Extraneous Load Events Correlate with Cognitive Burden Amongst Multidisciplinary Providers during Intensive Care Unit Rounds

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Rationale:

During rounds in an academic intensive care unit (ICU), trainee physicians communicate complex information to a multidisciplinary group to make critical patient management decisions. Inadequate rounding practices may impact the quality and safety of patient care as well as the effectiveness of trainee education. Cognitive load theory (CLT) suggests that learning and performance degrade when an individual's cognitive load exceeds their working memory capacity, and provides a framework to understand and potentially improve ICU rounding practices. Therefore, we sought to characterize the cognitive load providers experience during rounds and how providers perceive their cognitive load burden.

Methods:

We performed a prospective mixed-methods observational study of multidisciplinary providers that attend medical ICU rounds at Denver Health Hospital and University of Colorado Hospital. We measured task distractions (known as "extraneous load") per hour during rounds, as CLT suggests that minimizing these events can optimize task performance. We defined extraneous load events as: deviation from standard rounding protocol, distractions and interruptions, redundant communication, and split-attention events. Following rounds, we assessed each subject's cognitive load, as measured by the NASA Task Load Index (NASA-TLX). The NASA-TLX is a validated instrument that assesses the perceived workload associated with complex tasks; higher scores indicate increased cognitive load. We then performed semi-structured qualitative interviews of providers to understand common themes regarding provider perspectives on cognitive load during rounds.

Results:

During preliminary data collection, 45 providers were enrolled during 17 rounding encounters, including attending and trainee physicians, pharmacists and pharmacy residents, and charge nurses. The average census and rounding time were 12.2 ± 2.8 patients and 2h12m$\pm$48m, respectively. The mean extraneous load events per hour was 21.4 ± 5.6, including an hourly average of 8.0 external distractions, 7.9 deviations from standard rounding format, 2.1 redundant communication events, and 1.4 episodes of split-attention. Simple linear regression showed a significant relationship between hourly extraneous load events and mean NASA-TLX score, with an $R^2 = 0.66$. Mean NASA-TLX increased 6.4 points for every one-point increase in hourly extraneous load. Six subjects were interviewed; common factors felt to increase cognitive load included a high rounding patient census, emotional distractions, and "chaotic," unstructured discussion. Providers reported decreased teaching on rounds when perceived workload was high.

Conclusions:

Extraneous load events on rounds had a positive linear correlation with the perceived workload by multidisciplinary providers. Cognitive load theory suggests that reducing these extraneous events may improve performance and learning. Further research is needed to develop tailored interventions to reduce extraneous load during ICU rounds.