodes of care from six hospitals, a number of factors were identified that impact on the cost drivers of physiotherapy services. These included age, referral mechanism and source of income.

2.6 Summary of literature

Guidelines for quality service delivery in health care are well developed at state (NSW DOH), national (ACHS), and international (ISO) levels. Published indicators of quality include patient satisfaction and adherence to evidence-based practice and monitoring of adverse events. The focus of the published literature is on hospital practice. The development of new models of community care will need to encompass the existing principles of quality management and develop indicators that are relevant to the community health environment.

The measuring of health outcomes has not been universally adopted within the outpatient, ambulatory or community sector. Patient outcomes in this area of practice may not be based on medical diagnosis. Tools that have been most

successfully used are functional improvement measures, quality of life measures, and customer satisfaction surveys. These tools are common to many community service providers such as rehabilitation and home care services, and require multidisciplinary input.

Clinical and management decision-making can be assisted by improved information management systems. Linking of information systems and databases may increase the evidence on which to base decisions. Hospital and community data is compartmentalised and does not inform multidisciplinary allied health community services. The literature reviewed does not indicate that a multidisciplinary approach has been applied to data collection systems within health systems.

There has been little documented research on allied health cost effectiveness. Current systems using occasions of service are not useful. Diagnostic or service profiles were not available in the outpatient ambulatory community sector during the conduct of this thesis.

The further development of new models within this thesis will attempt to incorporate quality systems and patient outcomes suitable measures for community care that are also linked to resource utilisation. The collection of data for this thesis required the establishment of a new system, because the literature did not reveal any existing multidisciplinary system.

CHAPTER 3

DEVELOPING A MULTIDISCIPLINARY DATA SYSTEM

Containing information from:

Wilson S, Macarthur Ambulatory Information Infrastructure Project, *MAP Report*, Macarthur Health Service, Report submitted to NSW Department of Health 2000

3.1 Introduction

The measuring of health care inputs by casemix and diagnosis-related groupings (DRGs) was a fundamental shift for hospital-based care. The system was originally invented by Professor Fetter at Yale University as a quality assurance tool [85]. This US system was adapted for Australia. It was introduced into the Victorian public health system in 1993 and was, over the following few years, introduced into all the other states.

The cost of care for individuals and groups uses the DRG system to aggregate all the inputs for that group. This provides the data to apply costs to the inpatient episode of care [86]. The so-called "cost bucket" contains, among other things, ward medical, ward nursing, pathology, imaging, allied health and pharmacy. This is a fairly sophisticated system used to measure the hospital episode of care. Length of stay and weighting by type and severity of cases in the acute compartment is closely linked to costs, and is often applied as a performance indicator of hospitals generally [87].

This hospital inpatient approach ignores other parts of the total care of a patient within the ambulatory or community component of their care. The only data reported at an administrative level for this component of care is non-admitted occasions of service (NAPOOS), for example, Macarthur Health Services outpatient service operated with an estimated throughput of 113,888 non-admitted occasions of service in 1997/98 [88]. In the absence of an integrated system, individual disciplines, for example, community nursing and physiotherapy, have developed their own data sets for ambulatory and

community care which are generally used only within their isolated departments and disciplines.

The idea of an "episode" of health care means different things to different people within that system of care. The patient's perception of an illness episode will relate to his or her experience from commencement to resolution of the illness. In contrast, the provider will relate to a disease episode which may commence with history and diagnosis and will be completed after treatment when the provider determines that it is resolved. This provider approach is typical of hospital care. The third and more complete approach is to look at care episodes which contain all the components of care including hospital and ambulatory services [89].

The existing information systems within the settings for this study provided a challenge to the evaluation of models of multidisciplinary community health care. As a result, the author developed a new data system to support this study within the allied health departments at the Macarthur Health Service. This project was designed to measure inputs to patient care for this group of disciplines, regardless of inpatient or ambulatory status of the patient. The project was called the Macarthur Ambulatory Project or MAP. The acronym promoted the idea of a patient journey. The patient collected experiences (e.g. treatments and interventions) as they travelled through the time period of their health care experience. The output of the data system was expected to "MAP" their course of treatment or care episode against a minimum data set which was common to all disciplines involved.

