EMERGENCY MEDICAL ACTIVITY IN CORK UNIVERSITY HOSPITAL:
THE IMPACT OF THE OPENING OF THE ACUTE MEDICAL UNIT

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Public Health Competencies Addressed:

- Epidemiology and Health Intelligence
- Research
- Quality and Risk-Effectiveness, Outcome Assessment
- Communication
<table>
<thead>
<tr>
<th>Abbreviation</th>
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<tr>
<td>ALOS</td>
<td>Average Length of Stay</td>
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<tr>
<td>AMAU</td>
<td>Acute Medical Assessment Unit</td>
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<tr>
<td>AMU</td>
<td>Acute Medical Unit</td>
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<td>AMP</td>
<td>Acute Medicine Programme</td>
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<td>AMSSU</td>
<td>Acute Medical Short Stay Unit</td>
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<td>LOS</td>
<td>Length of Stay</td>
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<td>CT</td>
<td>Computerised Tomography</td>
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<td>CUH</td>
<td>Cork University Hospital</td>
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<tr>
<td>ED</td>
<td>Emergency Department</td>
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<tr>
<td>GP</td>
<td>General Practitioner</td>
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<tr>
<td>HIPE</td>
<td>Hospital Inpatient Enquiry System</td>
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<tr>
<td>HSE</td>
<td>Health Service Executive</td>
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<td>INMO</td>
<td>Irish Nurses and Midwives Organisation</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LOS</td>
<td>Length of Stay</td>
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<tr>
<td>MRI</td>
<td>Magnetic Resonance Imagining</td>
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<tr>
<td>RCPI</td>
<td>Royal College of Physicians of Ireland</td>
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<tr>
<td>SIVH</td>
<td>South Infirmary Victoria Hospital</td>
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<td>UK</td>
<td>United Kingdom</td>
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SUMMARY

In recent times, acute medical admissions to hospital have increased steadily, placing significant demands on health services. Consequently, new models of care to manage acute medical admissions have emerged. Amongst these, Acute Medical Units (AMUs) have been developed as an alternative to the traditional admission and care pathway for acutely ill medical patients. The establishment of AMUs now forms an integral part of acute medicine policy of a number of health services such as the UK and Australia. AMUs have been shown to improve the efficiency of care of acute medical patients, which has resulted in shorter lengths of stay, decreased bed usage, shorter waiting times in Emergency Departments (EDs), without a corresponding increase in readmissions.

In January 2011, the AMU of Cork University Hospital (CUH) opened on a background of reconfiguration of acute hospital services in the Cork region and reconfiguration of acute hospital services nationally. The National Clinical Programme for Acute Medicine had also been established, which includes AMUs as a key element of the programme. In 2010, a new Cardiac-Renal Centre had also opened in CUH.

Aims and objectives

Aims

To compare emergency medical activity in CUH in the year prior to the opening of the AMU (2010), with emergency medical activity in the year after the opening of the AMU (2012).

Objectives

- To describe the structure of the AMU.
- To compare the admission pathway of emergency medical patients before and after the opening of the AMU.
- To describe emergency medical activity in CUH before (2010) and after (2012) the opening of the AMU:
• To compare hospital activity in relation to emergency medical patients before and after the opening of the AMU.
• To compare age, gender and comorbidity of acute medical admissions before and after the opening of the AMU.
• To compare LOS of emergency medical admissions before and after the opening of the AMU.
• To compare LOS of emergency medical admissions aged 65 years or more, before and after the opening of the AMU.
• To compare readmission rates of emergency medical admissions before and after the opening of the AMU.
• To compare readmission rates of emergency medical admission aged 65 years or more, before and after the opening of the AMU.
• To compare comorbidity of acute medical admissions managed in the AMU, with acute medical admissions managed elsewhere in the hospital.
• To compare the number of patients awaiting a hospital bed in the ED before and after the opening of the AMU.

Methods
A Donabedian method of evaluation was used to examine structure, process and outcome. Site visits and staff interviews were carried out in order to describe the structure of the Acute Medical Unit. Process was examined in terms of the pathway of care for acute medical admission before and after the opening of the AMU, following staff interviews and site visits. Outcomes measured included median and mean Length of Stay (LOS), readmission rates for acute medical admissions, and numbers of patients awaiting admission in the ED. Outcomes for 2010 were compared to those of 2012. Sources of data included the Hospital In-Patient Enquiry System (HIPE), Irish Nursing and Midwifery Organisation “Trolleywatch” data, and the Health Service Executive “Healthstat” data. A database was developed in Microsoft Excel 2010. A Charlsion score was calculated for each admission to measure comorbidity. The database was imported into IBM SPSS version 21 for the purposes of analysis.
Results

The establishment of the AMU in CUH led to a new care pathway for acutely ill medical patients. Rather than the traditional assessment and admission pathway via the ED, patients are now assessed in the AMU by a senior clinician who makes the decision to admit or discharge the patient.

Between 2010 and 2012, adult acute medical admissions to CUH increased by 56%. Median age of admission increased from 60 to 62 years. There was no change in comorbidity of acute medical admissions as measured by the Charlson score. The proportion of acute medical patients looked after by non-AMU specialists in 2012 fell, with the exception of cardiology. AMU physicians looked after 13.8% of all acute medical admissions in 2012. Median LOS decreased from 3.0 days to 2.0 days. The decrease in median LOS seen in 2012 was independent of age or comorbidity. Mean LOS decreased by 2.54 days. Mean LOS for patients aged > 65 years decreased by 4.22 days. It was not possible to assess readmission rates from the data available as coding for planned readmission to the AMU had not been standardised. Median daily number of patients awaiting a hospital bed in the ED decreased by 42% from 28 in 2010 to 16 in 2012.

For the years 2010-2012 a lack of routinely collected data were identified, particularly with regard to patients assessed in and admitted to the AMU. In addition, data regarding outcome audit indicators which have been developed by the National Clinical Programme for Acute Medicine for AMUs and EDs was not available in CUH.

Recommendations

1. Hospital management and clinicians should ensure that the AMU has the on-going resources to deliver services to acute medical patients in CUH.

2. Dedicated radiology slots should be provided for the AMU to decrease the need for planned readmissions to the unit for such investigations.

3. The expansion of data collection systems within the AMU, integrated with the ED should be prioritised, so that monitoring and evaluation of the unit is possible. In
particular, data collection systems should facilitate the collection of data regarding
audit outcome indicators which have been set out by the National Clinical
Programme for Acute Medicine.

4. Formal KPIs should be developed for AMUs by the National Clinical Programme for
Acute Medicine to facilitate evaluation of services.

5. HIPE coding of planned readmissions to the AMU should be standardised.

6. An unique patient identifier is required in Ireland, so that readmission rates can be
accurately assessed. This would also facilitate the collection of hospital mortality
data.

7. Evaluation of readmissions rates of acute medical patients before and after the
opening of the unit should be carried out once data regarding planned
readmissions to the unit is standardised.

8. Further evaluation of the AMU is required, including assessment of markers of
quality such as patient satisfaction, and GP satisfaction surveys.
1. BACKGROUND

Changing demographics and burden of disease

In recent times, acute medical admissions to hospital have increased steadily, placing significant demands on health services. An ageing population, many with co-morbid conditions, coupled with lower thresholds for admission and changes in social provision for the elderly have all contributed to this increase. In Ireland, almost two thirds of acute admissions are of patients over 65, the majority with one or more co-morbidities (1). This increase in emergency admissions, the majority of which are of medical patients, has placed increasing pressure on emergency departments and in-patient beds in recent decades (2, 3). As a consequence, new models of care to manage acute medical admissions have emerged.

Acute medical admission and assessment units have been developed as an alternative to the traditional admission and care pathway for acutely ill medical patients. Acute medical assessment and admission units are facilities whose function is the immediate and early specialist assessment and management of acute medical patients in hospital (4). Internationally, acute medical units have been shown to improve the efficiency of care of acute medical patients, resulting in shorter lengths of stay and decreased bed usage, as well as shorter waiting times in EDs (5-7). There is also evidence of decreased hospital mortality for acute medical patients as a result of the establishment of these units (8, 9).

Acute Medicine Programme

In Ireland, a National Clinical Programme for Acute Medicine (Acute Medicine Programme) has been established. This is a clinician-led initiative between the Royal College of Physicians of Ireland (RCPI), the Irish College of General Practitioners, the Therapy Professions Committee, the Irish Association of Directors of Nursing and Midwifery and the Health Service Executive (4). The Acute Medicine Programme provides a framework for the delivery of acute medical services in Ireland and seeks to standardise and improve patient care for acutely ill medical patients. As part of the Acute Medicine Programme, acute medical units have been or are being established in all major acute hospitals in Ireland. In addition, acute medical assessment units or acute medical units with limited opening hours have been established in smaller hospitals. In
total, 26 acute hospitals in Ireland have now established acute medical units and/or acute assessment units\(^1\).

The Acute Medicine Programme classifies three types of Acute Medical Units (AMU), differentiated by levels of complexity. A tertiary (Model 4) hospital AMU (see Appendix II) has the function of providing the immediate and early specialist management of adult patients with a wide range of medical conditions. The structure and function of AMUs are defined as follows:

- Rapid assessment, diagnosis and commencement of appropriate treatment.
- Referral directly from primary care and decision regarding discharge or admissions made within 6 hours of arrival to hospital.
- Operation on a 24/7 basis.
- Co-location with the Emergency Department (ED).
- Admissions of patients for a short period (<48 hours).
- Adoption of standardised approaches to common presentations.

**Acute hospitals in Cork city and county: hospital reconfiguration**

Acute hospital services in Cork City and County are provided by five public and voluntary hospitals: Cork University Hospital (CUH), The Mercy University Hospital, Bantry General Hospital, Mallow General Hospital and, until recently The South Infirmary Victoria Hospital (SIVH) in Cork\(^2\).

Reports by the Health Information and Quality Authority on Mallow General Hospital and other smaller hospitals in Ireland identified that there were safety and quality issues associated with the delivery of acute services by smaller hospitals in Ireland. Reorganisation and reconfiguration of acute hospital services occurred nationally with the implementation of the Acute Medicine Programme and with the establishment and expansion of AMUs around the country.

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\(^1\) Personal correspondence, RCPI Acute Medicine Programme. Numbers relate to the time of writing November 2013.

\(^2\) a small number of Private Hospitals such as the Bons Secours Hospital Cork also provide acute services for private patients
Reconfiguration of hospitals in the area included the closure of the ED in the South Infirmary Victoria Hospital with the transfer of acute medicine and surgery services to CUH and Mercy University Hospital.

**Activity in Cork hospitals:**
Joinpoint regressions analysis of emergency admissions to Cork hospitals, carried out as part of a broader piece of work by the Hospital Reconfiguration Forum in the region, demonstrated a change in hospital activity in Cork city and county in recent years. Analysis of hospital activity indicates a shift of emergency medical admissions to CUH after the closure of the ED in SIVH (*Figure 1 and Figure 2*).

*Figure 1: CUH Emergency Medical Admissions 2006 to 2012*

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3 Personal correspondence, Regional hospital reconfiguration forum
Cork University Hospital

CUH is a Model 4 (tertiary) 1,000 bed university teaching hospital located in Cork city and is the largest hospital in Ireland. The hospital is one of five public hospitals in Cork serving Cork city and county, and also acts as a tertiary referral centre for Munster, and serves a population of 1.17 million people (10). The AMU of CUH opened in January 2011, initially as a 23 bed Acute Medical Short Stay Unit (AMSSU), which provides acute medical services to Cork city and county. In February 2011, an additional Acute Medical Assessment Unit (AMAU) opened as part of the AMU. In addition, a new Cardiac-Renal Centre had already opened in the hospital in 2010.

The evaluation of emergency medical activity in CUH and the impact of the opening of the AMU is an important consideration, at a time of reorganisation of acute services and the implementation of the Acute Medicine Programme, particularly in Cork city and the wider region. Furthermore, with an ageing population, it is likely that demands for acute medical care in the Cork area will continue to rise in the future.
2. AIMS AND OBJECTIVES

2.1 Aims
To compare emergency medical activity in CUH in the year prior to the opening of the AMU (2010), with emergency medical activity in the year after the opening of the AMU (2012).

