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# Improving Identification of Complicated Alcohol Withdrawal Syndrome Using the Prediction of Alcohol Withdrawal Severity Scale

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# Improving Identification of Complicated Alcohol Withdrawal Syndrome Using the Prediction of Alcohol Withdrawal Severity Scale

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**Abstract**

**Problem:** Individuals who drink alcohol excessively are at great risk for alcohol withdrawal syndrome (AWS) when hospitalized. Symptoms and their severity differ for everyone, and research shows that the identification and treatment of AWS is challenging and often inadequate. Mild AWS is often overtreated, while moderate to severe AWS is often underdiagnosed and undertreated, placing individuals at risk for longer hospital stays, more time needed in critical care units, and a variety of unintended consequences.

**Methods:** This evidence-based practice project had a pre-post intervention design in which the Prediction of Alcohol Withdrawal Severity Scale (PAWSS) was implemented to promptly identify individuals at risk for moderate to severe (complicated) AWS. Data was collected via retrospective chart review before the PAWSS implementation, followed by a prospective chart review after implementation. Data included length of stay, time spent in critical care units, timeliness of withdrawal protocol initiation, severity of withdrawal, and benzodiazepine usage for AWS. Independent samples T-tests were conducted to analyze the difference between data for the two groups.

**Results:** A statistically significant difference was found between the following outcomes: time from arrival to CIWA-Ar protocol initiation, time from arrival to prophylactic Librium administration, total length of hospital stay, time spent in the ICU/IMU, total Ativan administration, and the highest recorded CIWA-Ar score. There was also a decrease noted between transfers of patients to a higher level of care by 7.3%.

**Implications for Practice:** Widespread utilization of the PAWSS tool in inpatient settings could aid in promptly and accurately identifying patients at risk of complicated AWS and improve treatment and patient outcomes.

# Improving Identification of Complicated Alcohol Withdrawal Syndrome Using the Prediction of Alcohol Withdrawal Severity Scale

Alcohol is an addictive substance and the most commonly abused drug in the United States (Davis et al., 2018). Alcohol use disorder (AUD) has been defined as a problematic pattern of alcohol use that causes clinically significant impairment or distress in one's life (American Psychiatric Association, 2017). AUD typically involves excessive alcohol consumption for a prolonged period and can affect anyone. AUD is a public health concern that is under-recognized and undertreated (Butt et al., 2020). It's been reported that approximately 5.8% of the general population in the United States alone is affected by AUD (Lenik et al., 2021). Excessive use of alcohol is considered a public health crisis that is growing increasingly concerning. Davis et al. (2018) reported that in the United States in 2015, approximately 15.1 million adults had AUD. Statistics from the National Institute on Alcohol Abuse and Alcoholism (NIAAA) show that 28.6 million adults had AUD in 2021 (NIAAA, 2021).

According to the Centers for Disease Control and Prevention (CDC), excessive alcohol consumption shortens lives by an average of 26 years and is a leading preventable cause of death in the United States (CDC, 2022). AUD has been identified as a risk factor for many other health issues including hypertension, heart disease, stroke, liver disease, and many conditions of the gastrointestinal system (Butt et al., 2020). There is also clear evidence of a link between excessive alcohol and cancer of many organs. AUD has been associated with other mental health disorders including cognitive decline and dementia, depression, anxiety, and suicidality (Butt et al., 2020). Excessive alcohol intake creates an intense burden on the healthcare system as well. Each year, more than 2.4 million

hospitalizations are associated with an alcohol-related disorder costing the US healthcare system approximately $25 billion annually (Mahabir et al., 2020).

