Did an Acute Medical Assessment Unit improve the initial assessment and treatment of community-acquired pneumonia—a retrospective audit

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Abstract

Aim Medical Assessment and Planning Units (MAPUs) are proposed as a means to treat medically unwell patients in a timely and clinically appropriate manner, thus improving quality, facilitating safe early discharge, and reducing congestion in emergency departments. This study assessed the impact of opening a MAPU on the initial assessment and treatment of patients with community-acquired pneumonia (CAP).

Method A retrospective audit of patients presenting to Wellington Hospital was conducted from January to March 2009 and January to March 2010, straddling the opening of a MAPU. Outcome measures included timeliness of assessment, indicators of clinical quality, length of stay, recommended follow-up and mortality.

Results MAPU referred patients were less unwell and younger. Times to first doctor assessment and X-ray were longer than in the Emergency Department (ED) following the introduction of the MAPU; time to physician review for all admitted patients was unchanged compared to before the opening of the MAPU. Compliance with other aspects of evidence based guidelines was patchy and showed no improvement following the opening of the MAPU. Most patients whose length of stay was short were appropriately admitted to the MAPU.

Conclusions The MAPU has successfully streamed a cohort of less unwell patients away from the ED. Opportunity exists to improve the timeliness of treatment and compliance with guidelines. A disease-specific audit has served as a useful adjunct to other approaches to assessing a unit's impact.

MAPUs, also known as Acute Medical Assessment Units (AMAUs), are advocated as a means to achieving more timely and appropriate assessment and treatment of acutely unwell medical patients.[1] A large number of AMAUs have opened over the last 15 years. Limited controlled and observational studies suggest reductions in overall length of stay and mortality without increases in readmission rates.[2] Assessments of the impact of AMAUs on the quality and timeliness of the assessment and treatment of common medical conditions are scant.

Community-acquired pneumonia (CAP) is a common medical condition whose treatment is supported by evidenced based guidelines.[3] These include recommendations for a door-to-antibiotic treatment time for the majority of patients with confirmed CAP of less than 4 hours. Compliance with CAP guidelines is used as a means of assessing quality of clinical care.[4,5]

This study sought to retrospectively audit the impact of the opening of a MAPU on the treatment of CAP at Wellington Hospital, with respect to door-to-needle times and other clinical quality indicators suggested by evidence based guidelines.

The MAPU at Wellington Hospital was opened in November 2009, assessing and admitting direct referrals from GPs and patients presenting to and initially assessed by the emergency department (ED). The MAPU was modelled closely on the objectives and organisational structure of the IMSANZ Standards[6] with daily consultant rounds in a purpose designed 18 bed unit (also including a further 6 high dependency beds) close to the ED, with the objective of admitting all general medical patients with an expected length of stay less than 36 hours.

Methods

A retrospective audit was undertaken of all patients discharged from any hospital service with a primary diagnosis of CAP from January – March 2009 and from January – March 2010. These two cohorts straddle the opening of the MAPU, are matched for season (summer), and exclude the impact of the H1N1 pandemic commencing in April 2009.

A nearby secondary hospital, Kenepuru Hospital, accepted GP referred admissions direct to its inpatient medical service until November 2009. These were discontinued with the opening of the MAPU at Wellington Hospital. Patients from 2009 admitted to Kenepuru have been included in the analysis as these patients would have, in 2010, been referred to either MAPU or the Emergency Department.

Patients were identified by electronically selecting all adult discharges with a principal diagnosis coded as pneumonia or one of its subsets (ICD 10 code J189). Cases seen and discharged from the Emergency Department were not captured.

A total of 217 patients were identified, of which 62 were excluded as outside study criteria as follows:

Not pneumonia on presentation: patients presenting with an unclear diagnosis or admitted for another indication	15
Patients with possible respiratory tract infection, no X-ray change and complex comorbidity	12
Neutropenic sepsis: Oncology patients with known risk of neutropenia, presenting febrile and treated according to a neutropenic sepsis protocol	3
Inter-hospital transfers: admitted at another hospital and transferred, typically either for ICU care or decortication of empyema	13
Coding Error: Primary diagnosis of pneumonia not supported by consultant or radiologist	8
Elective day case bronchoscopy, for persisting consolidation, coded as pneumonia	3
Notes incomplete	3
Other reasons	5
Total	**62**

"Other reasons" included patients incorrectly coded to general medicine and without pneumonia (e.g. oncology and trauma patients with other lung pathology) and patients recorded as admitted who were only seen as ED patients.

