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Review article

Hospital medicine (Part 2): What would improve acute hospital care?

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ABSTRACT

There are so many obvious delays and inefficiencies in our traditional system of acute hospital care; it is clear that if outcomes are to be improved prompt accurate assessment immediately followed by competent and efficient treatment is essential. Early warning scores (EWS) help detect acutely ill patients who are seriously ill and likely to deteriorate. However, it is not known if any EWS has universal applicability to all patient populations. The benefit of Rapid Response Systems (RRS) such as Medical Emergency Teams has yet to be proven, possibly because doctors and nurses are reluctant to call the RRS for help. Reconfiguration of care delivery in an Acute Medical Assessment Unit has been suggested as a "proactive" alternative to the "reactive" approach of RRS. This method ensures every patient is in an appropriate and safe environment from the moment of first contact with the hospital. Further research is needed into what interventions are most effective in preventing the deterioration and/or resuscitating seriously ill patients. Although physicians expert in hospital care decrease the cost and length of hospitalization without compromising outcomes hospital care will continue to be both expensive and potentially dangerous.

1. Introduction

The practice of internal medicine is based on knowledge, pattern recognition and thinking. Most of us won our places in medical school by demonstrating our ability to memorise huge amounts of information. However, the ability to remember does not make a good doctor. Indeed people who cannot forget can have difficulty "seeing the wood for the trees", become overwhelmed with information and incapable of making a wise decision, especially if it is required quickly. The most important task that any doctor has to perform is to determine how likely a patient is to die and if there is anything can or should be done about it. Some doctors and nurses may intuitively be more adept at sensing severe illness, but mostly this skill comes from experience and also by following a few simple rules such as touching and feeling the patient, measuring vital signs with care and attention, and then quickly assessing the clinical situation using common sense.

2. Assessing the patient

Vital sign abnormalities would seem the most obvious way to detect patients who are likely to die. However, although the measurement of vital signs has been the standard practice for over a century, there have been few attempts to quantify their clinical performance. Until recently the largest study of respiratory rate was performed by Hutchinson in 1846 [1] and the largest studies on fever remain those performed by Wunderlich in the nineteenth century [2]. Amazingly the ominous significance of low temperatures has only recently been appreciated [3,4], and the mortality risk associated with transient hypotension only reported for the first time in 2006 [5]. Whilst occasionally healthy individuals can present with a persistent abnormality of one vital sign and remain well, it is most unusual for healthy patients to have two or more vital signs persistently outside the normal range. Yet, it was not until 1966 that the prognostic significance of the relationship between a high heart rate and low blood pressure (i.e. the Shock Index) was reported [6]. In 1997 Morgan et al. first reported an early warning score (EWS) that combined a variety of vital sign and mental status abnormalities to help detect acutely ill patients who were seriously ill and likely to deteriorate [7]. Since then several modifications of this EWS have been developed and adopted into clinical practice. These scores were developed empirically from expert opinion that selected the standard vital signs and changes in mental status and allocated scores to them without any prospective validation [4]. As a result the discriminative performance of these scores is poor with the area under their receiver operator curve (AUROC) ranging from 64% to 80% [8]. Some scores, derived from data analysis, have reported far higher discrimination with AUC of 85% to 90% [9–11]. However, these were developed and/or validated in patient populations that may not be representative of patients elsewhere [12]. The major concern, therefore, with all EWS systems is, that although they may perform satisfactorily in the local environments for which they were developed, it is not known if they have universal applicability to other patient populations. An alternative approach is for the initial assessment of illness severity is to be based entirely on objective laboratory data [13–15] Laboratory tests, however, always cause some delay and will never be able to replace the continuous

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monitoring of vital and other clinical signs and their competent interpretation. While the search for the "Holy Grail" of a well validated reliable universally applicable EWS continues, therefore, each hospital will have to decide on its own calling criteria. These could either be a single parameter (Table 1), or one of the better performing aggregate weighted scoring systems recently reported [9–11].

3. Determining the most suitable management: curative or comfort care?

Once serious life threatening illness has been identified it is essential to determine if the patient is potentially curable or if the point has been reached when further attempts at cure can only result in prolonged pain and suffering. This requires the formulation of a prognosis which was the traditional skill of the medical profession but has been abandoned in recent years [16]. At the end of the nineteenth century prognostication took up approximately ten per cent of medical textbooks, by 1970 this had fallen to nearly zero. As a result, although modern physicians commonly encounter situations that require prognostication they feel "poorly trained to do it, and find the whole process difficult and stressful" [17]. Even experienced oncologists are poor at estimating how long terminal cancer patients have left to live [18]. As a result many patients may be denied the benefits of appropriate terminal palliative care, or worse aggressive futile and unpleasant acute medical treatment may be attempted. Several scoring systems and algorithms have been suggested to determine how likely patient are to survive attempted resuscitation in the event of cardiac arrest [19–22]. However, these should be used with caution since a patient who cannot be resuscitated today may be fully recovered tomorrow — this would be particularly true for patients with severe infections such pneumonia or sepsis. Nevertheless it is not difficult to identify the point when many common conditions have entered their terminal phase and attempts at cure and resuscitation are pointless (Table 2) [22].