At least 50% of individuals with AUD will experience alcohol withdrawal syndrome (AWS) to some degree when alcohol consumption is stopped or reduced (Day & Daly, 2021; Jaworowski et al., 2019). AWS manifests on a continuum with symptoms ranging from mild autonomic hyperactivity and psychomotor agitation to severe, life-threatening complications such as withdrawal seizures and delirium tremens (Burkhardt et al., 2020). A timeline for AWS is available in Appendix A. When individuals with AUD are hospitalized, the abrupt discontinuation of alcohol greatly increases the risks of these more severe complications. AUD is reported in 10–32% of medically hospitalized patients (Maldonado et al., 2015). In about 80% of cases symptoms are mild, referred to as uncomplicated alcohol withdrawal syndrome (U-AWS). Although it's classified as mild, it is often overtreated, which can lead to many unintended consequences, discussed later in the literature review. Complicated alcohol withdrawal syndrome (C-AWS) presents with moderate to severe symptoms. It is seen in approximately 20% of cases yet is often missed. AWS is often not recognized in hospitalized patients until moderate to severe symptoms have appeared (Claus, 2022).

In the absence of effective identification and treatment of C-AWS, there is a risk of increased length of hospital stay, longer ICU stays, deterioration of patient condition, and increased morbidity and mortality rates (Maldonado et al., 2015). Additionally, there is increased utilization of healthcare resources and costs. Conversely, patients who are inappropriately placed on alcohol withdrawal protocols such as the Clinical Institute Withdrawal Assessment for Alcohol- Revised (CIWA-Ar) are likely to receive

unnecessary treatment which can lead to unintended consequences, discussed later in this review. Thus, improving AWS identification, risk of severity, and improving treatment accuracy is a critical goal to prevent unnecessary treatment, enhance outcomes, and optimize resource allocation.

The purpose of this evidence-based practice project is to implement the Prediction of Alcohol Withdrawal Severity Scale (PAWSS) screening tool to identify patients at risk for C-AWS. The project aims to distinguish those at risk for C-AWS versus U-AWS to manage treatment quickly, and more effectively, and improve patient outcomes. The primary outcomes of this project are the number of CIWA-Ar protocols implemented, the time of CIWA-Ar initiation, and peak CIWA-Ar scores. The secondary outcomes include the length of stay, length of time spent in the intensive care unit/intermediate care unit (ICU/IMU), transfers to a higher level of care related to AWS (such as increasing CIWA scores, hallucinations, agitation or patient deterioration), and benzodiazepine usage as per the CIWA-Ar protocol. Examples of the CIWA-Ar and medication protocols are available in Appendix B. Benzodiazepine usage will include time from admission to first doses of Librium and Ativan given (if any), and total doses of each given.

The clinical question guiding this research is as follows: In a population of patients admitted to a community hospital identified as alcohol users, how does implementing the PAWSS tool to detect the risk for complicated alcohol withdrawal syndrome, compared to no use of a predictive screening tool, affect CIWA-Ar implementation and patient outcomes within an eight-week timeframe? Patient outcomes include length of stay, time spent in the ICU/IMU, transfers to a higher level of care, and benzodiazepine usage.

## Literature Review

The purpose of this integrative literature review was to examine previous research regarding AWS and the use of screening tools to identify AWS. The search engines used for this literature search included Pubmed, CINAHL, APA PsychINFO, and Cochrane Library. The key terms searched in different combinations included: alcohol withdrawal syndrome, alcohol withdrawal assessment, acute care setting, hospital*, clinical institute withdrawal assessment for alcohol, CIWA, predict* alcohol withdrawal, alcohol withdrawal severity, and risk of alcohol withdrawal. Boolean operators utilized in the searches included AND and OR. A total of 12,246 articles were originally generated. Inclusion criteria included articles written within the last 5 years, articles written in the English language, academic journals, peer reviewed, and in full text. Exclusion criteria were those older than 5 years, those written in other languages, those not in an acute care setting, and those focusing on populations younger than 18. Once the search was refined the total number of articles included 983. Additionally, an ancestry research approach was used when an author's name was noted to appear in many of the articles. The ancestry search resulted in 10 studies. All articles were reviewed to which a total of 21 articles were selected to be utilized. Additionally, the American Society of Addiction Medicine Clinical Practice Guideline on Alcohol Withdrawal Management was also utilized. See Appendix C for an Evidence Matrix Table.

