Acute Medical Assessment Units:

A Literature Review

Feidhmeannacht na Seirbhíse Sláinte
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Abbreviations

AMAU	Acute Medical Assessment Unit
AMP	Acute Medicine Programme
AMU	Acute Medical Unit
HES	Hospital Episode Statistics
HIPE	Hospital Inpatient Enquiry
IMSANZ	The Internal Medicine Society of Australia and New Zealand
MAPU	Medical Assessment and Planning Unit
MAU	Medical Assessment Unit
RCPUK	Royal College of Physicians United Kingdom

Introduction

Chapter 1 Introduction

Background

The RCP London define acute medicine as 'that part of general (internal) medicine concerned with the immediate and early specialist management of adult patients with a wide range of medical conditions who present in hospital as emergencies' [1].

The Irish Acute Medicine Programme (AMP) have also adopted this UK definition. There are currently a variety of acute medical units in operation in Ireland and internationally. The following definitions have been used to define these various units:

An **acute medical unit (AMU)** is defined by the AMP as "a facility whose primary function is the immediate and early specialist management of adult patients (i.e. aged 16 and older) with a wide range of medical conditions who present to a model 4 (tertiary) hospital. Its aim is to provide a dedicated location for the rapid assessment, diagnosis and commencement of appropriate treatment on a 24/7 basis. If required, patients can be admitted to the associated short stay medical unit beds for a short period for acute treatment and/or observation where the estimated length of stay is less than 48 hours" [2-3].

An **acute medical assessment unit (AMAU)** is defined by the AMP as a unit which "will operate as an AMU with the following exceptions: It will be located in a model 3 (general) hospital; the hours of operation may vary from 12 to 24 hours, 7 days per week, depending on service need; and it will not have contiguous short stay medical beds" [3].

An **acute medical unit (AMU)** is defined by The Royal College of Physicians as " a specialised area of an acute hospital where patients suffering from acute medical illness can be assessed and initially admitted" [4].

The Internal Medicine Society of Australia and New Zealand (IMSANZ) define **medical assessment and planning units** (MAPU) as 'designated hospital wards that are specifically staffed and equipped to receive medical inpatients for assessment, care and treatment for up to a designated period (usually 36-48 hours) prior to transfer to medical wards or home if appropriate'[5].

History of Acute Medicine in Ireland

Formal planning for an acute medicine programme in Ireland started with Comhairle na nOspideal in 2002 when a committee was established with the following terms of reference:

"To examine the role, organisation and staffing of Acute Medical Admissions / Medical Assessment Units and other similar initiatives that are taking place in hospitals around the country and to make appropriate recommendations to Comhairle na nOspidéal regarding how such units, if deemed a positive development, could best be developed, organised, staffed and integrated within the acute hospital system."[6]

However this planning was predated by the development of independent MAUs in a number of hospitals nationwide. The first such unit was opened in Kerry General Hospital in 1993. Units were subsequently opened in Mayo, Sligo and Kilkenny. The aims of the taskforce were strengthened by the success of such units as the AMAU in St Luke's Hospital, Kilkenny which was established in 2000. This was also the first year Comhairle na nOspideal approved consultant posts for the medical assessment units at The Mid Western Regional Hospital and St James Hospital Dublin.

By 2010 Dr Barry White established the Clinical and Quality Care Programmes and the Comhairle na n Ospideal Taskforce for AMUs had evolved into the current Acute Medicine Programme (AMP).

The AMP in Ireland is a clinician led initiative between the Royal College of Physicians of Ireland (RCPI), the Irish Association of Directors of Nursing and Midwifery (IADNM), the Therapy Professions Committee (TPC), the Irish College of General practitioners (ICGP) and the Quality and Clinical Care Directorate (QCCD) , HSE[7].
The AMP working group examined each element needed to construct a comprehensive clinical programme to improve the quality and safety of acutely ill patient care. The working group outlined the actions needed to be taken to establish such a programme nationwide. The group are currently implementing a national model across all 33 hospitals accepting acute medical patients.

History of Acute Medicine internationally

In the UK acute medicine started similarly in independent MAUs. Establishment of successful units resulted in nursing and medical staff developing an interest in acute medicine [8]. As interest in the area grew, in 2000 The Federation of Medical Royal Colleges investigated the future of the physician's role in acute medicine [9]. The Society of Acute Medicine was established in 2000 following publication of this report. The Society of Acute Medicine is the UK national representative association for staff caring for medical patients in the acute hospital AMAUs. In 2003 acute medicine was recognised as a sub-speciality of general internal medicine by the UK Specialist Training Authority. [8] The 2004 European Working Time Directive and the four hour emergency department rule have also encouraged growth in the field of acute medicine in the UK. [10]

In Australia and New Zealand individual hospitals established dedicated MAPUs. As the number of units and staff working in the units increased The Internal Medicine Society of Australia and New Zealand issued a position statement on standards required for MAPUs throughout the region [5].

In the US, there does not appear to be comparable units or a comparable speciality. Acute medicine physicians are known as hospitalists and are more comparable to general medical physicians in Ireland. They are responsible for the management of patients throughout their inpatient stay.

There a variety of different terms used for AMAUs in Ireland and internationally, these include:

1. Acute Medical Unit (AMU)
2. Acute Medical Assessment Unit (AMAU)
3. Medical Assessment and Planning Unit (MAPU)

For the purposes of this review, the term AMAU will be used which will encompass the different unit concepts as described above.

Rationale for the Acute Medicine Programme in Ireland

The AMP is aiming to improve patient care by providing appropriate care at the most suitable location by properly trained staff. This would allow for efficient assessment, diagnosis and treatment.
There are six main benchmarks the dedicated units of the Acute Medicine Programme are aiming to achieve:

1. Assess and avoid admission.
2. Operation of an effective short stay unit.
3. Efficient processing of ordinary patients.
4. Appropriate care and discharge of complex patients.
5. Patients will be reviewed by a senior medical physician within one hour.
6. Decision regarding admission or discharge (disposition decision) will be made within six hours.

The Programme has also fixed targets for the percentage of acute medical hospital inpatients to have particular length of stays.

Discharge	**Target Percentage**
Same day	≤ 25%
One – Two day	≤ 31%
> Two days	≤ 44%
> Fourteen days	≤ 11%

Table 1.1: AMP Fixed Targets for the percentage of acute medical hospital inpatient length of stay

Currently in Ireland patient care is not standardised. There are many issues including overcrowding in ED, prolonged waiting times and lack of access to diagnostics.
The table on page 15 from the 2004 Comhairle na nOspideal Report on Acute Medical Units outlines a number of the limitations and associated consequences of the traditional hospital admission and medical care process.

Table 1.2: Adapted from Figure 1.2 Comhairle na nOspideal Acute Medical Units Report 2004 p11 (*nOspideal, 2004)*

Limations of Current Pathway	**Consequences**
Shortage of acute medical inpatient beds.	Significant delays, sometimes up to a few days, before an acute medical patient can be admitted to an inpatient bed. Increase in trolley days and trolley usage in A&E departments.
Inability of local GPs to directly access hospital services, thereby causing them to instruct their patients to present themselves at A&E departments.	No incentive for patients to attend their GP in the first instance, and no benefits for the patient if they have attended a GP and where further medical assessment is required. Perception among GPs that they have little support from their local hospitals. Increased workload in A&E departments. Increase in waiting times in A&E departments for all patients.
Repeat inappropriate re-assessment by emergency department staff of acutely ill patients already seen and referred by GPs for admission.	Delays by hospitals in treating patients who have been diagnosed by their GPs as needing inpatient treatment and/or urgently required investigations.
Majority of care in A&E is delivered by junior doctors, many of whom are relatively inexperienced. Due to the nature of their complaint, many medical patients can be left waiting for long periods of time in A&E departments before being assessed or treated as other more "urgent" cases are continually prioritised ahead of them. Delays associated with waiting for the relevant on-call medical team to assess an acute medical patient in A&E.	Decision making pathway slowed due to lateral referrals and insufficient senior clinical decision makers. Significant delays in treating and diagnosing acute medical patients and in identifying and implementing optimal care pathways. Patients' and relatives' perceptions of experiencing an unsatisfactory hospital service.
Delays in admission of medical patients until relevant medical team agrees.	A&E department playing the role of a holding facility with respect to emergency medical patients.
Patients with similar conditions who are being treated by the one consultant and their NCHD team being scattered throughout the hospital rather than located in one designated section/ward of the hospital.	Chaotic ward rounds for medical teams, commonly referred to in international literature and in the hospitals consulted as "safari" rounds. In certain instances, patients may be overlooked for a considerable period as the relevant teams may not have been informed of their precise location.
Admission of medical patients to inappropriate wards including surgical wards.	Patients can undergo a number of bed-to-bed transfers, as inappropriately placed patients are later moved to the appropriate wards as beds become available. Issue of the ability of surgical ward staff to look after medical patients.
Pressure in A&E departments to admit patients to any bed that is unoccupied in order to get patients off trolleys and chairs and free up much needed space in A&E departments.	Increased interruption and cancellation of elective activity and urgent inpatient investigations in both medical and surgical specialties.

The following table illustrates a PESTEL analysis conducted by the by the researcher for this report of the main driving factors which contributed to the development of the Acute Medicine Programme in 2010.

Table 1.3: PESTEL Analysis of Contributing Factors to the AMP Development

Political	Political pressure to solve the acute care crisis Report on the National Taskforce on Medical Staffing (Hanly, 2003) Commission on Financial Management and Control Systems in the Health Service (Brennan, 2003) Quality & Fairness: A Health System for You (DoHC, 2001)
Economic	Reduced healthcare expenditure Employment embargo
Socio-Cultural	Media reports re hospital beds Media coverage of inappropriate hospital care Patient expectations Dependance on A&E for care Population growth rate Increase in age profile of population
Technological	Reduced staff numbers Staff training changes Poor access to diagnostics
Environmental	Closing of wards Reduced hospital beds
Legislative	EU working time directive Health Act 2007

Several major reports have been commissioned by the government which make a series of recommendations designed to improve the quality and efficiency of patient care. The Hanly report was produced to design a plan for the provision of quality hospital health care in the

setting of reduced working hours of Non Consultant Hospital Doctors [11]. This plan included a number of objectives which would result in a major restructuring of the acute hospital services and workforce.

The 2003 Brennan report made a series of recommendations to reform the governance and financial management of the health service [12]. These recommendations included reorganisation of acute hospital services and General Medical Services costs to improve healthcare efficiency and productivity.

The 2001 Quality and Fairness report stipulated the need for equitable access to appropriate and timely services [13].

These reports resulted in increased political pressure to change the traditional acute hospital services to a patient centred efficient service. This political pressure contributed to the development of the Acute Medicine Programme.

An employment embargo introduced in 2009 has resulted in increased staff shortages due to failure to replace absent staff. This has resulted in increased pressure on staff, resulting in prolonged waiting times both in acute emergency and outpatient care.

According to the OECD, between 2000 and 2011 Ireland reduced per capita spending on healthcare by 6.6% [14]. This reduction in expenditure resulted in reduced funding availability for service improvement. This led to further pressure in acute hospitals.

Numerous articles have been published in Irish media highlighting prolonged waiting times and problems experienced in A&Es throughout the country.

The EU working time directive 2000/34/EC - which was subsequently replaced by Directive: 2003/88/EC - has further compounded this problem due to shorter junior doctors' hours. This has resulted in problems organising junior doctor rotas. This results in fewer junior doctors being available for patient care and assessment, ultimately causing prolonged delays in admission, patient care, access to diagnostics and discharge.

According to figures from the INMO Trolley Watch for the months January – April 2012; 26,106 patients who were admitted were left on a trolley awaiting an inpatient bed throughout the country. www.inmo.ie/7606 This represented a 3% decrease in patients awaiting an

inpatient bed compared to 2010 when 26,803 were left on a trolley. A number of factors contributed to this decrease including the positive impact of AMAUs on inappropriate admissions, trolley time and hospital beds since 2010.

It is essential that changes are made to address the current situation in order to improve patient care. Due to financial pressure the need for change is all the more urgent. The AMP aims to achieve this improved care through the provision of standardised safe patient care in dedicated units that is economically viable and sustainable in suitable locations.

Aims

The aim of this literature review is to establish the evidence for AMAUs. This will be approached from the Input – Process – Output framework as first described by Donabedian [15].

- Input (Structure) - identify the evidence for the proposed unit structure
- Process - investigate the evidence for the interventions and processes of care proposed for the AMAU network
- Outputs - establish the evidence for AMAU outputs

It is proposed that this evidence will be used by The AMP to inform the planning and development of AMAUs in acute hospitals in Ireland.
This literature review was also used to inform a National AMP Implementation Guide for AMAUs.
The findings of this review will be used as a guide for future research by the Acute Medicine Programme Research Steering Committee.

Objectives

The review objectives and terms of reference were established in consultation with the AMP leads. Members of the AMP working group and leads are listed in the Appendix A.