155 cases remained for formal review of hospital case records, collating information from paper notes and electronic records (Emergency Department, Laboratory, Radiology, and Patient Management systems). All ED and Medical histories were reviewed by the author. Pneumonia is a diagnosis often requiring clinical judgement. While formal definitions of pneumonia require focal radiological change, cases were included if the consultant on the post-take round agreed with the admitting diagnosis of probable pneumonia, even if the subsequent radiologist report did not (14% of cases).

Data collected on each patient included:

- basic demographic data
- presentation point and time, and referral source
- time of medical reviews and by doctors of which service. The ED patient tracking system automatically logs the time first seen by a doctor. The paper based system in MAPU relied upon doctors recording the time the patient was seen.
- vitals over the first 4 hours
- content of initial clinical assessment, consultant ward round diagnosis, and resuscitation discussions during the admission
- investigations, including blood tests, microbiology, x-rays
- time, location and class of initial antibiotics
- discharge time and destination

Statistical analysis was conducted using Epi Info software.

Results

Demographics—73 cases were audited in 2009 and 82 in 2010. In 2010, the mean age of MAPU patients was lower and these patients had fewer comorbidities and lower severity illness compared to patients presenting to ED. There were no significant variations in ethnicity between arrival points. Demographic data and disease severity data are presented in Table 1.

Table 1. Demographics of audited cases

	2009 ED & Kenepuru	2010		All Cases	P value (ED '10 vs MAPU)
		ED	MAPU		
Number	73	55	27	155	
Mean age	65	65	54	64	0.04
% Male	60%	49%	66%	57%	0.13
Other chronic illness[1]					
–Multiple systems	58%	62%	37%	55%	0.12
–Single system	24%	17%	26%	22%	
–None	18%	22%	37%	23%	
% Arriving by ambulance	58%	74%	33%	60%	<0.01
Average CURB65[2]	1.6	1.7	0.9	1.5	<0.01

[1]Comorbidities requiring on-going treatment, but excluding primary prevention (typically hypertension).

[2]CURB65 is a prospectively validated severity score giving 1 point for each of age > 65, respiratory rate >= 30, Urea > 7.0, hypotension (SBP < 90 or DBP <= 60), and confusion. CURB65 scores were only recorded on 15% of admissions. A retrospective CURB65 score was therefore calculated for all patients. Where Urea was not ordered, a point was given if the patient had an acute rise in creatinine or was clinically assessed as dehydrated, although this is an imperfect substitute. The presence or absence of confusion was often undocumented. This calculated score is therefore likely to understate average CURB65 scores.

Time to assessment and treatment—Patients' progress through the process of assessment is shown in Table 2. Times are stated in minutes, and are median times given the long tails occurring in both ED and MAPU patients. P values compare 2010

patients in ED compared to MAPU. 33% of MAPU admissions did not record the time of first assessment by the doctor. This potentially biases the average MAPU time to first medical review.

Table 2. Minutes to assessment and treatment

Variables	ED '09	Kenepuru '09	ED '10	MAPU '10	P value (ED '10 vs MAPU)
Arrival to first doctor	39	57	42	86	0.00
Arrival to X-ray ordered	61	63	65	84	0.54
From X-ray ordered to X-ray taken	33	52	28	83	<0.01
Arrival to ABs	179	233	155	215	0.36
% with ABs within 4 hours	70%	58%	67%	56%	0.36

Content of clinical assessment—The checklist in Table 3 was used to evaluate the admitting medical team's assessment, largely drawing from British Thoracic Society (BTS) Guidelines[3]. The rationale for a MAPU is not only more timely assessment by appropriate specialists, but more relevant and comprehensive assessment. Differences between 2009 and 2010 were therefore of interest.