The confusion surrounding terminology used by providers and administrators regarding episodes of care, occasions of service, and encounters was overcome by the definition of a new term for exclusive use during implementation of the MAP. The term "quantum of care" was used in its non-scientific interpretation for the quantity of patient care. The definition of a "quantum of care" was: The quantity of patient care, including all interventions and activities, that is delivered by subscribers to the MAP data system, from commencement to completion, for admitted patients and non-admitted outpatients.

3.2 Aims and objectives for the MAP

The aim of the MAP was to implement a data system as a management tool for allied health and outreach nursing which would also be useful for studies conducted within this thesis. The information collected was expected to promote interdepartmental teamwork and multidisciplinary care by common data entry on an integrated system. The data would also be patient-focused and produce evidence that would inform clinical and management decisions.

The objectives included identifying groups of patients not only by medical diagnosis but also by main problem and service type which were relevant to allied health disciplines. The "quantum of care" was to contain patient functional data, clinical outcome and resource data such as treatments, interventions and time units.

3.3 Method of data development

The participants were members of the Ambulatory Care Continuum which (at the time of the study) was the divisional structure comprised of Social Work,

Occupational Therapy, Physiotherapy, Dietetics, Speech Pathology and Macarthur Ambulatory Care Service Nursing (hereafter referred to in this chapter as MACS).

The setting was the Macarthur Health Service's inpatient, outpatient and community health facilities. The departments and disciplines of the Ambulatory Care Continuum delivered their services at Camden Hospital, Campbelltown Hospital and five community health centres.

A collaborative approach was used to develop the Minimum Data Set with allied health managers and clinicians. The development kept the datasets in line with the existing National Institution-Based Ambulatory Modeling (NIBAM) Project and other data sets [90]. These other resources were as follows:

1) Data Dictionary, version 1.0, NSW Allied Health Data Collection [91].
2) Data Dictionary for Emergency Departments in NSW Public Hospitals [92].
3) ICD-9 – CM Alphabetic Index of Diseases [93].
4) National Health Data Dictionary, Version 8 & 9 [94].
5) Data Dictionary of the Ambulatory Information Infrastructure Project [95].

Meetings were held with department managers and clinicians to review the existing discipline-specific data sets that they were currently using. Each data set

was reviewed and relevant codes were extracted. These data and code sets were aggregated across a spreadsheet where duplicates or inconsistencies were removed. This revised data set was compared to the existing published data sets and minor adjustments were made.

The information involved in the core process of the Ambulatory Care Event, a component of the NIBAM model, included: Communication Data and Ambulatory Care Visit Data, Appointment Data, Triage Data, and Service Event Data definitions. These definitions depend on the prevailing circumstances at the point of the collection. The MAP code sets covered the majority of the information required with exception of booking data. Table 3.1 relates the minimum dataset to the core processes in the NIBAM model.

Table 3.1 **Minimum data set**

Minimum Data Set	Core Process
Medical Record Number	Communication & Ambulatory Care Visit Data
Date of Birth	Communication & Ambulatory Care Visit Data
Sex	Communication & Ambulatory Care Visit Data
Postcode	Communication & Ambulatory Care Visit Data
DVA Colour	Communication & Ambulatory Care Visit Data
DVA Number	Communication & Ambulatory Care Visit Data
Indigenous Status	Communication & Ambulatory Care Visit Data
Referral Source	Communication Data
Ambulatory Care Admission Date	Ambulatory Care Visit Data
Medical Diagnosis	Communication Data
Clinical Service Type	Communication Data
Main Problem	Communication Data
Activity Type	Service Event Data
Intervention	Service Event Data
Time Units	Service Event Data
Session Time Units	Service Event Data
Ambulatory Care Discharge Date	Ambulatory Care Visit Data
Reason for Discharge	Ambulatory Care Visit Data

Note: Code sets for main problem, activity and intervention appear in Appendix 1

When the review and adjustment phase was completed, the data set was then installed onto the MAP computer data collection software system (Allied Health System Version 4.5), which was an existing system or "platform" available through the NSW Department of Health.