The review aimed to identify evidence for the proposed unit structure or inputs including:

- proposed skill set
- co location of unit with other areas such as ICU and ED
- staffing levels
- AMAU with Short Stay Unit (SSU)
- alternatives to AMAU

In terms of interventions and processes of care the following were examined:

- waiting times for unit diagnostics and procedures:
- trolley time
- seeing a doctor soon in relation to AMAU
- waiting times for diagnostics and procedures

Finally the review aimed to establish the evidence for AMAU output/outcomes including impact on:

- length of stay
- readmission rates
- mortality
- hospital bed occupancy and use of inpatient hospital beds
- disposition decision
- patient satisfaction surveys

Methodology

Chapter 2 Methodology

The literature search primarily involved an online search. An offline review of relevant articles and grey literature was also conducted. The following search limitations were applied:

- Published from 1st of January 2000 to 31st of October 2012
- English articles
- Articles involving developed countries
- Humans
-Available in Ireland

These limitations were established to find evidence from similar populations that would be relevant to the planning and development of AMAUs in acute hospitals in Ireland. The search was limited to English articles to prevent details being lost in translation. On initial preliminary search it became readily apparent very little was written on this topic prior to 2000, hence the year 2000 was chosen as a time limit. 2000 was also the first year Comhairle na nOspideal approved consultant posts for the AMAUs at The Mid Western Regional Hospital and St James Hospital Dublin. Following this a task force was established to examine the development of medical assessment units nationally. 2000 was also the year the formal Society of Acute Medicine was formed in the UK.A small number of key seminal articles published prior to 2000 that were referenced frequently were retrieved and included. Only three articles were unavailable to the researcher from an initial total retrieval of 697 articles.

Data Sources:

All of the major medical databases were searched including PubMed, CINAHL Plus with full text and PSYC Info via the online EBSCO Discovery federated search engine. The researcher's institution did not provide access to Embase. Other specialist information sources searched via the EBSCO Discovery search engine included:

- Cochrane library
- Biomedical Reference Collection: Comprehensive
- NICE
- TRIP database
- BioMedCentral

- British Library Document Supply Centre inside Serials and Conference proceedings
- Publisher Provided Full Text searching file
- Supplemental Index
- Academic Search Index
- Science Direct
- British Library EThOS
- Business Source Index
- NewsBank – Archives
- JSTOR Arts & Sciences IV
- Informit Health Collection
- NewsBank.
- Marquis Biographies Online
- Health Business Elite

The following sources were also included in the literature search:

- Reference lists in key studies
- Key author searches
- Known websites of relevance to the topic
- Colleagues with a specialised knowledge of this area

Search Strategy

Acute medicine is a relatively new and growing speciality. Terminology relating to AMAUs remains poorly standardised. The initial search was conducted using the online EBSCO discovery service. The search began with a search of Medical Subject Headings (MeSH). There are no specific medical subject headings for acute medical unit or medical assessment unit. Therefore multiple searches using a combination of search terms were performed

Search Strategy One

The search term "Medical Assessment Unit*" in the title was used with the expander "search within full text of article". Phrase searching and truncation (*) were used where appropriate to retrieve more relevant results and variant word endings. The above search limits were applied. This online search accessed the above listed databases.

Search Strategy Two

A second search was conducted using the search term "medical assessment unit" in the abstract using the EBSCO discovery service and the above listed databases.

Search Strategy Three

A further search using the EBSCO discovery service was conducted for synonyms of medical assessment unit such as: acute medical assessment unit, acute assessment unit, acute admission unit, emergency assessment unit, medical assessment and planning units, admission and planning unit and, early assessment and planning unit.

Search Strategy Four

Following these searches an analysis of common medical subject headings (MeSH) of retrieved articles was conducted. The three most common MeSH included:

1 Delivery of Healthcare / organisation and administration

2 ER Service, Hospital / organisation and administration

3 Needs Assessment / organisation and administration

These MeSH were then applied to the Medline database to find further relevant articles. They were combined using different Boolean operators to find relevant results.

Search Strategy Five

PubMed was then used to seek relevant articles cited in the reference lists of original key articles found in the previous searches.

Search Strategy Six

Relevant grey literature was reviewed using the above search criteria. Grey literature was accessed through review of relevant websites including professional societies, hospitals known to have acute medical units, position statements and annual reports relating to acute medical units. Leads from the AMP were consulted for further pertinent grey literature. See Appendix C for list of websites and reports accessed.

Search Strategy Seven

Key authors including Derek Bell, Chris Roseveare and Bernard Silke were searched for and their relevant publications were reviewed.

Search Strategy Eight

Leads from the AMP were consulted for other pertinent references.

Study Selection

Inclusion and exclusion criteria were developed, informed by the literature objectives and the scope of the review.

Inclusion Criteria:

- Measurement of acute medical assessment unit outcomes
- Evaluation of specific key indicators of benefit for an acute medical assessment unit
- Acute medical assessment unit processes of care
  - Organisational processes
- Acute medical assessment unit proposed structure
  - Workforce, geographical structure
- Alternative units which aim to improve the efficiency and quality of patient assessment diagnosis and care
- Acute hospital setting
- Adult medical patients

Exclusion Criteria:

- Setting

  Primary care / long term care / community care

- Population

  Paediatrics / obstetrics / surgical

- Article type

  Non scientific literature – newspaper articles, commentary piece

- Narrow focus on specialised process of care within a unit
- Narrow focus on specialised outcomes of care within a unit

Initial searches retrieved multiple citations. Abstracts of those relevant to the literature search were retrieved. Duplicate articles were removed. Inclusion and exclusion criteria were applied to the retrieved abstracts and full text articles were obtained that fulfilled the above criteria. The process is illustrated in figure 2.1 on page 28.

Search Results

Search Strategy One – The search term "Medical Assessment Unit*" in the title.

This search yielded one hundred and sixty three articles. Forty two duplicate articles were excluded. Three articles were excluded as it was not published in English. Three articles were unavailable for review. Sixty eight articles were irrelevant to the search criteria and aims and objectives of this literature review. Thirty seven articles were excluded as they were non scientific commentary articles or newspaper articles. This yielded a final total of ten articles for this search, one of which was a relevant editorial.

Search Strategy Two – The search term "medical assessment unit" in the abstract.

This search yielded a total of three hundred and thirty four articles. Forty three were excluded due to previous review in previous search. One hundred and forty one were deemed irrelevant to search criteria and aims and objectives of this literature review. One hundred and forty seven articles were excluded as they were non scientific commentary articles or newspaper articles. One article was excluded as it was based on research in a developing country. This yielded a final total of two relevant articles for this search.

Search Strategy Three – Synonyms for acute medical assessment unit.

This yielded a further nineteen articles. Eleven were excluded due to irrelevance. Four were excluded due to previous review. This resulted in a final yield of four articles for synonyms of medical assessment unit.

Search Strategy Four – Common MeSH.

This resulted in thirty eight articles being found. Ten were excluded due to previous review. Fifteen were irrelevant. Two were non scientific commentary pieces. One was based on research in a developing country and one was published in Spanish. Nine were relevant to the review.

Search Strategy Five – Reference lists in key studies.

This yielded a further one hundred and fourteen articles. Of these sixty eight were excluded on the basis of publication prior to 2000. Three were excluded due to research involving a developing country. Two were excluded as the articles were not published in English. Twenty two were excluded as the articles examined research questions irrelevant to the literature review. Twelve articles were excluded as they had previously been discovered in original

searches. Seven new articles were found and subsequently reviewed. The MeSH terms of these seven articles were reviewed and an additional subject search was conducted using the most common MeSH terms and an additional two articles were found. In total nine articles were found using this strategy.

Search Strategy Six – Grey Literature.
Sixteen reports were reviewed from the UK, Ireland, Canada, Australia and New Zealand.

Search Strategy Seven - Key authors.
This yielded four further articles.

Search Strategy Eight – Colleagues with a specialised knowledge of this area
Six further articles were reviewed.

Final Selection
In total sixteen grey literature reports were reviewed. Forty four journal articles were reviewed. Of this total, fourteen articles provided detail regarding alternatives to an AMAU. Meta analysis and meta synthesis was not possible due to diverse study methods and article types.

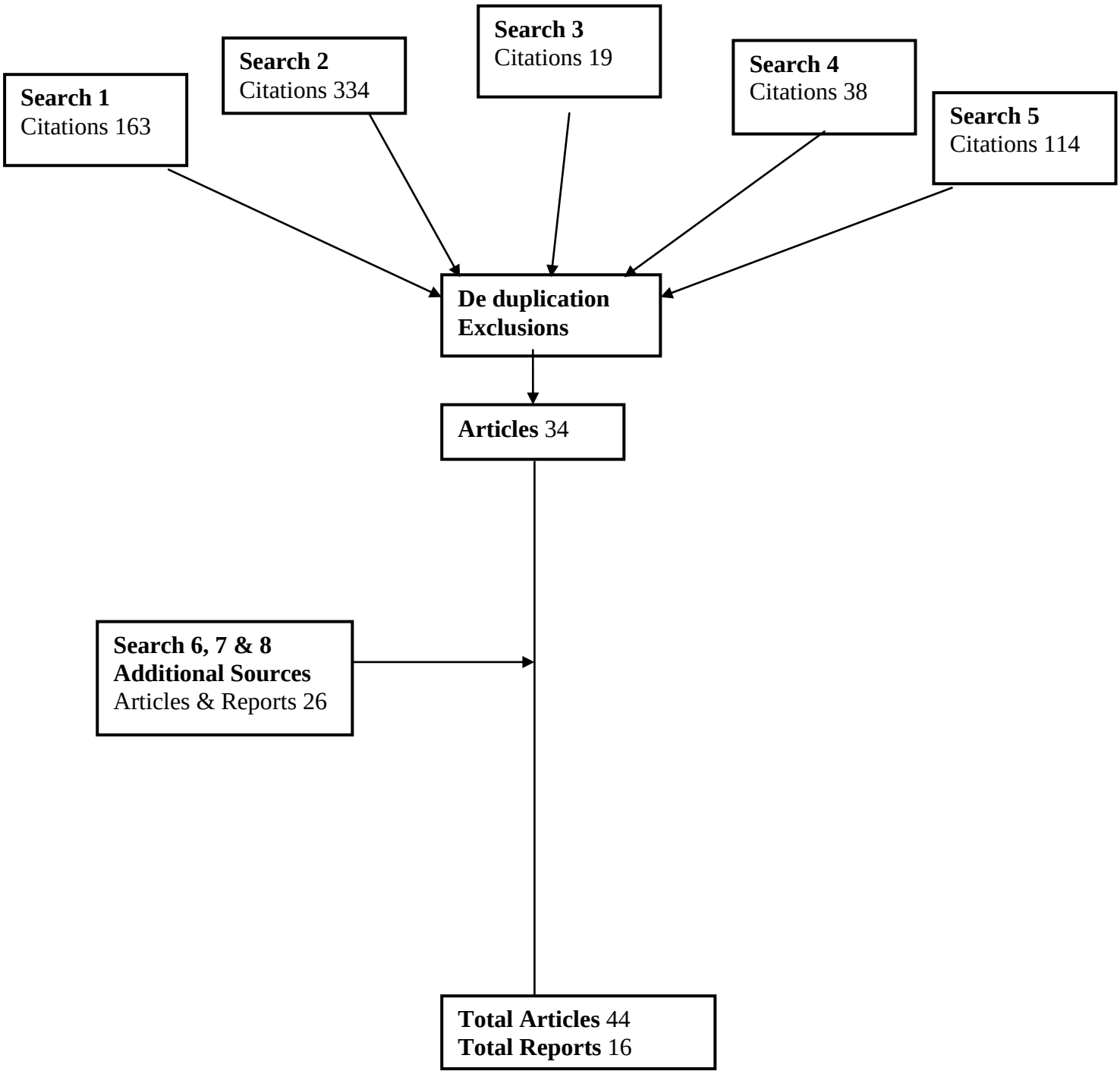


Figure 2.1: Literature Review Search Strategy

Critical appraisal Techniques

Study Methodologies

The literature was graded according to a hierarchy of evidence[16]. See appendix for further details. Methodologies of studies ranked according to this hierarchy are shown in Table 2.1

Table 2.1 Methodologies of reviewed studies

Level 1: Systematic review or meta-analysis of all relevant randomized controlled trials (RCTs), or evidence-based clinical practice guidelines based on systematic reviews of RCTs	0
Level 2: Evidence from at least one well-designed RCT	1*
Level 3: Evidence from a well-designed controlled trial without randomization	0
Level 4: Evidence from well-designed case-control and cohort studies	16
Level 5: Evidence from systematic reviews of descriptive and qualitative studies	6
Level 6: Evidence from a single descriptive or qualitative study	15
Level 7: Evidence from the opinion of authorities and / or reports of expert committees	6
Level 7: Grey Literature	16

RCT = Randomised Control Trial

There was no RCT pertaining to AMAU. The above RCT concerns a Chest Pain Observation Unit which was reviewed as part of the alternative to AMAU component of the literature review. The lack of RCT may be due to the difficulty of performing such a trial in this setting or due to the relative infancy of AMAU research. The majority of studies used a descriptive / observational / case control / cohort approach to measure study factors. In the absence of a randomised control trial, results of observational and experimental trials may be combined to provide significant evidence. However due to significant study heterogeneity meta-synthesis and meta-analysis were not feasible.

