JacobCanfield8 Update Research Proposal.md 2e91b8d · 2 hours ago History

Title Page (Title, Student name, Research Advisor Name)

> Age Guidelines For Limiting Resuscitation Thoracotomy Mortality

> Student: Jacob L. Canfield

> Advisors: Dr. Victoria Schlanser, Dr. Andrew Dennis, Dr. Julian Henderson

Abstract/ summary (250-350 word limit)

Resuscitative Thoracotomy (RT) is a potentially life saving intervention that is important in the setting of trauma to the thorax. Due to the high mortality rate of this procedure, guidelines are continuously being evolved to provide a framework for practictioners to determine whether RT is warranted for a given case. Many of the guidelines currently in place involve factors such as mechanism of injurt (MOI) i.e. blunt or penetrating, minutes of CPR performed prior to arrival at the emergency department (ED) and signs of life (SOL). The two major institutions creating these guidelines are the Eastern Association for the Surgery of Trauma and the Western Trauma Association. Currently, neither of these institutions provide guidelines regarding the efficacy of RT on the grounds of age. In this work we aim to establish an age based mortality threshold above which RT is contraindicated based on mortality statistics using the National Trauma Data Bank (NTDB).

Specific aims (Focused and relevant to 10 week program)

1. Obtain access to National Trauma DataBank (NTDB) database, isolate relevant case data and perform statistical analysis and processing of data.
2. Explore data for age relationships with mortality. Additionally, determine if there are secondary contributing factors that further stratify mortality within given age ranges.
3. Establish statistically driven threshold for mortality guideline beyond which RT is contraindicated. Further stratify with secondary factors if relevant relationships established.

4. Begin/complete writing manuscript for publication.
5. Submit manuscript for peer review at selected journal.
6. Prepare poster/ oral presentation for conference.

Significance/ Background (include hypothesis)

RT is a damage control surgery performed with the goal of locating and controlling exsanguinating bleeding in the thorax. Additionally, access to the heart to correct cardiac tamponade and exploration of the diaphragm to identify diaphragmatic injury (DI) can be accomplished (Mitchell et. al). This requires patient to go under general anesthesia in the operating room (OR). The patient has antiseptic skin preparation applied and is draped. A left mammary anterolateral thoracotomy is made from the sternal margin to the axillary fossa. From this point the incision can be extended to a bilateral thoracotomy, also referred to as a clam-shell thoracotomy, which can be performed when access to right side of thorax or mediastinal structures need to be addressed. RT is performed with the objective of controlling extsanguinating bleeding from the heart, lungs or major vessels, decompression of pericardial tamponade, prevent blood loss infradiaphragmatically, cross-clamping the descending thoracic aorta or initiating internal cardiac massage.

MOI plays a major role in the mortality of RT performed in the civilian sector. As mentioned by Mitchell et. al, civilian literature indicates a survival rate of 1-2% for blunt traumas and 11-16% for penetrating trauma. Numerous guidelines and algorithms have been proposed by major governing associations, namely the Western Trauma Association and the East Association of the Surgery of Trauma. Factors such as duration of CPR performed in pre-hospital setting (CPR <15 minutes for penetrating and <10 minutes for blunt trauma) are part of the algorithms along with other hemodynamic factors.

In this work, we propose introducing additional guidelines related to the patient's age. To our knowledge, the literature does not include studies that evaluate the relationship between RT mortality and age. Although there are works that describe thoracotomy mortality rates performed for non-emergent cases, there has yet to be a study exploring this topic in emergent traumatic scenarios. We hypothesize that mortality of RT increases with age and that there is an age-threshold that can be established over which RT is no longer recommended as a therapeutic modality. By establishing a robust age-specific threshold unnecessary RT can be avoided in lieu of rapidly pursuing alternative interventions that yield better outcomes for the patient.

