Reducing Patient Costs and Improving Outcomes through Evidence-Based Process Redesign: Effectively Treating Alcohol- Withdrawal Syndrome in the Inpatient Setting

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Abstract: Research has shown that symptom-triggered and symptom-monitored loading dose approaches to treating Alcohol Withdrawal Syndrome (AWS) reduce benzodiazepene use when compared against fixed dose or loading dose regimens. This paper examines how a structured process redesign effort that shifted the Seton Healthcare Family, a diverse, multi-hospital network, from a fixed-dose protocol for treating high-risk AWS patients to risk-assessment and symptom-triggered treatment protocol favorably impacted patient outcomes and patients’ mean total charge amount. Post-implementation ethanol withdrawal patients showed a 15.7% decrease in median length of stay (α=0.05) and an 8.14% decrease in mean total charge amount (α=0.10). Additionally, patients who were treated using a symptom-triggered protocol instead of the older fixed-dose protocol were 16.49% less likely to require transfer to a higher level of care (α≤0.01). Ongoing monitoring via a Tableau® dashboard has allowed us to enforce continued program compliance, monitor program quality indicators, and clearly communicate project status to Senior Clinical Leadership.

Keywords: Process Redesign, Alcohol Withdrawal Syndrome, Process Improvement, Outcome Measurement, Multidisciplinary Teams

INTRODUCTION
Alcohol Withdrawal Syndrome (AWS), which occurs when a patient’s brain enters a hyper excited state upon a sudden drop in alcohol intake, has wide ranging clinical manifestations from mild insomnia to delirium tremens and death.1 AWS is highly variable in both its incidence and its symptomology. For example, it is possible for a patient with a history of heavy, regular alcohol abuse to stop drinking without developing AWS and for patients with a history of more moderate, non-clinically significant daily alcohol use to develop severe AWS symptoms.2 Preventing and treating AWS efficiently in the inpatient setting can be challenging.

The medical community has developed several different modalities aimed at improving the identification and treatment of inpatients at risk of developing AWS. Past research has studied the relative effectiveness of front-loading, fixed-dose and symptom-triggered regimens in

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2 Ibid.
preventing and managing AWS.\(^3\) Findings indicate that the most effective way to treat at-risk patients is through a protocolized symptom-triggered or symptom-monitored loading dose approach where providers administer an optional initial dose of benzodiazepines to high-risk patients with a history of severe withdrawals (or patients with a condition preventing normal assessment) and monitor patients’ symptoms over the course of their stay, providing additional benzodiazepines only when patients’ Clinical Institute Withdrawal Assessment for Alcohol (CIWA-Ar) scores rise to 8 or above.\(^4\) Multiple reviews have found that this approach shortens the duration of detoxification and decreases benzodiazepine use compared with fixed dose or pure loading dose regimens.\(^5,6\)

In 2013, the Seton Healthcare Family (SHF) initiated a process redesign effort aimed to reduce treatment variance among acute and critical care patients at high-risk of AWS. This new process introduced protocols for evidence-based risk stratification using the Alcohol Use Disorders Identification Test (AUDIT-PC) for all admitted patients followed by regular monitoring of high-risk patients using the CIWA-Ar scale. A symptom-triggered benzodiazepine dosing protocol was initiated for patients with a CIWA-Ar score ≥ 8.\(^7,8\) Prior to this process change, patients were treated according to a fixed-dose regimen that resulted in wide variability in successful AWS management and created an environment where patients who became rapidly symptomatic before receiving treatment were often moved to higher levels of care, experienced drip complications (i.e. extravascular injection, phlebitis or thrombophlebitis), and had an extended length of stay. The new protocol was finalized and diffused across the SHF network beginning in November 2014.

In January of 2016, we began a retrospective review to determine whether the implementation of risk stratification and symptom-triggered protocols reduced patient length of stay, total charge amount, and transfers to a higher-level of care. Past research on treating AWS has focused on and provided strong evidence that symptom-triggered protocols reduce benzodiazepine use without causing additional risk to patients.\(^9\) While this work is highly relevant to the medical


\(^9\) Duby et. al, “Alcohol Withdrawal Syndrome in Critically Ill Patients”.

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community, it does not fully communicate the benefits of moving from a fixed-dosing to symptom-triggered approach to AWS treatment from either the patient’s or the hospital’s perspective. In an effort to advance the conversation around the benefits of symptom-triggered dosing protocols for AWS, our study focuses on the potential of research-based process redesign to both improve patient care and reduce costs across a diverse network of hospitals serving a large metropolitan area. In doing so, it provides a model for how analytics and performance improvement can be used to support not just strategic planning and research, but to develop and direct novel approaches to patient care.