2.2 Objectives
1. To describe the structure of the AMU.

2. To compare the admission pathway of emergency medical patients before and after the opening of the AMU.

3. To describe emergency medical activity in CUH before (2010) and after (2012) the opening of the AMU:
   • To compare hospital activity in relation to emergency medical patients before and after the opening of the AMU.
   • To compare age, gender and comorbidity of acute medical admissions before and after the opening of the AMU.
   • To compare LOS of emergency medical admissions before and after the opening of the AMU.
   • To compare LOS of emergency medical admissions aged 65 years or more, before and after the opening of the AMU.
   • To compare readmission rates of emergency medical admissions before and after the opening of the AMU.
   • To compare readmission rates of emergency medical admission aged 65 years or more, before and after the opening of the AMU.
   • To compare comorbidity of acute medical admissions managed in the AMU, with acute medical admissions managed elsewhere in the hospital.
   • To compare the number of patients awaiting a hospital bed in the ED before and after the opening of the AMU.
3. LITERATURE REVIEW

3.1 Introduction
In recent years, acute hospitals have seen a marked rise in the number of emergency admissions, linked to an ageing population with multiple co-morbidities presenting as emergencies to hospitals (3, 7). Sixty percent of all in-patients in Irish hospitals are emergency admissions, and in excess of 60% of acute beds are occupied by patients over 65, with over 70% of acute admissions having one or more co-morbidities (1, 11).

Admission of acutely unwell medical patients now represents the major workload of most hospitals (12). Coupled with rising costs, and a decrease in the number of hospital beds, this has led to congestion in EDs and pressure on in-patient beds with resulting inefficiencies in service delivery (7).

Traditionally, acute medical patients presenting to hospital were assessed in the ED often by junior staff, then referred to the medical on-take team for further assessment. This assessment was again often by junior staff who made the decision regarding admission. Admission to multiple wards, distant from investigative facilities led to care that was often fragmented and delivered by largely unsupervised junior medical staff (7).

In order to improve the quality of care of acute medical patients, alternative pathways of care for acute medical admissions have been developed, and as part of this, AMUs have been established in hospitals in the UK, Australia and Denmark. These units have also been called “acute medical assessment units”, “acute medical wards”, “medical assessment and planning units”, “rapid assessment units” and “early assessment medical units”. These units are designated hospital wards whose function is to receive acute medical patients from primary care and from the ED for rapid assessment of patients by senior medical staff in conjunction with a multidisciplinary team, and with treatment in the unit for a designated period, usually less than 72 hours (7). In many instances these units are co-located within EDs and have key rapid diagnostic services such as radiology on site.
The establishment of AMUs now forms an integral part of acute medicine policy of a number of health services and professional bodies. In Ireland, a report from Comhairle na nOspidéal, in 2004, recommended the establishment of AMUs in acute hospitals, as one of the elements of reform required in the acute hospital system (13). The establishment of AMUs in acute hospitals now forms an integral part of the Acute Medicine Programme, a clinical care programme developed by the HSE in conjunction with the RCPI, the Irish College of General Practitioners, the Therapy Professions Committee and the Irish Association of Directors of Nursing and Midwifery (4).

The Acute Medicine Programme is one of the National Clinical Programmes set up jointly by The RCPI and other Irish professional medical bodies and the HSE Directorate of Clinical Strategy and Programmes. These programmes were established in order to improve and standardise patient care by bringing together clinical disciplines to deliver greater benefits to patients. The objectives of the National Clinical Programmes are to improve the quality of care delivered to patients, to improve access to services and to improve cost effectiveness.

The Clinical Programmes focus on a range of areas including:
• Chronic diseases such as heart failure, stroke, epilepsy
• Out Patients services such as dermatology, neurology
• Acute hospital services such as radiology, acute medicine

The Acute Medicine Programme itself provides a framework for the delivery of acute medical services in Ireland and seeks to standardise and improve patient care for acutely ill medical patients (3). The establishment of AMUs in acute hospitals in Ireland is a key element of the Acute Medicine Programme.

Professional bodies in other countries have made similar recommendations; The Royal College of Physicians in the United Kingdom (UK) recommended that acute medical patients should be managed in a dedicated AMU (13). In the UK, 92% of hospitals are now admitting acute medical patients to an AMU (14). Recommendations on the management
of acutely ill medical patients in AMUs have also been made by the Australian and New Zealand Society of Internal Medicine (15).

A number of observational studies have reported on the impact of the establishment of an AMU on the outcomes for acute medical patients (Table 1).

**Table 1: Published studies of AMUs 1997-2011 and principal outcomes**

<table>
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<th>Author</th>
<th>Location</th>
<th>Year</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Vork J.C. et al(16)</td>
<td>Hospital of Southwest Esbjerg, Denmark</td>
<td>2011</td>
<td>Reduced Length of Stay, Reduced readmission rate, In-Hospital Mortality Unchanged</td>
</tr>
<tr>
<td>Brand C et al (17)</td>
<td>Royal Melbourne Hospital, Australia</td>
<td>2010</td>
<td>Reduced length of Stay in the Emergency Department</td>
</tr>
<tr>
<td>Jordan YZ Li et al(6)</td>
<td>Flinders Medical Centre Adelaide, Australia</td>
<td>2010</td>
<td>Reduced Length of stay, Reduced Emergency Department wait times, Unchanged unplanned readmissions rate, Reduced all-cause hospital mortality</td>
</tr>
<tr>
<td>St Noble V.J et al (18)</td>
<td>Chelsea and Westminster Hospital, UK</td>
<td>2008</td>
<td>Reduced Length of Stay, Increased direct discharge rates</td>
</tr>
<tr>
<td>Rooney T et al (9)</td>
<td>St James’ Hospital Dublin</td>
<td>2008</td>
<td>Reduced Hospital Mortality</td>
</tr>
<tr>
<td>Moore S.T. et al (19)</td>
<td>Royal Liverpool Hospital, UK</td>
<td>2006</td>
<td>Reduced Hospital Mortality for medical patients, Reduced, length of stay</td>
</tr>
<tr>
<td>Moloney E.D. et al (20)</td>
<td>St James’ Hospital Dublin</td>
<td>2006</td>
<td>Reduced median number of patients waiting in ED for a Hospital bed</td>
</tr>
<tr>
<td>Moloney E.D. et al (5)</td>
<td>St James’ Hospital Dublin</td>
<td>2005</td>
<td>Reduced Length of stay, Reduced Emergency Department wait times, Reduced Hospital Costs</td>
</tr>
<tr>
<td>Armitage M, Raza T(21)</td>
<td>Royal Bournemouth Hospital, UK</td>
<td>2002</td>
<td>Increased direct discharge rates, Reduced total medical beds and reduction in outlier beds</td>
</tr>
<tr>
<td>Hanlon P et al(22)</td>
<td>Royal Alexandra Hospital Paisley, Scotland</td>
<td>1997</td>
<td>Nursing staff reported more stress, Patient satisfaction good</td>
</tr>
<tr>
<td>Wanklyn P et a l(2)</td>
<td>Leeds General Infirmary UK</td>
<td>1997</td>
<td>Increased direct discharge rates, Decreased readmissions rates, High levels general practitioner satisfaction</td>
</tr>
</tbody>
</table>
While differences exist between established units in different hospitals, their organisation and day to day operation, the overall objectives of early assessment by a senior physician and early discharge are a common goal. However, these studies are all observational studies and, an inherent difficulty in such studies is in disentangling general improvements in care and changes in external factors, from the direct impact of the establishment of an AMU on outcomes (12).

3.2 Emergency department wait times
A number of observational studies have examined the impact of the establishment of an AMU on waiting times in EDs. A Dublin study reported the median daily number of patients in the ED awaiting a hospital bed in the years before and after the establishment of an AMU. The median daily number of patients awaiting a hospital bed decreased from 14 to 8, following the establishment of the unit (20). A follow-up study from the same hospital reported a reduction of 30% in the number of patients waiting more than four hours in the ED in the year following the establishment of an AMU (5). At a London hospital, similar reductions in ED waiting times were found; the proportion of patients waiting more than 3 hours in the ED decreased from 82% to 55% after the introduction of an AMU (8). In a study from Melbourne, the establishment of an AMU led to a reduced length of stay in the ED for patients (17). Staffing of the AMUs which were studied varied; some were staffed by dedicated AMU physicians, some by physicians from other specialties (5). Not all units accepted referrals from General Practitioners (GPs) (5). Consequently results from different studies may not be directly comparable.

3.3 Length of stay (LOS)
A number of studies have evaluated the impact of the establishment of an AMU on length of stay for acute medical patients. A study from London, reported a decrease in average LOS from 8.8 to 6.9 days following the establishment of an AMU (8). Similarly, median LOS in St James’ Hospital in Dublin decreased from six to five days after the establishment of an AMU, despite no change in comorbidity of acute medical patients admitted to hospital (5). These decreases in LOS occurred without an associated increase in readmission rates or mortality during this time. Similar decreases in LOS were seen in other hospitals in the UK , Australia Denmark (7, 16). As these studies were observational in nature, changes
within the hospital or in pre-hospital or post-discharge care may have had an impact on LOS.

3.4 Early discharge
Several studies have reported on the impact on AMUs on the early discharge of emergency medical patients. Direct discharges at 24 and 48 hours increased significantly following the opening of an AMU in a number of hospitals in the UK (8) ((7). As stated above, the availability of post-discharge services and supports in the community may have an impact on early discharge from hospital, and must be considered when interpreting results of studies.

3.5 Readmissions
Several studies of AMUs reported on the impact of the establishment of AMUs on readmission rates. In general readmissions within 30 days of discharge with the same principal diagnosis are classified as readmissions. From reports published, despite decreased length of stay and increased early discharge, readmission rates did not increase following establishment of an AMU. This was reported from several hospitals in the UK and in Dublin (5, 7, 16, 21). A study from Leeds reported readmission rates which decreased from 13 to 6% following the establishment of an AMU (2, 7). In addition, in a report from Denmark readmissions fell by 36% (16). There is debate in the literature whether readmission rates reflect quality of patient care. Some studies have suggested that many readmissions are preventable and that readmission to hospital within 30 days is a reflection of poor-quality and therefore modifiable care (23). However, other studies reported that reasons for readmission to hospital are multifactorial and include the complexity of a patient’s condition, and the availability of post-discharge care and supports (24, 25). In fact, some argue that the majority of readmissions may be due to un-modifiable factors (23). The usefulness of global readmission rates as a measure of quality of patient care is therefore unclear.

3.6 Mortality
Several studies have reported on the impact of the establishment of an AMU on hospital mortality. Hospital mortality reflects the proportion of patients who die during or shortly
after admission to hospital (26). However problems exist in reporting hospital mortality in relation to the quality of patient care. Firstly, observational studies are unable to disentangle other factors which may have had an impact on mortality, including pre-hospital care, and changes in life-expectancy over time (12). Secondly, reporting in-hospital mortality may not reflect quality of care if inadequate adjustments for case-mix and comorbidity are not taken into account (26). In addition, mortality data is highly dependent on the quality of coding of mortality in hospitals. In some countries such as Ireland, the absence of a unique patient identifier means that it is not routinely possible to identify those patients who may have died shortly after discharge from hospital (27).

In the UK and Canada, Hospital Standardised Mortality Ratios are used to compare hospital mortality between hospitals. In the UK, this ratio has been modified to include mortality up to 30 days after discharge through linkage with vital statistics data. In Ireland a methodology for calculating Irish hospital mortality ratios has recently been developed (28). While Hospital Standardised Mortality Ratios serve as a screening tool to compare mortality between individual hospitals and the national average caution must be used in interpretation of results (29). Changes in mortality within the same hospital over time are not the primary purpose of these indices but rather ratios are used as a screening tool to compare different hospitals to the national average.

Despite these limitations the impact of the opening of an AMU on in-hospital mortality has been analysed by many reports. In a prospective five year study of the AMU in a Dublin Hospital, all-cause hospital mortality decreased from 12.6% to 7.0% and this was independent of covariates including comorbidity or illness severity (9). Chelsea and Westminster Hospital in London, as well as Flinders Medical Centre in Australia, also reported a decrease in in-hospital mortality following the introduction of an AMU (8). A retrospective study at Liverpool University Hospital reported a decrease in all-cause hospital mortality, with the most significant decrease of 27% reported in patients less than 65 (7). No change in mortality was seen in a Danish study which examined mortality (16). However, interpreting these results as a measure of quality remains problematic, and any results of studies demonstrating a decrease in in-hospital mortality as a result of an AMU must be interpreted with caution.
3.7 Other outcomes
Studies of AMUs have reported on other outcomes. Published findings have included reduced hospital costs (5), increased patient satisfaction (7, 30) and increased medical staff satisfaction (7). However, there is some evidence however, that for nursing staff, dealing with a concentration of acutely ill patients in an AMU may lead to increased stress levels (7).

