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Original Article

A pragmatic triage system to reduce length of stay in medical emergency admission: Feasibility study and health economic analysis

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ABSTRACT

Background: Departments of Internal Medicine tend to treat patients on a first come first served basis. The effects of using triage systems are not known.
Methods: We studied a cohort in an Acute Medical Unit (AMU). A computer-assisted triage system using acute physiology, pre-existing illness and mobility identified five distinct risk categories. Management of the category of very low risk patients was streamlined by a dedicated Navigator. Main outcome parameters were length of hospital stay (LOS) and overall costs. Results were adjusted for the degree of frailty as measured by the Clinical Frailty Scale (CFS). A six month baseline phase and intervention phase were compared.
Results: 6764 patients were included: 3084 in the baseline and 3680 in the intervention phase. Patients with very low risk of death accounted for 40% of the cohort. The LOS of the 1489 patients with very low risk of death in the intervention group was reduced by a mean of 1.85 days if compared with the 1276 patients with very low risk in the baseline cohort. This was true even after adjustment for frailty. Over the six month period the cost of care was reduced by £250,158 in very low patients with no increase in readmissions or 30 day mortality.
Conclusions: Implementation of an advanced triage system had a measurable impact on cost of care for patients with very low risk of death. Patients were safely discharged earlier to their own home and the intervention was cost-effective.

1. Background

The decision to admit a patient to hospital depends on a large range of factors but is strongly influenced by the admitting physician's personal style and intuition [1] as opposed to patients' preferences. Many patients treated in Internal Medicine Departments and Acute Medical Units (AMUs) have straight-forward conditions that can be easily and quickly managed. However, often these patients have to "wait their turn" as more complicated patients are dealt with.

Triage on admissions to hospital usually aims to identify patient groups at high risk. Scoring systems have been developed to triage patients with single organ illness [2–5] and to identify patients at risk of catastrophic deterioration on admission to hospital [6,7]. Some scoring systems allow quantifying risk of mortality of patients admitted to hospital [8,9]. Identification of critically ill patients and early treatment reduces mortality and shortens length of hospital stay [10]. However, up to 40% of patients admitted to hospital have a very low risk of dying [20]. The Simple Clinical Score (Fig. 1) has been shown in several studies to detect these patients with a very low risk of death [8,20,21]. Not only could early treatment prevent some of these "low risk" patients becoming "high risk" patients and improve their outcome [11], but also their efficient management could potentially yield considerable cost savings.

In addition to the value of the Simple Clinical Score at the time of presentation, measures of global health status, such as frailty [12], may better describe vulnerability when patients are older and have multiple and potentially interacting health problems. Multi-disciplinary evaluations are of proven benefit for frail older patients and increase their likelihood of being alive and in their own homes after an emergency admission to hospital [13]. At the same time early mobilization of frail elderly hospitalized patients reduces their subsequent dependency [14]. Complex quantification of frailty [15–18] means that few studies in Internal Medicine adjust results for it.

We hypothesized that explicitly identifying very low risk patients would result in their speedier diagnosis, treatment and earlier discharge and, possibly, financial savings.

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		Independent Predictors	*Points*
A'	**Age**	>75	4
		>=50 men and >=55 for women and <=75	2
A	**Airway**	Coma (responds only to pain or unresponsive)	4
		Oxygen saturation <90%	2
		Oxygen saturation >=90% and <95%	1
B	**Breathing**	Respiratory rate >30/min	2
		Respiratory rate >20/min and <=30/min	1
		Breathlessness – complaining of	1
C	**Circulation**	Systolic blood pressure <=70 mmHg	4
		Systolic blood pressure >70 mmHg and <=80 mmHg	3
		Systolic blood pressure >80 mmHg and <=100 mmHg	2
		Pulse > systolic blood pressure	2
D	**Disability**	Stroke – new presentation	3
		Altered mental status >=50 (not intoxicated) *	2
		Unable to stand unaided or Nursing Home resident	2
		Prior illness – some part of daytime in bed	2
		Diabetes (Type I or II)	1
E	**ECG**	Abnormal ECG (does not include brady or tachycardia)	2
F	**Fever**	Temperature <35ºC or >= 39ºC	2
		Total	

