

Patient Safety Tip of the Week

May 20, 2025

New Early Warning System Integrates Nurse Surveillance Patterns

A variety of early warning systems have been utilized over the years to detect patients at risk of clinical deterioration. Most have relied on trends detected using physiological data. Many have utilized the Modified Early Warning Score ([MEWS](#)) for Clinical Deterioration. Our March 2012 What's New in the Patient Safety World column “[Value of an Expanded Early Warning System Score](#)” highlighted an expanded version of the MEWS that was introduced in the Netherlands in 2009. A study ([Smith 2012](#)) reported the impact of that score in predicting clinical deterioration in patients admitted to general or trauma surgery wards. The tool included the basic parameters included in earlier versions of the MEWS (heart rate, systolic BP, respiratory rate, oxygen saturation, temperature, and level of consciousness) but added some new parameters. One was urinary output. The other was a more subjective parameter: the nurse’s level of concern about the patient’s condition.

We commented that, despite all the potential merits of technological solutions, we liked the idea that the expanded MEWS in the Netherlands study also used what we consider a most valuable measure: the nurse’s bedside gestalt of the patient’s condition!

A new study amplifies the importance of adding nursing observations to an early warning system ([Rossetti 2025](#)). The COmmunicating Narrative Concerns Entered by RNs (CONCERN) early warning system (EWS) uses real-time nursing surveillance documentation patterns in its machine learning algorithm to identify deterioration risk.

The researchers compared outcomes between patients whose care teams were and patients whose care teams were not informed by the CONCERN EWS. There were 60,893 hospital encounters at multiple sites (33,024 in the intervention group, 27,869 in the usual care group). Patients in the intervention group had a 35.6% decreased risk of death (adjusted hazard ratio 0.64), an 11.2% decreased length of stay (adjusted incidence rate ratio 0.91), a 7.5% decreased risk of sepsis (aHR 0.93) and a 24.9% increased risk of

unanticipated intensive care unit transfer (aHR 1.25) compared with usual-care group encounters (all results statistically significant).

The CONCERN EWS model uses electronic health record (EHR) metadata (for example, date and time stamps, and data type) of nursing surveillance activities. Their previous study notes it identifies all-cause deterioration up to 42 hours earlier than models reliant on only physiological indicators ([Rossetti 2021](#)). Therefore, CONCERN EWS can be used as clinical decision support to make the care team aware of deterioration much earlier so that more timely interventions can be performed.

The authors note that nurses can recognize subtle, yet observable, clinical changes that may not be captured in physiological data or well-displayed in EHR's (examples: changes in skin color, small changes in mental status). Increases in nursing surveillance often reflect increased nursing concern.

To objectively measure and test nurses' concern levels in predicting patient deterioration, the authors created a machine learning-based predictive model that processes nurse surveillance patterns from metadata of nurse-entered documentation, with a small additional signal from natural language processing of 'mentions' of concern in nurses' narrative notes.

The tool uses nurses' concern levels reflected by nurses' increased surveillance, such as

1. increased frequency of assessments (for example, respiratory rate checked every 2 hours for a non-intensive care unit (ICU) acute care floor patient)
2. assessments performed at uncommon times (for example, checking vital signs in the middle of the night for a non-ICU acute care floor patient)
3. nursing medication administration interventions, such as not administering a scheduled medication when it is due (typically because the patient is clinically unstable)

After calculating the nurses' concern level, the model assigns a categorical deterioration risk score of green (low), yellow (increased) or red (high), updates the score hourly and presents the score to care team members on the CONCERN clinical-decision-support EWS display in the EHR.

So, the study showed that patients with hospital encounters during which the interprofessional care team was informed by CONCERN EWS were a third less likely to die and a quarter more likely to be transferred to intensive care. There was also an 11.2% decrease in length of stay (LOS) and a 7.5% decrease in in-hospital risk of sepsis.

We love this concept. Utilizing nursing patterns of care to reflect concerns that nurses have about patients can thus be captured readily by CONCERN EWS to help identify early clinical deterioration and improve patient outcomes.

Some of our other columns on MEWS or recognition of clinical deterioration:

- February 26, 2008 “[Nightmares: The Hospital at Night](#)”
- April 2009 “[Early Emergency Team Calls Reduce Serious Adverse Events](#)”
- December 15, 2009 “[The Weekend Effect](#)”
- December 29, 2009 “[Recognizing Deteriorating Patients](#)”
- February 22, 2011 “[Rethinking Alarms](#)”
- March 15, 2011 “[Early Warnings for Sepsis](#)”
- October 18, 2011 “[High Risk Surgical Patients](#)”
- March 2012 “[Value of an Expanded Early Warning System Score](#)”
- September 11, 2012 “[In Search of the Ideal Early Warning Score](#)”
- May 2013 “[Ireland First to Adopt National Early Warning Score](#)”
- September 17, 2013 “[First MEWS, Now PEWS](#)”
- January 2014 “[It MEOWS But Doesn't Purr](#)”
- March 11, 2014 “[We Miss the Graphic Flowchart!](#)”
- July 15, 2014 “[Barriers to Success of Early Warning Systems](#)”
- November 11, 2014 “[Early Detection of Clinical Deterioration](#)”
- February 2015 “[Detecting Clinical Deterioration: Don't Neglect Clinical Impression](#)”
- April 28, 2015 “[Failure to Escalate](#)”
- September 8, 2015 “[TREWScore for Early Recognition of Sepsis](#)”
- October 2015 “[Even Earlier Recognition of Severe Sepsis](#)”
- December 15, 2015 “[Vital Sign Monitoring at Night](#)”
- June 2016 “[An EMR-Based Early Warning Score](#)”
- May 2018 “[Pediatric Early Warning System Fails](#)”
- May 26, 2020 “[Early Warning Scores](#)”
- December 1, 2020 “[An Early Warning System and Response System That Work](#)”
- July 2021 “[EPIC Sepsis Prediction Tool Falls Short](#)”
- July 13, 2021 “[The Skinny on Rapid Response Teams](#)”
- December 2021 “[Can AI Triage Postoperative Patients More Appropriately?](#)”
- April 26, 2022 “[Challenges with Early Warning Systems](#)”

References:

Smith T, Den Hartog D, Moerman T, et al. Accuracy of an expanded early warning score for patients in general and trauma surgery wards. British Journal of Surgery 2012; 99(2): 192-197

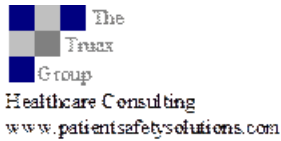
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Rossetti SC, Dykes PC., Knaplund C, et al. Real-time surveillance system for patient deterioration: a pragmatic cluster-randomized controlled trial. Nature Medicine 2025; Published: 02 April 2025

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Rossetti SC, Knaplund C, Albers D, et al. Healthcare process modeling to phenotype clinician behaviors for exploiting the signal gain of clinical expertise (HPM-ExpertSignals): development and evaluation of a conceptual framework. J Am Med Inform Assoc 2021; 28, 1242-1251

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