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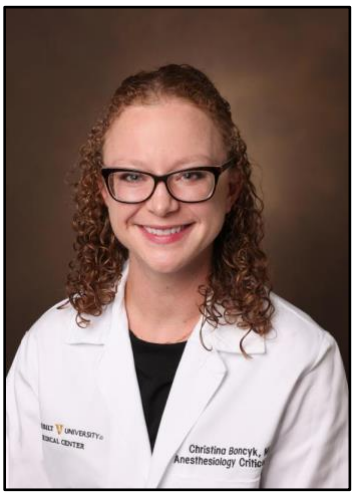

Practicum Site: Vanderbilt University Medical Center - Anesthesiology and Perioperative Informatics Research

Practicum Site Supervisor: Robert Freundlich, M.D., M.S., M.S.C.I.

Creation of a Validated Intensive Care Unit Data Mart

Keywords: perioperative, informatics, patient outcomes

Introduction: The acceptance and adoption of findings from observational studies based on data derived from the electronic health record (EHR) is frequently limited by the perception that these data are inadequately validated and inherently inferior to data collected through more traditional means. We sought to create a structured, rigorously validated intensive care unit (ICU) data mart based on data automatically and routinely derived from the EHR, inclusive of data elements commonly used for quality improvement and research purposes, including high-quality outcomes data.

Methods: Key variables were identified by study investigators and faculty critical care physicians. Physicians worked closely with analysts using a structured approach. First, the presence of data in routine clinical practice was confirmed using chart review. Next, algorithmic definitions were created for complex data elements, including most outcomes, leveraging existing literature, when available. Data analysts worked to identify the location of variables within the data architecture underlying the EHR. Test patients were extracted and algorithms were iteratively refined. Once shown to be reproducible in a broad cohort of patients, structured query language (SQL) was used to extract, transform, and load data from the EHR into a relational database housed on a departmental server. The sensitivity and specificity of algorithmic definitions was formally assessed.

Results: A total of 459,465 patient ICU encounters were identified and included within the ICU data mart. These patients include over 460,000,000 individual laboratory results and 4,610,776 vital signs (with q1 minute fidelity in the first 24-hours of admission). We currently have 26 validated outcomes, structured within 19 tables, all of which have a sensitivity and specificity of greater than 95%. These data can be joined to 215 validated variables included within 125 tables comprising an existing anesthesiology perioperative data warehouse (PDW) for perioperative patients.

Conclusions: We propose a methodology for building a robust and highly granular ICU data mart, leveraging the synergistic expertise of clinicians and data analysts. Work to further identify and validate additional patient variables remains a core component of future quality improvement and research processes.