An evaluation of an acute medical unit in a general hospital in Ireland found high levels of patient and GP satisfaction with the unit. In addition, using a validated tool, this report examined the appropriateness of acute medical admissions. Following the introduction of an AMU, the level of “inappropriate” medical admissions decreased, and this result was statistically significant (31).

3.8 Limitations of the literature
Limitations to these studies exist. All reported studies are observational in nature, and therefore inherent difficulties exist in disentangling general improvements in care and changes in external factors from the direct impact of the establishment of an AMU on outcomes. In addition, studies have been carried out in different countries, with different health systems. External factors within these health-systems, such as the delivery of pre-hospital care or primary care and provisions for care after discharge will impact on the care of emergency medical patients in hospital.

The AMUs studied operated in different way; for example, some were staffed by dedicated AMU physicians, while others are staffed by the on-take medical physician. Differences also existed in referral pathways to units in that some accepted referrals directly from GPs, while others accepted referral only from the ED. Therefore comparison of results is problematic.

These factors must also be considered if applying evidence from the literature to a single AMU in an Irish situation.
3.9 Conclusion
As part of the re-structuring of the care of acute medical patients in hospital, the establishment of AMUs has taken place in many countries including Ireland. Several observational studies have shown beneficial outcomes as a result of managing acute medical patients in an AMU. These include decreased waiting times in EDs, decreased LOS and increased early discharge, without a corresponding increase in readmission rates. In fact there is some evidence that readmission rates may decrease as a result of the presence of AMU. Reduced hospital costs, reduced inappropriateness of admission and increased staff, general practitioner and patient satisfaction may also result from the establishment of AMUs in acute hospitals.
4. METHODS

4.1 Evaluation model
A Donabedian model was used as the evaluation model. This model used the framework of structure, process and outcomes to evaluate healthcare services (32). This is a recognised evaluation tool which is focused on the quality of patient care.

- **To assess the structure of the AMU**, site visits to the AMU and to the ED were undertaken. In addition, informal interviews with staff were carried out.
- **Process** was examined by direct observation of the care pathway of acute medical patients and by documentary analysis of records of patients assessed and managed in the AMU. Comparison was made with the care pathway for the management of acute medical patients in the hospital with that prior to the establishment of the AMU. Informal interviews with clinical staff were conducted, and review of relevant documents took place.
- **Outcomes** were assessed by retrospective analysis of routinely collected data including ward and hospital inpatient information systems and the Hospital Inpatient Enquiry (HIPE) system. Information available from other sources, such as the Irish Nurses and Midwives Organisation “Trolleywatch” data were also analysed, as well as data available from the Health Service Executive “Healthstat” system. *Healthstat* is a databank of performance information from Irish public health services. It provides monthly results from 33 teaching, regional and general hospitals and for health and social care services in the community.

4.2 Data collection

4.2.1 Acute Medical Unit data
The AMU collects data on the number of patients assessed in the AMAU, the source of referral and outcome i.e. whether discharged or admitted to the AMSSU. This data were analysed for the purposes of this report. Patient level data for 2012 regarding factors such as date of birth, reason for attendance, diagnosis and comorbidity were entered manually in a ledger stored in the AMU. This data were not available electronically for all patients assessed in the AMAU. Collection of this data would have required review of both the
ledger and individual patient charts before entry of this date into a database for analysis. For the purposes of this report this was not collected.

A number of limitations to the data that was available exist:

- Data were incomplete for 2012. The source of referral of patients assessed in the AMAU was only available from October to December.
- Individual patient data such as age, reason for attendance and comorbidity diagnosis was not included for the reasons stated above.
- From the data available, it was not possible to quantify the number of patients admitted to the AMSSU who remained under the care of the AMU service, the number transferred to the care of other specialties, or the number who were admitted under the medical team on call, and were then transferred to the care of AMU physicians.

**Acute Medicine Programme outcome audit indicators**

At the time of the establishment of the Acute Medicine Programme, it was envisaged that an integrated patient information system would be set up between EDs and AMUs within hospitals to allow for collection of data regarding outcome audit indicators defined by the Acute Medicine Programme. To date this system has not been set up\(^4\). Therefore, it was not possible to collect data on outcome audit indicators defined by the Acute Medicine Programme for both the ED, and the AMU.

**4.2.2 Emergency Department data**

Data from the Irish Nurses and Midwives Organisation (INMO) was used to analyse the impact of the opening of the AMU on patients in the ED. The INMO contacts EDs in hospitals around the country each morning and a count of the number of patients in the ED who have been admitted and are awaiting a bed is recorded. This data is known as “Trolleywatch” and gives individual hospital data, as well as regional and national data.

\(^4\) Personal correspondence, Consultant in Public Health Medicine, Acute Medicine Programme.
A number of limitations to this data exist: data is incomplete. No data were available for trolley counts for weekends or holiday periods and national and regional data for 2009-2013 was available only as total numbers of trolleys.

Data for the suite of outcome audit indicators for acute medicine is not routinely collected in the ED as mentioned above. Therefore data such as time from registration to time of admission or discharge was also not available.

Healthstat national data for ED s was available from January 2009 to 2012. However hospital level data, specific to CUH, was available only from 2011 onward. The lack of this data, containing waiting times for all patients admitted to hospital via the ED, meant that comparison of waiting times in the ED between 2010 and 2012 could not be examined.

4.2.3 General internal medicine data
Analysis of HIPE data were carried out to evaluate emergency medical care in CUH and the impact of the opening of the AMAU for patients admitted as emergency medical admissions.

The HIPE database was searched using the following inclusion and exclusion criteria:

Inclusion Criteria:
- Years 2010, 2012
- Emergency admissions and readmissions
- Admitting consultant was a Medical Consultant or Emergency Medicine consultant

Exclusion Criteria:
- Admissions under paediatrics, obstetrics and gynaecology, surgery, radiology or anaesthetics
- Those whose principal procedure was dialysis, radiotherapy or chemotherapy were excluded
• Patients aged 15 or less, as these patients are not admitted or assessed in the AMAU and are in the main admitted under the paediatric service.

A number of limitations to this data exist:
• Data captured admissions and discharges under named consultants. In order to quantify the impact of the opening of the AMU on the general medical and medical specialty service, admissions under specific consultants were analysed for 2010 and 2012. However, transfer of acute medical in-patients between specialties occurs. HIPE may therefore not truly capture workload of specific consultant specialty groups such as AMU consultants, as in up to 20% of admissions, admitting consultant was not the same as discharge consultant. When discharge consultant is examined, the same problem arises: as in up to 20% of cases discharge consultant is different to admissions consultant.
• Admissions under Emergency Medicine Consultants were included, although it was not ascertained what proportion of these admissions were for non-medical diagnoses.

4.2.4 Charlson score
A Charlson score was calculated for each patient admitted in 2010 and 2012 (33). The Charlson score is a score which gives expected survival at 12 months and is used as a measure of comorbidity. It is computed from variables including age and co-morbid conditions to give an overall Charlson score. For each decade over 40 years of age, a weight of 1 point is added to the score. Co-morbid conditions are also weighted. Weighting of conditions with ICD Codes are shown in Appendix II.

4.3 Data analysis
Descriptive analysis was performed, comparing the distribution of variables among discharges in 2010 and 2012, summarising using frequencies (percentages) and means (95% Confidence Interval).
Comparison of proportions was performed using the Chi-squared statistic for categorical variables, Wilcoxon Rank sum test for non-parametric continuous variables and two-tailed, unpaired Student t-test for means for parametric continuous variables. Data for LOS was significantly skewed; non-parametric tests were therefore carried out to calculate differences in LOS between years. However, mean LOS is used throughout the literature when describing length of stay. Mean LOS is meaningful in practice, particularly when hospital costs and bed utilisation are examined. Therefore analysis of mean LOS using student t-test was also carried out.

Binary logistic regression was carried out to explore the relationship between independent variables of year of discharge, age, gender and Charlson score, and median length of stay (greater or less than 3 days). Data were analysed using IBM SPSS version 21.0.

4.4 Ethics approval
Ethics approval was granted by the Clinical Research Ethics Committee of the Cork Teaching Hospitals in April 2013.

4.5 Literature review methodology
Electronic databases of PubMed and Embase were searched using search terms “acute medical unit” and synonyms including “acute medical assessment unit”, “acute assessment unit”, “acute medical ward”, “medical short stay unit” and “rapid assessment unit”. The search was limited to articles published after 1995, and in English. Relevant references cited by journal articles were also reviewed by the author. Eleven peer-reviewed reports were found as well as a systematic review. Websites of national organisations such as the HSE in Ireland and the RCPI were scanned for documents relating to Acute Medicine and Acute Medical Units. Lensus, an on-line repository of the Health Service Executive reports and publications was also searched for relevant material. The website of CUH was scanned for relevant documents. A Google Scholar search was carried out using “acute medical unit” or synonyms to retrieve documents from health departments and professional societies in other countries such as the UK and Australia.
5. RESULTS

5.1 Structure of the AMU
The AMU of CUH consists of an Acute Medical Assessment Unit (AMAU) and an Acute Medical Short Stay Unit (AMSSU). The AMU opened on the 10\textsuperscript{th} of January 2011, initially as an AMSSU, a 23-bed short-stay unit. In February 2011, the AMAU opened; accepting referrals directly form GPs as well as the ED.

The AMAU is a 13 bed assessment area plus eight trolleys, four couches and three consulting rooms. Adjacent to the AMAU is a 23-bed AMSSU. The AMU is located on the floor directly above the ED. The unit is staffed as shown in Figure 3. Three of the four consultant physicians working in the AMU have a specialisation in medicine for the elderly. The other consultant is specialised in gastroenterology.

![Figure 3: Clinical staff in AMU](image)

Consultants are present in the unit from 8 am to 8 pm from Monday to Friday. From Monday to Friday, one consultant in the unit is responsible for the AMAU each day and accepts referrals from general practitioners and from the ED.

In addition, a team of non-consultant hospital doctors consisting of a medical registrar, three senior house officers and an Intern rotate through the AMU. Senior house officers and Interns work on a shift basis in the unit and do not have on-call commitments elsewhere.

Three to four nursing staff are on duty in the AMAU. A senior nurse holds the position of Case Manager and is responsible for accepting referrals from GPs and from the ED.

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*Personal correspondence AMU physicians*
following triage. Her role also includes acting as Liaison Nurse between the Emergency Department and General Practice. Six to seven nurses are on duty in the AMSSU daily.

An AMU outpatient clinic to where only patients who have attended the AMU can be referred for follow-up has also been established. The outpatient clinic does not take referrals from any other source e.g. GPs, and only accepts referrals directly from the AMU.

5.2 Process: pathway of care

5.2.1 Pathway of care prior to opening of the AMU
Prior to the opening of the unit emergency medical patients were initially assessed in the ED. Those referred by GPs, walk-ins and those attending by ambulance were triaged in ED, and assessed by ED medical staff on duty, usually by junior staff such as senior house officers. Emergency medical patients were then either discharged home or referred to the on-take medical team. Patients were then assessed by the on-take medical team, usually by a junior member of the team. Following assessment, these patients were then either discharged home with follow-up if necessary, or admitted to an acute medical bed in the hospital as shown in Figure 4. Acute medical beds were distributed throughout the hospital on multiple wards. Frequently access to a senior medical clinician was not available until the next working day following admission.

The on-take admitting team was responsible for the care of the patient while in hospital, unless care was transferred to a more appropriate specialty following admission. Discharge home was from an acute bed with follow-up in outpatients if necessary.

5.2.2 Pathway of care following the opening of the AMU: assessment and admission pathway
The AMAU is open from 8am to 8pm from Monday to Friday while the AMSSU remains open 24 hours a day seven days a week. The AMAU accepts referrals from GPs and from ED triage. Small numbers of patients are also referred to the AMAU from the ophthalmology day ward. In general the AMU assesses and admits patients with an acute medical condition who do not have the following contra-indications to entry:
- Haemodynamic instability requiring invasive monitoring or intensive care.
- Patients with special medical requirements such as stroke, oncology or dialysis.
- Chest pain of possible cardiac origin as these patients are assessed in a dedicated chest pain service run by the cardiology service.
- Behaviourally disturbed patients best suited to admission under psychiatric services.