3.4 Method of implementation

A draft data dictionary containing the common code sets (Appendix 1) was developed during the period of implementation, and given to each discipline department. Most department managers extracted the relevant sections for their staff and kept a copy near the computer for easy reference.

The final data set was presented to all clinicians and managers at two training workshops to demonstrate the data display as it appeared on the MAP system. A trial period was organised for clinicians to review the data set in "action" by entering data as they would normally. This highlighted any inconsistencies or problems, which were amended, where possible, prior to the real collection of data. The offer of a trial period also identified the varying degrees of computer and data entry competency of staff members, which could be remedied.

During the trial period, training was offered to all staff on basic computer literacy and on using the MAP system for data entry. This consisted of two 2-hour group sessions with at least one session per department and many individual training sessions. The diversity of training types and high number of sessions offered was to combat the broad range of computer competency within the user group of approximately 80 therapists.

Training was ongoing throughout the duration of the study, especially for any newly recruited staff beginning data entry. An initial training session was given by the project officer where a new staff member had started. This session was also implemented for those staff that had used the older single-discipline Allied Health System version 4.1 in order to demonstrate the unique differences of entering data on our own multidisciplinary MAP system (Allied Health System version 4.5). The number of training sessions for new staff was also dependent on their level of computer competency as identified by the user and/or their manager.

Random checks were made on the data by a temporary project officer who was experienced in data management. Any anomalies were reported to the Department Managers to inform their staff so that corrective action could be taken. Anomalies included incomplete data being entered or the misunderstanding of certain fields. These minor difficulties were overcome by constantly reviewing the data and feeding back to department managers to raise issues at staff meetings. Another way of giving feedback to staff in the initial stages of the project was by circulating a newsletter. This newsletter reminded clinicians about how to enter data, changes to the system, and where to go to for help.

Collection of data was performed from 1st April to 31st August 2000. This was the period when implementation was considered completed and staff were adequately trained and conversant with the system. Selections of these data are presented here to reflect areas of interest in relation to further research studies within this thesis. The areas selected were: age and gender, sources of referral,

common clinical service types, main problems, admission data, session time units and discharge data.

3.5 Results of MAP data

These data are presented as a description of the services delivered by the members of the Ambulatory Care Continuum (Division). There were 2639 quanta of care commenced within the Ambulatory Care Continuum between 1st April and 31st August 2000. All data presented are based on this period. Each single quantum of care relates to an individual patient from commencement to completion of care regardless of inpatient or ambulatory status. A single patient may have completed two quanta of care, although this is very unlikely within the time frame of this study. The sample studied includes patients who have commenced although many may not have completed the quantum of care during the period of this analysis.

Age Range and Gender: The 1996 Census of Population and Housing for outer South Western Sydney states that the ratio of males to females is 49.3% to 50.7%. Compared with these figures, there was a slightly higher proportion of females accessing services than would be expected. The figures indicate an over-representation of the elderly with a greater burden on health services in comparison to population figures. The large numbers in the paediatric and adolescent area are consistent with the demographics of the rapidly growing population of this district (Table 3.2).

Table 3.2 **Age distribution and gender**

	Number	% Of MAP subjects	% Per 1996 Census
Age Range (years)			
0-9	407	15.42	18.93
10-19	184	6.97	17.84
20-29	206	7.81	14.86
30-39	263	9.96	16.47
40-49	288	10.91	15.33
50-59	309	11.71	8.17
60-69	281	10.65	4.39
70-79	330	12.50	2.85
80-89	242	9.17	1.02
90-99	34	1.29	0.13
>99	1	0.04	0.01
Incorrect Data	92	3.49	-
Not entered	2	0.08	-
TOTAL	**2639**	**100.00**	**100.00**
Gender			
Male	1185	44.9	49.3
Female	1454	55.1	50.7
TOTAL	**2639**	**100.0**	**100.0**

Admission Data: The data on "admission type" demonstrate that there was a much higher proportion of outpatient-only treatment than all other treatments combined. The ratio of outpatient to inpatient activity was 78% to 22%. The definitions of admission types are as follows with items in italics.