Critical Appraisal

The Critical Appraisal Skills Programme checklist was applied to assess the literature[17]. Cohort, case control studies, RCT, qualitative and reviews were appraised using tools from CASP. Evidence from studies which achieved 0-3 CASP criteria was ranked as 'poor'. Evidence from studies which achieved 4-7 CASP criteria was ranked as 'fair'. Evidence from studies which achieved 8-11 CASP criteria was ranked as 'good'.

The remainder of studies were appraised using the following criteria derived from CASP and the Monash Institute Centre for Clinical Effectiveness EBM workbook [18].

1) Did the article address a clearly focussed question?

2) Was the research design appropriate to meet the objectives of the research?

3) Has the research design minimised the opportunity for bias?

4) Is the sample appropriate?

- population
- size

5) Were the research findings described adequately?

6) Has bias been considered in forming conclusions?

7) Have confounders been considered?

8) What is the clinical significance of the effect?

9) What is the precision (statistical significance) of the effect?

10) Can the results be applied to development of a nationwide network of dedicated acute medical assessment units in Ireland?

Evidence from studies which achieved 0-3 of these criteria was ranked as 'poor'. Evidence from studies which achieved 4-7 was ranked as 'fair'. Evidence from studies which achieved 8-10 of these criteria was ranked as 'good'.

Evidence from studies which achieved 0-3 CASP criteria was ranked as **"poor".**

n=13 **29%**

Evidence from studies which achieved 4-7 CASP criteria was ranked as **"fair".**

n= 20 **45%**

Evidence from studies which achieved 8-11 CASP criteria was ranked as **"good".**

n= 11 **25%**

The majority of those papers ranked as "good" were of the qualitative type rather than a quantitative study type.

Papers were divided into those describing outcomes of AMAUs, structures and processes of care pertaining to AMAUs and alternatives to AMAUs.

Methodological limitations of studies reviewed

Limitations of studies reviewed included:

- No randomised control trials were found regarding structure, process and outcomes of acute medical assessment units. Observational studies were the main type of study used to assess AMAU in the literature
- Small sample size [19]
- Short description of results which led to problems interpreting same [20], [21-22]
- Lack of statistical testing prevented interpretation of results.[23]
- A large number of studies relied on hospital coded data. Studies failed to recognise the potential of coding errors which could effect results [22] [24]
- Methods of measurement of outcome factors not reliable for detection of all outcomes [25]
- External confounders not identified or considered in analysis of results [26]
- Internal confounders not identified or considered in analysis of results. A number of articles did not adjust for casemix or illness severity. [27] [20]
- Short study time period [23]
- Systematic review of literature for AMAU and emergency observation and assessment units did not include details of critical appraisal methods employed or results of same[28-29]
- No consideration of the relationship between researcher and participants in qualitative studies [30]
- Unclear study design and research question [31-33]
- The heterogeneity of definitions for AMAU and for variables examined made comparison of study findings difficult.
- The heterogeneity of populations studied and the context in which they were studied made comparison of findings difficult

Results

Introduction

This chapter describes the results of the literature review. The first section gives an overview of the studies retrieved. The second section details research and grey literature findings on AMAUs and hospital outputs and patient outcomes. The third section describes the research and grey literature findings on AMAU proposed structure and processes of care. The fourth section describes the research and grey literature findings on alternatives to AMAUs.

Chapter 3 Results

Table 3.1: Critical Appraisal of Studies which examined AMAU Outcomes

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Effectiveness of acute medical units in hospitals: a systematic review Scott I et al	2009	UK	1990-2008	Systematic Review	AMU	Mortality LOS+ Waiting Time in the ER Discharge rates & destinations Readmissions Patient & staff satisfaction	Five	6/10	Fair
Improving continuity of care in an acute medical unit: initial outcomes ST NOBLE V et al	2008	UK	2005-2006	Retrospective Observational Analysis	AMU 3163 patients	LOS+ Direct Discharge Rate Readmission Rate	Four	7/10	Fair
Impact of an acute medical admission unit on length of hospital stay, and emergency department 'wait times' Moloney ED et al	2005	IRL	2002-2003	Retrospective Observational Study	Admitted Emergency Medical Patients 7857	LOS+ ED Waiting times	Four	9/10	Good
Effect of an acute medical admission	2007	IRL	2002-2004	Cohort	Admitted Emergency	Readmission rates Short stay patients	Four	9/10	Good

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
unit on key quality indicators assessed by funnel plots Moloney ED et al					Medical Patients 11928	Long stay patients			
What is the effect of a consultant presence in an acute medical unit? McNeill G et al	2009	UK	January-August 2005	Cohort	AMU 2928	LOS+ Same Day Discharge, Readmissions	Four	8/10	Good
The impact of weekends on outcome for emergency patients Schmulewitz L et al	2005	UK	January – December 2001	Cohort	MAU 3244	LOS+ Readmission Rates	Four	6/10	Fair
Evaluation of the impact of implementation of a Medical Assessment and Planning Unit on length of stay Brand C et al	2010	Australia	August 2003 – January 2004	Cohort	Admitted general medical patients 3154	LOS+ Readmission rates In hospital mortality rates	Four	5/10	Fair
Medical Assessment Units and the older patient: a retrospective case – control study Ong Bin S et al	2012	Australia	2008-2009	Case control	Admitted AMU >65 patients 89	LOS+ Mortality Readmission rates Discharge destinations	Four	6/11	Fair

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
The impact of twice-daily consultant ward rounds on the length of stay in two general medical wards Ahmad A,	2011	UK	2008-2010	Audit	Admitted AMU patients No unknown	LOS+ Mortality Readmission rates Bed occupancy	Six	6/10	Fair
Evaluation of a dedicated short-stay unit for acute medical admissions Downing H et al	2008	UK	3 week period January 2006	Cohort	Admitted short stay patients 209	LOS+ Bed occupancy Readmission rates	Four	5/10	Fair
Emergency Department census of patients awaiting admission following reorganisation of an admissions process Moloney ED	2006	IRL	2002-2004	Cohort	Admitted emergency medical patients 11928	Waiting times Delayed discharges	Four	8/12	Good
Impact of an acute medical admission unit on hospital mortality: a 5-year prospective study ROONEY T et al	2008	IRL	2002-2006	Prospective observational study	Admitted emergency medical patients 19528	Mortality	Four	9/10	Good
Does integrated emergency care reduce mortality	2012	UK	2003-2009	Cohort	Admitted emergency medical patients	Mortality Admission rates	Four	7/10	Good

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
and non – elective admissions? A retrospective analysis. Boyle A et al					212785				
Acute Medical Assessment Units: An Efficient Alternative to In-Hospital Acute Medical Care Watts M et al	2011	IRL	January – June 2010	Retrospective observational study	Referred medical emergency patients to AMAU and Emergency Department 3027	Discharge destination Patient satisfaction General practitioner satisfaction	Six	3/10	Poor
Efficient management of acute medical problems McMenamin L et al	2011	IRL	January – April 2011	Prospective observational study	MAU patients 147	Patient satisfaction Discharge destination Thirty day outcomes Hospital beds	Six	1/10	Poor

***Rank according to critical appraisal scores: 0-3 = poor, 4-7 = fair, 8-11 = good**
LOS+ Length of stay

Table 3.2: Critical Appraisal of Studies which examined AMAU Processes

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Use of emergency observation and assessment wards: a systematic literature review Cooke MW	2003	UK	1960 – 2003	Systematic literature review	Emergency observation & assessment ward studies	Summary of benefits no pre defined outcomes	Five	4/10	Fair
Does reporting of Plain Chest Radiographs Affect the Immediate management of Patients Admitted to a Medical Assessment Unit? Grosvenor L.J et al	2003	UK	3 month period – date not specified	Prospective Observational study	MAU 200 patients	CXR findings documented. Disagreement on CXR findings between radiologists and physicians. Change in immediate management due to radiologist's CXR report.	Four	7/10	Fair
Did an Acute Medical Assessment Unit improve the initial assessment	2012	New Zealand	Two 3 month periods January - March 2009 & January - March 2010	Audit	AMAU 155 patients	Time to assessment and treatment Content of clinical assessment	Four	7/10	Fair

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
and treatment of community acquired pneumonia – a retrospective audit Tripp DG									
Optimizing care for acute medical patients: the Australasian Medical Assessment Unit Survey McNeill G. B. S et al	2011	Australia & New Zealand	3 month period in 2009	Audit	MAU 32 hospitals	MAU size and purpose Design principles Operational principles Patient flow Interface with specialities Staffing and operations -Medical -Nursing -Allied health professionals Patient review Service evaluation	Six	6/10	Fair
Patients' perceptions of quality of care at an emergency	2006	Sweden	2002	Qualitative	Emergency Department 200 patients	Perceived Quality of care Patient state of health after the ED visit.	Six	6/10	Fair

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
department and identification of areas for quality improvement. Muntlin A et al						Advice & directions given. Waiting time & transit time through ED.			
Engaging Staff with Intentional Rounding Dix G et al	2012	UK	January – June 2011	Audit	MAU Staff & patient questionnaire	Frequency of call bell usage. Time taken to respond to call bells. Identification of pressure ulcers. Patient satisfaction. Staff comments.	Six	1/10	Poor

***Rank according to critical appraisal scores: 0-3 = poor, 4-7 = fair, 8-11 = good**
LOS+ Length of stay

Table 3.3: Critical Appraisal of Studies which examined AMAU Structure

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Acute medical care. The right person, in the right setting – first time: how does practice match the report recommendations? Ward D et al	2009	England & Wales	2007-2008	Audit	39 AMU	Multiple factors re structure & process of care	Six	7/10	Fair
A consultant physician in acute medicine: The Bournemouth Model for managing increasing numbers of medical emergency admissions Armitage M et al	2002	UK	Not stated	Descriptive Study	Acute Admissions Unit	Direct discharge. Medical outlier bed days. Readmission rates. Role of Physician described.	Six	2/10	Poor
Optimising Multi - professional working in the acute medical unit? Almond S et al	2009	UK	Not stated	Descriptive Study	AMU	Description of optimal structure	Seven	3/10	Poor
The Acute care Nurse Practitioner:	2006	Northern Ireland	Not stated	Qualitative Study	Emergency Doctors & nurses	Opinions of emergency nurses and	Six	6/10	Fair

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
challenging existing boundaries of emergency nurses in the United Kingdom Norris T et al					114	doctors of the potential introduction of an Acute Care Nurse Practitioner service in the emergency department			
Clinical Skills for nurses in medical assessment units Carroll L et al	2004	UK	2001	Qualitative Study	47 MAU nurses	key skills required by nursing staff	Six	6/10	Fair
A Community of Practice: The nurse' role on a medical assessment unit Griffiths P et al	2010	UK	2003-2006	Qualitative Study	MAU Observation 200 hrs Interviews with MAU staff & patients - 19	key skills required by nursing staff	Six	5/10	Fair
Patient need at the heart of workforce planning: the use of supply and demand analysis in a large teaching hospital's acute medical unit Le Jeune et al	2012	UK	Two 2 month periods in 2011	Audit	AMU 6720 patients	Mean number of patients admitted per day. Total number of doctors available by hour. Junior doctor	Six	9/10	Good

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
						clerking time.			

Rank according to critical appraisal scores: 0-3 = poor, 4-7 = fair, 8-11 = good** ***LOS+ Length of stay

Table 3.4: Critical Appraisal of Studies which examined AMAU Alternatives

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Emergency frailty unit helps get patients home quicker Blakemore S	2012	UK	N/A	Descriptive study	Emergency frailty unit	Description of unit structure	Seven	2/10	Poor
Interface geriatrics: evidence-based care for older people with medical crises Conroy S	2010	UK	2001-2009	Descriptive study	Acute frailty unit 257 patients	Evidence for acute frailty unit	Seven	2/10	Poor
The Effectiveness of Inpatient Geriatric Evaluation and management Units: A systematic Review and Meta Analysis Van Crean K	2010	Belgium	Inception - 2007	Systematic Review & meta analysis	Geriatric Evaluation and Management Units Studies	Mortality Institutionalisa Functional ıe Hospital readmission LOS+	One	7/10	Good
Impact of specialist care on clinical outcomes for	2006	UK	1995-2003	Retrospective Observational study	Emergency Specialty Triage. 133509	LOS+ Mortality Readmission rates	Six	4/10	Fair

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
medical emergencies Moore S					patients				
Short stay units and observation medicine: a systematic review Daly S	2003	Australia	1960-2000	Systematic review	Short stay Unit articles	Clinical Outcomes LOS+ Emergency department efficiency Medical admissions Cost of care Patient satisfaction	Five	5/10	Fair
Impact of hospital wide process redesign on clinical outcomes: a comparative study of internally versus externally led intervention Scott I	2011	Australia	2005-2008	Case control study	Five hospitals	ED access block Elective surgery waits LOS+ 30 day in hospital mortality 30 day same hospital readmission rate	Four	5/10	Fair
Achieve Cost Benefits with Innovative Care	2003	USA	-	Descriptive study	Progressive Care Units	-	Seven	3/10	Poor