Prior to being accepted for assessment, all patients referred to the AMAU are discussed with either the consultant physician covering the AMAU or the case manager; Walk-ins are not accepted in the unit. Patients are assessed by the AMAU team, with review by the AMU consultant physician who is on duty for the AMAU. Therefore access to a senior clinician is available to patients at the time of assessment, within one hour of arrival in the unit (4).

The AMU receives priority access to diagnostics as there are four dedicated ultrasound slots each day for AMU patients. The unit also gets priority for MRI and CT. However there are no dedicated slots for these procedures for AMU patients. The AMU physician specialised in gastroenterology carries out endoscopy for AMU patients and the unit has priority access to specialty consultation in other specialities.

Following assessment, patients are either discharged home, or admitted to the AMSSU. If most suitable for admission under a different specialty they can be transferred to another specialty. Patients, who are not admitted from the AMSSU, may be followed up in the outpatient AMU clinic if necessary. Planned readmission to the AMU is arranged for patients who require further radiological investigations such as MRI.

The on-duty AMU consultant conducts a ward round each morning of patients admitted to the AMSSU and discharges patients who are suitable for discharge. In addition, the on-duty AMU consultant accepts selected medical patients from the overnight medical take from the consultant physician on-call.
The model of care is designed to accommodate patients in the AMSSU for a maximum of 48 hours. Patients admitted to the unit are then either a) discharged home, or b) transferred to another service within the hospital if not ready for discharge. However, these patients may remain in a bed in the unit, even if they have been transferred to another service. There can be delay in transferring patients to appropriate specialties, so that patients may remain in AMSSU beyond 48 hours, if a bed is unavailable elsewhere.

Between 8pm and 8am, the AMAU is closed but the AMSSU remains in operation. The on-call general medical team is responsible for the assessment, admissions and care of acute medical patients from 8 pm to 8 am. Some patients may therefore be admitted to a bed in the AMSSU by the on-call team and remain under their care until transferred to the care of AMU consultants if appropriate. AMU consultants also take part in the general on-call rota for medicine.
Figure 4: Admission pathway before and after the establishment of the Acute Medical Unit

ADMISSION PATHWAY ACUTE MEDICAL PATIENTS 2010

1. Admitted to Acute Bed
2. Assessment by On-Take Medical Team → Discharged
3. Assessment by ED Team → Discharged
4. ED Triage
5. GP Referrals
6. ED Walk-Ins or Ambulance
7. Other

ADMISSION PATHWAY ACUTE MEDICAL PATIENTS 2012

1. Admitted to Acute Bed ↔ Admitted to Medical Short-Stay Unit
2. Acute Medical Assessment Unit → Discharged
3. GP Referrals
4. ED Triage
5. ED Walk-Ins or Ambulance
6. Other
5.3 Outcomes

- **5.3.1 Outcomes in relation to emergency medical activity in the Hospital**
  Outcomes were derived from analysis of HIPE data from 2010, prior to the opening of the AMU unit, and 2012, after the opening of the AMU.

- **5.3.2 Outcomes in relation to the Emergency Department**
  Outcomes were derived from analysis of INMO trolley watch data, and from HSE Healthstat data.

- **5.3.3 Outcomes in relation to the Acute Medical Unit**
  Outcomes were derived from AMU data.

**5.3.1 Outcomes in relation to emergency medical activity in the hospital**
HIPE reports were generated of adults admitted as acute medical admissions to CUH, excluding admissions whose principal diagnosis was dialysis, chemotherapy or radiotherapy.

**Characteristics of admissions 2010 and 2012**
Adult emergency medical admissions in CUH increased from 8,606 in 2010 to 13,442 in 2012, an increase of 56% (*Table 2*). There was no difference in gender distribution of admissions between 2010 and 2012. The median age of patients admitted increased.

There was no difference in comorbidity between admissions in 2010 and 2012. Median length of stay decreased from 3 days to 2 days.
**Table 2: Characteristics of admissions to CUH in 2010 and 2012**

<table>
<thead>
<tr>
<th></th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Admissions</td>
<td>8,606 (100.0)</td>
<td>13,442 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4,498 (52.0)</td>
<td>7,053 (53.0)</td>
<td>0.767</td>
</tr>
<tr>
<td>Median Age in years</td>
<td>60.6</td>
<td>62.0</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Median Charlson Score</td>
<td>3.0</td>
<td>3.0</td>
<td>0.841</td>
</tr>
<tr>
<td>Median Length of stay in days</td>
<td>3.0</td>
<td>2.0</td>
<td>&lt;0.000</td>
</tr>
</tbody>
</table>

**Admissions and readmission rate to CUH 2010 and 2012**

The readmission rate showed a marginal increase from 0.5% of all admissions in 2010, to 0.8% of all admissions in 2012 (Table 3).

**Table 3: Proportion of admissions and readmissions to CUH 2010 and 2012**

<table>
<thead>
<tr>
<th></th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total emergency medical admissions</td>
<td>8606 (100)</td>
<td>13442 (100)</td>
<td></td>
</tr>
<tr>
<td>Emergency medical admissions</td>
<td>8563 (99.5)</td>
<td>13332 (99.2)</td>
<td>0.005</td>
</tr>
<tr>
<td>Emergency medical readmissions</td>
<td>43 (0.5)</td>
<td>110 (0.8)</td>
<td></td>
</tr>
</tbody>
</table>
Admissions under speciality groups

The number of acute medical admissions increased from 8,606 in 2010 to 13,442 an increase of 56% in 2012 (Table 4). Admissions under AMU specialities, 1,854 admissions, accounted for almost 40% of this increase. In 2012, 13.8% of acute medical admissions were admitted under the AMU team. For most other medical specialties, the proportion of acute admissions admitted under each specialty decreased in 2012 relative to 2010 as would be expected.

Table 4: Total adult emergency medical admissions to CUH under specialty groups, and proportion of admissions under each specialty in 2010 and 2012

<table>
<thead>
<tr>
<th>Specialty</th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>Change in number of admissions</th>
<th>% change in distribution by specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency medicine</td>
<td>2012 (23.4)</td>
<td>2431 (18.1)</td>
<td>+419</td>
<td>- 5.3</td>
</tr>
<tr>
<td>Acute medical unit</td>
<td>0 (0.0)</td>
<td>1854 (13.8)</td>
<td>+1854</td>
<td></td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>666 (7.7)</td>
<td>850 (6.3)</td>
<td>+184</td>
<td>-1.4</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>515 (6.0)</td>
<td>612 (4.6)</td>
<td>+97</td>
<td>-1.4</td>
</tr>
<tr>
<td>Medicine for the elderly</td>
<td>675 (7.8)</td>
<td>777 (5.8)</td>
<td>+102</td>
<td>-2.0</td>
</tr>
<tr>
<td>Nephrology</td>
<td>688 (8.0)</td>
<td>578 (4.3)</td>
<td>-110</td>
<td>-3.7</td>
</tr>
<tr>
<td>Neurology</td>
<td>836 (9.7)</td>
<td>1054 (7.8)</td>
<td>+218</td>
<td>-1.9</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>272 (3.2)</td>
<td>325 (2.4)</td>
<td>+53</td>
<td>-0.8</td>
</tr>
<tr>
<td>Haematology/oncology</td>
<td>579 (6.7)</td>
<td>657 (4.9)</td>
<td>+78</td>
<td>-1.8</td>
</tr>
<tr>
<td>Medicine other&lt;sup&gt;6&lt;/sup&gt;</td>
<td>42 (0.5)</td>
<td>763 (5.7)</td>
<td>+721</td>
<td>+5.2</td>
</tr>
<tr>
<td>Respiratory medicine</td>
<td>667 (7.8)</td>
<td>863 (6.4)</td>
<td>+196</td>
<td>-1.4</td>
</tr>
<tr>
<td>Cardiology</td>
<td>1326 (15.4)</td>
<td>2393 (17.8)</td>
<td>+1067</td>
<td>+2.4</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>328 (3.8)</td>
<td>285 (2.1)</td>
<td>-43</td>
<td>-1.7</td>
</tr>
<tr>
<td>Total number of admissions</td>
<td>8606 (100)</td>
<td>13442 (100)</td>
<td>+4836</td>
<td>+56.2</td>
</tr>
</tbody>
</table>
The exception to this is cardiology. The proportion of acute medical admissions admitted under cardiology increased by 2.4% in 2012 compared to 2010. There was also an increase in the proportion of admissions admitted under medical consultants without a documented specialty; however, only 42 admissions were admitted under this specialty in 2010. This specialty is accounted for by a medical consultant who takes part in the general-on-call rota, but does not have a documented specialty, and has academic commitments.

**Comorbidity as measured by the Charlson index 2010 and 2012**

The complexity of patients, as defined by comorbidity and measured by the Charlson Index, did not change between 2010 and 2012 (Table 5). There was no difference in the proportion of admissions with low or high comorbidity between the two years.

**Table 5: Mean Charlson score for admissions to CUH in 2010 and 2012**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2012</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Charlson Score</strong></td>
<td>3.41 (-2.97 to 9.79)</td>
<td>3.40 (-2.79 to 9.59)</td>
<td>0.841</td>
</tr>
<tr>
<td><strong>2010 n (%)</strong></td>
<td>3538 (41.1)</td>
<td>5375 (40.0)</td>
<td>0.100</td>
</tr>
<tr>
<td><strong>Charlson Score 0-2</strong></td>
<td>5068 (58.9)</td>
<td>8067 (60.0)</td>
<td>0.100</td>
</tr>
<tr>
<td><strong>Total Admissions</strong></td>
<td>8606 (100)</td>
<td>13442 (100)</td>
<td></td>
</tr>
</tbody>
</table>
Comorbidity as measured by Charlson index across specialty groups 2012

Further analysis was undertaken to determine if patients admitted under AMU physicians were less complex than medical patients admitted under other specialties. ED consultants admitted the least complex patients, followed by Neurology. Haematology/Oncology admitted the most complex patients as defined by Charlson Score (Table 6).

Admissions under AMU physicians had a mean Charlson score that was lower than that of other general medical specialties (Table 6). However, 95% Confidence Intervals overlapped (Figure 5); therefore results were not statistically significant. Results show that patients of equal complexity are being admitted under AMU physicians when compared to other medical specialties.

Table 6: Mean Charlson score for admissions to CUH 2012 across medical specialties

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Mean Charlson Score (95% CI)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency medicine</td>
<td>1.22 (-1.62 to 4.06)</td>
<td>1</td>
</tr>
<tr>
<td>Acute Medical Unit</td>
<td>3.22 (-2.46 to 9.08)</td>
<td>3</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>3.79 (-1.83 to 9.41)</td>
<td>4</td>
</tr>
<tr>
<td>Medicine for the elderly</td>
<td>5.12 (-1.83 to 12.1)</td>
<td>5</td>
</tr>
<tr>
<td>Nephrology</td>
<td>4.67 (-0.05 to 9.39)</td>
<td>5</td>
</tr>
<tr>
<td>Neurology</td>
<td>1.84 (-1.64 to 5.32)</td>
<td>2</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>3.46 (-0.81 to 7.73)</td>
<td>4</td>
</tr>
<tr>
<td>Haematology/oncology</td>
<td>8.82 (-4.17 to 21.89)</td>
<td>6</td>
</tr>
<tr>
<td>Medicine other</td>
<td>3.69 (-1.09 to 8.47)</td>
<td>4</td>
</tr>
<tr>
<td>Respiratory</td>
<td>3.94 (-1.41 to 9.29)</td>
<td>4</td>
</tr>
<tr>
<td>Cardiology</td>
<td>3.57 (0.04 to 7.11)</td>
<td>4</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>3.65 (-1.29 to 8.50)</td>
<td>4</td>
</tr>
</tbody>
</table>
Figure 5: Mean Charlson Score of admissions to CUH showing 95% Confidence Interval
**Age distribution across specialty groups 2012**

Mean and median ages were lower for admissions under emergency medicine and Neurology. In contrast, mean and median ages were higher for Medicine for the Elderly, in part accounting for higher Charlson score for admissions under this Specialty. As 95% Confidence Intervals of overlapped, no statistically significant difference in mean age was seen between admissions under AMU when compared to other specialties (Table 7).

