Outlying Factors Increasing Length of Stay in Patients with *Staphylococcal* Sepsis at the University of Colorado Hospital, A Preliminary Quality Improvement Study

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Abstract

Objectives

- Gather data from patients with *Staphylococcal* sepsis at University of Colorado Hospital (UCH) who exceeded expected length of stay (LoS)
- Determine the factors presumably leading to increased length of stay
- Eventually design and test a novel hospital protocol that addresses these factors

Background

At the University of Colorado Hospital between March of 2021 and March of 2022, patients diagnosed with *Staphylococcal* sepsis had a median length of stay that was 2.04 days longer than the expected length of stay based on their hospital course and discharge diagnoses. This patient subgroup had significantly longer hospital stays compared to patients with other common diagnoses during this period at UCH. During the same timeframe at UCH, all other diagnoses had a median LoS of -0.41 in comparison to the *Staphylococcal* sepsis group (statistically significant with a p-value of <0.001 via a Mann-Whitney-U test), which prompted this investigative quality improvement study. Due to the massive breadth of factors possibly influencing hospital stay in this population, there is limited evidence to guide this preliminary single-site study. Therefore, this stage of research sought to help narrow down the controllable factors in our treatment of this diagnosis and identify areas for the improvement of healthcare delivery at this medical center.

Aim Statement

In patients diagnosed with *Staphylococcal* sepsis at the University of Colorado Hospital between 2021 and 2022, we will determine the main drivers of increased length of stay to later develop and test a novel method of practice that attempts to address these factors.

Methods

A random sample of 15 patients diagnosed with *Staphylococcal* sepsis at UCH between 2021 and 2022 were used to analyze common factors extending their length of stay. This diagnostic subgroup was defined by sepsis caused by any species of *Staphylococcus* that was clinically treated as a non-contaminant infectious cause of illness. Of note, none of the patients in this sample had a history of intravenous drug use and further breakdowns of infectious sites and culture speciation are discussed later. Data was gathered from the following categories: medical unit placement, number of sites of infection, total procedures, time to procedure, total consults, time to Infectious Disease team consult, presence of diabetes, degree of glycemic control, social work issues with disposition placement, time in Intensive Care Unit (ICU), and presence of encephalopathy. Basic statistical assessments were performed on the quantitative data to determine medians, means, and standard deviations. Thematic analysis was additionally used to group common findings gathered from notes within the Electronic Medical Record (EMR), combining a variety of factors ranging from comorbid medical treatments to social issues.

Results

Qualitative data from EMR notes was found to fall into five main categories: procedure delays, delays in acceptance to rehabilitation facilities, coordination of care between medical teams, family's medical decision making, and the patient's overall severity of disease. The primary infectious species that was found in blood cultures was *Staph aureus* (9 patients with MSSA bacteremia, 5 with MRSA bacteremia). In this sample, the median length of stay difference from the insurance-calculated expected length of stay was 3.5 days. The median number of non-bedside procedures per patient was 1, with 60% of these having a significant delay in a non-bedside procedure (defined as >24 hours from order placement to time of procedure). The median number of consulted healthcare teams for each patient during their hospital stay was 6. Additionally, the amount of time from admit to consultation of an infectious disease team had a median of 1.82 days. Other notable findings included 47% of patients complicated by encephalopathy, 33% requiring ICU time for a median of 3.25 days, 33% with poor glycemic control while inpatient, and 73% of patients facing various disposition issues as defined by social work/case management notes.

Conclusions and Implications

There is little established causative evidence on length of hospital stays that is specific to the diagnosis of *Staphylococcal* sepsis and generalizable across nationwide hospital systems. After discovering that *Staphylococcal* sepsis had a significantly longer median LoS from all other diagnoses at the University of Colorado Hospital, this study

sought to examine ways to improve how we treat patients with this diagnosis. Between both quantitative analyses and thematic analyses of subjective information from medical notes during admissions, this study attempted to narrow down the large breadth of driving factors that increased LoS in this patient population. Unfortunately, many of the influential factors were found to be less suitable for Plan-Do-Study-Act interventions due to their case-by-case variability and lack of pertinence to the UCH healthcare system. These factors included delays in family meetings to determine the course of medical management, lack of rehabilitation availability from factors such as COVID-19 outbreaks and understaffing, and general case management hurdles such as insurance approvals and transportation coordination.

Therefore, this study centered on the more controllable factors within the UCH hospital system. With the high numbers of consulting teams and procedures per patient, we decided to investigate ways to decrease time-to-procedure and enhance timely communication among the various medical teams. This preliminary study is to provide the basis for the eventual trial of a novel hospital protocol that notifies consulting procedural teams earlier into the admission and creates a multidisciplinary meeting for patients with *Staphylococcal* sepsis that is akin to a tumor board. The implications of these changes, if successful, would be to reduce both hospital and patient costs, increasing patient turnover for more open beds, and possibly reduce mortality from *Staphylococcal* sepsis.