Improving risk stratification and decision support for deteriorating hospital patients

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In the 1990s, there was increased interest in understanding the antecedents to serious adverse events such as in-hospital cardiac arrest, unplanned admission to the intensive care unit (ICU) and in-hospital death. Studies from multiple countries around the world revealed that such adverse events were often preceded by objective signs of instability that manifested in derangements in vital signs, documentation of staff concern or increasing intensities of treatment such as oxygen therapy.[1–3] In addition, staff on hospital wards did not reliably or consistently recognise clinical deterioration, nor respond in a manner that was commensurate to the requirements of the patient's clinical needs.[2–4]

In response to such observations, rapid response systems were developed to improve the recognition of, and response to signs of, clinical deterioration.[5 6] This approach involves the use of objective criteria that trigger escalation to a predefined team of clinicians. These criteria are either single parameter or aggregated early warning scores. The responding team is variable but often comprises staff from the ICU. For example, in the UK, the team is typically a nurse-led critical care outreach team,[7] whereas in Australia, it is most frequently a physician-led medical emergency team (MET).[8]

At least four systematic reviews report that the introduction of rapid response teams was associated with reductions in in-hospital cardiac arrests and in-hospital mortality.[9–12] In addition, rapid response teams are also frequently involved in the assessment of patients whose medical conditions mean that ICU admission is not appropriate.[13 14] However, rapid response teams have not been shown to consistently reduce the frequency of unplanned admissions to the ICU.[15 16]

Published studies suggest that approximately 80% of patients reviewed by the rapid response team remain on the same ward following review.[17] Moreover, some patients receive multiple reviews by the rapid response team during the same hospital admission, which is associated with increased risk of admission to the ICU and subsequent in-hospital mortality.[17]

Thus, while rapid response teams have improved the outcomes of hospitalised patients, there is a need to develop systems and processes to further improve patient outcomes. Many institutions now have well-established databases that allow determination of which hospitalised patients are at increased risk of rapid response team review.[18–22] In addition, several investigators have attempted to evaluate associations with worse patient outcomes following rapid response team review, including repeat calls and subsequent ICU admission.[23–25]

In an effort to identify patients at risk of poor outcomes and needing enhanced care following a MET review, in this edition of the journal, Batterbury and colleagues[26] describe a retrospective cohort study with 1500 adult patients who remained on the ward following a MET call at an Australian quaternary hospital. The authors measured illness severity and care dependency using the Sequential Organ Failure Assessment and Nursing Activities Instruments, both of which are validated in the critically ill. Outcomes included all-cause mortality, unplanned ICU admission and repeat MET review within 48 hours. Latent profile analysis was used to identify five distinct patient clusters with increasing illness severity and care complexity (dependency).

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Not surprisingly, patients in clusters with the highest illness severity had the highest risk of death, unplanned ICU admission and subsequent MET review within 48 hours. Clusters with the highest care complexity had workload intensity similar to high dependency unit or ICU patients. The authors concluded that profiling illness severity at the conclusion of the MET may be used to determine the need for special resource/staffing arrangement on the ward if the patient is not admitted to the ICU.

The study by Batterbury and colleagues provides an important proof of concept that it is possible to stratify patients reviewed by the rapid response team to identify those who might be subsequently at increased risk of adverse outcomes. The statistical approach used resulted in a limited number of discrete categories, rather than a continuous score (as is the case with the Sequential Organ Failure Assessment and Nursing Activities Instruments). It will be important to next confirm the findings of this study in other settings with well-established rapid response teams. It is possible that the variables that predict adverse outcomes may differ between organisations according to patient case mix, ICU bed availability, and other systems and processes that target deteriorating patients. Future research should also attempt to separate out mortality that is potentially preventable versus deaths associated with chronic and progressive comorbidity in the context of limitations of medical treatment. In addition, it will be interesting to ascertain whether this approach can be employed using longer-term outcomes and patient-reported outcome measures.

It will also be important to establish whether such risk stratification can be conducted in real time, in order to provide decision support to clinicians at the point of patient care. By identifying the risk of subsequent adverse outcomes, clinicians may opt to provide increased surveillance, closer patient follow-up by critical care outreach staff or pre-emptive admission to the ICU. Finally, in some circumstances, it may be appropriate to initiate discussions regarding goals of care end decisions around limitations of care or transition to a more palliative approach.

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