**Table 7: Age distribution of acute admissions to CUH across specialty groups 2012**

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Mean Age in years</th>
<th>Median Age in years</th>
<th>SD</th>
<th>95% CI of the Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Admissions</td>
<td>58.61</td>
<td>62</td>
<td>20.07</td>
<td>36.61 to 80.61</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>43.38</td>
<td>42</td>
<td>17.62</td>
<td>9.63 to 77.13</td>
</tr>
<tr>
<td>Acute Medical Unit</td>
<td>59.63</td>
<td>63</td>
<td>20.45</td>
<td>54.83 to 99.71</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>61.88</td>
<td>66</td>
<td>20.77</td>
<td>21.18 to 102.58</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>62.10</td>
<td>67</td>
<td>21.5</td>
<td>19.94 to 82.04</td>
</tr>
<tr>
<td>Medicine for the Elderly</td>
<td>76.19</td>
<td>79</td>
<td>13.33</td>
<td>50.19 to 102.19</td>
</tr>
<tr>
<td>Nephrology</td>
<td>63.69</td>
<td>67</td>
<td>19.39</td>
<td>25.69 to 101.9</td>
</tr>
<tr>
<td>Neurology</td>
<td>46.16</td>
<td>46</td>
<td>15.29</td>
<td>16.2 to 76.12</td>
</tr>
<tr>
<td>Infectious Diseases</td>
<td>64.88</td>
<td>70</td>
<td>19.87</td>
<td>25.94 to 103.82</td>
</tr>
<tr>
<td>Haematology/Oncology</td>
<td>61.27</td>
<td>64</td>
<td>15.14</td>
<td>31.01 to 91.53</td>
</tr>
<tr>
<td>Medicine Other</td>
<td>65.30</td>
<td>70</td>
<td>19.08</td>
<td>27.91 to 93.21</td>
</tr>
<tr>
<td>Respiratory</td>
<td>62.89</td>
<td>67</td>
<td>19.29</td>
<td>25.09 to 100.69</td>
</tr>
<tr>
<td>Cardiology</td>
<td>63.86</td>
<td>66</td>
<td>14.87</td>
<td>48.99 to 93.02</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>64.16</td>
<td>69</td>
<td>19.56</td>
<td>25.81 to 102.51</td>
</tr>
</tbody>
</table>
Length of stay (LOS)

Median length of stay: Wilcoxon Rank Sum Test

Wilcoxon Rank Sum test was carried out to analyse the difference in median LOS for admissions in 2010 and 2012. Median LOS decreased in 2012 for all admissions (Table 8). Sub-analysis by specialty also showed a decrease in median LOS for all specialties except haematology/oncology. These differences were statistically significant for all specialties except rheumatology.

Table 8: Median length of stay for acute medical admissions to CUH 2010, 2012

<table>
<thead>
<tr>
<th>Median length of stay in days</th>
<th>2010</th>
<th>2012</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.0</td>
<td>2.0</td>
<td>&lt;0.000</td>
</tr>
</tbody>
</table>
Mean length of stay 2010 and 2012

The mean LOS for all adult acute medical admissions decreased by 2.54 days (95% CI 2.12 to 2.97) from 8.34 days in 2010 to 5.78 days in 2012. A decrease in mean LOS in 2012 was seen in all specialties, except emergency medicine, haematology/oncology and gastroenterology (Table 9, Figure 6). The greatest decrease in mean LOS was seen in medicine other. However, numbers of admissions were small for 2010. Medicine for the elderly also saw a decrease in mean LOS of 6.66 days.

Table 9: Mean LOS for adult acute medical admissions to CUH 2010 and 2012

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Mean LOS 2010</th>
<th>Mean LOS 2012</th>
<th>Mean difference</th>
<th>95% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All admissions</td>
<td>8.34</td>
<td>5.78</td>
<td>2.54</td>
<td>2.12 to 2.97</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>1.75</td>
<td>1.67</td>
<td>0.09</td>
<td>-0.10 to 2.97</td>
<td>0.37</td>
</tr>
<tr>
<td>Acute Medical Unit</td>
<td>3.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>11.44</td>
<td>11.14</td>
<td>0.31</td>
<td>-1.65 to 2.26</td>
<td>0.759</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>11.51</td>
<td>7.92</td>
<td>3.59</td>
<td>1.71 to 5.47</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Medicine for the elderly</td>
<td>16.19</td>
<td>9.53</td>
<td>6.66</td>
<td>4.28 to 9.04</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Nephrology</td>
<td>12.11</td>
<td>9.37</td>
<td>2.74</td>
<td>0.80 to 4.67</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Neurology</td>
<td>9.49</td>
<td>7.48</td>
<td>2.74</td>
<td>0.20 to 3.83</td>
<td>0.029</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>10.03</td>
<td>6.04</td>
<td>3.99</td>
<td>1.53 to 6.45</td>
<td>0.002</td>
</tr>
<tr>
<td>Haematology/oncology</td>
<td>9.05</td>
<td>8.17</td>
<td>0.88</td>
<td>-1.11 to 2.87</td>
<td>0.387</td>
</tr>
<tr>
<td>Medicine other</td>
<td>17.81</td>
<td>6.02</td>
<td>11.79</td>
<td>1.97 to 21.59</td>
<td>0.02</td>
</tr>
<tr>
<td>Respiratory</td>
<td>12.82</td>
<td>9.06</td>
<td>3.76</td>
<td>1.81 to 5.72</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Cardiology</td>
<td>4.91</td>
<td>5.92</td>
<td>0.99</td>
<td>0.48 to 1.48</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>11.53</td>
<td>8.68</td>
<td>2.84</td>
<td>0.43 to 5.25</td>
<td>0.021</td>
</tr>
</tbody>
</table>
Figure 6: Mean length of stay by specialty for 2010 and 2012, with 95% confidence interval
Mean length of stay: Acute Medicine Programme categories

Further analysis was carried out of mean length of stay according to categories laid out by the Acute Medicine Programme. The AMP defines, as one of their outcome audit indicators, discharges of acute medical patients according to length of stay. These are categorised as discharges with the following mean LOS:

- Same day discharge, 1-2 days, 3-14 days, 15-30 days, ≥ 30 days.

Between 2010 and 2012 there was a shift towards a shorter length of stay, with the proportion of same day discharges and mean LOS of 1-2 days increasing in 2012 (Table 10). While there was an increase in the total numbers of patients with a mean LOS of 3-14 days, the proportion of these admissions fell by 4.5%. There was a decrease in the proportion of admissions staying more than 14 days in hospital. Differences were highly statistically significant (p<0.000).

Table 10: Length of stay in Acute Medicine Programme categories

<table>
<thead>
<tr>
<th>Category</th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>% Change</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Same day discharge</td>
<td>2775 (32.2)</td>
<td>5335 (39.7)</td>
<td>+7.5</td>
<td></td>
</tr>
<tr>
<td>1-2 days</td>
<td>882 (10.2)</td>
<td>1639 (12.2)</td>
<td>+2.0</td>
<td></td>
</tr>
<tr>
<td>3-14 days</td>
<td>3814 (44.3)</td>
<td>5353 (39.8)</td>
<td>-4.5</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>15-30 days</td>
<td>748 (8.7)</td>
<td>749 (5.6)</td>
<td>-3.1</td>
<td></td>
</tr>
<tr>
<td>&gt;30 days</td>
<td>387 (4.5)</td>
<td>366 (2.7)</td>
<td>-1.8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8606 (100.0)</td>
<td>13442 (100.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Binary logistic regressions model: analysis of median LOS by year of discharge 2010 and 2012.

Length of stay was categorised into two groups using the median value, based on preliminary analysis of median LOS. Length of stay was categorised as ≤3 days and 4 days or longer.

Univariate analysis was carried out to determine the association between the median LOS ≤ 3 days, or 4 days or longer and the following variables: year of discharge, age, gender, and Charlson score.

Binary logistic regression analysis was then carried out to assess the impact of a number of factors on the likelihood of LOS of ≤ 3 days. The model contained four independent variables (year of discharge, age, gender, and Charlson score). The full model containing all predictors was statistically significant $\chi^2 = 3182.7$, $P < 0.000$.

As shown in Table 11, three of the independent variables made a statistically significant contribution to the model: year of discharge, age, and Charlson score. Discharge from hospital in 2012 was associated with an increased likelihood of LOS in hospital ≤ 3 days (OR 1.64 95%CI 1.55 to 1.74). As expected, increasing age, and increasing Charlson comorbidity scores were associated with a decreased likelihood of a length of stay in hospital of 3 days or less.

Table 11: Binary logistic regression analysis of length of stay by years 2010 and 2012

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of discharge 2012</td>
<td>1.64</td>
<td>1.55 to 1.74</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Age</td>
<td>0.98</td>
<td>0.97 to 0.98</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Female gender</td>
<td>1.01</td>
<td>0.95 to 1.07</td>
<td>0.797</td>
</tr>
<tr>
<td>Charlson score</td>
<td>0.87</td>
<td>0.86 to 0.88</td>
<td>&lt;0.000</td>
</tr>
<tr>
<td>Constant</td>
<td>6.56</td>
<td></td>
<td>&lt;0.000</td>
</tr>
</tbody>
</table>
Sub-analysis of patients aged 65 and over
Sub-analysis was carried out of patients aged 65 and over.

Total admissions patients aged 65 and over
Admissions in this age group increased by 63% in 2012 compared with 2010 (Table 12), compared with an increase of 56% for all admissions.

Table 12: Admissions aged 65 and over 2010 and 2012.

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2012</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>All admissions</td>
<td>8606</td>
<td>13442</td>
<td>+56.2</td>
</tr>
<tr>
<td>Admissions ≥ 65 Years</td>
<td>3656</td>
<td>5961</td>
<td>+63%</td>
</tr>
</tbody>
</table>
Acute medical admissions aged 65 and over under specialties

Number of admissions of patients aged 65 and over increased for all specialties in 2012, except nephrology and rheumatology (Table 13). The proportion of admissions aged 65 and over admitted under different specialties decreased in 2012, with the exception of medicine other and cardiology. The biggest decrease was seen in medicine for the elderly.

**Table 13: Acute medical admissions to CUH aged 65 and over under medical specialties**

<table>
<thead>
<tr>
<th>Specialty</th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>Change in number of admissions</th>
<th>% Change in distribution by specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency medicine</td>
<td>262 (7.2)</td>
<td>332 (5.6)</td>
<td>+70</td>
<td>-1.6</td>
</tr>
<tr>
<td>Acute medical unit</td>
<td>0</td>
<td>868 (14.6)</td>
<td>+868</td>
<td>+14.6</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>331 (9.1)</td>
<td>445 (7.5)</td>
<td>+114</td>
<td>-1.6</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>281 (7.7)</td>
<td>334 (5.6)</td>
<td>+53</td>
<td>-2.1</td>
</tr>
<tr>
<td>Medicine for the elderly</td>
<td>667 (18.2)</td>
<td>696 (11.7)</td>
<td>+29</td>
<td>-6.5</td>
</tr>
<tr>
<td>Nephrology</td>
<td>365 (10.0)</td>
<td>313 (5.3)</td>
<td>-52</td>
<td>-5.7</td>
</tr>
<tr>
<td>Neurology</td>
<td>70 (1.9)</td>
<td>104 (1.7)</td>
<td>+34</td>
<td>-0.2</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>134 (3.7)</td>
<td>192 (3.2)</td>
<td>+58</td>
<td>-0.5</td>
</tr>
<tr>
<td>Haematology/oncology</td>
<td>261 (7.1)</td>
<td>320 (5.4)</td>
<td>+59</td>
<td>-1.7</td>
</tr>
<tr>
<td>Medicine other</td>
<td>30 (0.8)</td>
<td>464 (7.8)</td>
<td>+434</td>
<td>+7.0</td>
</tr>
<tr>
<td>Respiratory medicine</td>
<td>356 (9.7)</td>
<td>462 (7.8)</td>
<td>+106</td>
<td>-1.9</td>
</tr>
<tr>
<td>Cardiology</td>
<td>711 (19.4)</td>
<td>1267 (21.3)</td>
<td>+556</td>
<td>+1.9</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>188 (5.1)</td>
<td>164 (2.8)</td>
<td>-24</td>
<td>-2.3</td>
</tr>
<tr>
<td>Total</td>
<td>3656 (100.0)</td>
<td>5961 (100.0)</td>
<td>+2305</td>
<td></td>
</tr>
</tbody>
</table>
Emergency readmissions of patients aged 65 years and over

Table 14 shows that the proportion of admissions that were readmissions increased marginally from 0.4% to 0.8%. This difference was statistically significant (P=0.02). Again it was not possible to differentiate between emergency readmissions, and planned readmissions to the AMU.

