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Titolo tesi: BedsidePEWS score performance, clinical impact and factors influencing escalation of care

ABSTRACT

Background:

Unrecognized clinical deterioration in hospitalized paediatric patients may lead to adverse outcomes, such as cardiac arrest or death. Survivors of cardiac arrest are at risk of moderate to severe neurological damage. Evidence of paediatric clinical deterioration in the clinical record has been described as early as 11 hours before a code or Rapid Response Team (RRT) call. Timely intervention to halt deterioration and transfer to higher levels of care are crucial to support vital functions and prevent potentially avoidable deaths.

Hospital systems must be qualified to prevent and respond to deteriorating patients on the wards. Rapid Response Systems (RRS) provide the organizational structure, tools and skills to achieve this aim. Paediatric systems of early warning, often referred as Paediatric Track and Trigger Systems (PTTS), and Rapid Response Systems (RRS) have been developed to standardize patient observations and referrals according to an escalation protocol based on patient risk, through a system that provides advanced resources and expertise at the bedside of deteriorating patients. RRS have four main components: an afferent and an efferent limb, an administrative and a process improvement limb. The Bedside Paediatric Early Warning System (BedsidePEWS) score is a PTTS, with documented validity in identifying children at risk of in-hospital cardiopulmonary arrest at least one hour before a clinical deterioration event. The evidence on the validity and utility of PTTS is still weak. Evidence of the BedsidePEWS performance in the Italian context has never been evaluated, nor the impact of its use on important clinical outcomes such as hospital mortality. Also, factors affecting the implementation of complex interventions, such as PTTS and RRS have rarely been explored in paediatrics.

Aim of the Thesis:

The aim of this thesis is to describe the performance, clinical impact and factors influencing the use of the BedsidePEWS.

Study 1:

The aim of this study was to describe the performance of the BedsidePEWS in a group of Stem Cell Transplant children in an Italian tertiary care children's hospital. The study design was a case control study. Cases were defined as clinical deterioration events (PICU urgent admissions, cardiac arrests or deaths on the ward). The control group were other patients admitted on the same ward at the time of a case episode. The BedsidePEWS was retrospectively measured at 4-hour intervals in cases and controls 24 hours before an event (T4-T24). In 19 cases and 80 controls, the score significantly increased in cases from a median of 4 at T24 to a median of 14 at T4. The proportion of correctly classified cases and controls was >90% from T8. The Area Under the Curve Receiver Operating Characteristic was 0.9. The BedsidePEWS is an accurate screening tool to predict clinical deterioration in Stem Cell Transplant patients.

Study 2:

A multi-centre cluster randomized trial (EPOCH trial) including 23 hospitals located in seven countries that provided inpatient paediatric care for infants (gestational age >37 weeks) to teenagers (aged <18 years) between February 2011 and June 2015. The aim of the study was to determine the effect of the Bedside Paediatric Early Warning System (BedsidePEWS) on all-cause hospital mortality and late admission to the intensive care unit (ICU), cardiac arrest, and ICU resource use. The BedsidePEWS intervention (10 hospitals) was compared with usual care (no severity of illness score; 11 hospitals). The primary outcome was all-cause hospital mortality. The secondary outcome was a significant clinical deterioration event, which was defined as a composite outcome reflecting late ICU admission.

Regression analyses accounted for hospital-level clustering and baseline rates. All-cause hospital mortality was 1.93 per 1000 patient discharges at hospitals with BedsidePEWS and 1.56 per 1000 patient discharges at hospitals with usual care (adjusted between-group rate difference, 0.01 [95%CI, -0.80 to 0.81 per 1000 patient discharges]; adjusted odds ratio, 1.01 [95%CI, 0.61 to 1.69]; $P = .96$). Implementation of the Bedside Paediatric Early Warning System compared with usual care did not significantly decrease all-cause mortality among hospitalized paediatric patients.

Study 3:

The aim of this study was to explore the experiences of parents and healthcare professionals of in-hospital paediatric clinical deterioration events to identify factors associated with escalation of care. The study used a qualitative design with focus groups. Across two hospital sites, six focus groups with 32 participants were conducted including parents and healthcare professionals who had cared for or witnessed a clinical deterioration event of a child. Transcripts of audio recording were analysed for emergent themes using a constant comparative approach.

Four themes and 19 subthemes were identified: 1) Impact of Staff Competencies and Skills 2) Impact of Relationships in Care focusing on communication and teamwork; 3) Processes Identifying and Responding to Clinical Deterioration, such as patient assessment practices, tools to support the identification of patients at risk and role of the rapid response team; 4) Influences of Organizational Factors on Escalation of Care. The findings of this study emphasized the considerable influence of social processes such as teamwork, communication, models of staff organization, and staff education. Conclusion:

The BedsidePEWS has proved to be a reliable screening tool for patients at high risk of clinical deterioration such as Stem Cell Transplant patients. The EPOCH study has been the first clinical trial evaluating the impact of a PTTS on hospital mortality, late admission to the ICU, cardiac arrests and ICU resource use. However, the clinical utility of the BedsidePEWS has not been proved to reduce hospital mortality. Social, cultural and organizational factors, found in the qualitative study on influencers of escalation of care may contribute to the uptake of complex interventions such as PTTS and RRS. The impact of those factors need further research to improve the efficiency and effectiveness of rapid response systems.