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Management Quintero J									
The Synergy Model in Practice. Promoting synergy in Progressive Care Ecklund M	2002	USA	-	Descriptive study	Progressive Care Units	-	Seven	2/10	Poor
Progressive care Units: Different but the Same Stacy K	2011	USA	-	Descriptive study	Progressive Care Units	-	Seven	3/10	Poor
Randomised controlled trial and economic evaluation of a chest pain observation unit compared with routine care. Goodacre S	2004	UK	2001-2002	Cluster RCT & Cost effectiveness analysis	Chest Pain Unit 972 Patients	Proportion of patients admitted QALY 6 months post attendance Cost per patient over 6 months Reattendance rates to the ED Readmission rates	Two	7/11	Good
Should we establish chest pain	2000	UK	-	Systematic review	Chest pain Observation Unit studies	Multiple factors	Five	3/10	Poor

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
observation units in the UK? A systematic review and critical appraisal of the literature. Goodacre S									

Rank according to critical appraisal scores: 0-3 = poor, 4-7 = fair, 8-11 = good** ***LOS+ Length of stay

Table 3.5: Critical Appraisal of additional AMAU Studies

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Acute Medical Assessment Units UdDin M	2007	IRL	-	?	AMAU	-	Seven	0/10	Poor
The importance of preparation for doctors' handovers in an acute medical assessment unit: a hierarchical task analysis Raduma-Tomas M	2012	UK	2008-2009	Qualitative study Hierarchal task analysis	AMAU 32 observations 13 interviews	Handover Process	Six	6/10	Fair
Does a Post – Take ward Round (PTWR) Proforma Lead to Sustainable Improvements in Quality of Documentation for Patients admitted to the Medical Assessment	2006	UK	-	Audit	MAU 216 case records	Quality of post take ward round documentation	Six	7/10	Good

Study Title & Author	Year	Country	Time Period	Study Design	Source & Size of Population	Factor Evaluated	Hierarchy of Evidence Grade	Critical Appraisal Score	Evidence Rating Level
Unit? Kamara A									
Renaissance of Hospital Generalists Wachter RM	2012	UK & USA	-	Analysis – descriptive article	AMAU & General Medical units	Factors causing increase in acute medicine	Six	3/10	Poor
Medical Crises in Older People. Discussion Paper Series: Identification of Seniors at Risk. Umbrella review of tools to assess risk of poor outcome in older people Edmans JA	2012	UK	2002 - 2010	Literature Review	AMU systematic review papers	aspects of decline predicted evidence of validity reliabililty clinical utility	Five	7/10	Good

Rank according to critical appraisal scores: 0-3 = poor, 4-7 = fair, 8-11 = good.** ***LOS+ Length of stay

Countries of Origin of Research

The below tables illustrates the countries of origin of the primary research and grey literature articles.

Table 3.6: Country of Origin of Primary Research

Country of Origin	No. of Articles
United Kingdom	24
Ireland	8
Australia/New Zealand	6
Sweden	1
Belgium	1
United States	4

Table 3.7: Country of Origin of Grey Literature

Country of Origin	No. of Articles
United Kingdom	12
Ireland	2
Australia/New Zealand	2

A large number of articles reviewed were from the UK. This is perhaps because AMAUs are well established in the UK and acute medicine is a recognised medical discipline.

Impact of Medical Assessment Unit on Length of stay

The Royal College of Physicians in the 2004 report recommends that AMAUs should function in such a manner that patients needs are met in an expert and timely manner [1]. If patients' needs are met efficiently it will have a positive impact on length of stay. The 2010 AMP Report proposes that patient length of stay on the short stay units associated with the AMAUs is less than forty eight hours [3]. Patients who require longer admission than forty eight hours must move from this unit to a dedicated in-patient ward. The AMP recommend the average length of stay target for total medical inpatient stay to be 5.8 days [3].

International evidence for the impact of AMAUs on patient length of stay was confined mainly to the UK. A 2009 systematic review of the effectiveness of AMUs examined the literature for the impact of these units on length of stay amongst other outcomes [28]. This was a comprehensive review which searched a number of electronic databases, grey literature between 1990 and 2008 and consulted acute medicine professional societies.

Four studies reviewed by Scott et al demonstrated a statistically significant reduction in length of hospital stay as a result of establishment of an AMU. One study reviewed did not demonstrate a statistical significant impact on length of stay.

A retrospective cohort analysis on the length of stay following the introduction of an AMU in The Chelsea and Westminster Hospital demonstrated a significant reduction in average length of stay [22]. Average length of stay following introduction of the acute medical unit reduced by 1.5 days ($p = 0.028$).

A cohort study conducted in the UK demonstrated a statistically significant reduction in mean length of stay following the development of a short stay unit (SSU) associated with an AMU at the Queen Elizabeth Hospital Gateshead [19]. Mean length of stay for all medical admissions fell by 0.9 days ($p=0.02$).

The 2007 Report of the Acute Medicine Task Force further recommends that units will require daily clinical review of the entire bed base by a competent clinical decision maker to ensure efficiency [4].

The presence of a consultant in the AMAU had an independent effect on patient length of stay [34]. Data from an Ipswich cohort study revealed the mean length of stay (excluding inpatient deaths) was significantly reduced by 1.34 days when the consultant was present on the AMU (95% CI 0.01 to 2.67), ($p=0.048$).

The impact of consultant input on length of stay was evaluated further in a UK audit which examined the consequences of twice daily consultant ward rounds on the length of stay [20]. Consultant ward rounds were increased from a baseline frequency of twice weekly to twice

daily. Data was collected for twelve months following the change and compared with data for the twelve months prior to the change in consultant working patterns. The average length of stay decreased following the changes by 5 days ($p<0.01$).

The 2012 Royal College of Physicians report on consultant input into acute medical admissions management found that the mean length of stay was significantly reduced by 0.3 days in hospitals with ≥850 beds in which;

- the Early Warning Score is linked to a response protocol, and;
- patients are reviewed more often by consultants at the weekend, and;
- in hospitals where there are fewer than 850 beds

($p<0.001$) [35]

The influence of weekday versus weekend admission on patient length of stay was evaluated for an AMAU in Edinburgh [36]. This year long cohort study examined hospital length of stay for patients admitted at a weekend and those admitted during the week. Patients admitted with the six most common predetermined medical emergencies were analysed. Weekend admission was not associated with an increased length of stay for these six conditions. Median length of stay for weekend and weekday admissions was five days.

An Australian cohort analysis which assessed the effect of implementation of a medical assessment and planning unit (MAPU) on hospital length of stay found there was a non-significant reduction in median length of stay [21]. Length of stay was compared for those admitted through the MAPU compared with patients admitted directly to a conventional ward setting over a six month period. Median length of stay for MAPU patients was 1.6 days shorter than non MAPU patients.

An Australian case control study specifically examined the effects of a AMAU on older patients' outcomes of care [37]. Length of stay for the four most common diagnosis related groups – falls, COPD, other major respiratory disease and cellulitis - were assessed in a AMAU compared to a general medical ward. The Emergency Department length of stay for the AMAU was 1.6 days shorter compared to the control group ($p=0.012$). There was no difference in hospital length of stay between the groups.

Irish research on the impact of an AMAU on length of stay was primarily conducted at St James University Hospital Dublin. A cohort study by E.D. Moloney et al found a statistically significant 1 day reduction in median length of stay following the introduction of an AMAU ($p<0.0001$) [38].

The impact of the same unit on length of stays ≤ 30 days was examined through the use of funnel plot analysis in a further study [39]. Median length of stay for short stay patients (≤ 30 days) was reduced by 2 days ($p<0.0001$).

However the 2007 Report of the Acute Medicine Task Force recommends the length of stay for a patient on an AMAU should not be dictated by predefined arbitrary limits but should be according to the clinical need of the patient [4]. Therefore an AMAU should have the capacity for varying patient clinical status and associated length of stay variations. The 2007 report also recommends an estimation of anticipated length of stay is recorded for all patients and reviewed regularly in order to prevent prolonged length of stay [4].

Impact of Medical Assessment Unit on Readmission Rates

The AMP aims to reduce the overnight admission rate of medical patients by 10% per year without increasing the thirty day readmission rates [3].

The 2012 Royal College of Physicians report on consultant input into acute medical admissions management found that hospitals where the admitting consultant was present for more than four hours per day, seven days per week had a lower twenty eight day readmission rate [35].

Primary research for the impact of a AMAU on readmission rates included a 2008 cohort study by St. Noble et al which found that implementation of an AMAU did not result in any change in 7 day readmission rates [22].

A 2009 systematic review which examined the literature for effectiveness of AMAUs found three studies which described the effect of AMAUs on 30 day readmission rates [28]. In each study no change in 30 day readmission rate was demonstrated following the introduction of an AMAU, despite associated reductions in length of stay and increased numbers of patients.

Similarly 28 day readmission rates were found to remain stable (6.1%) following the introduction of a SSU associated with a MAU in a UK cohort analysis conducted by Downing et al [19].

Irish primary research performed on the effects of an AMAU found there was no change in 28 day readmission rate over a three year analysis period, despite a substantially shortened length of stay [39].

A 2009 cohort analysis of the effect of consultant presence in an AMU on 30 day readmission rates found there was no statistical significant difference in rates whether a consultant was present or absent in the AMU [34]. There was also no change in 1 week readmission rates in those who were discharged within 24 hours of original admission.

A 2011 study which examined the effect of consultant working pattern on an AMU, found there was no statistical significant difference in 28 day readmission rates following a change from twice weekly to twice daily consultant ward rounds [20].

Readmission rates for patients admitted at the weekend was compared to patients admitted during a weekday to an AMAU in a Scottish 2005 study **[36].** There was no statistical difference in the effect of weekend compared with weekday admission on both 7 and 28 day readmission rates, within 6 months of discharge.

A cohort study which specifically examined the effect of a MAU on older patients found there was no significant difference in 28 day readmissions for people ≥ 65 years following the establishment of the unit [37].

One Australian study retrieved, identified a non-significant higher rate of 28 day readmissions to hospital for patients admitted to the MAPU as opposed to the patients admitted to a conventional ward [21]. 145 patients were readmitted to the MAPU and 129 patients were readmitted to the conventional ward.

The 2011 Royal College of Physicians Report on the duties, responsibilities and practice of physicians in medicine recommends that all AMAUs have a clinical governance strategy that includes monitoring of 7 day readmission rates [40].

Monitoring 28 day readmission rates is recommended as a key performance indicator for MAUs in Australian guidelines [41].

Impact of Medical Assessment Unit on Trolley Time

There was a paucity of research conducted on the effect of AMAUs on trolley time.

The 2004 Comhairle na n Ospideal report recommends AMAUs be given priority access to inpatient beds within the hospital [6]. This would optimise patient flow and minimise trolley time.

The 2008 New South Wales Operational Guide for Medical Assessment Units advocates the need for priority access to inpatient beds [41].

Primary research by E.D.Moloney et al examined the effect of an AMAU on waiting times in the emergency department [38]. Establishment of the new unit resulted in a statistically significant 30% reduction in the number of patients waiting for a bed in the emergency department. Following establishment of the AMAU there were four months where more than ten people - on average - were waiting for a bed at 7 am. This compared to nine months in the previous year - prior to unit establishment - where more than ten patients were waiting for identification of a bed at 7 am. ($p<0.05$)

A further study conducted in St James University Hospital found the median number of patients waiting for a bed at 7 am in the emergency department in 2002 was fourteen [25]. This fell to a median number of eight patients waiting for a hospital bed at 7am in 2004 following the introduction of an AMAU. ($p<0.001$)

Impact of Medical Assessment Unit on Mortality

Primary research conducted on the effect of an Irish MAU found that there was a significant reduction in all cause mortality following introduction of an AMAU [24] . The annual mortality rate in acute medical patients decreased from by 5.6% between 2002 and 2006 (representing a 44.4% relative reduction during the course of the study ($p<0.0001$). 30 day mortality was also examined in an effort to control for varying numbers of long-stay patients occupying acute hospital beds. A similar, highly statistically significant decrease in mortality over time was observed ($p< 0.0001$). This study had precise results and a large effect.

A study which examined the influence of weekend versus weekday admission to a MAU on mortality rates for specific conditions, found varied resultant mortality rates [36]. There was a statistically significant lower mortality rate for those with pneumonia admitted at the weekend compared to those admitted on a weekday. Mortality rates for five other conditions were assessed and no significant differences between mortality rates for weekend and weekday admissions were found. However the data in this study was not adjusted for severity of illness on admission hence, should be interpreted with caution.

A UK study which examined the effect of an integrated medical admissions unit and emergency department on mortality found a statistically significant 5.8 relative risk reduction in all-cause mortality rates for non-elective admissions following reconfiguration ($p>0.001$) [26]. However, external confounders such as increased staff numbers were not considered or adjusted for in the study result's analysis.

An Australian cohort analysis which assessed the effects of a MAPU on in-hospital mortality, found a 4.4% significant difference in hospital mortality rates between patients admitted via the MAPU and those admitted via a conventional ward [21].

An Australian study which specifically examined the effect of a MAU on older patients, found there was no significant difference in mortality rates for those patients admitted via the AMAU and those admitted via a conventional ward [37].

A 2011 audit which examined the effect of MAU consultant working patterns on mortality rates, found there was no significant difference in mortality rates when consultant ward round frequency was increased from twice weekly to twice daily [20].

