

# Artificial Intuition: Clinicians and Machines “Thinking and Learning Together” to Reduce Diagnostic Errors in Sepsis Management

Clinical Decision Support (CDS) technology used with electronic medical record (EMR) data has the potential to provide promising benefits in reducing diagnostic errors (incorrect, missed or unnecessarily delayed diagnoses) towards enhanced patient safety and outcomes in hospitalized patients [1,2]. However, most CDS tools available today are generating rule-based alerts that are deemed “insufficiently specific” to be effective in reducing diagnostic errors [3]. In the case of rapidly progressive deadly diseases such as sepsis, missed diagnosis or delays in recognition can have dire consequences. Indeed, mortality from septic shock increases by 7.6% with every hour of delay in treatment [4].

Although there are many causes of diagnostic errors that include external system factors (e.g. missing or not readily available important patient information such as prior diagnoses, tests, imaging), physician personal factors (e.g. faulty knowledge, distracted/tired, etc.), and cognitive errors (e.g. mistakes in perception, faulty pattern recognition, and biases), studies suggest that more medical errors involve cognitive error resulting from faulty reasoning rather than either lack of knowledge or information [5].

In the last 20 years, important gains have been made in psychological research on human decision-making. Dual-process theory has emerged as the predominant clinical reasoning model, positing two systems of decision making, System 1 (heuristic, intuitive) and System 2 (systematic, analytical)[6]. Studies indicate most clinical decisions are made using the fast, hardwired intuitive System 1 approach that depends heavily on the inductive reasoning experience of the decision maker...the experience and recognition skills of the decision maker will determine how well the presented information is interpreted. Most System 1-based decisions are correct, but also subject to bias-induced error in cases where atypical signs/symptoms present, or when a non-specific pattern is mistakenly associated with the wrong diagnosis [7].

VFusion is an expert-knowledge-base driven Artificial Intelligence CDS platform directed at interventions to reduce cognitive-bias induced diagnostic error [8]. We believe that for CDS to be effective as an “artificial intuition” physician assistant in reducing delays and missed diagnoses in time sensitive critical care settings, computerized CDS decision support systems should be matched to the reasoning processes that expert clinicians use when diagnosing/treating complex patients, directly address known causes of diagnostic error in time sensitive settings, , and represent expert competence in dealing with less-than-perfect data commonly associated with such settings.

- [1] <https://www.healthitoutcomes.com/doc/reducing-diagnostic-errors-through-clinical-decision-support-0001>
- [2] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4381462/>
- [3] <https://psnet.ahrq.gov/primers/primer/28/alert-fatigue>
- [4] <https://www.ncbi.nlm.nih.gov/pubmed/20154597>
- [5] <https://www.ncbi.nlm.nih.gov/pubmed/16009864>
- [6] <https://www.ncbi.nlm.nih.gov/pubmed/19638766>
- [7] <https://www.ncbi.nlm.nih.gov/pubmed/22543420>
- [8] [https://www.healthit.gov/sites/default/files/jsr-17-task-002\\_aiforhealthandhealthcare12122017.pdf](https://www.healthit.gov/sites/default/files/jsr-17-task-002_aiforhealthandhealthcare12122017.pdf)