Table 3. Content of clinical assessment for all patients 2009 vs 2010

Variables	Comment	2009	2010	P value
Smoking history	Did the team record smoking history, given it is an independent and modifiable risk factor for CAP[7]	74%	72%	0.33
Confusion comment	Was any comment made on confusion in those age >65	43%	24%	0.05
Severity comment	Was any comment made on the severity of the illness (including, but not limited to CURB65 score[8])	32%	17%	0.03
More than one set of observations	Was more than one set of observations taken in the first 4 hours to detect physiological trends	75%	81%	0.33
Urine output considered in hypotensive patients	If SBP <90 or DBP ≤ 60 at any stage in the first 4 hours, was any assessment made of urine output	11%	4%	0.03
Antibiotic –Beta-lactam –Macrolide	–	100% 92%	96% 75%	0.17 0.30
–Appropriate route	Percentage where oral antibiotics were prescribed for CURB65 0 or 1 with no prior oral ABs	13%	4%	0.21
VTE prophylaxis	Was enoxaparin considered at or during admission	25%	20%	0.53
Resuscitation status discussed	If the patient was ≥ 65 and unwell (required non-invasive or invasive ventilation, or had a CURB65 score ≥ 2), was any discussion had with the patient about their wishes in the event of life-threatening deterioration.	53%	32%	0.09
Follow up	Appropriate chest follow-up recommended at discharge where the patient was >50 or a smoker	45%	37%	0.21

First inpatient review—Median time to next review was longer in MAPU compared to ED (16.3 vs 12.5 hours, p = 0.14), although the time of next medical review was

only recorded in 45 of 82 cases in 2010. The spread of these times is illustrated in Figure 1.

Figure 1. Hours till next medical review 2010
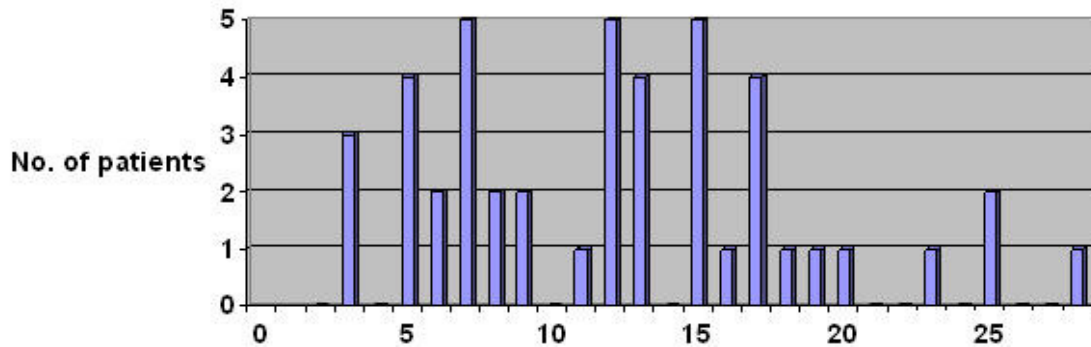
For all patients, the next medical review was the post-take ward round the following morning (80%), at the request of nursing staff (16%) or earlier as requested by the admitting registrar (4%).

Length of stay—Average length of stay (LOS) from presentation (at either ED or MAPU) to discharge between the 2009 and 2010 cohorts showed a non-significant decrease (5.0 vs 4.4 days, p = 0.28). A statistically significant reduction is apparent across all general medical patients in the year following the opening of the MAPU, so failure to reach statistical significance in this audit is possibly due to small numbers. Length of stay comparisons between patients admitted via ED and via MAPU are not relevant, given the different average age and severity of these cohorts.

Discussion

This audit aimed to assess the quality of management of CAP in the context of complex and on-going organisational change. In addition to the opening of the MAPU other potentially confounding changes occurred over this time. First, roster changes in June 2009 increased the number of admitting medical registrars in the evening from one to two.

Second, a "6 hour rule" was introduced nationally for emergency departments in July 2009. The aim was for 95% of patients to be discharged or transferred from the emergency department within 6 hours. Staffing and process changes supporting this initiative may have contributed to differences between the 2009 and 2010 cohorts. Despite these potentially confounding factors, a number of useful observations can be made from the data.

The MAPU is attracting a younger, less unwell cohort that would otherwise have been referred by GPs for assessment by the medical team in the emergency department. The average age of the MAPU patient was younger (54 vs 65), they had fewer comorbidities (37% with multiple system comorbidity vs 62% in ED) and had a lower CURB65 score (0.9 vs 1.7). This largely reflects GP filtering of MAPU patients, and

the higher acuity of self-presentations to ED. There remains a significant pool of patients presenting to, and being assessed in, ED who would be appropriate for MAPU assessment: 25 of 55 patients presenting to the ED had CURB65 scores of 0 or 1.