Several themes were identified throughout the literature review process. One was that alcohol is one of the most frequently abused substance in the United States, as highlighted in the introduction. Secondly, many articles highlighted the complications and detrimental health effects associated with AWS. Another noted theme was how early

recognition of AWS and implementation of treatment positively impacts patient outcomes. It was also identified that risk assessment for AWS is more accurate based on screening tools than clinical judgment. Much of the research concluded that the PAWSS tool was the most accurate screening tool. Finally, the last theme identified was inconsistencies in the treatment of AWS, specifically the improper use of the CIWA-Ar.

The symptoms and dangers of alcohol withdrawal were identified and explored in many articles. U-AWS symptoms are mild and can include tremors, insomnia, anxiety, and increased pulse, respiration rate, body temperature and blood pressure (Jaworowski et al., 2019). Patients in U-AWS normally have intact orientation and are fully conscious (Jesse et al., 2016). C-AWS involves more severe signs and symptoms. Approximately 8% of individuals will experience hallucinations, which can be visual, auditory, and/or tactile (Day & Daly, 2021). Withdrawal-seizures occur in approximately 10% of cases and delirium tremens in approximately 5%, which is considered a medical emergency and carries a mortality rate of 4% (Day & Daly, 2021; Jaworowski et al., 2019). All patients experiencing AWS are at higher risk of additional complications such as physical injury, falls, dehydration, and electrolyte imbalances (Jesse et al., 2016).

Many researchers identified how early recognition of AWS and early implementation of treatment positively impacts patient outcomes (Jaworowski et al., 2019; Lenik et al., 2021; Claus, 2022). Jaworowski et al. demonstrated a significant relationship between period of time until a diagnosis of AWS was made and the length of hospitalization: the shorter the time to diagnosis, the shorter the hospitalization (Jaworowski et al., 2019). Lenik et al. demonstrated how the majority of the patients in their study who had a PAWSS score within the realm that predicts C-AWS and were

treated preemptively did not develop C-AWS (Lenik et al., 2021). Claus (2022) demonstrated how the use of the screening tool decreased ICU days from 4.7 to 4.2. They also reported a decrease in unintended transfers to the ICU, suggesting a decrease in the severity of AWS due to more effective treatment (Claus, 2022). Using the PAWSS to guide implementation of a benzodiazepine sparing withdrawal protocol, Smith et al. (2022) saw a decrease in ICU use and length of stay as well. Melkonian et al. (2019) not only found a decrease in length of stay and ICU transfers after screening tool initiation, but a reduction in average benzodiazepine use and patient deterioration requiring intubation as well. Maldonado et al. reported in their study that in cases of C-AWS left untreated, mortality rates range from 15% to 20%, compared to 2% when treated appropriately (Maldonado et al., 2017). Desai et al. (2023) implemented the PAWSS screening tool in a preoperative setting and, after treatment protocol was initiated when appropriate, saw a reduction in postoperative medical and surgical complications, length of hospitalization, and hospital-related costs.

Currently, the risk of severity of AWS relies heavily on clinical judgment versus screening tools. However, several researchers demonstrated how predicting the severity of AWS is best done using a standardized instrument that incorporates identified predictors versus clinical judgment alone (Davis et al., 2018; Mahabir et al., 2020; Wood et al., 2018). One systematic review by Maldonado et al. (2015) yielded results that revealed how using only clinical judgment, AUD was accurately identified in under half of cases and healthcare professionals reported having substantial difficulty with AUD identification. In the study conducted by Claus (2022), prior to implementation of the screening tool, an AWS protocol was initiated based on clinical judgement. The

percentage of admitted patients who had AWS protocol treatment initiated in the Emergency Department (ED) was 0% because no screening for risk was done. After implementation, nearly 37% of patients with an AWS protocol were initiated in the ED as a result of the screening process (Claus, 2022). The literature revealed the use of screening tools mitigated variability in assessment and treatment and improved assessment and treatment accuracy.