Table 14: Emergency readmissions to CUH of patients aged 65 and over.

<table>
<thead>
<tr>
<th></th>
<th>2010 n (%)</th>
<th>2012 n (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency admission</td>
<td>3641 (99.6)</td>
<td>5913 (99.2)</td>
<td></td>
</tr>
<tr>
<td>Emergency readmission</td>
<td>15 (0.4)</td>
<td>48 (0.8)</td>
<td>0.020</td>
</tr>
<tr>
<td>Total</td>
<td>3656 (100)</td>
<td>5961 (100)</td>
<td></td>
</tr>
</tbody>
</table>
Mean length of stay for patients aged 65 and over

Mean LOS for patients aged 65 and over decreased by 4 days, from 12.11 days in 2010 to 7.89 days in 2012.

Endocrinology, medicine for the elderly, nephrology, infectious diseases, and respiratory medicine specialties saw a decrease in mean LOS between 2010 and 2012 that was statistically significant (Table 15 and Figure 7).

Table 15: Mean length of stay for patients aged 65 and over under specialty groups

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Admissions 2010 n</th>
<th>LOS 2010</th>
<th>Admissions 2012 n</th>
<th>LOS 2012</th>
<th>Mean difference in LOS</th>
<th>95% CI of Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>All admissions</td>
<td>3656</td>
<td>12.11</td>
<td>5961</td>
<td>7.89</td>
<td>4.22</td>
<td>3.52 to 4.91</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>262</td>
<td>3.50</td>
<td>332</td>
<td>2.61</td>
<td>0.89</td>
<td>-0.32 to 2.11</td>
</tr>
<tr>
<td>Acute Medical Unit</td>
<td>868</td>
<td>5.56</td>
<td>696</td>
<td>9.99</td>
<td>6.24</td>
<td>3.87 to 8.77</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>331</td>
<td>13.98</td>
<td>445</td>
<td>13.44</td>
<td>0.55</td>
<td>-2.37 to 3.47</td>
</tr>
<tr>
<td>Endocrinology</td>
<td>281</td>
<td>15.64</td>
<td>334</td>
<td>9.78</td>
<td>5.86</td>
<td>2.86 to 8.85</td>
</tr>
<tr>
<td>Medicine for the elderly</td>
<td>667</td>
<td>16.31</td>
<td>696</td>
<td>9.99</td>
<td>6.24</td>
<td>3.87 to 8.77</td>
</tr>
<tr>
<td>Nephrology</td>
<td>365</td>
<td>14.41</td>
<td>313</td>
<td>10.37</td>
<td>4.04</td>
<td>1.01 to 7.07</td>
</tr>
<tr>
<td>Neurology</td>
<td>70</td>
<td>20.49</td>
<td>104</td>
<td>13.02</td>
<td>5.68</td>
<td>-3.82 to 18.76</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>134</td>
<td>12.37</td>
<td>192</td>
<td>6.92</td>
<td>5.54</td>
<td>1.38 to 9.59</td>
</tr>
<tr>
<td>Haematology/Oncology</td>
<td>261</td>
<td>9.35</td>
<td>320</td>
<td>7.92</td>
<td>1.43</td>
<td>-0.109 to 2.69</td>
</tr>
<tr>
<td>Medicine other</td>
<td>30</td>
<td>21.00</td>
<td>464</td>
<td>7.74</td>
<td>13.26</td>
<td>-0.24 to 26.75</td>
</tr>
<tr>
<td>Respiratory</td>
<td>356</td>
<td>14.45</td>
<td>462</td>
<td>10.39</td>
<td>4.06</td>
<td>1.57 to 6.60</td>
</tr>
<tr>
<td>Cardiology</td>
<td>711</td>
<td>5.87</td>
<td>1267</td>
<td>5.10</td>
<td>0.08</td>
<td>-0.09 to 1.63</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>188</td>
<td>14.43</td>
<td>164</td>
<td>11.17</td>
<td>3.25</td>
<td>-0.51 to 7.02</td>
</tr>
</tbody>
</table>
Figure 7: Mean length of stay for admissions to CUH aged 65 years and over showing 95% Confidence Interval
5.3.2 Outcomes in relation to the ED

**National trends in ED attendances and acute admissions: Healthstat and HIPE data.**

Nationally, attendances to ED decreased between 2009 and 2011, following which, attendances to the ED increased, as shown in *Figure 8*. Trends in all emergency admissions nationally demonstrate an increased in emergency admissions to hospital over this five year period (*Figure 9*). This includes all emergency admissions both adult and paediatric, and medical, surgical, obstetric and psychiatry admissions.

*Figure 8: Emergency Department attendances nationally Healthstat data*

*Figure 9: Trends in emergency admissions nationally 2008 to 2012*
Trends in ED attendance and ED admissions CUH: HIPE and Healthstat data

Between 2010 and 2012 there was a 13% increase in total attendances to the ED of Cork University Hospital (Table 16).

Adult emergency admissions (those aged 15 years and over) increased by 38%. This includes admissions under surgical, medical, obstetric and psychiatry services.

Table 16: Total ED attendances and emergency admissions for CUH

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2012</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total attendances to ED</td>
<td>56,376</td>
<td>63,940</td>
<td>+13.4%</td>
</tr>
<tr>
<td>Emergency admissions</td>
<td>20,084</td>
<td>26,728</td>
<td>+33.1%</td>
</tr>
<tr>
<td>Emergency admissions adults</td>
<td>14,996</td>
<td>20,749</td>
<td>+38.4%</td>
</tr>
<tr>
<td>Emergency admissions children</td>
<td>5,088</td>
<td>5,979</td>
<td>+17.5%</td>
</tr>
</tbody>
</table>
INMO Trolleywatch yearly trolley numbers

National trends
National trends in INMO trolley counts show an increase in trolley counts between 2008 and 2011, following which a decrease occurred (Figure 10).

Figure 10: INMO national trolley counts
Regional trends

*Table 17* shows INMO trolleys counts in Emergency Departments in hospitals in the HSE-South area for which data were available and trolley numbers nationally. Some hospitals in the region experienced an increase in trolley numbers, but there was an overall decrease in trolley numbers regionally of 9.4%.

**Table 17: Total numbers trolleys in ED. National and HSE-South**

<table>
<thead>
<tr>
<th>Year (January-April)</th>
<th>2010</th>
<th>2012</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>75859</td>
<td>66308</td>
<td>-12.6%</td>
</tr>
<tr>
<td>HSE South</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cork University Hospital</td>
<td>7021</td>
<td>4230</td>
<td>-39.7%</td>
</tr>
<tr>
<td>Mercy University Hospital Cork</td>
<td>1910</td>
<td>1922</td>
<td>+0.6%</td>
</tr>
<tr>
<td>Kerry General Hospital</td>
<td>623</td>
<td>606</td>
<td>-2.7%</td>
</tr>
<tr>
<td>South Tipperary General Hospital</td>
<td>666</td>
<td>2138</td>
<td>+221.0%</td>
</tr>
<tr>
<td>Waterford Regional Hospital</td>
<td>1349</td>
<td>1590</td>
<td>+17.8%</td>
</tr>
<tr>
<td>Regional</td>
<td>11569</td>
<td>10486</td>
<td>-9.4%</td>
</tr>
</tbody>
</table>
CUH trends

CUH data shows a similar trend to the national trend: the numbers of trolleys increased in 2010. By 2012 numbers had decreased overall. However, unlike national trends, by 2012, trolley numbers had dropped to below 2008 levels as shown (Figure 11).

Figure 11: INMO trolley counts CUH

Mean and median daily trolley numbers decreased in CUH in 2012, as shown in Table 18. The median daily number of trolleys decreased from 28 in 2010 to 16 in 2012. Mean daily trolley numbers fell from 27.75 in 2010, to 16.85 in 2012, a difference of 10.89, and this difference was statistically significant (P<0.000, 95% CI 9.03 to 12.77).

Table 18: Total, mean, and median numbers of trolleys in the ED by year

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2012</th>
<th>Mean difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>28</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>27.75</td>
<td>16.85</td>
<td>10.89 (9.03 to 12.77)</td>
</tr>
<tr>
<td>Total</td>
<td>7021</td>
<td>4230</td>
<td></td>
</tr>
</tbody>
</table>
5.3.3 Outcomes in relation to the AMU
Patients assessed in AMAU: source of referral

Data regarding source of referral of patients assessed in the AMAU was available from October 2012. Between October 2012 and December 2012, more than half of patients were referred from the ED. Referrals from GPs made up 30% of referrals (Table 19).

Table 19: Source of referral for patients assessed in AMAU

<table>
<thead>
<tr>
<th></th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assessed</td>
<td>493</td>
<td>513</td>
<td>389</td>
<td>1395 (100)</td>
</tr>
<tr>
<td>Planned readmissions</td>
<td>51</td>
<td>67</td>
<td>48</td>
<td>166 (11.9)</td>
</tr>
<tr>
<td>Referred from GP</td>
<td>170</td>
<td>145</td>
<td>100</td>
<td>415 (29.7)</td>
</tr>
<tr>
<td>Referred from ED</td>
<td>256</td>
<td>290</td>
<td>230</td>
<td>776 (55.6)</td>
</tr>
<tr>
<td>Referred from eye ward</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>9 (0.6)</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>22 (1.6)</td>
</tr>
<tr>
<td>Not recorded</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7 (0.5)</td>
</tr>
</tbody>
</table>

Outcome for patients assessed in AMAU

In 2012, 4,420 patients were assessed in the AMAU. The majority of patients were discharged on the day of assessment. A quarter of patients assessed were admitted to the AMSSU as shown in Figure 12.

Figure 12: Outcomes for patients assessed in AMAU
6. DISCUSSION

6.1 Evaluation of services in a changing environment
This evaluation focuses on emergency medical activity in CUH and in particular on the impact that the opening of the AMU has had on this activity. However, the AMU opened at a time of hospital re-configuration in the Cork and Kerry area, with the closure of the ED department in the South Infirmary Victoria Hospital in Cork City and transfer of acute medicine and surgery services to CUH and the Mercy Hospital. A number of changes also took place in CUH during this time. A new Cardiac-Renal centre opened in October 2010 in CUH.

Against the background of regional and national changes, the workload of hospitals in the region changed with a shift of emergency medical activity to CUH which began as early as 2009.

Given the changes that occurred regionally, nationally and within the hospital during this time, the impact of the opening of the AMU on emergency medical activity in CUH cannot be viewed in isolation, but rather as one of a suite of changes in the care of acute medical patients in the hospital. In addition, as with any observational study, cause and effect of any differences seen following the opening of the unit cannot be attributed solely to the AMU. Changes in pre-hospital care, and post-hospital care, for example may have occurred during this time. However, the AMU is an important element in the changes made in the overall model of care of acutely ill medical patients in CUH and therefore it is likely that it has contributed substantially to changes seen.

6.2 Acute medical service work-load
Between 2010 and 2012, admissions of acute medical patients increased by 56%. For patients over 65, the increase was even greater; admissions increased by 63%. This increase in acute medical activity is likely to reflect in part the re-configuration of acute hospitals in the area.
The AMU accounted for 13.8% of acute medical admissions in 2012 and 14.6% of acute medical admissions over 65 years. A corresponding decrease in the proportion of patients admitted under each specialty occurred during this time, with the exception of cardiology, however, admissions under cardiology increased by only 2.5% in 2012 compared with 2010 (the proportion of admissions under medical consultants without a documented specialty also rose however; these accounted for less that 1% of admissions in 2010, and less than 6% of admissions in 2012, and are therefore not a major factor in changes seen). The AMU is likely to be a major contributor to this change in workload, with a proportion of acutely ill medical patients being looked after by the AMU who would previously be looked after by other specialties.

Limitations to using HIPE data for the purposes of this analysis exist. HIPE data identifies the admitting consultant and the discharge consultant for each admission. For the purposes of this study, analysis focused on the admitting consultant’s specialty. However in reality, transfer of patients between specialties does occur. Therefore results may not be truly representative of workload of different specialties.

