Exploring an Imputation Strategy for TQIP ICU Days from Hospital Data

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Description of the Problem

Intensive Care Unit **(**ICU) free days is an important variable derived from the ICU length of stay (LOS). However, for the Linking Investigations in Trauma and Emergency Services (LITES) study, the ICU free days calculation has a foundational threat: inaccurate reporting of ICU LOS in Trauma Quality Improvement Program (TQIP) data. For example, out of 77,539 TQIP records collected from eight sites from 2017 through June 2021, 184 (~0.24%) reported ICU days that were greater than the hospital LOS and 1,022 records (~1.3%) reported total days on a mechanical ventilator, by definition part of ICU care, without reporting ICU days. Also, 12,025 (~15.5%) TQIP records do not match in-hospital records with respect to ICU admission.

Purpose of Study

Given the importance of characterizing data appropriately, it is necessary to improve the accuracy of data by reducing the number of incorrect values. Researchers understand this but may not realize that there may be problems with reported ICU length of stay. The goal of this study is to bring awareness to this problem and to provide a straight-forward, programmatic method for identifying data quality issues and/or improving data quality.

Methods and Results

The number of calendar days in the ICU was calculated using start and end dates in hospital location records from ICU departments. As ICU stay may include partial days, the programmatic method counts all partial days without overcounting days when patients were in more than one ICU department on the same day. The final ICU calendar day counts were compared to 30,165 TQIP records (~38.9%) that had reported ICU days. The calculation of ICU length of stay for 15,677 of those records (~52%) equaled the ICU days reported in TQIP. The following table compares the summary statistics of ICU days reported in TQIP with those calculated using hospital data for the 1,206 records with inconsistent values, that is, where the number of ICU days exceeded the number of hospital days or days on ventilator were reported without ICU days:

Table 1. Summary statistics for reported and imputed ICU days for records with inconsistencies.

Source	Total Records	Total in ICU	Average ICU Days (SD)	25th Percentile ICU Days	Median ICU Days	75th Percentile ICU Days
TQIP (reported)	1206	184	8.7 (9.94)	3	5	10
Hospital (imputed)	1206	669	11.27 (11.52)	4	8	15

Conclusion and Practical Implications

Although TQIP is the primary data source, comparing TQIP ICU LOS with calculations from hospital data brought awareness to the limitations of TQIP. Likewise, the results from this study suggest that clinicians and researchers could benefit from this method for analyzing hospital data to identify and understand limitations of TQIP data. In addition, this work may provide opportunities to improve data quality and reporting.

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