Data offering guidance on the management of AWS is limited and can be conflicting. Treatment can vary across providers and organizations. The CIWA-Ar is the most widely used and accepted treatment protocol for inpatient AWS. The CIWA-Ar is a type of symptom-triggered therapy in which benzodiazepines are used to treat symptoms as needed and symptoms are monitored continuously. Some research has seen advantages of symptom-triggered therapy versus fixed-dose treatment including shorter duration of detoxification and less utilization of benzodiazepines consequently allowing for decreased risk of sedation and respiratory depression (Jesse et al., 2016). However, improper use of this treatment protocol carries risks of its own and can lead to further complications.

Eloma et al. (2017) concluded from their data that CIWA-Ar is appropriately initiated in only 48% of AWS cases. They suggest this may be due to a lack of formal education and training for providers in treating patients with AWS. They reported that providers may order the protocol when it is not necessary or fail to order the protocol when warranted. This may be due to being unfamiliar with validated risk factors for AWS and failure to assess them when obtaining the health history (Eloma et al., 2017). Research indicates that the CIWA-Ar protocol is often overutilized, and patients are

treated despite being at low risk for C-AWS, creating unnecessary benzodiazepine exposure (Bregger et al. 2020; Burkhardt et al., 2020). Benzodiazepine overuse in the inpatient setting has been shown to increase the risk of over-sedation, respiratory depression, impairment in cognition, and delirium in patients (Eloma et al., 2017).

The PAWSS screening tool was designed to quickly differentiate C-AWS and U-AWS in medically ill individuals to better guide treatment. It has been validated for inpatient use with a 93.1% sensitivity and a 99.5% specificity (Maldonado et al., 2015). Subjects are assessed using the PAWSS tool, where a score of four or greater indicates risk of C-AWS and less than four indicates risk for U-AWS. The American Society of Addiction Medicine (ASAM) Clinical Practice Guideline on Alcohol Withdrawal Management recommends the use of PAWSS to predict alcohol withdrawal severity and not base risk and treatment on clinical judgment alone (ASAM, 2020). The PAWSS tool has been found to be the most accurate tool for predicting the severity of AWS in inpatient medical settings (Wolf et al., 2020; Wood et al., 2018). Although it has been validated for inpatient use only thus far, Desai et al. (2023) found the PAWSS tool to be useful and reliable and recommended in the preoperative period for head and neck cancer patients undergoing surgery as well.

To date, predictive screening tools have not been widely implemented. This has been attributed to several various reasons. Firstly, much of the previous research is limited by heterogeneous designs. Additionally, much of the research is limited due to retrospective design, and results may be affected by errors in documentation. Another issue faced is the use of different definitions for and the ambiguous nature of signs, symptoms, and outcomes. Data is also greatly limited by a lack of generalizability and

external validation for various reasons, including small sample sizes tested, and demographic and geographical differences in populations (Burkhardt et al., 2020).

Many issues in the treatment of individuals experiencing AWS have been identified. Often, treatment protocols for AWS are not implemented promptly and treatment is delayed, thus symptoms progress more urgently, and riskier, more extensive treatment is warranted (Claus, 2022; Mahabir et al., 2020). Inadequate treatment with medication therapy may cause more severe AWS to develop, which increases the risk of morbidity and mortality. Not identifying patients who may experience only mild AWS can lead to benzodiazepine overexposure and further complications. This literature review has highlighted how the use of a screening tool can help mitigate these issues.