Outpatients are those patients treated by allied health therapists and nurses who have had no hospital admission to Campbelltown Hospital during their quantum of care. *Inpatients* are those patients, whose entire quantum of care occurred during a hospital admission, who received treatment by allied health therapists. *Day Only* patients are those admitted to the Macarthur Ambulatory Care Service (MACS) for a day-only procedure. This is considered to be an inpatient service of the hospital located within the hospital building. *Inpatient/Outpatient*

admissions are those patients treated by allied health professionals both during and after their admission to Campbelltown Hospital. *Day Only/ Outpatients/Inpatients* are patients who were admitted for a day-only procedure but required follow up as an inpatient or outpatient due to a clinical reason. These data are displayed within Inpatient, Outpatient and Day Only criteria in Table 3.3.

Table 3.3 **Admission data**

Admission Type	April	May	June	July	August	Total	Percent
Inpatients Only	12	32	122	108	134	408	15.5%
Outpatients Only	416	489	354	385	418	2062	78.1%
Day Only Patients	-	7	7	4	3	21	0.8%
Inpatient / Outpatient	17	37	27	33	32	146	5.5%
Day Only / Inpatient	-	1	-	-	-	1	0.05%
Day Only / Outpatient	-	1	-	-	-	1	0.05%
TOTAL	**445**	**567**	**510**	**530**	**587**	**2639**	**100%**

The proportion of outpatient work was 22% greater in April (93%) when compared to August (71%), which was statistically significant (χ^2=80.9, df 1, p<0.001).

Referral data: Sources of referral according to type of therapist is shown in Table 3.4. Multiple referrals can be generated for a single Medical Record Number within the patient's quantum of care. For example, one patient can be seen by a physiotherapist, social worker and an occupational therapist. From the 2639 patients who commenced their quantum of care between 1st April and 31st August, 3181 referrals were generated. There is only one referral recorded per

discipline in the MAP database, which indicates that 542 referrals were to one or more other therapists.

The source is identified from where the referral was generated. This identifies the source of entry into each service and assists in determining the services required. This field also identifies the relationship and internal referral networking between the services, as well as relationships with GPs, specialists and other agencies.

Table 3.4 **Sources of referral within quantum, n=2639**

Description	Number	% Of total
Accident & Emergency	167	5.25
Allied Health (Macarthur)	211	6.63
Allied Health Other	41	1.29
Doctor (Macarthur)	531	16.70
Day Surgery	10	0.31
Diet Technician	106	3.33
General Practitioner	609	19.14
Intensive Care/Coronary Care Units	35	1.10
Non-Government Organisation	5	0.16
Nursing Home	1	0.03
Other Hospital	56	1.76
Other	106	3.33
Primary Health Nurse	66	2.07
School	32	1.01
Self/Parent	107	3.36
Specialist Rooms (Macarthur)	157	4.94
Specialist Rooms (other)	95	2.99
Therapist (Other)	10	0.31
Visiting Medical Officer (Macarthur)	39	1.23
Ward Nurse	737	23.17
Not Entered	60	1.89
Total	**3181**	**100.00**

The referral site of ward nurse (23.17%) is of interest as it closely matches the inpatient component of care from the admission data reflecting inpatient referrals. Community referrals from general practitioners were 19.14% and primary health nurses 2.07%.

Diagnosis: Therapists recorded diagnosis using the ICD-9 data set. The most common diagnosis recorded was Diabetes Mellitus (7.6%) followed by Chronic Obstructive Airways Disease (3.1%), Cellulitis (2.9%), and Low Back Pain (2.7%).