In general, treatment was less timely in MAPU compared to ED. Time to first doctor and times for X-ray were significantly longer, time to first antibiotic was longer but did not reach statistical significance.

Five factors likely to be causing relative delays in MAPU are:

- The presence of sicker patients amongst those presenting to ED.

- Significant attention given to prompt treatment in ED, with electronic systems to record and feedback on progress against clear time targets and formal systems for identifying and prioritising sicker patients. MAPU does not have similar systems or time targets.

- The priority accorded to ED admissions over MAPU admissions by admitting medical registrars, given the pressure of "the 6 hour rule".

- Nursing staff in MAPU managing patients awaiting assessment as well as the on-going needs of existing inpatients, creating complex prioritisation decisions which may delay management of newly arrived patients.

- Logistical issues—particularly accessibility to X-ray.

Options to improve the timeliness of MAPU treatment could include:

- Introduction of a tracking system to electronically record and report on arrival and treatment times, similar to those common in Emergency Departments.

- Inclusion of MAPU patients within the national "6 hour rule" target. The distinction between ED and MAPU in terms of priority is both arbitrary and artificial. The pressure to see ED patients first is administrative, not necessarily based on acuity. Having a shared target across both "front doors" to the hospital is clinically appropriate, consistent with the intention of the 6 hour rule, and resolves this distortion to clinical practice.

- Introduction of a nurse-lead sepsis protocol is being discussed to improve the timeliness of triage and investigations, and focus nursing attention on the prompt administration of antibiotics.

- Attention to logistical issues. For example, access to x-ray in ED is prompt due to the presence of a dedicated orderly to transport the patient. MAPU orderlies are drawn from the general hospital pool of orderlies, introducing delay. In a number of cases, the patient could walk themselves if they were x-rayed before being placed in a gown and on a bed.

The timeliness, and appropriate choice and route of antibiotic therapy is of particular interest, given evidence of morbidity from delay in antibiotics,[9] and the impact of route of antibiotic on length of stay.[10] Pressure for early antibiotic administration is tempered by concerns that this may lead to an increase in inappropriate antibiotic use.[11] MAPU showed non-significantly longer times to antibiotics, and both ED and MAPU had very low rates of oral antibiotics in mild pneumonia.

In general, given MAPU patients are less unwell, there may well not be any impact on clinical outcomes as a result of these longer treatment times. However, there are likely to be resource implications and greater clinical risk as a result of the consequently increased congestion.

MAPU guidelines emphasise the value of early specialist review in improving the management of acutely unwell medical patients, although IMSANZ Standards permit once daily consultant rounds with ad-hoc earlier review if clinically appropriate.[6] In this case, hours till next medical review generally reflects the time during the day the patient was admitted.

The longer average time to next medical review in MAPU over ED is largely accounted for by the MAPU not admitting patients overnight, so the average MAPU patient waits longer before the morning ward round. The MAPU is not achieving a common objective in the literature of earlier consultant review.[6] For the subset of lower acuity patients identified in this audit, there are potential gains in terms of earlier discharge from changes to support earlier review.

In terms of the content of the admission, rather than the process, poor compliance with guidelines is consistent with other studies.[12,13] The reason for the decline in the rate of comment on severity, confusion or resuscitation status is unclear. Potential reasons include:

- A different cohort of registrars doing the admissions, and

- The relocation of admissions away from Kenepuru Hospital – which has a largely geriatric focus to its medical inpatients. Assessment of confusion and resuscitation status on admission may be more common in this setting.

Overall, the introduction of a MAPU did not improve the quality of admissions over ED. While this may be expected given the same registrars are admitting in both locations, the MAPU did aim to improve the quality of clinical practice.

Conclusion

Initial assessment is slower in MAPU than in ED, and time to physician review has not improved as a result of the new MAPU. Most admission assessments omit features recommended by evidence based guidelines – with no difference between ED and MAPU assessments and no improvement over the pre-MAPU cohort. MAPU is successfully capturing lower acuity patients, but remains an underutilised resource in streaming acute medical patients away from ED.

A disease-specific audit has served as a useful adjunct to other approaches to assessing a unit's impact.

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