	Very Low Risk	**Low Risk**	**Average Risk**	**High Risk**	**Very High Risk**
Mortality	***0-3 points***	***4-5 points***	***6-7 points***	***8-11 points***	***>=12 points***
0-6 hr	0%	0%	0.1%	0.5%	3.2%
0-24 hr	0%	0%	0.4%	1.0%	6.8%
30 days	0.1%	1.6%	3.9%	10.3%	34.4%

*** Altered Mental Status but not Coma (i.e. responds to voice)**
Agitated
Alert and attentive (i.e. normal)
Alert and inattentive
Confused
Poor memory (i.e. does not know year of birth and/or current year)
Fluctuating level of consciousness

Fig. 1. The Simple Clinical Score.

2. Methods

We undertook a prospective cohort study: a 6-month intervention period was compared with the preceding 6-month period.

2.1. Setting

Wrexham Maelor Hospital is a District General Hospital in North Wales with 643 beds, serving a population of 250,000. The hospital offers comprehensive secondary care services including renal dialysis and a 13-bedded critical care unit. The AMU admits patients referred from General Practitioners (GP) and Emergency Physicians (EP). In the AMU, patients are assessed by a junior doctor who reviews the EP and GP findings, orders investigations and starts treatment. Patients are then admitted to specialist services. The patients are subsequently reviewed by a Senior Physician who confirms the diagnosis and may order further investigations or may decide on an appropriate plan for discharge.

For analysis we included all patients admitted to the AMU during the study period. Patients with possible cardiac chest pain are admitted directly into an Acute Cardiac Unit, this group of patients is not part of the present analysis.

2.2. Triage system

The AMU's Electronic Point of Care (EPOC) system uses physiological bed-side observations, past medical history and functional measures to place patients into five risk groups of in-hospital death using the Simple Clinical Score (SCS, Fig. 1) [8]. Summary scores of the SCS range from 0 to 33. The "Very low-risk" categories is attributed to patients scoring 0–3 points, "Low risk" for patients with 4–5 points, "Intermediate risk" for patients with 6–7 points, "High risk" for patients with 8–11 points and "Very high risk" for patients with 12 points or more. The system was used to prospectively capture risk profiles of all patients in the baseline and intervention groups.

"Very high-risk" patients were seen as a priority by the Navigator and referred for immediate intervention by resident doctors and a Rapid Response Team. This part of the study will be reported in a separate communication.

In preparation of and during the intervention phase an additional triage tool for frailty was introduced. The patients' frailty was classified using simple icons and patient profiles as part of the Clinical Frailty Scale (CFS), which uses a scale from 1 to 9 from "very fit" to "terminally ill" [19]. The tool was used to allow faster classification and identification of patients with greater care needs and who may have required input from intermediate care services. The CFS was additionally used for case mix adjustment.

2.3. The intervention

Patients identified by the computerised algorithm as "very low risk" with no frailty issues (CFS 1–3) on admission were interviewed and examined by the Navigator (an advanced practitioner with prescribing competencies). The Navigator established a working diagnosis, inserted intravenous access where needed, sent basic blood tests, ordered chest x-rays and was able to prescribe and administer a limited range of interventions including intravenous antibiotics, fluids and paracetamol. The Navigator would then collate results and present to the senior in charge of the AMU. Complex investigations were authorised by the senior doctor. In patients requiring specialists' input, the Navigator would request their opinion directly (pull system).

For junior doctors the pathway consisted of similar elements but treatment, specialist referral or specialist investigations would usually be initiated only after the review by the senior in charge (push system) (Fig. 2).