Clinical service types: Clinical service type is the classification used for the clinical stream in which services are delivered to a patient within an ambulatory care department. The most frequent grouping was musculoskeletal services (22.9%), followed by general medicine (21.3%), respiratory (7.9%) and developmental (paediatric) services (5.6%).

Problems referred: This MAP field is entered at the time the referral is taken, with each patient having a maximum of five main problems per referral. The main problem is the nature of the trigger responsible for occasioning the attendance of the person at that particular department. It is also a condition or complaint either coexisting with the principal diagnosis or one which arises during the quantum of care. This field may describe more accurately services being delivered on a departmental basis, and provides the opportunity for the patient to have input as to why they are accessing particular ambulatory care services.

Table 3.5 Admission: Diagnosis, Service Type, Main Problem

DIAGNOSIS	Code	Number	% of Total
Diabetes Mellitus	250	201	7.6
Chronic Obstructive Airways Disease	496	83	3.1
Cellulitis	682	76	2.9
Low Back Pain	724.2	71	2.7
Cerebral Vascular Accident/Infarct	436	66	2.5
Acute Myocardial Infarct	410	57	2.2
Cervical Spine Neck pain	723.1	46	1.7
Pneumonia-lobar	481	45	1.7
Shoulder – rotator cuff lesion	726.1	42	1.6
Osteo-arthritis	715.05	41	1.6
Deep Vein Thrombosis	451.19	40	1.5
Delayed Development (without diagnosis)	783.4	34	1.3
SUB TOTAL		**802**	**30.4**
Other classifications		1327	50.3
Not entered		510	19.3
TOTAL		**2639**	**100.0**

SERVICE TYPE	Number	% of Total
Musculo Skeletal	727	22.8
General Medicine	678	21.3
Respiratory	250	7.9
Developmental Services	178	5.6
Orthopaedics	176	5.5
Endocrine	171	5.4
Paediatric Medicine	162	5.1
Cardiology	141	4.4
Aged Care	101	3.2
General Surgery	83	2.6
Other Service Types	514	16.2
TOTAL	**3181**	**100.0**

MAIN PROBLEM	Number	% of Total
Pain	430	12.6
Medical Condition	337	9.8
No Apparent Disorder - but at risk	89	2.6
Activities of Daily Living/Self Care	183	5.4
Mobility	185	5.4
Physical Function	143	4.2
Range Of Movement	120	3.5
Diabetes	163	4.8
Dysphagia	116	3.4
Ventilation	108	3.2
SUB TOTAL	**1874**	**54.9**
Total Other Problems	1082	31.6
Not Entered	460	13.5
TOTAL	**3416**	**100.0**

From 3181 referrals processed, 460 did not have a main problem identified. The remaining 2721 referrals generated a total of 2956 problems, grouped into 62 different main problem types. Pain was the most frequently reported (12.6%) reason for referral. The ten most common problems are displayed in Table 3.5

Activity type: Each referral can lead to one or more interventions. From the 2639 patients who commenced their quantum of care between 1st April and 31st August, 3181 referrals were generated to the six departments. These departments then supplied 11,836 contacts/services to these patients.

Activity type is the type of service by the therapist that is performed for or to the patient during the current contact with the patient. This includes direct and indirect patient care. Therapy took 67.4% of the total activities with off-site visits in 8.4%. The results for departments and activities performed are displayed in Table 3.6.

Table 3.6 Activity type distribution by department

Description	MAC	ND	OT	PT	SP	SW	Total	% of Total
Therapy	16	1316	479	5146	701	326	7984	**67.4**
Other	968	11	251	12	91	71	1404	**11.8**
Off-site Visit	946	-	38	13	3	1	1001	**8.4**
Non Attendance	-	4	42	407	41	-	494	**4.2**
Telephone Call	64	32	74	16	85	234	505	**4.3**
Written Communication	2	30	146	13	80	33	304	**2.6**
Family Conference	1	3	6	-	11	119	140	**1.2**
School Visit	-	-	1	-	2	1	4	**0.1**
TOTAL	**1997**	**1396**	**1037**	**5607**	**1014**	**785**	**11,836**	**100.00**