The 2012 evaluation of consultant input into acute medical admissions management in England, found AMUs in which the admitting consultants work blocks of more than 1 day had lower excess weekend mortality [35]. Hospitals in which there were two or more AMU

ward rounds per day had a lower adjusted case fatality rate for patients with a hospital length of stay of more than 7 days.

Impact of Medical Assessment Unit on Hospital Beds

The AMP Report specifies medical bed savings of 10% per annum for three years, post-implementation, as one of the key programme objectives [3].

The Internal Medicine Society of Australia and New Zealand also specify the need for optimal bed management through the creation of alternative care pathways in the MAPU [5].

Research regarding the effect of an AMU on hospital beds was limited.

Research by E.D. Moloney et al demonstrated 4,039 bed days were saved as a result of introduction of the unit to St James University Hospital [38]. This yielded a cost benefit of €1,714,152, excluding those with a length of stay greater than thirty days.

A study conducted in the AMAU at the Mid Western Regional Hospital in Limerick compared discharge destinations for patients referred via the AMAU and those referred in the same period to the emergency department [42]. Of 1562 patients assessed in the AMAU, 12.5% were admitted to an inpatient bed. Of 1465 patients assessed in the emergency department, 43.3% were admitted to an inpatient bed. The urgency of illness in both groups was comparable as indicated by the category assigned at triage. This study indicates a major reduction in hospital bed use as a result of assessment in the AMAU. However, no statistical analysis was conducted in this study therefore it is difficult to interpret these results.

A 2011 audit of patients presenting to the MAU in Waterford Regional Hospital found 64 admissions were avoided in 74 patients studied, resulting in inpatient hospital bed savings [23]. However, statistical analysis was not conducted for these figures and it is unclear how these figures were calculated in the published article.

A cohort analysis of a SSU found that the unit had no effect on percentage medical bed occupancy. Occupancy remained high at 94% and was unchanged over 12 months of assessment [19].

The influence of consultant working pattern in an AMU on unit bed occupancy was examined in a 2011 audit [20]. There was a significant reduction in bed occupancy following a change from twice weekly to twice daily consultant led ward rounds, 95.3% to 87.5% ($p<0.01$).

Impact of Medical Assessment Unit on Waiting Times for Unit Diagnostics and Procedures

The AMP maintain the necessity for same day diagnostics for AMAU patients [3]. Diagnostic support underpins competent medical decisions. Prompt access to diagnostics will reduce delay to treatment and prevent unnecessary prolonged inpatient stays. Access to diagnostics includes the need for priority radiology and outpatient diagnostic tests.

A cohort which examined the effect of reporting chest Xrays on patient management found there was a change in immediate management due to radiologist's CXR report in 11% (22) patients [27]. There was a significant disagreement on CXR findings between radiologists and physicians in 49% of cases (95% CI = 40-57%). This research reiterates the need for same day diagnostics for safe patient management.

A retrospective audit examined the effects of a MAPU on the assessment and treatment of community acquired pneumonia in New Zealand [43]. The audit found that there was a significant time lag of 83 minutes between when Xrays were ordered and subsequently taken in the MAPU compared to 28 minutes in the Emergency Department ($p<0.01$). The authors did acknowledge there was a difference in the type of patients attending both services. The Emergency department served sicker, older patients which may somewhat explain the prompt Xray service.

The 2006 position statement of the Internal Medicine Society of Australia and New Zealand specifies the need for service level agreements with support services to prioritise laboratory specimen processing and radiology requests for medical assessment and planning units [5].

The 2011 Royal College of Physicians report on the duties, responsibilities and practice of physicians in medicine advocate the provision of immediate outpatient services as a means of avoiding admission [40].

The 2007 report of the Acute Medicine Task Force asserts the need for AMU scheduled seven-day access to diagnostic and treatment procedures such as diagnostic GI endoscopy and twenty four hour urgent access to 'life saving' interventions such as GI endoscopy. These specifications aim to improve patient care and efficiency of the unit [4].

The 2012 Society for Acute Medicine quality standards for AMUs specify the need for twenty four hour access to radiology[44]. This includes access to; plain film and; ultrasound with referral guidelines for chest drain insertion, and central venous access, and; CT and; MRI. It also stipulates the need for twenty-four access to consultant radiology advice.

The 2008 New South Wales Operational Guide for MAUs specifies the need for same day access to diagnostics such as radiology, endoscopy and pathology services as a requirement for units [41]. It is also essential the results of these tests are communicated to senior decision makers promptly.

Twenty four hour access to conventional radiology, CT scanning with immediate reporting is an obligatory requirement for hospitals which admit patients as an emergency according to the 2007 report of the National Confidential Enquiry into Patient Outcome and Death [45].

Impact of Medical Assessment Unit on seeing a Doctor Soon

One of the objectives of the 2010 AMP Report is that all patients will be seen by a senior medical doctor within an hour of arrival [3].

A New Zealand audit which examined the impact of a recently established AMAU on time to first assessment by a doctor in patients with pneumonia found some unexpected results [43]. Time to first assessment by a doctor was longer for patients assessed in the AMAU (86 minutes) compared to those assessed in the emergency department (42 minutes). However these results were biased by 33% of these AMAU admissions not recording the time of first assessment by a doctor. This study also found longer waiting times for chest Xray and for first antibiotic administration in the AMAU group. These prolonged times contradict the objectives of an AMAU.

A 2011 audit of AMAUs in Australia and New Zealand found 77% of AMAU provided registrar review for patients within four hours [46]. This audit was based on criteria set by the 2006 Internal Medicine Society of Australia and New Zealand position statement [5]. This statement recommends a policy of, all patients admitted to the unit directly from triage, being assessed by a medical registrar within two hours of arrival at the unit.

The 2004 Royal College of Physicians on acute medicine organisation and training recommends a member of the clinical staff assess patients attending the AMU within four hours of arrival but according to clinical need [1]. This assessment includes the development of a management plan. This four hour assessment and management plan is echoed in the 2012 Society for Acute Medicine Quality Standards [44].

The 2008 New South Wales Operational Guide recommends acute medical patients are assessed medically by both nurses and medical staff within two hours of arrival at the unit[41].

Impact of Medical Assessment Unit on Disposition Decision within Six Hours

The AMP stipulates that a disposition decision regarding admission or discharge should be made within six hours of arrival [3]. This six hour rule is also a key recommendation for Emergency Departments in Ireland. This recommendation was made by The Emergency Department Task Force as part of the 2007 Report on Emergency Departments [47].

Evaluation of primary research for evidence of the impact of AMAUs on the time to disposition decision using the described search strategies did not result in any relevant articles. The grey literature did reveal a number of recommendations though.

In the UK the Society for Acute Medicine stipulate the clinical assessment, disposition decision and management plan should be in progress within four hours of a patient arriving at an AMU [44]. In UK emergency departments there is a similar four hour rule. The definition of the four hour rule for emergency departments is "95% of patients arriving at the emergency department are to be seen and either admitted, discharged or transferred within four-hours from the time of triage" [48].

In Australia a care management plan is instituted on arrival of a patient at a MAU [41]. The care management plan should be completed and communicated to the patient within four hours of arrival to the unit. This includes disposition decision and estimated date of discharge. This four hour rule is in keeping with the emergency department length of stay regulations in Australia.

Patient Satisfaction Surveys regarding Acute Patient Assessments in an Acute Hospital Assessment

One of the objectives of the AMP is that AMAUs improve patients' experience of acute medical healthcare [3]. Patient satisfaction surveys will be used to identify means of improving patient care from the patient perspective.

A 1997 survey by Hanlon et al identified by a systematic review found patient satisfaction levels rose following the introduction of an AMU [28]. There was a significant 10% increase in the number of patients who expressed that staff had time to explain their management plan following introduction of the AMU ($p<0.05$).

A study conducted at the AMAU in The Mid Western Regional Hospital Limerick found 77% of thirty six patients surveyed were extremely satisfied with the level of care they had received at the unit [42]. However, there was no control group reported in order to compare this level of satisfaction.

A telephone interview survey of patients who had been treated at the AMAU in Waterford Regional Hospital found that 82% of patients surveyed were very satisfied with the level of care they had received at the unit [23]. Again however there was no control group for comparison.

A patient satisfaction survey conducted in an emergency department in Sweden found mixed results for perceptions of quality of care received in the department [30]. 17% rated care received as inadequate, 16% rated care received as excess. The remaining 67% rated the care as fairly good. There were a variety of areas identified for quality improvement, these included the environment and access to a locker for valuables and clothes. 20% of the two hundred patients surveyed reported ineffective pain relief, incorrect diagnosis, lack of information given about self care and that the nurses did not show interest in their life situation. However the survey also identified areas patients were satisfied with, including treatment, waiting time and medical care.

Only one researcher conducted analysis of the two hundred completed questionnaires which may have led to bias. There was no consideration of the relationship between the researcher and study participants. Two registered nurses helped study participants to complete the questionnaire if they were having difficulties. This "help" by healthcare providers may have influenced the responses given by study participants.

One of the major findings of a systematic literature review which assessed the use of emergency observation and assessment wards found that patient satisfaction increased with observation units [29].

The effect of intentional nursing rounds on patients' level of satisfaction in a medical assessment unit was examined in a 2011 UK study [49]. Intentional rounding occurs when nurses check patients at regular intervals to assess and manage patient needs. Patient feedback cards were used to measure patient level of satisfaction. There was a 58% increase in positive commentary on the patient feedback cards during the period of intentional rounding compared to a similar time period prior to commencement of the intentional rounding. This study also examined staff satisfaction following the change to intentional rounding [49]. Analysis of data collected concluded that staff were less satisfied since the change and perceived they had less time to spend with each patient.

The Internal Medicine Society of Australia and New Zealand recommend the use of formal patient and staff satisfaction questionnaires as a means of evaluating medical assessment and planning unit performance level [5].

The 2007 Report of The Acute Medicine Taskforce recommended emergency care networks record data on patients' experience of the AMAU in order to improve the service provided [4].

The Society for Acute Medicine in the UK includes the use of patient feedback regarding treatment and care as a quality standard for AMAUs [44]. The society stipulates the need for a regular audit of patient and carer feedback.

Evidence for proposed Skill Set in an Acute Medical Assessment Unit

Proposed Medical Skill Set:

The 2010 AMP Report proposes that a consultant physician with a special interest in acute medicine undertake the role of AMAU lead physician [3]. The assigned clinical lead will have overall responsibility for the effective management of the AMAU. The clinical lead will also provide leadership, and work with other team members to agree unit policies including a clinical governance strategy, operational policy and clinical targets for the AMAU. They will also develop strategic plans and budget submissions for the management and development of the unit. They will ensure the highest professional standards are adhered to within the guidelines of the Irish Medical Council [40].

A 2009 audit which examined the organisational issues and consultant working patterns in UK AMUs found that of 26 units assessed 26 had designated consultant clinical leads [50].

The 2006 position statement of the Internal Medicine Society of Australia and New Zealand advocate the need for a clinical director [5].

A follow up 2011 audit of AMAUs in Australia and New Zealand found that 73% of units had a dedicated clinical director [46].

The AMP advocates the need for a dedicated consultant physician on call to the AMAU during core working hours (Group, 2010). This consultant would be free from other commitments during this time. Ideally this consultant would be present on the AMAU during working times however, a senior registrar or SpR should be on duty at all times, with two available during periods of surge demand. The consultant physician on-call for the hospital will manage the AMAU out of hours.

The 2004 Royal College of Physicians report recommends a doctor with appropriate skills in acute medicine should be present at all times in the AMAU [1]. This doctor would be at the level of a specialist registrar or equivalent in medicine who has the MRCPUK Diploma or equivalent, and two years recent experience in managing patients presenting as acute medical emergencies. A consultant physician who has no other scheduled commitments should support this doctor. This report also acknowledged the importance of a geriatric contribution to the acute medical assessment unit service delivery. This is as a result of the significant number of geriatric patients who attend the units.

This requirement for a consultant physician to be free of other commitments when attending the AMAU was also recommended in the 2007 report of the National

Confidential Enquiry into Patient Outcome and Death. This would allow consultants to deal with emergency admissions without undue delay [45].

However a 2012 audit of 101 AMAUs in the UK found in almost half of the hospitals assessed, the first consultant on-call undertakes other routine clinical duties while managing the acute take, as opposed to being dedicated to the acute unit. The hospitals in which admitting consultants have no other fixed clinical commitments while on acute take, had a lower adjusted case fatality rate [35].

A 2011 Royal College of Physicians report on consultant physicians recommends that AMUs have a consultant physician on site for at least 12 hours per day, 7 days a week [51].

A 12 hour presence on the AMAU would allow for senior review and implementation of a management plan for all patients admitted [52]. Time to consultant review for patients should be shorter when the consultant is present on the AMAU.

In the initial Irish report on AMUs - Comhairle na n Ospideal - also advocated the need for consultant physicians not to have other fixed/scheduled commitments when on AMU duty [6].

The 2007 report of the acute medicine taskforce recommends a rota of contacts for senior speciality opinions likely to be required by the AMAU, thus allowing for efficient speciality consultation which will aid efficient patient assessment and management [4]. This rota should ensure patients are seen by the necessary specialist within a four hour period of request. The report also states the necessity of formal support from the community psychiatric team and formal links with liaison psychiatry, including services dedicated to older people.