The integrated-Promoting Action on Research Implementation in Health Services (i-PARIHS) framework was chosen as the theoretical framework to guide this project. It holds an underlying philosophy that implementing research into healthcare practice is complex, unpredictable, and nonlinear. The core constructs of i-PARIHS are facilitation, innovation, recipients, and context, with facilitation positioned as the active construct that assesses, aligns, and integrates the other three constructs (Melnyk & Fineout-Overholt, 2023). Innovation refers to what is being implemented into practice as well as why it is important. Recipients include those who are involved in or affected by the implementation process. Recipient factors that support the successful implementation of the innovation include (1) whether they want to implement it, (2) how well it fits within their environment, and (3) whether they feel they can implement it (Melnyk & Fineout-Overholt, 2023). The environment or setting in which the innovation is to be implemented is considered the context.

## Method

### Design

This project used an evidence-based practice approach with a pre/post-intervention design. The first phase included education of staff and a retrospective chart review. Data was collected from the electronic health record (EHR) retrospectively from the 8 weeks prior to the intervention. The second phase began with the launch of the intervention, the PAWSS tool. After eight weeks, a prospective chart review allowed for data collection where the PAWSS tool was utilized in the setting.

### Setting

This project took place at Anderson Hospital in Maryville, IL. It is a not-for-profit community hospital with 144 inpatient beds. Anderson Hospital sees approximately 90,000 patients annually, with a wide range of ailments and illnesses. The focus for this project was on patients admitted to the Intermediate Care Unit (IMU), Intensive Care Unit (ICU), and the three Medical/Surgical floors.

### Sample

The sampling technique used for this project was purposeful sampling. For the retrospective chart review, the sample consisted of individuals admitted who had CIWA-Ar protocols ordered as part of their treatment. The sample for the prospective chart review consisted of patients admitted who completed the PAWSS screening tool as well as had CIWA-Ar protocol ordered. Exclusion criteria included patients with altered mental status and unable to answer questions appropriately, patients who are nonverbal, patients under 18 years of age, patients who had CIWA-Ar initiated in the ED before admission, and patients who refused the screening tool. The desired sample size for this project was 50 or more patients in both groups.

**Approval Process**

This project received IRB approval from Anderson Hospital and was determined to be exempt. UMSL IRB approval was obtained prior to data collection to ensure human subjects' protection. Steps were taken to avoid risks associated with this project, including the protection of personal information and patient identifiers being excluded from data collection. Of special note, this project was not specifically designed to guide treatment. It was at the physicians' discretion whether to take into consideration the PAWSS scores when making decisions on the care and treatment of their patients. This minimized potential risks and ensured human subjects' protection.

**Tools**

The PAWSS is a screening tool used to assess the risk of an individual developing C-AWS (See Appendix D). This tool consists of 10 Yes or No questions and is designed to be administered in an inpatient setting to medically hospitalized individuals prior to the development of AWS symptoms. Each question is scored as one point, with a maximum score of 10. A patient must be oriented and able to communicate to answer the subjective questions appropriately. A score of four or more suggests a greater risk for C-AWS and treatment may be indicated. A score of less than four indicates a lower risk of C-AWS, which indicates treatment may not be indicated. Meditech is the EHR system utilized at Anderson Hospital and will be the source of data for this project.

**Procedure**

Education material was given to the nursing staff at Anderson Hospital (see Appendix E) and a presentation was given informing the physicians of the project. One week prior to the implementation of the tool, an email was sent to staff serving as both a reminder and an opportunity to ask questions. The tool was then launched, and

retrospective data was collected. Upon admission, individuals are asked about alcohol use. For any individual who stated they are "current" or "former" drinkers of alcohol, the EHR automatically triggered the PAWSS tool to be completed. Use of the tool ceased after eight weeks and data collection was completed with a prospective chart review.

**Data Collection**

From the retrospective chart review, the following data was collected:

1. Date and time of admission
2. Date and time of CIWA-Ar initiation
3. Highest recorded CIWA-Ar scores
4. Length of hospital stay
5. Length of time in the ICU and/or IMU
6. Dates and times of all doses of chlordiazepoxide (Librium) received
7. Dates and times of all doses of lorazepam (Ativan) received
8. Transfers to a higher level of care (the ICU and IMU)

The prospective chart review consisted of the collection of the same data with the addition of the PAWSS scores. See Appendix F for the data collection tools utilized to organize data.

