“Easy to cure but difficult to detect”—the case for early warning systems in the acute hospital

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“…in hectic fever, that in the beginning of the malady it is easy to cure but difficult to detect, but in the course of time, not having been either detected or treated in the beginning, it becomes easy to detect but difficult to cure”

(Nicolo Machiavelli, The Prince Chapter III, Concerning Mixed Principalities)

Warning systems that reveal “easy to cure but difficult to detect” malady hold the promise of improved patient outcomes. Early Warning systems (EWS) were designed specifically to secure the timely presence of skilled clinical expertise at the bedside of patients exhibiting physiological signs compatible with established or impending critical illness. However unless supported by an organised in-hospital responses, with appropriately resourced and trained personnel, who in turn have access to support for those patients requiring an escalation in therapy (such as access to acute operating theatre, intensive care or high dependency services), an early warning system on its own is destined to fail.

Despite enthusiasm for early warning system activation and medical emergency teams, initial attempts to demonstrate their benefits in a scientific way were frustrating. Complex study design using cluster randomised sites, variation in practice between hospitals, case mix and treatments creating the potential of a large noise to signal ratio. Early evidence suggested decreased cardiac arrest rates, without clear evidence of other patient-centred benefit. Drower et al, in this edition of the Journal, demonstrates a similar result, decreased cardiac arrest rate, this time in a New Zealand setting after the introduction of a EWS.

The criteria used to trigger escalation is of obvious concern, as too low a threshold for medical emergency team response results in increased “cry wolf” responses, which come at increased resource utilisation, while too high threshold defeats the purpose of the “early “ warning system. The Waikato groups have utilised well-researched trigger criteria. Previously Jones reported an inverse relationship between call intensity and the reduction in cardiac arrests, suggesting that there may be a dose response to the EWS and subsequent medical emergency team (MET) intervention. Identifying, calibrating and testing the criteria for intervention is essential.

Interestingly the Waikato criteria did not include the subjective “worried carer” criteria that has been popular on many other EWS system. In previous studies the “worried” criterion was the single most common reason (29%) for a MET activation, but if it was the sole criterion for MET activation resulted in a cardiac arrest rate one seventh of that of those that met the objective physiological criteria, although overall outcome were no different.

If reduction in cardiac arrest is the primary aim of the intervention it would appear that objective rather than subjective criteria would be a desirable. The Waikato group experienced a slight, but not sustained rise in the medical emergency team response.
Objective criteria, although not foolproof may allay anxieties of Intensive care staff about inducing “acopia” in the wards, and the fear in ward-based clinicians of loss of clinical autonomy in patient management.

Reduction in cardiac arrest rates following MET and early warning score implementation have been previously demonstrated, although these reductions have not always resulted in a positive effect on mortality or other patient focused outcomes.\(^4,6\) Should we be discouraged if all that is shown initially is a reduction in cardiac arrest rate? Probably not, for at least two good reasons.

Firstly, in a longer term analysis of over 5.9 million hospital admissions and over 73 thousand deaths in Victoria of the effect following a EWS and MET team intervention, Tobin and Santamaria showed that while mortality in the first 2 years after the introduction was not different from the pre-MET period. However, in the longer term, MET team exposure resulted in a reduction in hospital mortality.

It is encouraging therefore that the New Zealand study in this early cohort demonstrated a reduction in cardiac arrest rate so early on, there is the promise that the EWS and MEC response, carefully applied may provide support to acute hospital care. Although not a primary focus, available data suggest a trend towards overall reduction in Waikato’s in-hospital mortality. Whether the enhanced early warning results in overall better patient outcomes after a longer bedding down remains to be seen, but certainly warrants further study.

Secondly, Drower’s study focus was the cardiac arrest rate. In the absence of prospective directive to the contrary, for patients arresting in hospital the default position in New Zealand would be would be the delivery of CPR.\(^7\) One possible reason for the reduction in cardiac arrest rate, as Drower suggests, could be increased diversion of patients from full resuscitation pathway to a palliative-only approach their care, as the Liverpool care pathway was introduced in the same time frame.

Other studies have found a high proportion of deaths associated with a do-not-resuscitate order after a MET team suggesting that early identification of the need for palliation is a potentially important role of the MET team. It is possible the Waikato finding was the result of more timely, appropriately conducted end-of-life discussions, precipitated by a EWS score, with or without a MET response. An earlier detection of deterioration that highlights that a patient’s options need to be considered and their wishes respected would also be a positive outcome even in the absence of a reduced mortality or length of hospital stay.

Many of the innovations aimed at improving patient care and safety that are being advocated by district health boards require multifaceted interventions. It is often difficult to identify which facet of the complex intervention is critical to improvement, and what effect any modification may have. Recent projects have been based upon plausible theorising about the cause and effect of observational findings.

For example the shorter stays in emergency departments (ED) health target is based upon the assumption that mortality will be reduced if ED are less crowded, and that this can most cheaply be achieved by reduced length of ED stay.\(^8,9\) However, shorter length of stays themselves are not associated with lower mortality, and simply achieving this surrogate marker of improvement does not guarantee success.\(^10\) A similar situation exists with the introduction of the EWS and the associated medical
response. While “cardiac arrests” events may be reduced, unless this is associated with better patient outcomes, the intervention may not be cost effective, or even beneficial to the average patient.

Rapid response team implementation in other health systems did not improve the severity-of-illness-adjusted outcome of patients transferred from the ward, but did increase ICU admission rates, and early transfer of other patients to the ward, bring with it the real risk of unforeseen costs without obvious benefit. This is a situation we need to avoid.

The Waikato experience is set against the background of a well-established high dependency and intensive care service, in a tertiary hospital. Their well-constructed audit, provides comfort that the EWS and the associated response they have developed, seems to be beneficial. For other hospitals the process needs to be carefully thought through, taking into account current practice, case mix and resources.

Most importantly, when similar plans are implemented, careful analysis of the effect on patient care and outcomes over extended periods of time will be needed so we can monitor and tweak the system.

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