In 1997, in Bournemouth a dedicated consultant physician in acute medicine was appointed to manage an acute admissions ward [31]. This consultant worked 7 sessions per week and included duties such as, daily post take ward rounds, an outpatient clinic and two specialist sessions for procedures and outpatients. Having a dedicated consultant physician for acute medicine resulted in the direct discharge rate increasing to 32% of total admissions within three years of consultant appointment. The article however, does not give the baseline direct discharge rate for comparison.

The 2012 Royal College of Physicians report on acute medical care for older people recommends consideration of a lead clinician specialising in geriatric concerns in AMAUs [53]. This is due to a high proportion of people over the age of 65 years attending units. Older people have the longest length of stay hence, geriatric intervention at assessment stage has the potential to improve length of stay.

Proposed Nursing Skill Set:

The 2010 AMP Report proposes that a clinical nurse manager is appointed for the day to day management and strategic development of the unit [3].

The 2011 Australia and New Zealand audit found of the units assessed, 100% had a nurse unit manager [46]. In addition to a unit manager, the audit found that 68% units had a clinical nurse lead [46].

A 2009 UK commentary on AMU optimal skill set advocates the need for senior nurse leadership to facilitate the development and support of nursing roles [33].

A Northern Ireland qualitative study examined the proposed benefits of an acute care nurse practitioner in the emergency department setting [54]. These benefits included reduced waiting times, increased patient satisfaction, safer practice and enhanced communication with patients and the multidisciplinary team. An acute care nurse practitioner could potentially play an important role in an AMAU, if these benefits were achieved. Development of this role should be considered for planned AMAUs. Further study in an AMAU setting is required prior to staff policy changes.

A qualitative study which examined the skills required by nurses in MAUs described eleven essential skills for nurses [55]. The survey respondents clearly stated that the level of skill possessed by an individual nurse should be dependent on grade and experience. The eleven recommended skills were;

1. Triage skills and ability to recognise a sick patient
2. Communication skills
3. ECG recording and interpretation, venepuncture and interpreting the results, cannulation and catherisation
4. Basic treatment of life threatening disorders
5. Prescribing through patient group directives
6. Basic life support provision
7. Requesting X rays and basic interpretation
8. Assessment of patients with mental health problems
9. Advanced life support provision
10. Research and audit skills
11. Arterial blood gas sampling and interpretation.

These skills could be used to develop a training programme for nurses who wish to specialise in acute medicine. The possession of the identified skills could also be used as part of the recruitment process for AMAU nursing staff.

A 2010 Welsh qualitative study which examined the nurses' role on a MAU, identified three different skill sets to those identified in the 2006 study [56]. The main skills required by nurses were identified as bed management, having professional knowledge and the ability to work under pressure. However, the article also noted there was no specific education preparation for AMAU nurses. This is something that could be considered for development by a national acute medicine programme.

Proposed Allied Health Skill Set:

A 2009 commentary also advocated the need for a dedicated specialist clinical pharmacist in the unit [33]. The pharmacist would provide pharmaceutical advice to ensure treatment followed best practice. The pharmacist would also help prevent iatrogenic complications and readmissions related to medications.

The 2009 commentary also advocates the need for a physiotherapist and occupational therapist in the AMU to aid assessment of the older patient [33]. The author also recommends the need for specialist liaison roles to offer support and guidance for patients with intellectual disability or dementia.

53% of AMAUs audited in Australia and New Zealand in 2011 received 7-day cover from physiotherapy [46].

The Royal College of Physicians 2012 Acute Medical Care for Frail Older People Toolkit recommends the need for a multidisciplinary approach to assessment of the older frail person in the AMAU [53]. This approach requires physiotherapy, occupational therapy, pharmacy, social work and nursing services, including community liaison nurse to be available to the AMAU. The RCP estimate that 60-70% of all hospital inpatients in the UK are over 65 hence, the need to prioritise initial comprehensive assessment [53]. This will reduce the numbers of patients admitted and improve efficiency and quality of patient care, through access to pertinent services.

Of the MAUs audited in 2011, in Australia and New Zealand, pharmacy, occupational therapy, speech pathology, social work and dietetics were most commonly available only on a weekday [46].

Evidence for Co-location of Unit with other Areas such as ICU and ED

The AMP recommends the need for co-location of the AMAU with the Emergency Department [3]. This would allow rapid transfer of patients. For model four hospitals, a designated acute floor area should be developed and accommodate a co located Emergency Department, Clinical Decision Unit, AMAU, Acute Stroke Unit, Acute Surgical Assessment Unit, ICU, HDU, CCU, Interventional Cardiology and Diagnostics including imaging [3].

The 2004 Comhairle na nOspideal report recommends locating the AMAU in close proximity to the emergency department and diagnostic facilities [6].

The Internal Medicine Society of Australia and New Zealand proposed that an AMAU be located adjacent to the emergency department [5]. This would allow for effective patient management and intervention. The statement also recommends the need for close proximity and prioritised access to diagnostics and pharmacy services. It is acknowledged that the structure and organisation of units is dependent on a number of local circumstances including the size of hospital, case mix, physician and nurse availability, and primary care and community services [5].

The Acute Medicine Taskforce recommended the need for co-location of the AMAU with the emergency department [4]. This would facilitate patient access to the AMAU from the community. It is recommended further, in common with the AMP acute floor area, that the unit is situated on an emergency floor where the AMAU, emergency department, critical care facilities and diagnostics are co-located.

The 2008 New South Wales Operational Guide for MAUs does not recommend co-location of the AMAU with the emergency department due to concerns about the AMAU being used as a surge facility [41]. The Guide specifies the need for a separate unit in a distinct area proximal to the emergency department, diagnostics and transport.

The National Confidential Enquiry into Patient Outcome and Death found that of the cases examined, 62% were managed in an emergency assessment unit that was separate to the emergency department [45]. Though the authors acknowledge all sick patients should be able to access appropriate speciality care, the cross site transfer may have played a role in their death.

There is a paucity of primary research on structure of acute medical units including co location with other departments.

An audit of MAUs in Australia which examined criteria for units proposed by the Internal Medicine Society of Australia and New Zealand found that of 32 hospitals assessed, only 2were co-located with the Emergency Department [46]. Only 23% of units surveyed had a high dependency area with appropriate monitoring within the unit. Co-location with other areas such as ICU and diagnostic facilities was not examined in this audit.

A 2009 commentary on AMUs proposed the need for co-location of the unit with the emergency department [33]. It is also recommended the AMU is co-located with ICU, radiology and acute surgical services. According to the article this would allow the possibility of sharing staff and beds in addition to more efficient patient management. However the author acknowledges the geographical structure and infrastructure of the units will be dictated by local circumstances.

Evidence for staffing levels

The 2010 AMP Report states staffing levels need to reflect the intensive nature of service delivery in an AMAU [3].

According to the UK Acute Medicine Taskforce, the staff numbers required will depend upon the size and configuration of the unit, and the nature of the services offered [4].

In 2004 a report by the Royal College of Physicians recommended there should be at least three consultants with primary responsibility for acute medicine in every acute hospital by 2008 [1].

The 2012 Acute Care Toolkit proposes 1- 1.5 consultants are needed in a unit with ≤ 30 beds to allow senior review of all patients present in the AMU [52]. This report further recommends a minimum of ten consultants in the weekend rota to ensure a sustainable frequency of weekend working arrangements in larger units ≥ 30 beds.

The 2008 New South Wales Operational Guide for MAUs recommends a cohort of approximately 5-10 physicians to provide adequate medical coverage in units where staff are provided from the main hospital and do not practice solely in the unit [41].

A 2009 commentary piece on optimal skill set for an AMU proposed that medical workforce should mirror patient demands [33]. The busiest period in the MAU at the Royal Liverpool Hospital was found to be between early afternoon until late evening and junior doctor rotas were rearranged to allow for increased staff cover for this period. However at the time of publication this rearrangement was yet to be evaluated.

A 2012 study which examined the use of a supply and demand analysis to calculate junior doctor staffing levels found all information required to do this was available to all acute medical assessment units [57]. Demand was defined by analysing admission times for patients presenting to the AMU from the Emergency Department Information System. Twenty four hour supply of junior doctors was calculated by analysis of rota patterns, AMU policy on leave (theoretical supply of doctors), junior doctor interviews and direct observation on the wards (realistic supply of doctors). This information was used to create an 'optimal ratio' of patients per doctor hour. By comparing optimal patient per doctor hour ratios to actual patient per doctor hour ratios and then applying this ratio to the absolute numbers of patients arriving per hour, a cumulative prediction of the number of un-clerked patients was derived over the 24-hour period. The optimal patient per doctor hour ratio was calculated as 0.75. This allows patients to be promptly assessed and safely managed without the inefficiency associated with over staffing. This model can be applied to other AMAUs to

predict most efficient staffing levels [57]. The model could also be adapted to predict other staffing levels required, for example nurses. This model could be used to predict funding and resource allocation in individual AMAUs.

The 2012 Society for Acute Medicine Quality Standards for Acute Medical Units gives specific recommendations for staffing levels [44]. It recommends daily attendance by a pharmacist on the unit, with access to 24/7 pharmaceutical advice and medication supply. Clerical support is recommended on a 24 hour basis. It recommends a nurse to patient ratio of 1:6, but states that staffing levels should respond to the number and dependency of patients. Occupational therapy and physiotherapy should work on the unit between 11am and 8pm, seven days per week [44]. Speech therapy and dietetics should be available during normal working hours and available to see patients at weekends.

The 2007 Acute Medicine Taskforce recommends the need for dedicated portering and cleaning staff to facilitate patient flow through the unit and rapid turn-over of bed use [4].

The 2006 position statement of the Internal Medicine Society of Australia and New Zealand are very specific about staffing levels [5]. The statement recommends a minimum nurse: patient ratio of 1:6 on a 24 hour continuous basis. Staffing levels for a twenty five bed unit are recommended as follows;

- one full time equivalent Community Health liaison nurse;
- 0.5 full time equivalent social worker;
- 0.5 full time equivalent clinical pharmacist;
- 0.2 full time equivalent speech therapist;
- 0.5 full time equivalent occupational therapist and;
- 0.5 full time equivalent physiotherapist.

This is on a seven day per week basis with core working hours of 10am to 10pm. [5]. Clerical support for the unit is required from 7.30am to 10.00pm seven days per week.

There was a paucity of primary research regarding nursing staffing levels within an AMAU. It was noted that actual staff numbers per shift will depend upon the size and configuration of the unit and the nature of the services offered as part of acute medical care [58]. The baseline for registered staff: unregistered staff ratios within an acute medical unit (or ward) need to be proportionately greater to encompass all the skills/facets attributed to AMU's. This may be as high as 75% registered staff to 25% unregistered staff required to deliver safe effective care [59].

Evidence for Short Stay Units associated with Acute Medical Assessment Units

The AMP have proposed the need for medical SSUs to be associated with AMAUs. However these wards would be separate to the AMAU and managed as a separate unit.

A UK cohort analysis which examined the impact of the establishment of a SSU, found the mean length of stay reduced by 0.9 days for all medical admissions (p=0.02) [19]. This reduction in length of stay did not effect the 28 day readmission rate which remained stable at 6.1% compared to 6.2% in the year prior to the opening of the unit. Percentage medical bed occupancy was also unchanged at 94%. However caution should be used regarding these results as data was only collected over a three week period.

A 2011 evidence summary for the effectiveness and safety of emergency department SSUs produced by the Ottawa Hospital Research Institute found that there was very little evidence in the literature regarding SSUs [60].

A systematic review by Daly et al concluded that these units have the potential to reduce length of stay, cost of patient care and increase patient satisfaction [61]. There was significant variation in study methodology included in this review. Outcomes measured were disease specific as opposed to unit specific. It is difficult to interpret whether impact on measured outcome was actually as a result of unit functioning or protocols used within the hospitals.

Alternatives to Acute Medical Assessment Units

AMAUs are one of a number of recent solutions proposed to solve the issues associated with emergency acute medical care. A number of other potential solutions are reviewed in the literature.

A number of studies examined the impact of Geriatric Assessment Units on patient care. A 2010 American systematic review and meta-analysis examined the effect of such unit on a number of patient outcomes [62]. Following meta-analysis of retrieved studies, there was significantly less functional decline demonstrated at discharge in those patients admitted to a geriatric evaluation and management units. However following meta-analysis, there were no unit admission benefits in relation to mortality, institutionalisation, length of stay and readmission.

A UK commentary on Emergency Frailty Units reported, since opening, the number of patients admitted has reduced by 20 -30%, 5184 bed days per annum have been saved. Readmission rates have also fallen however, the figures were not specified [63]. This is a commentary piece hence, further research needs to be conducted on the value of such units.

A 2010 UK study which examined elderly people attending a frailty unit found, that based on the first 257 patients attending the unit, the discharge rate for complex older people is 9% – higher than for other complex older people not managed in acute frailty unit, and higher than historical controls 5% [64]. The 30-day readmission rate (patients discharged from acute frailty unit) was 18%, not significantly worse than historical control rate of 15%. These results are based on limited data hence, further primary research is needed prior to recommending such units as an alternative to AMAU.