6.3 Length of stay
This study demonstrates that following the opening of the AMU, median LOS decreased by one day for all acute medical admissions. Patients discharged in 2012, were more likely to be admitted for a shorter period of time (3 days or less) when compared to 2010, and this was independent of age and Charlson score. Mean LOS also decreased in 2012, for all admissions and for admissions of patients over 65. This was despite an increase in the age of patients and no change in comorbidity.

While other changes occurred in CUH during this time, in particular the opening of the Cardiac-Renal centre, the AMU was a contributor to the improved efficiency of the care of acute medical patients in the hospital. Reduction in LOS following the establishment of an AMU is supported by evidence from the literature. A reduction in LOS following the opening of an AMU was seen in in St James’ Hospital where LOS decreased from 6 days to 5 days. Studies carried out in hospitals in the UK, Australia and Denmark, also reported a
reduction in LOS following the opening of an AMU (4, 5). Assessment of patients by a senior AMU consultant physician with daily ward rounds within the AMSSU is likely to contribute to this. As well as the benefits of a senior physician reviewing patients early and daily, there is evidence that patients of general medical consultants (such as those working within the AMU) have shorter LOS than specialists, while maintaining a high quality of patient care (34, 35). This may also contribute to the decreased LOS. Dedicated slots for radiology investigations for AMU patients may also contribute to a shorter LOS, since patients are not waiting for investigations for long periods of time. LOS amongst other specialties also decreased during this time, suggesting that the AMU has contributed to increased efficiency in acute medicine, perhaps by focusing acute general medical workload for specialist physicians away from general medicine, and towards their own speciality.

6.4 Acuity and comorbidity
It has been suggested that AMAU and AMSSUs that accept referrals directly from GPs assess and care for less complex medical patients who in the absence of such units would be looked after in primary care, and that this has an impact on both the numbers of patients admitted, and on the LOS.

Acuity
Analysis of the acuity of patients assessed in the AMAU or admitted to the AMSSU was not carried out as part of this evaluation. However, following this evaluation, an audit of acuity of patients assessed in the AMAU in September 2013 was carried out by AMU staff. This examined the Manchester Triage Category for patients assessed in the AMAU, for both GP referrals, and referrals from the ED (See Appendix V).

For both GP referrals and ED referrals, the most common Triage Category was Category 3, followed by Category 4. No Category 1 patients are accepted by the AMAU (for Manchester Triage Categories see Appendix VI).
There was no Category 5 patients assessed, indicating that no patients with minor illnesses are being referred to the AMAU. Most Category 4 patients seen were for conditions for which no alternative care pathway exists other than the AMAU or ED, for example patients with suspected Deep Venous Thrombosis. This audit confirms that the AMAU in CUH assesses, investigates and manages undifferentiated medical patients of high medical acuity referred from ED and GP (See Appendix VI). This reflects what was found in a study of the AMU of Tralee General Hospital of the appropriateness of patients looked after by the AMU (31).

**Comorbidity**

For the purposes of this study, comorbidity was examined for Acute Medical Admissions in 2010 and 2012, but was not carried out for all patients who were assessed in the AMAU.

There was no statistically significant difference in comorbidity as measured by the Charlson score for admissions under AMU specialties compared with other medical specialties. In addition, no difference was seen in comorbidity of acute medical admissions between 2010 and 2012. Therefore, admissions before and after opening of the unit had the same level of comorbidity, and AMU physicians cared for patients of equal comorbidity as other specialties. These results are similar to those found by a study from St James’ Hospital in Dublin which reported no statistically significant difference in mean Charlson score in the years before and after the opening of an AMU in their hospital (5). In fact a study from Melbourne suggested a trend towards higher acuity of acute medical admissions following the opening of an AMU (17).

**6.5 Readmissions rates**

Readmission rates are commonly measured as a marker of quality of care as readmissions may reflect patients being discharged too soon or reflect poor quality of care. Studies carried out in the UK and in Denmark have shown unchanged or decreased readmission rates following the establishment of an (18, 21) (5). However a study from the Royal Melbourne Hospital did show an overall increased readmission rate for medical patients
following the opening of an AMU although no difference in readmission rates was found between patients admitted to the AMU and those admitted to the general medical service (19).

In this study, a small but statistically significant increase in readmission rates occurred in 2012, compared to 2010. However, poor quality of data meant that it was not possible to comment on readmission rates. Increase in readmission rates may be due to planned readmissions to the AMU which occur when patients were brought back to the unit, most commonly in order to complete radiological investigations. Analysis of data indicated a discrepancy between the number of readmissions in HIPE data and AMU data. The number of planned readmissions to the AMU exceeded the total number of total readmissions of acute medical patients in HIPE. Discussion of HIPE coding with coders in the hospital indicated that coding of planned readmissions to the AMU had not been standardised. It is difficult to interpret readmissions rates, as the number of readmissions in HIPE, may actually be planned readmissions to the AMU. Therefore this study was unable to quantify the impact that the AMU may have had on readmissions rates for acute medical patients.

In addition a lack of individual patient identifiers in Ireland means that it is not possible at present, using the HIPE system, to ascertain if patients discharged from CUH were readmitted to another hospital, a further issue when examining readmission rates.

Re-evaluation of readmission rates in CUH in future years will be possible as coding of AMU admissions from 2013 is standardised within the hospital, and may be valuable in future evaluations of acute medical activity in the hospital. The introduction of a unique patient identifier in Ireland will make data regarding readmissions of greater validity in years to come. Whether readmission rates actually reflect quality of patient care has been questioned, and remains controversial, since there is some evidence that most readmissions are not preventable and are affected by the level of supports available in the community, and the complexity of individual patient’s condition (23, 24). On a practical level, as regards the current situation in CUH, if more dedicated radiology slots were provided for the AMU, the need for planned readmissions to the AMU would decrease.
Alternatively, attendance at the dedicated AMU outpatient clinic could be an alternative pathway for patients to access radiology.

### 6.6 AMU activity

Site visits to the AMU confirmed a new pathway of care for acute medical patients in CUH, with patients reviewed by a senior physician both in the AMAU and the AMSSU. However, outcome data regarding both the AMAU and the AMSSU was limited and few if any conclusion can be drawn from the data available. Data for the audit outcome indicators identified by the Acute Medicine Programme is not routinely collected in the AMU or indeed in the ED, as an integrated data collection system has not been established. Data regarding outcomes defined by the Acute Medicine Programme could therefore not be collected or analysed; for example, the percentage of patients admitted to the AMSSU within six hours of registration in the AMAU, or the time to see a senior physician in the AMAU. In addition, since formal KPIs have not been set by the Acute Medicine Programme this makes assessment of outcomes challenging.

### 6.7 ED activity and INMO trolley numbers

CUH experienced a substantial increase in patients presenting to ED of 13% between 2010 and 2012, and an increase in acute adult emergency admissions of 38% during this time. This is likely to be in part because of re-configuration of hospitals in the area with patients who would previously have attended the South Infirmary Victoria Hospital ED, migrating to CUH.

Despite this increase in attendances and admissions, trolley numbers decreased by 10% during this time. It is accepted that patients waiting on trolley are in general acute medical admissions rather than surgical or other admissions. More than 50% of all patients assessed in the AMAU in 2011 were referred from the ED. In the absence of the AMAU, these patients would await assessment and admission to an acute bed in the ED. Patients referred directly to the AMSSU by GPs, bypassed the ED entirely and therefore if admitted were not waiting for a hospital bed in the ED. In addition, almost 52% of patients assessed in the AMAU in a three month period were discharged home. This new model of care is therefore a key contributor to the decrease in trolley numbers in ED. Had the AMAU not
been in existence, these patients would have had to go through the traditional pathway for acute medicine including assessment by junior staff. It is possible that some of these patients would have been admitted to an acute bed, contributing to the numbers waiting a bed in the ED. Early assessment by a senior physician in the AMAU may have avoided admission for some patients.

Several limitations to the data exist: INMO Trolley Watch data provides a crude measure of the number of patients waiting in the ED for a hospital bed. However this data is incomplete with data missing particularly for weekends. It also does not give information of the length of time spent in ED by admitted patients who were on trolleys. Despite this INMO Trolleywatch data is used within the health services as data is timely and provides a marker for numbers awaiting a hospital bed in the ED. Healthsat data regarding wait times on trolleys was not available for the years prior to the opening of the unit and therefore comparison was not possible before and after the AMU opened.

Data for the Acute Medicine Programme audit outcome indicators for the ED is not routinely collected in the ED or indeed in the AMU. These indicators include time to admission, time to see a senior physician, and such data would have given a clearer picture of patients’ experience in the ED, as well as the efficiency and quality of the service. In addition formal KPIs for acute medicine have not been defined by the Acute Medicine Programme which makes assessment of outcomes challenging.

In summary, despite the limitations of the data, a decrease in trolley numbers was identified, in spite of an increase in attendances to the ED, and in the number of adult acute admission. The positive impact of the opening of an AMU on the ED is supported by evidence from the literature (4) (17). The AMU is therefore likely to have been a key contributor to the positive changes seen.
7. CONCLUSIONS

1. The AMU opened at a time of reorganisation of acute medical services in Cork city and county and in CUH itself. Evaluation of emergency medical activity in CUH and the impact of the opening of the AMU on this activity in this changing environment was therefore a complex process.

2. Between 2010 and 2012, CUH became busier, with an increase in patients presenting to the ED an increase in emergency admissions and an increase in acute medical admissions during this time.

3. In 2012, a more efficient service across specialties was observed, with mean and median LOS decreasing for all specialty groups, despite an increase in mean age of admissions and no change in comorbidity. A more efficient service for admissions over 65 years of age was also noted in 2012. Mean LOS decreased by more than four days. The AMU is likely to have had a significant impact on LOS of acute medical patients.

4. The distribution of workload across specialties changed following the establishment of the AMU. Medical inpatient specialties managed a relatively smaller proportion of total acute medical admissions following the establishment of the unit, with the exception of cardiology.

5. Following the establishment of the AMU all medical specialties admitted a relatively smaller proportion of patients over 65.

6. Admissions under AMU physicians had similar levels of comorbidity as admissions under general medical specialties. Therefore admissions to the AMU are of comparable complexity as admissions under other general medical specialties.
7. It was not possible to quantify changes in readmission rates to CUH due to deficits of coding of planned readmissions to the AMU.

8. In 2012, ED trolley numbers decreased. The AMU is one of the factors that contributed to this, as the new model of care means that emergency medical patients bypass the ED and are assessed directly in the AMU by a senior physician.

9. An audit of AMU activity demonstrated that the majority of patients assessed in the AMAU are of an appropriate level of acuity.

10. For the time period being studied, a lack of routinely collected data were identified, particularly with regard to the patients assessed in the AMAU and admitted to the AMSSU. In addition, data regarding Audit Outcome Indicators identified by the AMP for AMUs and EDs was not available in CUH.

11. The lack of formally established KPIs for acute medicine makes evaluation of both AMU and ED activity challenging.

12. This report is limited by the quality and completeness of data. A number of areas have been identified for future research: data collection and analysis of AMAU and AMSSU activity is required to evaluate the AMU in relation to process and quality indicators laid down by the Acute Medicine Programme, and in relation to patient and GP satisfaction with the unit. Analysis of readmissions rates of acute medical Patients to CUH is also required.
8. RECOMMENDATIONS

1. Hospital management and clinicians should continue to support the AMU to ensure it has on-going resources to deliver services to acute medical patients in CUH.

2. Dedicated radiology slots should be provided for the AMU to decrease the need for planned readmissions to the unit for such investigations.

3. The expansion of data collection systems within the AMU, integrated with the ED should be prioritised, so that on-going monitoring and evaluation of the unit is possible. In particular, data collection systems should facilitate the collection of data regarding audit outcome indicators which have been set out by the National Clinical Programme for Acute Medicine.

4. Formal KPIs should be developed for AMUs by the National Clinical Programme for Acute Medicine to facilitate future evaluations of services.

5. HIPE coding of planned readmissions to the AMU should be standardised.

6. A unique patient identifier is required, so that readmission rates can be accurately assessed. This would also facilitate the collection of hospital mortality data.

7. Evaluation of readmissions rates of acute medical patients before and after the opening of the unit should be carried out once data regarding planned readmissions to the unit is standardised.