**Data Analysis**

The independent sample T-tests were utilized to analyze the means across data for statistically significant differences. These include the quantitative data of the number of CIWA-Ar protocols initiated, the time in minutes between admission and the CIWA-Ar protocol initiation, highest recorded CIWA-Ar scores, total length of stay, the length of stay in the ICU and/or IMU, time in minutes between the first dose of Librium given (if any), time in minutes between the first dose of Ativan given (if any), total doses of Librium received, and total doses of Ativan received.

## Results

The retrospective chart review yielded a total of 43 cases for analysis. After review, two cases were omitted from the project, and their data was not used for analysis. This was due to one patient being emergently transferred to an outside facility for medical necessity, thus information was missing, and data analysis would be affected. The second case was excluded due to the patient having severe medical complications during the hospitalization which led to a lengthy ICU stay requiring intubation and sedation. It was decided to exclude this case because such severe extraneous variables would create contextual outliers, greatly affecting the data.

A total of 208 patients were screened with the PAWSS tool to determine their risk of C-AWS. Of these, 32 patients had a score of four or greater, which according to the PAWSS is indicative of a risk of C-AWS and were placed on the CIWA-Ar protocol. An additional nine patients were also placed on the CIWA-Ar protocol, despite their scores being less than four. This was due to the physicians' orders, as the option to treat their patients with or without considering the PAWSS scores was at their discretion. Thus, both groups had 41 cases ($N = 41$). For the remainder of this report, the group prior to the implementation of the PAWSS tool will be referred to as Group 1 ($N = 41$). The group that had the PAWSS tool implemented will be referred to as Group 2 ($N = 41$).

The average age of patients in Group 1 was 43.07 ($SD = 10.86$). The average age of patients in Group 2 was 42.44 ($SD = 11.14$). Age was further analyzed by ranges, in which for both groups the most frequent age range was between 40-44 ($N = 10$, 24.4%; $N = 11$, 26.8%). The most frequently observed gender was male for both groups ($N = 24$, 58.5%; $N = 27$, 65.9%). Race was noted to be Caucasian, African American, or Latino, of

which Caucasian was the most frequent for both groups ($N$ = 31, 75.6%; $N$ = 32, 78%). Tables, graphs, and charts associated with these demographic analyses are available in Appendix G.

An independent samples t-test was conducted for all continuous variables between both groups, with $p < .05$ indicating statistical significance. See Appendix H for tables, graphs, and charts associated with these statistical analyses. Group 2 results show a significant difference in time decrease to initiate the CIWA-Ar protocol ($M$ = 4.04, $SD$ = 2.32) compared to Group 1 which showed lengthened time to initiate CIWA-Ar protocol ($M$ = 6.48, $SD$ = 5.75); $t(80) = 2.93$, $p = .002$. Next, Group 2 results reveal a significant difference in the time reduction for administering the first dose of Librium dose ($M$ = 4.78, $SD$ = 1.69) compared to the time Group 1 administration time for the first dose of Librium ($M$ = 11.39; $SD$ = 10.29); $t(80) = 3.11$, $p = .002$. Results also demonstrated a significant difference in the total number of Ativan doses received, with Group 1 having more doses of Ativan received ($M$ = 3.29, SD = 4.83) compared to Group 2 that received less doses of Ativan ($M$ = 1.54, $SD$ = 2.56); $t(80) = 2.06$, $p = .021$.

