Development of a Palliative Care Trigger Tool for Trauma Patients at Jamaica Hospital

Angelo P. Canedo DO PGYI, R. Jonathan Robitsek PhD, Sebastian D. Schubli MD, Alan R. Roth DO, Angelo R. Canedo PhD,

Introduction

Trauma accounts for 41 million annual ED visits, 2.3 million annual hospitalizations, and 30% of all life years lost in the US [1]. Traumatic Injury incurs over $406 billion in combined direct and indirect costs (in 2010). The Department of Health and Human Services define trauma as “...the point in time when the body sustains a serious injury from a visible mechanical force, such as a fall, a motor vehicle crash, or a gunshot wound.” As the body’s response to injury is multifaceted, the role of Palliative Care within the setting of the ICU is emerging. There are a myriad of justifications for this focus on Palliative Care: reduced likelihood of meeting the Palliative Care needs of patients. Proactive case finding in the ICU through a consensus panel of Palliative Care specialists. The implementation of these criteria, require a dedicated individual to gather the information daily [9]. Several criteria are less quantitative in nature. Retrospective analysis pre and post-implementation of these trigger criteria did not result in an increased number of Palliative Care consults for ICU patients [10]. There was also no change in the time from trigger identification to receiving a Palliative Care consult between the pre and post-intervention (trigger criteria) groups [10]. There was no change in the number of ICU stays or in-hospital mortality between groups despite the fact that meeting a single trigger conferred at least a 50% risk of in-hospital mortality [10].

Background

We hope to develop a novel set of Trigger criteria for identifying patients at high risk for unmet Palliative Care needs. The panel recommended that each institution devise a systematic approach to identify patients with high risk of unmet Palliative Care needs [2]. The consensus panel also advised that screening should occur at the time of admission and continue throughout the hospital course to ensure the provision of a timely manner. Consultation Checklists and Trigger Tools for Palliative Care case finding have been designed, implemented and assessed within the confines/context of the Intensive Care Unit. Proactive case finding in the MICU through the use of Trigger Criteria has been shown to result in decreased length of stay in ICU without changing mortality rates or discharge disposition [3-5].

To isolate the quantitative patient variables involved in triggering a palliative care consult, a database was created via retrospective review of all trauma activation and trauma consult patients at JHMC between 05/01/2014 and 07/31/2014 from the JHMC Trauma Registry. Variables collected include patient demographics, GCS on admission, disposition post trauma bay, advanced directives on admission, presence or absence of a Palliative Care consult during the admission, vital signs and select laboratory values. All pre-existing conditions will be collected to calculate the Charlson Comorbidity Index (Deyo’s modification). The HPI of each patient will also be reviewed to identify the following conditions: pelvic/hip fractures, metastatic fractures, TBI, neurodegenerative disease, shock index will also be calculated for each patient to provide an indicator of tissue perfusion. All statistical analyses are being conducted using R version 3.1.2. A fully saturated logistic regression model will be employed using all of the variables described previously that are not suspect of collinearity to identify the variables with the greatest odds of being associated with a palliative care consult being ordered. In order to assess our proposed model, the data will also be modeled using a much smaller set of predictors. All of the relevant data collected from the EMR will be also be entered into the APACHE II scoring system, an ICU scoring system that is effective in predicting mortality. While we are not trying to predict mortality per se, many of the variables that we are collecting overlap with those included in the APACHE II. As such, a second logistic regression will be performed using the APACHE II score, the Charlson Comorbidity index, intuition status, disposition, presence of advanced directives, and the 8 variables contained in the APACHE II scoring system as independent predictors. The predicted probabilities from the two logistic regression models will be utilized in an ROC curve analysis, with the dependent variable (presence/absence of a palliative care consult) as the classification variable. Area under the curve (AUC) will be compared between the two models, with the higher AUC taken as reflecting better prediction. The Hosmer-Lemeshow goodness of fit test will also be used to compare models. Lastly, the AIC (Akaike’s Information Criterion) will be compared between the two models. A priori, we predict that our proposed model will have better predictive power than the model that consists of only the APACHE II score + CCI; thus, the Type-I error rate will be lower following the Hosmer-Lemeshow simulations for our model than the alternative model, as will the AIC. In order to assess how accurate our model is in predicting who needs a palliative care consult, based on quantitative medical data alone, data from the 3 month time period described above, where the status of a palliative care consult is known will serve as the “training” data set, but only 75% of the responses will be utilized. The remaining 25% of the dataset will serve as the “test” data set. The test dataset does not contain the variable that indicates the presence/absence of a palliative care consult. That is, we will set the variable (model fit) equal to the training data, then using the model fit predicted above using the training data Predicted probabilities will be computed using the model fit developed with the training data set, and a confusion matrix created. The confusion matrix allows visualization of the “actual” state of whether a patient received a palliative care consult vs. what the model predicted. The confusion matrix also allows the calculation of multiple parameters used to judge model fit including accuracy, sensitivity, negative predictive rate, classification rate, specificity, and precision. We will also calculate confusion criteria used to determine how well we would perform by chance alone. An ROC curve will be generated, which will allow calculation of the AUC for the model as to how well it predicts outcome. Depending on the performance of the logistic regression model, we may apply one, or more of other modeling techniques, including: Random forest decision trees, partial linear discriminant analysis, neural networks, and support vector machines.

Methods

Palliative Care Needs in the Elderly Trauma Population.
13. Campbell, M.L. and J.A. Guzman, Assessing the impact of implementing these criteria via established outcome measures including but not limited to: Hospital Length of Stay, ICU Length of Stay, time to palliative care consultation, rate of withdrawal of life-sustaining care, patient/family satisfaction, discharge disposition (i.e. Hospice) as well as other potential measures of life-altering morbidity/functional limitation and mortality rates.

References