A number of studies examined the impact specialised Chest Pain Units have on patient care. A 2004 randomised control trial compared patient outcomes of a chest pain observation unit with routine care patient outcomes [17]. The proportion of patients admitted to hospital from the chest pain unit was 36.7%, compared to, 53.8% admitted from routine care ($p<0.001$). 12.7% of chest pain unit patients re-attended the ED, compared with, 17.2% of routine care patients. 7.7% of chest pain unit patients were re-admitted, compared with, 10.5% of routine care patients. The cost per patient for the chest pain unit over six months was £478, compared with, £556 per patient for routine care over six months ($p= 0.252$). However, the results need to be interpreted carefully due to confounders. Depending on the place of

assessment patients were treated differently therefore, it is difficult to compare outcomes and hence, assign causality.

A 2000 systematic review also examined the evidence for both the effectiveness and the economic efficiency of the chest pain units [65]. This review was based on American studies only. The review concluded that there was no strong evidence that a chest pain unit would improve outcomes if routine practice is good. There is also uncertainty whether chest pain units would produce cost savings in an Irish setting due to the low rate of interventional cardiology. Chest pain units would only serve a subgroup of patients attending AMAU and hence would not provide an alternative to an AMAU.

Other care units examined in the literature included Progressive Care Units [66-68]. Progressive Care Units are intermediary units between the ICU and general medical ward. These three articles were descriptive hence, further research is required prior to recommending such units in an Irish setting. The 2003 article describes the steps needed to establish a successful progressive care unit [67]. These steps could be employed to establish an effective AMAU in a hospital setting. The 2002 article describes the optimal skill mix of nurses required to run a progressive care unit [68]. A similar staff assessment could be used when determining the skill set required for an effective AMAU. In view of the very different role these units play in medical care they would be unsuitable as an alternative to an AMAU.

An Australian study examined the effects of a hospital wide change in structure and processes of care on patient outcomes [69]. These changes were effected by an externally led consultancy group and, compared with, changes effected by an internally led redesign. The changes included new bed management processes and implementation of a 23 hour elective surgical ward and a MAPU in the internally led redesign. The externally led consultancy group introduced ward based changes including a governance group, ward improvement teams and programme evaluation group. The internally led redesign changes resulted in a non significant sustained improvement in emergency department access block and a non significant reduction in length of stay. However there were multiple confounders hence it is impossible to determine the cause of these non significant outcome effects.

A 2006 UK retrospective observational study evaluated the effects of early placement of admitted patients under the care of the most appropriate specialist team [70]. This was achieved by admitting patients under the most suitable specialist for their needs, with interim care being provided by the AMAU team. Following the changes there was a significant reduction in the subsequent mortality of the under 65 age group, in excess of the underlying downward trend by a further 0.64% (p=0.021), equivalent to approximately 51 fewer deaths per year. There was no significant reduction in mortality in the over 65 age group. There was a non-significant reduction in readmission rates and length of stay following the changes. The authors conclude that these improvements were due to early placement under specialist care. However causality cannot be assigned due to confounders. The AMAU care may be responsible for these improvements. External confounder such as changes in primary care and nursing home standards of care may have accounted for the changes. There was also an underlying downward trend in mortality rates which may have accounted for the changes. This article provides further evidence for the potential benefits of AMAU and specialists working together. Further research in the area of early specialist care placement is required prior to implementing policy changes.

Discussion

Chapter 5 Discussion

The researcher was tasked by the AMP to establish the national and international evidence for AMAUs. The evidence found will inform the planning of a nationwide network of acute medical assessment units across acute hospitals in Ireland. This literature review was also used to inform The AMP Implementation Guide for Acute Medical Units and guide future AMP research on AMAU.

The review was specifically focussed on finding evidence for the interventions and processes of care proposed for the AMAU network. It also aimed to identify evidence for the proposed unit structure and evidence for AMAU outcomes. The review demonstrated that AMAUs are a recent concept and established that the evidence for AMAUs is limited. This review has identified the areas where further research is required.

Difficulties Encountered

One of the challenges encountered in the preparation of this literature review was the heterogeneity of terminology and definitions used in describing AMAUs. This heterogeneity was overcome by performing searches of the literature using multiple search terms.

The evidence for AMAUs is limited. This is a recent concept in acute hospitals both nationally and internationally and may account for the paucity of evidence on the subject. There are no randomised control trials reported to date. Randomised control trials are the highest level of evidence in the evidence hierarchy. This may be a result of the relative infancy of AMAU research. A randomised control trial though difficult to design in this setting, would establish firm evidence for a network of AMAUs.

In the absence of a randomised control trial, results of observational and experimental trials may be combined to provide significant evidence. The researcher found many studies which examined the structure, processes and outcomes of AMAU however due to significant study heterogeneity meta-synthesis and meta-analysis were not feasible. Different methodologies employed by studies and factors examined, led to difficulties comparing studies. Differences in structure and organisation of AMAUs in different jurastictions and contexts, led to challenges when comparing structure, process and outcomes. However, the researcher overcame this by presenting all the results of the literature review. The results were then objectively critically appraised using tools form the

Critical Appraisal Skills Programme checklist[17]. This critical appraisal technique was chosen as it is a well recognised technique which has proven valid in previous systematic literature reviews.

A large number of articles reviewed were from the UK. This is perhaps because AMAUs are well established in the UK and acute medicine is a recognised medical discipline.The researcher optimised the number of articles found from elsewhere by, conducting searches which included all western developed countries. This allowed research from all similar populations that would be relevant to the development of the Irish Acute Medicine Programme to be included in the results.

The researcher noted a paucity of articles that related to the structure of the proposed acute medicine units. The researcher optimised the number of articles found by conducting multiple searches.

Another difficulty encountered by this literature review was the poor methodologies employed by some included articles [32]. Despite this, as a result of the multiple searches conducted using multiple databases and approaches, quality evidence for AMAU were found as evident from the critical appraisal scores.

Summary of Findings and potential for incorporation into the National AMP

Significant research has been conducted on the impact of AMAUs on outcomes including average length of stay both nationally and internationally. Data regarding length of stay is readily available in a hospital setting due to routine hospital data collection. This may account for the predominance of these study types in the area of AMAU research. It was noted that significant gains have been made in the UK in the reduction of average length of stay [20, 22]. In the UK, Local Authority Social Services are held accountable for delayed discharge and prolonged stay in the elderly [71]. This accountability may somewhat explain the reduction in length of stay in the UK. However, the effect of AMAU on average length of stay was found to be positive in all studies reviewed, with the majority showing statistically significant reductions in length of stay [21]. This reduction in length of stay suggests that establishment of a network of AMAU in Ireland will result in improved acute hospital productivity and efficiency and may ultimately result in a reduction in health expenditure.

However, the researcher noted means as opposed to medians were employed as a measurement of length of stay. Research using mean as opposed to median as a measure of length of stay should be interpreted with caution. The mean is readily affected by outliers,

the median is a more accurate measure of length of stay. Currently the AMP uses the mean as a measure of length of stay, as it is more easily understood and computed. It also has the advantage of allowing the full number of bed days used to be calculated and taken into account. The AMP intends to further develop median and quartile measures.

Age standardised rates could also be considered to compare length of stay coherently between populations. In Australia and New Zealand measurement of length of stay in an AMAU is divided into two categories: Adult acute medical patients ≤75 years and adult medical patients ≥75 years [41]. A significant proportion of older patients, has complex needs and is at increased risk of adverse health outcomes, prolonged hospital stay or readmission [72]. This results in potentially increased measured lengths of stay. By developing separate key performance length of stay indicators for adult patients under 75 years and adult patients over 75 years, length of stay can be more accurately measured. This will prevent skewing of length of stay data and may preclude the need to measure length of stay using medians rather than means.

The AMP aims to reduce the overnight admission rate of medical patients by 10% per year without increasing the 30 day readmission rates [3]. Internationally all of the responsible professional bodies advocate the need to reduce admission rates without increasing readmission rates. Furthermore monitoring of readmission rates is recommended in Australia, New Zealand and the United Kingdom [40-41]. This key performance indicator should be considered by the AMP to ensure readmission rates are not adversely affected by discharge decisions in the AMAU. Primary research on the effect of the AMAU on readmission rates has not found any change in readmission rates apart from one Australian study which demonstrated a non-significant higher rate of readmission [21]. Overall there was little evidence for an increase in readmission rates and this suggests the need to monitor both 28 and 7 day readmission rates. In the UK financial incentives are given to prevent readmission [71]. NHS Trusts are held accountable for readmission and this may explain part of the reason for readmission rates remaining unaffected by AMAU policy.

Regarding the impact an AMAU had on mortality rates, there was an overall reduction in mortality rates attributed to the AMAU. Only two studies reported no significant difference in mortality rates as a result of changes associated with an AMAU [20, 37].

The review also examined the evidence for Unit processes of care. These processes of care will determine patient flow and length of stay.

There was very little research conducted on the effect of an AMAU on trolley time. The only primary research conducted on this aspect was done so in one Irish institution [25, 38]. It appeared these studies examined the same core data for both research papers. The core data collection was extended for a further year period to produce another study in 2007 [39]. The core data was collected for a further year to produce a subsequent study [24]. This has resulted in multiple publication bias. Though the studies scored highly in the objective critical appraisal, this multiple publication bias somewhat devalues their significance. This institution has been the main focus for research on the impact of AMAU. There is a need for further research to be conducted in other Irish settings to test the validity of these findings and that of other AMAU benefits on patient care. The grey literature did recommend a number of strategies to reduce trolley time [41].

There were guidelines in the grey literature regarding the impact of AMAU on hospital beds [5]. A number of studies found the AMAU had a positive impact on hospital beds. Only one study demonstrated the AMAU had no effect on hospital beds [19].

The AMP advocates the need for same day diagnostics. This is also recommended by international professional bodies responsible for the development of acute medicine in individual countries. A New Zealand study found that availability of same day diagnostics had significant impact on patient management [27]. A subsequent New Zealand study published in 2012 however, found that the MAPU had longer waiting times for chest Xray than the emergency department [43].

All the professional bodies responsible for the development of acute medicine both nationally and internationally recommend patients are seen within a number of hours of arrival to the unit. The targets for seeing a doctor vary internationally. Studies conducted on the ability of units to achieve this target have mixed results. The AMP stipulates that a patient must be reviewed by a senior physician within one hour of arrival, and a disposition decision regarding admission or discharge should be made within six hours of arrival [3]. Internationally a four hour target is set for disposition decision. Though the target timeframe varies, these targets are all based on national prevailing emergency department policy. This target aims to achieve uninhibited patient flow and increase efficiency of the acute hospital setting. This will ultimately result in better access to and reduced cost of acute medical care for all.

The AMP is aiming to improve patients' experience of acute medical healthcare [3]. This is advocated at an international level also. Bradshaw categorises needs into four types: Felt,

Expressed, Normative, Comparative [73]. Expressed need is synonymous with demand and is readily assessed through review of waiting times in the AMAU. Normative need is a health professional's judgement of an individual's health needs. This occurs on a daily basis in AMAU by health professionals. Comparative need is the process of comparing services available in different areas. This can be established through analysis of data through the Hospital Inpatient Enquiry database. Felt need is an individual's subjective perception of need. In order to establish this, individuals must be questioned directly. Routine patient satisfaction surveys are recommended by professional bodies to establish patients' needs. Review of the literature demonstrates the widespread use of these surveys. In the UK the Society for Acute Medicine in the UK includes the use of patient and carer feedback regarding treatment and care as a quality standard for acute medical units. [44] This survey could be incorporated into the AMAU audits [3]. These surveys would not only improve patient experience but may also improve clinical risk management at a unit level. A similar study design to Muntlin et al Swedish questionnaire could potentially be used as a means of assessing patient satisfaction in an AMAU [74].

Much has been written in the grey literature regarding recommended skill set for AMAU. This includes the need for multidisciplinary involvement at unit level. Assessment of these recommendations has been done through audits in the UK, Australia and New Zealand. Significant primary research has been conducted on the skills required by nursing staff working in the AMAU. There is a paucity of research regarding the skill set of other practitioners required for an effective AMAU including physician skills. This review has identified the need for primary research regarding the optimal skill set for an AMAU in order to establish an effective nationwide network of AMAUs across acute hospitals in Ireland.

Co-location of the AMAU with the emergency department is recommended by professional bodies nationally and internationally in the grey literature. Furthermore establishment of an acute floor concept which allows rapid access to diagnostics, the emergency department and ICU for the AMAU is recommended. However, there is little evidence of primary research in the literature which establishes the need for this co-location and reconfiguration. No consensus has been reached in co-locating units and concern has been raised regarding the use of AMAU beds if emergency department surge capacity is surpassed.

Specific recommendations regarding staffing levels for AMAU have been made by the AMP. Similarly in the UK and Australia specific guidelines regarding staffing levels for

AMAU have been made. However the conclusion by all professional bodies was that staffing levels depended on local AMAU circumstances. Review of the literature found that modelling techniques such as the supply and demand analysis employed in a 2012 study were beneficial in workforce planning [57]. In view of the four hospital models and associated variety of AMAU proposed by the AMP, the use of modelling techniques could aid staffing level planning in the network of nationwide AMAUs. Modelling analysis techniques should be studied further by the AMP to assess their application in AMAU workforce planning.
Significant research has been conducted on finding solutions, aimed at improving acute medical care in the hospital setting. There is much variety of solutions proposed to improve acute medical patient care in the literature. This includes the SSUs which are also recommended by the AMP. There is a paucity of strong evidence for SSU benefits in the literature. This review identified the need for Irish primary research to establish the impact these units would have on acute medical care.