4. Rapid response systems

All animals are designed to die once and, with luck and probably for teleological reasons, to die quickly [23]. Therefore, speed is essential to defer death. There are so many obvious delays and inefficiencies in our traditional system of acute hospital care it is surprising that young patients seem to survive it. However, it is clear that old patients cannot tolerate serious illness for long [24] and that if their outcomes are to be improved prompt accurate assessment immediately followed by competent and efficient treatment is essential. Therefore, if acute hospital care is to be improved radical restructuring will be required to ensure that patients are promptly and accurately assessed, and appropriately treated as soon as possible. It has been proposed that hospitals should formalize this process by introducing a Rapid Response System (RRS) that includes two principle components: one for event recognition (afferent arm) that when triggered activates a response (efferent arm) that promptly provides appropriately equipped expertise [25]. In addition the RRS should provide post hoc process improvement activities and an administration infrastructure to support the entire system. The efferent arm may take the form of dedicated physician lead medical emergency team (MET) or nurse led outreach or patient-at-risk teams (PART), or may simply be the "front line" afferent arm staff trained and empowered to provide fast, competent and appropriate care. Whatever option is chosen the pre-requisite of the system is that serious illness is swiftly recognized and help is promptly called for. Bitter experience has shown that there are several important barriers to staff calling for help [26]. Firstly, nursing staff is reluctant to breech the traditional hierarchical referral model of care, even when the patient is severely ill. Secondly, junior doctors responsible for the patient although concerned about the patient's condition may also still opt to hand the problem either to the next shift or up the traditional hierarchy, rather than call the medical emergency team. Thirdly, although physiological variables are abnormal, staff may still feel that the patient looks "too well" to call for senior help. In addition there may be other complex and less obvious reasons why doctors and nurses do not call for help, which need to be further researched [27].

Table 1
Calling criteria for Rapid Response Systems.

Airway	
	Respiratory distress
	Threatened airway
Breathing	
	Respiratory rate >30 breaths per minute
	Respiratory rate <6 breaths per minute
	Oxygen saturation <90% on oxygen
	Difficulty speaking
Circulation	
	Blood pressure <90 mm Hg despite treatment
	Pulse rate >130 beats per minute
Neurology	
	Decreased level of consciousness
	Fitting
Other	
	Concerned
	Need of treatment and prompt help

Modified from Buist et al. [26].

Table 2
Conditions unlikely to benefit from attempted resuscitation.

Cardiac
Intractable heart failure — ejection fraction <= 20%
Respiratory
Respiratory failure or exercise tolerance less than 20 yards
Stroke
Dense hemiplegia or repeated strokes in need of all care
Malignancy
Inoperative/untreatable malignancy suitable for palliation only
Renal
Deteriorating chronic renal failure not suitable for dialysis
Dementia
Requires help feeding and other activities of daily living — does not recognise family.

Modified from Ambery et al. [22].

5. Future hospital care: outstanding questions

The use of RRS is controversial. In-hospital cardiac arrests have been reduced in several single centre historical control studies [28], but the only randomized prospective study showed no such benefit [29]. Apart from the reluctance of staff to call for help there are other issues that influence how a RRS will function. Firstly, the patient needs to have been placed in an appropriate care setting, with clear instructions on what parameters need to be monitored, and what to do and when to call if there are explicitly defined signs or symptoms of deterioration. Secondly, there is no clear consensus as to what the efferent RRS team does when it arrives at the bedside, and what interventions are in fact "life saving". Prompt airway, oxygen and fluid management are obviously essential aspects of any resuscitation. Two recent advances can greatly assist the management of acutely ill patients: many respiratory emergencies can be avoided by non-invasive ventilation, and bedside ultrasound makes it easy to quickly determine if patients are hypovolemic or in heart failure, and assess response to treatment.

Recently Silke et al. have shown that reconfiguration of care delivery in an Acute Medical Assessment Unit can dramatically reduce mortality [30]. This "proactive" approach ensures that every patient is in an appropriate and safe environment from the moment of first contact with the hospital, rather than the "reactive" approach of the