Research Plan (Design/ Methods)

> The NTDB will be used to obtain mass data about trauma cases across the country to perform mortality analysis and stratification by age and secondary factors. Cases to be used for our study will be isolated by filtering for cases in which a resuscitative thoracotomy was performed. Subsequently, overall mortality rates for RT will be performed and additionally, for RT performed with mechanism of injury (MOI) of penetrating and blunt trauma separately due to their reported discrepancy in mortality as reported and established in civilian literature.

> Next, overall mortality and by MOI will be calculated by ages placed into 10 year bins (i.e. ages 51-60). Statistical analysis will be performed to compare each of these age-specific mortality rates to overall mortality rates for respective catgegories. Several methods for establishing age cut-off for which RT will be contraindicated will be explored. Proposed methods of establishing this threshold include but are not limited to: choosing a mortality rate manually (least useful), determining what age group begins to show statistically significant deviation from general mortality rates, determining rates of change in mortality across age groups or performing a regression analysis that minimizes mortality below threshold while simultaneously minimizing denying candidates for RT that would benefit from the procedure above that age range (AUROC?).

> To evaluate this method, the mortality of patients below age threshold will be satistically compared to mortality rates of overall population of cases that underwent RT. Additionally, the mortality above the age threshold will be calculated and statistically compared to population that underwent RT. With the given hypothesis that mortality of RT increases with age and that our established age threshold is valid, we would expect to see that there is an improvement in mortality from RT in cases where the patient is in an age group below the threshold. It would also be expected to see a statistical increase in mortality in the age groups that are above our proposed age threshold.

References (Bibliography)

> Works CitedBoddaert, G., et al. “Resuscitation Thoracotomy.” Journal of Visceral Surgery, vol. 154, Dec. 2017, pp. S35–S41, https://doi.org/10.1016/j.jviscsurg.2017.07.003. Accessed 14 Mar. 2024.

> Breyer, M.D., Robert H. “Thoracotomy in Patients over Age Seventy Years.” Journal of Thoracic and Cardiovascular Surgery, vol. 81, no. 2, Feb. 1981, pp. 187–193, www.sciencedirect.com/science/article/pii/S0022522319376251. Accessed 14 Mar. 2024.

> Cannon, Jeremy W., et al. “Damage Control Resuscitation in Patients with Severe Traumatic Hemorrhage.” Journal of Trauma and Acute Care Surgery, vol. 82, no. 3, Mar. 2017, pp. 605–617, https://doi.org/10.1097/ta.0000000000001333. Accessed 14 Mar. 2024.

Harwell, Paige A., et al. “Outcomes of Rural Trauma Patients Who Undergo Damage Control Laparotomy.” The American Journal of Surgery, vol. 218, no. 3, Sept. 2019, pp. 490–495, https://doi.org/10.1016/j.amjsurg.2019.01.005. Accessed 14 Mar. 2024.

Hashmi, Zain G., et al. “Practical Guide to Surgical Data Sets: National Trauma Data Bank (NTDB).” JAMA Surgery, vol. 153, no. 9, 1 Sept. 2018, p. 852, https://doi.org/10.1001/jamasurg.2018.0483. Accessed 14 Mar. 2024.

Mitchell, Thomas A., et al. “An 8-Year Review of Operation Enduring Freedom and Operation Iraqi Freedom Resuscitative Thoracotomies.” Military Medicine, vol. 180, no. 3S, Mar. 2015, pp. 33–36, https://doi.org/10.7205/milmed-d-14-00440. Accessed 14 Mar. 2024.

Radulovic, Nada, et al. “Predictors of Survival in Trauma Patients Requiring Resuscitative Thoracotomy: A Scoping Review.” Trauma, 15 Mar. 2023, p. 146040862311562, https://doi.org/10.1177/14604086231156265. Accessed 14 Mar. 2024.

Letter of Support written by Research advisor (submitted as single pdf with proposal)

INSERT HERE WHEN FINISHED

Formating guidelines for final document to be submitted

```
 - Name file LASTNAME_FIRSTINITIAL_KAS_PROPOSAL_2024.pdf

 - Name of applicant in head and page number in footer

 - Narrative portion (exclude title page and references) should not exceed 5
pages single spaced
```