Recommendations for Future Research Consideration

Particular areas identified as having a current limited primary research evidence base include the following;

- SSU
- The impact of AMAU on;
  - Trolley times
  - Hospital beds
  - Waiting times for diagnostics
  - Seeing a doctor soon
  - Time to senior physician assessment & disposition decision

These areas could be explored in future primary research endeavours. However, in order to get results that are relevant & applicable to practice and that will improve patient care, it is essential that appropriate methodologies are employed. Ultimately the work done can then be used to achieve the overarching aims of the National Clinical Programmes - improve patient care, access to services and reduce healthcare expenditure [75].
The impact of an AMAU on outputs and outcomes of care, such as mortality and length of stay could be evaluated using HIPE data and methodologies such as those used in the St James' studies [24, 38]. By repeating these methodologies in other settings, the St James

findings will be externally validated and it will ensure all AMAUs are complying with the recommendations of the AMP working group.

Processes and structures of care could be assessed through audit, similar to the 2012 RCP audit and the 2011 Australasian Medical Assessment Unit Survey [35, 46]. The 2012 RCPUK survey evaluated the impact of consultant input into acute medical admission management. This methodology could be adapted for use in an Irish setting. This was an online questionnaire which was completed by a nominated staff member of each of the AMAUs targeted. Information regarding the organisation, structure and processes of care in AMAUs was collected. The survey responses were then audited against published standards for the staffing and organisation of Medical Assessment Units. Anonymised HES data on an agreed list of patient outcome variables including case fatality rates, length of stay and readmission rates were extracted for the trusts completing the online survey. Correlations and multiple regression analysis were used to look for associations between patterns of staffing and patient outcomes.

Age standardised rates should be used to compare outcomes between different populations. Casemix should also be considered when evaluating unit structure, processes of care and outcomes.

Public Health Implications

Results of this review indicate that a nationwide network of acute medical assessment units in acute hospitals in Ireland would have significant positive public health implications. Public health is defined as "the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals." [76]

To date the AMP - through organised efforts and collaboration with physicians in acute hospitals - have established 33 AMAU in Ireland. This review illustrates the beneficial public health impacts AMAU have had in Ireland and internationally including reduced inpatient length of stay and reduced mortality. The overall effect has therefore been; the prevention of disease, prolonging of life and promotion of health.

As evident from this review implementation of an AMAU in an acute hospital has the potential to decrease costs in the acute hospital setting through reduction in length of stay and reduced morbidity. This will enable saved budget funds to be reinvested in prevention and other public health projects.

AMAU care is not based on ability to pay for services but the provision of care for all strata of society. By providing quality care to all, health inequalities will be reduced.
This review indicates that AMAU will result in improved access for patients to care as a result of same day diagnostics and reduced time to disposition decision regarding admission or discharge.
The WHO defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” [77] This review provides evidence that implementation of an AMAU results in increased patient satisfaction which leads to mental and social well being.

Chapter 5 Conclusion

As evident from the review, significant grey literature exists internationally regarding proposed structure and organisation of AMAUs. The AMP has done significant work in preparation of establishment of a network of AMAUs nationwide. [3, 78]

The primary research that has assessed AMAUs provides evidence of the impact AMAU have on acute medical care. This includes the potential to improve the cost and quality of care provided by, reducing length of stay, readmission rates, mortality rates, trolley times, bed occupancy and waiting times for diagnostics. It also includes time targets for patients to be seen by a doctor and have disposition decisions to be made. The evidence also highlights the positive impact patent satisfaction surveys and proposed skill sets, staffing levels and locations of AMAU can have on patient care. Review of the alternatives to AMAUs demonstrated the superior gains to be made by AMAU as opposed to alternative units.

A significant investment and reallocation of resources will be required to establish an effective network of AMAU in Ireland. This review has demonstrated however that the savings gained through reduction in length of stay and mortality rates will ultimately result in overall reductions in healthcare expenditure.

There is a need for Irish primary, well designed, prospective research studies to support the development of a nationwide network of AMAU. This research will highlight potential AMAU savings and benefits. This will in turn facilitate reallocation of resources to the development of this network.

Establishment of the proposed network of nationwide AMAU will ultimately result in better access to and reduced cost of acute medical care. These in turn will lead to improved quality of care. Reduced cost, improved access and improved quality of care are the foundation objectives of the National Clinical Programmes as outlined by the Clinical Strategy and Programmes directorate.[78]

APPENDIX A

Acute Medicine Programme Working Group

Prof. Garry Courtney - Programme Lead

Dr. Orlaith O'Reilly - Director of Public Health, HSE South (SE)

Ms. Anne-Marie Keown – Programme Manager

Dr. Barbara Kearns - ICGP representative

Ms. Eilish Croke - Programme Service Planner

Ms. Avilene Casey - Clinical Nurse Lead

Dr. Simon Wolford – External Advisor

APPENDIX B

Acute Medicine Programme Research Steering Committee

Prof. Garry Courtney - Programme Lead

Dr. Orlaith O'Reilly - Director of Public Health

Ms. Anne-Marie Keown – Programme Manager

Ms. Avilene Casey - Clinical Nurse Lead

Ms. Eilish Croke - Programme Service Planner

Dr. Barbara Kearns - ICGP representative

Dr. Simon Wolford – External Advisor

Dr. John Cullen – Consultant Physician AMAU AMNCH

Dr. Catherine McGorrian – Consultant Physician AMAU MMH

APPENDIX C

Appendix of Grey Literature Websites

Royal College of Physicians	www.rcplondon.ac.uk
The Acute Medicine Society	www.acutemedicine.org.uk
NSW Health	www.health.nsw.gov.au
NHS Institute for Innovation and Improvement	www.institute.nhs.uk
Internal Medicine Society of Australia and New Zealand	www.imsanz.org.au
National Confidential Enquiry into Patient Outcome and Death	www.ncepod.org.uk

APPENDIX D

Appendix of Hierarchy of Evidence

Rating System for the Hierarchy of Evidence: Quantitative Questions

Level 1: Systematic review or meta-analysis of all relevant randomized controlled trials (RCTs), or evidence-based clinical practice guidelines based on systematic reviews of RCTs

Level 2: Evidence from at least one well-designed RCT

Level 3: Evidence from a well-designed controlled trial without randomization

Level 4: Evidence from well-designed case-control and cohort studies

Level 5: Evidence from systematic reviews of descriptive and qualitative studies

Level 6: Evidence from a single descriptive or qualitative study

Level 7: Evidence from the opinion of authorities and / or reports of expert committees

Above information from "Evidence-based practice in nursing & healthcare: a guide to best practice" by Bernadette M. Melnyk and Ellen Fineout-Overholt. 2005, page 10.

APPENDIX E

Communications and Potential Public Health Impact

The findings of the literature review were presented to the Acute Medicine Programme Research Steering Committee at the AMP Ireland Office at Kings Inn House, Parnell St. Dublin 1 on the 24/06/2013 at 2pm. This was the inaugral meeting of the research committee. The findings were presented by oral presentation. The findings were used to guide future research initiatives of the AMP. The findings aided in planning for evaluation of the national AMAU. The review recommended study designs which will be used to evaluate; the input/ structure of the units; and the interventions and processes of care in the units; and the impact of the AMAU on patient outputs and outcomes of care. The review recommended a standardised approach is employed for future evaluation of the programme. The review recommended appropriate research questions are asked and appropriate study methodologies are employed for future research and service evaluation. Appropriate methodologies will result in practical findings which can be applied to AMAU practices. It is hoped that service evaluation will then result in service improvement.

The presentation made to the Acute Medicine Programme Research Steering Committee is attached below.

Acute Medical Assessment Units: A Literature Review

Dr Elyce McGovern MICGP
SpR in Public Health Medicine

ACUTE MEDICINE

June 2013

Aim

- Establish the evidence for AMAU

Input	Process	Output/ Outcome
Skill set Staffing levels Co location	Waiting time Trolley time Seeing a Dr soon	LoS Disposition decision Patient satisfaction Hospital beds Readmission Mortality

Dr. Elyce McGovern

Methodology

PubMed

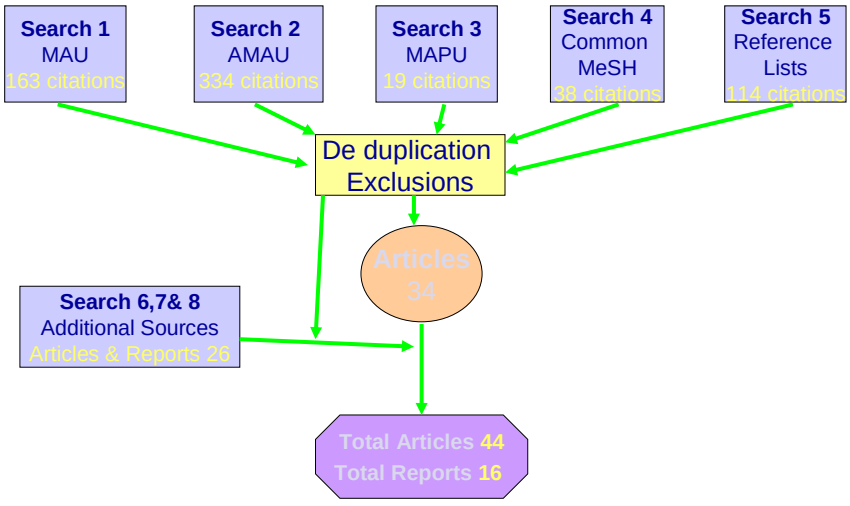
sam

The Cochrane Library Evidence for healthcare decision-making
Visit thecochranelibrary.com

CINAHL®
Available via EBSCOhost®

Dr. Elyce McGovern

Search results



Dr. Elyce McGovern

Critical Appraisal

Level 1: Systematic review or meta-analysis of all relevant RCTs	0
Level 2: Well-designed RCT	1
Level 3: Well-designed controlled trial without randomization	0
Level 4: Well-designed case control, cohort studies and observational with controls	16
Level 5: Systematic reviews of descriptive and qualitative studies	6
Level 6: Single descriptive or qualitative study	15
Level 7: Opinion of authorities and / or reports of expert committees	6
Level 7: Grey Literature	16

*(Melnyk B, 2005). * RCT = Randomised Controlled Trial*

Dr. Elyce McGovern

Critical Appraisal

- Critical Appraisal Skills Programme Checklist

		n	%
0-3 CASP Criteria	'Poor'	13	29%
4-7 CASP Criteria	'Fair'	20	45%
8-11 CASP Criteria	'Good'	11	25%

Dr. Elyce McGovern

Factors Studied

Study Factor		Primary Research	Grey Literature
Input	Skill Set	6	9
	Staffing Levels	2	7
	Co-Location	2	6
Process	Waiting Time for Diagnostics	2	7
	Trolley Time	2	2
	Seeing a Doctor soon	2	5
Output / Outcome	Length of Stay	9	10
	Disposition Decision	0	4
	Patient Satisfaction	6	4
	Hospital Beds	4	2
	Readmission	10	4
	Mortality	7	2

Dr. Elyce McGovern

AMAU Impact

Study Factor	Country	Impact	Effect
Length of Stay	UK	⇓	1.5 days
	Australia	⇓	1.6 days
	Ireland	⇓	1-2 days
Mortality	UK	⇓	5.8 RRR
	Australia	⇓	4.4%
	Ireland	⇓	5.6%
Readmission	UK	⇔	
	Ireland	⇔	
Hospital Beds	UK	⇓	7.8%
	Ireland	⇓	4039 beds

Dr. Elyce McGovern

Methodological Limitations of Studies

- No RCT
- Small Sample Size
- Short Study Period
- No Statistics
- Heterogeneity of Populations
- External Confounders
- Internal Confounders
- Unclear Design & Question
- Heterogeneity of Definitions

Dr. Elyce McGovern

Future Research

- **Output / Outcome**

HIPE Data SJUH

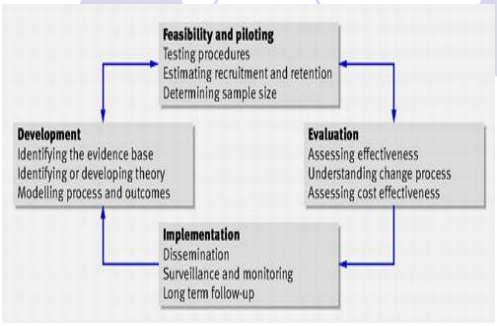
- **Input / Process**

Audit RCP UK

- **Areas for Future Research**

SSU
Hospital Beds
Waiting Times for Diagnostics
Disposition decision
Trolley Times
Seeing a Doctor soon

Dr. Elyce McGovern



Source: MRC: Developing and Evaluating Complex Interventions: New Guidance 2008

Source: CDC: Framework for Programme Evaluation in Public Health MMWR 1999

Thank You

Dr. Elyce McGovern

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