8. Further evaluation of the AMU is required, including assessment of markers of quality such as patient satisfaction, and GP satisfaction survey
9. REFERENCES

27. Health Information and Quality Authority. Recommendations for a Unique Health Identifier for Individuals in Ireland. 2009.
APPENDIX I

Communication of report findings

An evaluation of acute medical activity including evaluation of the AMU was requested by the Consultant Physician in the AMU of CUH who is a member of the National Clinical Programme for Acute Medicine. This report was therefore submitted to her for dissemination to Hospital Staff, and to the Acute Medicine Programme. Following this report, an audit was carried out by AMU staff to examine the acuity of patients presenting to the AMAU which is included in Appendix VI.

The report was provided to members of the Regional Hospital Reconfiguration Forum. Since the completion of this report, the Regional Hospital Reconfiguration forum was abolished following the establishment of the Southern Hospitals Groups. It is planned to submit this report to the group, once management of the group has been established.

The report has been submitted to members of the Study of the Impact of Reconfiguration on Emergency and Urgent Care Networks (SIREN) in University College Cork.
### APPENDIX II

**Weighting of co-morbid conditions for Charlson score.**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
<th>ICD 10 code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial Infarct</td>
<td>1</td>
<td>I21.x, I22.x, I25.2</td>
</tr>
<tr>
<td>Congestive Heart Failure</td>
<td>1</td>
<td>I09.9, I11.0, I13.0, I13.2, I25.5, I42.0, I42.5-I42.9, I43.x, I50.x, P29.0</td>
</tr>
<tr>
<td>Peripheral Vascular Disease</td>
<td>1</td>
<td>I70.x, I71.x, I73.1, I73.8, I73.9, I77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>1</td>
<td>G45.x, G46.x, H34.0, I60.x, I69.x</td>
</tr>
<tr>
<td>Dementia</td>
<td>1</td>
<td>F00.x, F03.x, F05.1, G30.x, G31.1</td>
</tr>
<tr>
<td>Chronic Pulmonary Disease</td>
<td>1</td>
<td>I27.8, I27.9, J40.x, J47.x, J60.x, J67.x, J68.4, J70.1, J70.3</td>
</tr>
<tr>
<td>Connective Tissue Disease</td>
<td>1</td>
<td>M05.x, M06.x, M31.5, M32.x, M34.x, M35.1, M35.3, M36.0</td>
</tr>
<tr>
<td>Ulcer Disease</td>
<td>1</td>
<td>K25.x to K28.x</td>
</tr>
<tr>
<td>Mild Liver Disease</td>
<td>1</td>
<td>B18.x, K70.0 to K70.3, K70.9, K71.3 to K71.5, K71.7, K73.x, K74.x, K76.0, K76.2 to K76.4, K76.8, K76.9, Z94.4</td>
</tr>
<tr>
<td>Hemiplegia</td>
<td>2</td>
<td>G04.1, G11.4, G80.1, G80.2, G81.x, G82.x, G83.0 to G83.4, G83.9</td>
</tr>
<tr>
<td>Moderate to Severe Renal Disease</td>
<td>2</td>
<td>I12.0, I13.1, N03.2 to N03.7, N05.2 to N05.7, N18.x, N19.x, N25.0, Z49.0 to Z49.2, Z94.0, Z99.2</td>
</tr>
<tr>
<td>Diabetes with End Organ</td>
<td>2</td>
<td>E10.2 to E10.5, E10.7, E11.2, E11.5, E11.7, E12.2 to E12.5,</td>
</tr>
<tr>
<td>Damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>Any Tumor</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C00.x to C26.x, C30.x to C34.x, C37.x to C41.x, C43.x to C45.x, C58.x to C60.x, C76.x to C81.x, C85.x to C88.x, C90.x to C97.x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leukemia</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>As Above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lymphoma</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>As Above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate to Severe Liver Disease</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>I85.0, I85.9, I86.4, I98.2, K70.4, K71.1, K72.1, K72.9, K76.5, K76.6, K76.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metastatic Solid Tumor</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>C77.x-C80.x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIDS</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>B20.x-B22.x, B24.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX III

Hospital models, Acute Medicine Programme

Model 1: Hospital Community/District Hospital

Model 2: Hospital Local Hospital with selected (GP-referred) medical patients

Model 3: Hospital General Hospital

Model 4: Hospital Tertiary Hospital
APPENDIX IV

Statement of participation

Participation in this report by the author was as follows:

Involved in study design

Submission of application for ethics approval

Carried out literature review

Meetings with stakeholders

Site visits to the AMU and ED of CUH

Generation of HIPE reports

Analysis of data

Writing of report
APPENDIX V

Audit of acuity of patients assessed in AMAU in September 2013

This report was produced by Dr Jennifer Carroll Consultant Physician AMU and colleagues AMU CUH.

The AMAU in CUH consists of 8 trolleys, and is co-located with Medical Short Stay Unit.
The AMAU operates on a 5/7 basis from 8am to 8pm, though in practice it accepts ED patients from 7am onwards.

During the month of September 2013, a total of 413 patients were admitted to the AMAU, with an average of 20 patients per day rotating through 8 AMAU trolleys over a 12 hour period.

- Admissions to MSSU = 83 (20.1%)
- Admissions to Wards = 101 (24.46%)
- Same-Day Discharge Rate = 229 (55.45 %)

The ALOS for the patients admitted to the co-located Medical Short Stay Unit is 2.8 days, and the ALOS for medical patients admitted to the wards under GIM following admission in AMAU is 5.7 days.

Patient referrals to AMAU fall under 3 main categories:

1. Emergency Department = 196 (47%)
2. Total * GP = 154 (37%)
3. Planned Returns = 43 (10%)
4. Others = 20 (6%)

These 3 groups account for 94% of the total number of 413 admissions to AMAU while “999 Ambulance Transfers” and “Unscheduled OPD Admissions” account for the remaining 6%.
This paper provides an overview of the referral groups, under the following headings:

- Referred Patient Numbers
- Clinical Acuity Level – Triage Category

1. Referred Patient Numbers

   a) GP Referred Admissions:

   There was a 154 * GP referrals (9 per day) to AMAU during September. This group consists of two strands:

   1. GP referred patients direct from ED triage. (coded in ED as a GP referral but processed by the AMAU)

   2. Direct GP referrals by phone to Case Manager in AMAU which bypass ED registration

   The current coding does not enable a breakdown between these two GP groups. However, a review of the charts is currently underway to determine the number of direct GP versus those indirect referrals from ED. It is our opinion that they are evenly divided 50:50 split

   If the AMAU did not accept GP referrals, then the 38% who were admitted via AMAU would otherwise await admission on trolleys in ED, compounding the problem we wish to clear. Additionally, a proportion of the same day discharges from AMAU may well be admitted by ED e.g. 5 per day.
Thus, the impact of this admission avoidance service to GPs is a saving of at least > 4 trolleys per day.

b) ED referred admissions

196 patients were referred

- 42 patients admitted to MSSU (21%)
- 69 patients admitted to Medical Ward beds (35%)
- 85 patients discharged same day (44%)

The majority of ED referrals are from 8am to 5pm with a turnaround time of only 3 hours for the last patients before AMAU closes at 8pm. There are a significant number (66) of ED transfers at 7am every morning following the medical take which allocate 3/4 of AMAU trolleys while boarding and this prevents further referrals from ED particularly from 2pm onwards.

c) Planned readmissions:

There were 43 patients who were planned to return, in the main for investigations such as Ultrasound, MRI, Upper and Lower GI Scopes and very occasionally CT Scans. This practice countered the previous process of admitting for investigation, therefore saving bed days and numbers on trolleys.

d) Other unscheduled admissions

This sub-set comprised of (9) “999 Ambulance Transfers “ 7 of which were discharged same day, 8 unscheduled AMAU, Eye Casualty, OPD admissions with 5 discharged, 2 self-referrals and one urgent admission from private rooms.
2. **Clinical Acuity Level – Triage Category**

These charts demonstrate that Triage Category 3 is the most common category presenting to AMAU with Triage Category 2 being the second most common for both GP and ED Referrals. This confirms that the patients assessed and managed in the AMAU in CUH are of acuity, appropriate for an effective, efficient, productive AMAU as directed by the AMP. A number of Category 4 patients are reviewed such as DVT’s for which we have a defined pathway and for the present are appropriate, unless an alternative site and staff are provided for in Ambulatory Care facility. No Category 5’s were seen or referred to the AMAU in CUH.

**Direct GP Triage Categories**

![Pie chart showing Direct GP Triage Categories]

- Category 1: 10%
- Category 2: 27%
- Category 3: 56%
- Category 4: 17%
- Category 5: 0%
Summary

These sample data demonstrate that The AMU in CUH assesses, investigates and manages undifferentiated medical patients of high medical acuity from ED and GP and has a high same day discharge rate, which has been one of the main contributors to a reduction in ALOS for ALL Medicine to 6.16 days.

There are constraints to fully implementing AMP which are

- Insufficient bed numbers for patients with longer lengths of stay
- No egress from SSU to the hospital beds for medical patients under other medical Consultants
- Lack of NCHD support
- 5/7 working week

We believe we can make further gains for the hospital if supported with additional resource as suggested by the AMP.
## APPENDIX VI

### Manchester triage categories

<table>
<thead>
<tr>
<th>Triage category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>People who need to have treatment immediately or within two minutes are categorised as having an immediately life-threatening condition. People in this group are critically ill and require immediate attention. Most would have arrived in Emergency Department by Ambulance. They would probably be suffering from a critical injury or cardiac arrest.</td>
</tr>
<tr>
<td>2</td>
<td>People who need to have treatment within <strong>10 minutes</strong> are categorised as having an imminently life-threatening condition. People in this group suffer from a critical illness or are in very severe pain. People with serious chest pains, difficulty in breathing and severe fractures are included in this group.</td>
</tr>
<tr>
<td>3</td>
<td>People who need to have treatment within <strong>30 minutes</strong> are categorised as having a potentially life-threatening condition. People in this group suffer from severe illness, bleed heavily from cuts, have major fractures, or be dehydrated.</td>
</tr>
<tr>
<td>4</td>
<td>People who need to have treatment within <strong>one hour</strong> are categorised as having a potentially serious condition. People in this group have less severe symptoms or injuries, such as a foreign body in the eye, sprained ankle, migraine or earache.</td>
</tr>
<tr>
<td>5</td>
<td>People who need to have treatment within <strong>two hours</strong> are categorised as having a less urgent condition. People in this group have minor illnesses or symptoms that may have been present for more than a week, such as rashes or minor aches and pains.</td>
</tr>
</tbody>
</table>
APPENDIX VII

Full list of performance metrics contained in the Report of the National Acute Medicine Programme 2010

17.6.3 Outcome audit indicators (proxy outcome)
This data only relates to “medical patients” greater or equal to 16 years* (See definition)
Benefit measure Target

QUALITY
1. Number and percentage of non-elective readmissions with the same condition for medical patients
Within
A. 7 days
B. 30 days

2. Number and percentage of in-hospital deaths of medical patients

ACCESS
3. Number of medical patient attendances at
A. Acute Medical Unit
B. ED

4. Median, mean and upper and lower 75th centile times from patient registration to decision to admit for
Medical patients attending
A. Acute Medical Unit
B. ED

5. Median, mean and upper and lower 75th centile times from patient registration to decision to
Discharge for medical patients attending
A. Acute Medical Unit
B. ED

6. Mean, median and upper and lower 75th centile times from decision to admit to medical patient
Leaving AMU/ED for patients from
A. Acute Medical Unit
B. ED

7. Percentage of medical patients admitted to the hospital within six hours of registration from
A. Acute Medical Unit
B. ED

8. Number and percentage of medical patients discharged within six hours of registration from
A. Acute Medical Unit
B. ED

9. Mean number of medical patients admitted per day and percentage, for each day of the week;
(Average over previous month)
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

10 Mean numbers of medical patients discharged per day and percentage, for each day of the week;
(Average over previous month)
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
COST

11 Number and percentage of medical patients with mean length of stay =;

0 days* Also grouped as
1 day ALOS 0 – 2 days
2 days ALOS 3 – 10 days
3 days 11 – 14 days
4 days 15 days plus
5 days Total ALOS
6 days
7 days
8 days
9 days
10 days
11 days
12 days
13 days
14 days
15 days plus

* Definition – mean length of stay = 0 applies to all medical patients assessed in the AMU/AMAU,

Or medical patients presenting at ED who are referred to the medical team for assessment.

12 Number and percentage of beds filled with delayed discharges
13 Number of bed days used for medical patient in patient discharges and deaths
14 Total number of medical in patient discharges and deaths.

* Definition: Patients greater or equal to 16 years.