Clinical Decision Support Systems in the Emergency Department: Opportunities to Improve Triage Accuracy

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Triage decisions are made under time pressure, utilizing limited information, in an environment rich with interruptions and other unpredictable factors. The triage nurse's decision about the acuity, or risk level, for each patient has multiple consequences, including the patient's initial prioritization of care and his or her room placement within the emergency department; it also has an effect on the amount of time that elapses before the patient is assessed by a provider. Accurate triage decisions are essential for successful ED operations and for optimizing patient outcomes.[1]

Although the phrase "triage accuracy" lacks a universal definition, typically it is considered to be the assignment of an "appropriate" acuity score or risk level using a validated triage scale, compared with an expert opinion or final diagnosis. Certain patient populations such as children,[2,3] patients with chronic illnesses, and women or elderly persons with acute myocardial infarction can be particularly challenging to assess because of atypical or subtle presentations for some acute and life-threatening conditions. Pediatric patients historically have had a lower level of consistency in triage decisions, and up to 50% of patients with acute myocardial infarction are undertriaged or assigned an acuity level that is lower than what it should be based on their final diagnosis.[4-6] Mis-triage is a problem among nurses of all experience levels[4] and can lead to dangerous delays in care.

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J Emerg Nurs 2019;45:220-2.
0099-1767

https://doi.org/10.1016/j.jen.2018.12.016

Clinical Decision Support Systems

Clinical decision support systems (CDSSs) were first introduced into health care in the 1970s and experienced renewed focus in the 2000s after the Centers for Medicare and Medicaid Services began incentivizing health care institutions for programs that utilized them to improve patient care, processes, and outcomes. CDSSs refer to systems that utilize an available body of knowledge, such as care bundles, clinical decision rules, or drug-related information, to present patient-specific information.[7] They can be designed to alert the user at the point of care (typically a nurse or medical provider) of a patient's risk for a specific condition or to suggest evidence-based treatments for an identified patient condition. Sepsis bundles, sepsis early warning scores, and chest pain risk scores are examples of guidelines to consider integrating into the ED electronic health record as a CDSS to enhance the quality of care and optimize patient outcomes.

ED CDSSs

The unique environment of the emergency department makes it fertile ground for unrecognized clinical deterioration, and CDSSs have already begun to help identify some of these high-risk patients. CDSSs suggested, studied, or utilized in the emergency department include those designed to help nurses and other health care professionals assess and stratify risk for acute coronary syndrome, acute myocardial infarction,[5,6,8] sepsis,[9] syncope,[10] and head injuries.[11,12] These conditions all represent potential life-threatening situations and are known for their sometimes subtle or atypical clinical presentations.

Identifying Clinical Deterioration and Sepsis

Abnormalities in vital signs captured in the electronic health record can help identify septic shock or other clinical deterioration up to several hours prior to a serious adverse

event.[13] For example, studies have shown that at least 80% of adult patients who have experienced severe sepsis have had tachycardia and tachypnea.[9] However, studies also have shown that many septic children present in compensated shock, with tachycardia being the only indicator of potential decompensation.[14] These physiologic differences, and the fact that febrile illnesses are so common in children, make sepsis very challenging to identify in the pediatric population. Provider assessment alone misses up to 25% of children with severe sepsis.[15] In a study by Balamuth et al,[15] when use of an evidence-based CDSS was combined with clinician judgment in a pediatric emergency department, 324 of 326 pediatric patients with sepsis (99%) were identified while minimizing false-positive results.

In the emergency department, vital sign and laboratory data analyzed by CDSS have helped identify patients of all ages at risk for clinical deterioration as a result of sepsis.[16] This information has been integrated into the development of CDSS for early sepsis detection[9] to produce early warning score alerts in the patient's electronic health record. These scores represent aggregate weighted scorings of some combination of physiologic variables pulled from individual data that has been input into the electronic health record. Early warning scores that provide real-time alerts based on vital signs and laboratory data also have been successful in supporting early identification and treatment of patients at risk for myocardial infarction.[9]

Stratifying Risk for Pediatric Head Injuries

Another challenge within the process of triage decision making is predicting which children younger than 2 years are at risk for underlying skull fracture or intracranial bleeding after a sustained or suspected minor head injury.[3,17] Head injury risk variances stratified by the age of the child, the mechanism of injury, the region of skull injured, and the presence or size of a hematoma are reflected in validated medical decision rules for pediatric patients. However, most of these data are not present in existing nurse triage resources, and the medical decision rules are designed to help guide the medical provider's radiography decision, not the nurse's acuity decision. Evidence-based data at the point of care in the form of a CDSS that would "score" a child's risk of skull fracture or intracranial bleeding for a head injury and suggest an acuity level based on the calculated risk score could be used to aid ED nurses in making acuity decisions for these patients.[3,17]

Conclusion

CDSSs implemented in the ED environment using best-practice methods for development and implementation have the potential to help nurses and providers of all experience levels recognize high-risk conditions. By helping triage nurses identify high-risk conditions using the latest evidence, CDSSs have the ability to increase triage accuracy, minimize the risk of clinical deterioration, and optimize patient outcomes.

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