Key to Departments:
MAC Macarthur Ambulatory Care (Nursing) Service
ND Nutrition and Dietetics
OT Occupational Therapy
PT Physiotherapy
SP Speech Therapy
SW Social Work

Clinical interventions: An intervention is carried out to improve, maintain or assess the health of a person in a clinical situation. Clinical interventions include invasive and non-invasive procedures, physical therapy and cognitive interventions. Each contact with the patient can have up to five interventions recorded. An example could be a patient seen on a home visit who receives assessment, education and an injection, i.e. three interventions for the one activity (home visit). From the 11,836 activities/contacts, 597 had no interventions recorded. The remaining 11,239 activities/contacts generated 29,202 interventions, an average of 2.6 interventions for each activity/contact. The ten most common interventions are shown in Table 3.7. The majority of the

597 contacts which had no interventions recorded were non-attendances (83%). This means that there were no interventions to be recorded. A peculiarity of the MAP is that "non attendance" is recorded under "activity" as a contact when no actual contact has occurred. The remaining 17% were divided evenly between the remaining contact types and can only be attributed to user error.

Table 3.7 The ten most common interventions (Quanta n=2639)

Description	Number	% of Total
Education	7232	24.8
Diagnostic/Assessment	3160	10.8
Assessment	3104	10.6
Exercise (General)	3069	10.5
General Therapeutic Techniques Intervention	2396	8.2
Cardio-Respiratory Intervention	1232	4.2
Mobilisation (General)	1209	4.2
Liaison	1175	4.0
Follow-up	903	3.1
Intravenous Antibiotic	852	2.9
Other	4870	16.7
TOTAL	**29,202**	**100.0**

Time Units: Session time units are the total time spent on a patient. It is an aggregate of both direct and indirect patient care time. It can be used to calculate the time spent by therapists in indirect patient care by subtracting direct patient care time (time units) from session time units. Each time unit represents five minutes. As shown in Table 3.8, MACS spends 54.8% of time in direct care with part of the residual time in travelling. Physiotherapists spend most of their time (85.7%) in direct patient care.

Table 3.8 **Direct and indirect time attributed to patient care**

	MACS	Dietetics	O/T	Physio	Speech	SW
Session:						
Time Units	18,946	10,528	8,127	40,982	8,652	6,257
Minutes	94,730	52,640	40,635	204,910	43,260	31,285
Hours	1,578	877	677	3,415	721	521
Direct patient care:						
Time Units	10,378	6,274	4,989	35,122	6,122	4,508
Minutes	51,890	31,370	24,945	175,610	30,610	22,540
Hours	864	523	416	2927	510	376
% Of Session Time Spent on Direct Patient Care:						
Percentage	54.8	59.6	61.5	85.7	70.7	72.2

Discharge Reason: Discharge reason is the reason why therapy is no longer required for this current quantum of care. Discharge may be better described as completion of care, as it identifies situations where the therapy/service is no longer required or able to be provided. Of the 2639 patients admitted between the 1st April and 31st August, 1540 were discharged from care. Patient goals were achieved in 40.2% of completed cases. It should be noted that in 25.2% of cases no reason for discharge was recorded (Figure 3.9).

Table 3.9 **Discharge reason**

Description	Number	% 0f Total
No Intervention Required	120	7.8
Review Only	25	1.6
Goals Achieved	619	40.2
Patient Plateaued	43	2.8
Patient's Medical Deterioration	13	0.8
Patient Died	22	1.4
Patient Failed To Contact	80	5.2
Patient Initiated	63	4.1
Patient/Parent Non-Compliant	7	0.4
Transfer To Other Centre	29	1.9
Transfer Inpatient To Outpatient	23	1.5
Transfer Outpatient To Inpatient	2	0.1
Home visit	1	0.1
Transfer Home visit To Outpatient	1	0.1
Transfer Home visit To Inpatient	2	0.1
Transfer Beverly Park Special School To Outpatient	1	0.1
Doctor Initiated	101	6.6
Not entered	388	25.2
SUB TOTAL	**1540**	**100%**
Undischarged	1099	-
TOTAL	**2639**	**-**

3.6 Case studies

Two case studies are presented as a demonstration of the MAP system.

