Exploring an Imputation Strategy for TQIP ICU Days from Hospital Data

Lisa Over

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Introduction

- LITES Task Order One (TO-001)
  - Linking Investigations in Trauma and Emergency Services (LITES)
  - https://www.litesnetwork.org/
- Data
  - Trauma Quality Improvement Program (TQIP) datasets
  - In-hospital electronic health records (EHR)
  - Electronic health records from pre-hospital transport services

Motivation

In-hospital ICU status	TQIP reports ICU days = null	TQIP reports ICU days = 0
Patients in ICU	100	404
Patients not in ICU	518	0

Table 1: TQIP values by In-hospital ICU status.

* TQIP total records = 77,538

Current Approach

Impute missing ICU days with TQIP ventilation days.

- ICU and ventilator days are highly correlated with r=0.87.

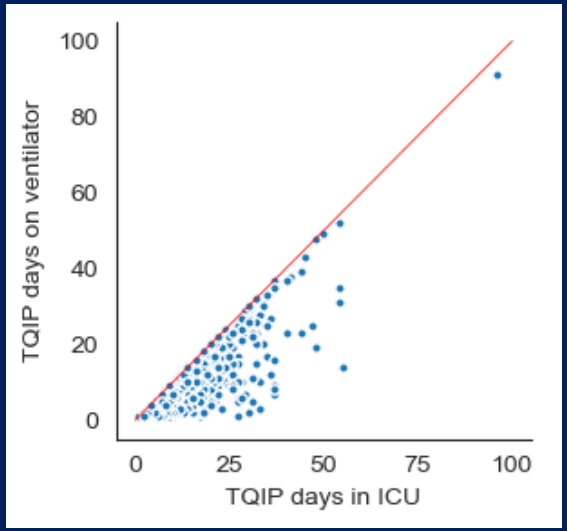

Figure 1: TQIP days in ICU by TQIP days on ventilator with 45° line with sample data (n=1,115), see Method step 5 below.

Study Objective

Estimate ICU length of stay (LOS) from in-hospital location records and estimate Lin's Concordant Correlation Coefficient (CCC) to assess agreement with TQIP reported ICU days.

Method

1. Evaluate the 504 records where in-hospital location records and TQIP disagree.
2. Evaluate the 518 records where in-hospital locations records and TQIP agree.

ICU status	Total Records	Average ventilation days (SD)	25th, 50th, 75th, 85th of ventilation days
TQIP ICU days are 0 or null, but in-hospital ICU records exist	504	7.14 (9.18)	1, 4, 8, 14
TQIP ICU days are null, and in-hospital ICU records do not exist	518	1.21 (0.98)	1, 1, 1, 1

Table 2: Summary of TQIP ventilation days by agreement with in-hospital ICU records.

Method

3. Estimate ICU LOS using a record-by-record count of days from in-hospital ICU location records.
4. Test the algorithm by comparing two methods for calculating hospital LOS.
5. Evaluate agreement between the estimated ICU LOS and TQIP ICU LOS using Lin's Concordant Correlation Coefficient (CCC).

Results

	CCC	95% C□
New Method	0.86	(0.85, 0.88)
Current Approach	0.72	(0.69, 0.74)

Table 5: Lin's Concordant Correlation Coefficient (CCC) with 95% confidence interval with sample data (n=1,115).

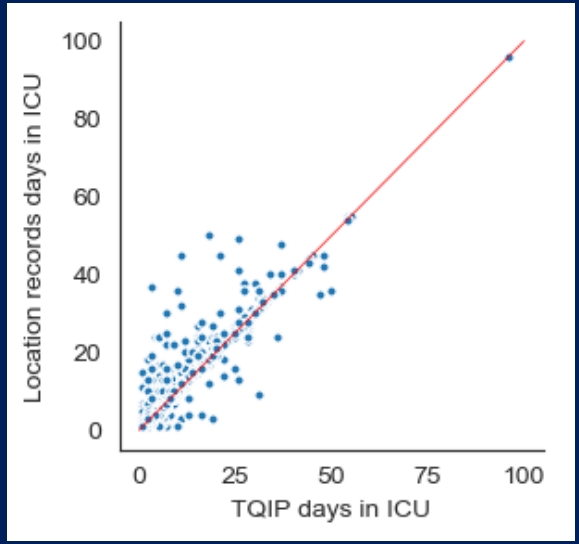

Figure 2: TQIP days in ICU by record-by-record count of days in ICU from in-hospital location records with 45° line with sample data (n=1,115).

Conclusion

- The data show higher agreement between TQIP ICU LOS and the estimated ICU LOS from in-hospital location records (CCC=0.86) than between TQIP ICU LOS and TQIP ventilation days (CCC=0.72).
- Based on the results from this study, we can impute TQIP ICU LOS when records meet these criteria:
  - In-hospital records indicate patients were in the ICU.
  - TQIP ventilation days are greater than 0.
  - TQIP ICU days are 0 or null.

Contact and Access

- Lisa Over, lisa.over@pitt.edu

Google Scholar

GitHub

University of Pittsburgh

Authors

Lisa Over, MLIS[1,2], Kuo-Ting Huang, PhD[2], Bryan A. Cotton, MD MPH[3], Andrew Dennis, DO[4], Francis Guyette, MD[5], Brian Harbrecht, MD[6], Bellal A. Joseph, MD[7], Ernest Eugene Moore, MD[8], Daniel G. Ostermayer, MD[9], Silvia Owusu-Ansah, MD MPH[10], Mayur B. Patel, MD MPH[11], Martin Schreiber, MD[12], Samual R. Todd, MD[13], Chad T. Wilson, MD[14], Stephen R. Wisniewski, PhD[15], Jason Lee Sperry, MD MPH[16]

[1]University of Pittsburgh, Epidemiology Data Center; [2]University of Pittsburgh, Department of Information Culture and Data Stewardship; [3]University of Houston School of Medicine, Department of Surgery; [4]Cook County Health, Department of Trauma and Burn; [5]University of Pittsburgh School of Medicine, Department of Emergency Medicine; [6]University of Louisville School of Medicine, Department of Surgery; [7]University of Arizona Tucson College of Medicine, Department of Surgery; [8]University of Colorado Denver Health, Department of General Surgery; [9]University of Houston School of Medicine, Department of Emergency Medicine; [10]University of Pittsburgh School of Medicine, Assistant Professor of Pediatrics and Emergency Medicine; [11]Vanderbilt University Medical Center, Department of Surgery; [12]Oregon Health & Science University, Department of Surgery; [13]Grady Memorial Hospital, Department of Trauma Surgery; [14]Baylor College of Medicine, Department of Surgery; [15]University of Pittsburgh, School of Public Health; [16]University of Pittsburgh School of Medicine, Department of General/Trauma Surgery

University of Pittsburgh

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