**METHODOLOGY**

We began our review by identifying pre and post implementation patient populations. Our cohorts included patients who either had an ethanol withdrawal diagnosis (ICD-9 291.0 or 291.81; ICD-10 F10.23*) or were placed on a structured ethanol withdrawal order set. Roll-out for updated AWS risk-assessment and treatment protocols began in November 2014 but the process was not fully in place at all sites until July 2015. The pre-implementation cohort included patients discharged from an SHF inpatient hospital between November of 2014 and April of 2015 while our post-implementation cohort included patients discharged between November 2015 and April 2016.

Once our populations were identified, we used Structured Query Language (SQL) to pull administrative and clinical data on patients to assess whether improved AWS identification and treatment protocols reduced patients’ median length of stay and mean total charge amount. In addition, we compared data on patients with a documented ethanol withdrawal diagnosis between December 1st, 2015 and May 31st, 2016 who were placed on symptom-triggered treatment plans against those who were not to determine whether these protocols reduced the frequency with which patients required elevation to a higher-level of care. It should be noted that the population of patients in the fixed-dosing regimen (n=57) was smaller than the population of patients placed on the symptom-triggered regimen (n=648). During the study period, all sites had been introduced to and trained on symptom-triggered protocols; however, there were enough patients who did not receive this improved treatment protocol to allow for an effective statistical comparison.

In all cases t-Tests were used to assess the statistical significance of observed differences between different patient groups. Finally, to support ongoing monitoring and encourage compliance with improved AWS screening and treatment protocols, a Tableau® dashboard was created to show month-over-month trends in median length of stay, mean total charge amount, and protocol compliance rate. This dashboard is reviewed quarterly by sponsoring Network Clinical Care Councils to continuously monitor the successes and opportunities for improvement in how we treat patients at risk for AWS.

**RESULTS**

Our analysis revealed a statistically significant decrease in both median length of stay and mean total charge amount. Compared with the pre-implementation group, patients discharged after full-implementation of improved AWS treatment protocols showed a 0.98 day decrease in the median length of stay ($\alpha=0.05$) as shown in Figure 1 and a $7,331 decrease in the mean total charge amount ($\alpha=0.10$) as shown in Figure 2. Both effects were statistically significant at or above the 90% confidence level.
Figure 1: Median AWS Patient Length of Stay in Days: Pre & Post Implementation

Figure 2: Mean AWS Patient Total Charge Amount: Pre & Post Implementation
When comparing patients discharged between December of 2015 and May of 2016 with an ethanol withdrawal diagnosis or a positive score (at or above 8) on the CIWA-AR tool, we found that those who were placed on a symptom-triggered treatment regimen (PowerPlan) were significantly less likely to be transferred to a higher level of care than those who were treated with a fixed-dosing regimen. Between December of 2015 and May of 2016 42.11% of patients treated under the outdated fixed-dosing regimen required admission to the Intensive Care Unit (ICU) compared with 25.62% of patients treated under the symptom-triggered regimen ($t=2.42, \alpha<0.01$) as shown in Figure 3.

![Figure 3: Percent of AWS Patients Admitted to the ICU by PowerPlan Status](image)

This result reaffirms previous findings that symptom-triggered treatment with benzodiazepines effectively addresses alcohol withdrawal syndromes and prevents patients from deteriorating to the point where intensive care is required and led us to include measures in our monitoring dashboard to ensure that all sites remain compliant with improved, symptom-triggered AWS treatment protocols.

**CONCLUSION**

Implementing a symptom-triggered treatment protocol for patients at risk of developing AWS not only reduces benzodiazepine use but, as shown by these results, also decreased patients’ median length of stay and mean total charge amount. Additionally, when compared to patients treated via fixed-dose approach, patients who receive treatment through a symptom-triggered protocol based on regular CIWA-Ar assessments are less likely to transfer to a higher level of care. These findings both support previous studies and provide new evidence that a risk assessment program and protocolized symptom-triggered approach to AWS treatment positively
impacts the value of care from both the patients’ and hospital’s perspective. As the healthcare industry continues to emphasize the importance of improved quality outcomes at a reduced cost, the work done at the SHF with this initiative can serve as an example of how making measured changes to screening and treatment protocols can promote healthcare that works, healthcare that is safe, and healthcare that is cost-effective.

REFERENCES