Case 1: A 64-year-old male patient suffering from Chronic Airways Limitation (CAL) spent seven weeks as an outpatient during the winter months, after being referred by his general practitioner. The main problem identified by the therapist was sputum retention. During his seven weeks, he received 12 treatment sessions (and two non-attendances) totalling almost ten hours of treatment time (nine

hours, 50 minutes). Of this time, seven and a half hours were direct patient treatment time. All the activities were "therapy" (clinic-based) delivered by physiotherapists. The items below indicate which interventions occurred during his quantum of care (Figure 3.10). The patient's goal was not ultimately achieved, and the patient was discharged back to his general practitioner because he had "plateaued". There was no record of this patient attending Campbelltown Hospital Accident and Emergency during this quantum of care.

Table 3.10 **Case study 1. MAP data**

Intervention Type	Number
Cardio-respiratory intervention	11
Education	11
General therapeutic technique	2
Exercise	2
Diagnosis/assessment	1
TOTAL	**27**

Case 2: A patient with a deep vein thrombosis received 12 treatments after being referred from Accident and Emergency. One day after beginning treatment with the acute ambulatory nursing services (MACS), occupational therapy began treating the 58-year-old female and three days later physiotherapy became involved. The physiotherapist identified physical function as the patient's main problem and the patient's goal was to improve her function. The patient was treated for a total of eight hours and 45 minutes. Of this time, six hours and 30 minutes was direct patient treatment (74% total time). The patient contact/service types consisted of three home visits, eight clinic visits and one other contact.

3.7 Discussion and conclusions

The descriptive data collected during the trial period showed the expected demographics with larger groups of the young and the old attending for treatment. The high proportion overall of outpatient activities (78%) was an unexpected finding. There was a significantly lower proportion of outpatient services in August compared to April ($p<0.001$). This difference corresponds to the seasonal winter increase in hospital admissions, and suggests that allied health disciplines respond to the needs for acute patient care. It also brings into question optimal staffing for these disciplines, and even the need for such a high outpatient workload attached to an acute hospital.

These results demonstrate a low rate of participation in multidisciplinary care with only 542 (21%) patients with recorded referral to another therapist or nurse within the 2639 MAP "quanta of care". GPs were the largest single referrer from the community (19%), which confirms a relationship between doctor and therapist. There were only 66 referrals from the approximately 40 MHS community nurses, suggesting a lack of a process for, or facilitation of, multidisciplinary care between these community services and hospital-based services. The first case study is an example of a chronic and complex condition (CAL), which would be suitable for multidisciplinary care, being treated by a single therapist with questionable outcome. The second is a condition (DVT) seemingly requiring a single discipline. This patient experienced the care of three disciplines with a good outcome. Several interventions to enhance multidisciplinary care will be tested later in this thesis.

The most useful impairment documentation was decided at the outset by the discipline managers to be clinical "service type". Thus it became a mandatory registration item. The optional "main problem" data was not entered in 13% of referrals, and diagnostic data was not entered in 19% of referrals. Although this was not ideal, the service types gave some indication of patient illness or impairment which had not been previously available.

It is difficult to comment on the quality of care as demonstrated through recorded "interventions" and "discharge reason", as there are no benchmarks with which to compare. The most frequent interventions of education (25%), diagnosis (11%), assessment (11%) and exercise (11%) appear acceptable. The other indicators, such as 40% goals achieved and only 1% family conferences, appear suboptimal.

The implementation of the MAP system was a success in terms of its acceptance by the discipline managers as their mandatory hospital reporting system at the completion of this trial. This decision by the allied health and MACS nurses demonstrated that a common data information system was possible, and also provided a system for collecting patient information to evaluate the effect of interventions such as the new models of care tested in this thesis.