Group 2 has a significant difference in total length of stay with results indicating less number of days spent in the hospital total ($M$ = 3.23, $SD$ = 1.76) and fewer days in the ICU/IMU ($M$ = 1.06, $SD$ = 1.34) in contrast Group 1 shows greater number of days spent in the hospital ($M$ = 4.08, $SD$ = 2.27); $t(80) = 1.87$, $p = .032$ and more time spent in the ICU/IMU ($M$ = 1.85, $SD$ = 1.93); $t(80) = 2.14$, $p = .018$. Group 2, who had the PAWSS implementation, the results indicate a significant difference with lower scores recorded on CIWA-Ar ($M$ = 8.56, $SD$ = 6.34) unlike Group 1, who did not have PAWSS

implementation beforehand and CIWA-Ar scores were higher ($M$ = 13.37, $SD$ = 10.01); $t(80) = 2.6$, $p = .0006$.

The study demonstrated a decrease in total Librium doses received between Group 1 (M = 5.10, SD = 5.79) and Group 2 ($M$ = 3.32, $SD$ = 4.42), but the difference was not found to be statistically significant $t(80) = 1.57$, $p = .061$). However, when looking at Cohen's $d$ to measure the effect size of the intervention, we can see the effect size is considered large based on it being greater than 0.8 ($d$ = 5.15), 95% CI [-.09, 0.78]. So, although the difference is not statistically significant, it may be viewed as clinically significant.

Lastly, there was a decrease in the length of time between admission to initial Ativan administration between Group 1 ($M$ = 7.45, $SD$ = 5.88) and Group 2 ($M$ = 5.39, $SD$ = 2.49), but the difference was not found to be statistically significant $t(45) = 1.47$, $p = .074$). However, the effect size, as measured by Cohen's $d$, was greater than 0.8 indicating it had a large effect ($d$ = 4.75), 95% CI [-.15, 1.02]. Thus, although we did not find a statistically significant difference, it may be viewed as clinically significant.

It was observed that in Group 1 five patients had transferred to the higher level of care floors, including transfers from the medical floors to the IMU or ICU, and transfers from the IMU to the ICU. In Group 2, there were only two patients who required transfer. This indicated a decrease in transfers to a higher level of care by 7.3%. It is acknowledged that this does not prove causation, as there are a variety of factors that may contribute to transfers such as the patients' medical conditions. These factors would be too challenging to control for in this study. Nonetheless, it is a significant change that is worth noting.

## Discussion

The results of this study indicated that utilization of the PAWSS tool upon admission to the hospital greatly affects the identification and treatment of AWS. There was a statistically significant decrease observed in the length of stay and length of time spent in the critical care units. The average time from arrival to CIWA-Ar protocol initiation and Librium administration was observed to be significantly decreased as well. Librium is recommended by ASAM as a prophylactic AWS treatment as it is considered one of the safest and most effective benzodiazepine options. Because it is long-acting, its use can lead to a more controlled and smoother course of withdrawal (ASAM, 2020). The total doses of Librium received decreased but were not statistically significant. This may be due to the overall decrease in the length of stay in the hospital. Since this medication is more prophylactic with fewer side effect risks, the overall use is not the outcome of greatest importance, but the time of initial administration is. The ultimate decrease in time of initial administration may have influenced the overall decrease in CIWA-Ar scores observed, as well as the decrease in urgent transfers to the critical care units. Additionally, it could have affected the decrease in Ativan usage. Ativan is a short-acting benzodiazepine, and it is typically administered as needed for AWS symptoms dependent on CIWA-Ar scores. The overall usage of Ativan is important because it has a heavier side effect profile and is more likely to lead to complications that were discussed previously. The decrease in Ativan administered is likely codependent on the lower CIWA-Ar scores observed. A statistically significant decrease in time was not observed, however as it is given on an as-needed basis, this is not of utmost importance; the total decrease in doses required is, which was statistically significant.

An implication identified from this study is how likely AWS identification and its treatment are poorly controlled. This issue has the potential to be mitigated with the use of a severity risk assessment tool such as the PAWSS. There is a wide array of barriers to the prompt identification and effective treatment of AWS, including patients' medical conditions, demographic differences, differences in their alcohol usage, and honesty. These factors are also limitations within this study: confounding variables were not held constant or compared. Additionally, the study sample was relatively small. Further exploration in future studies that include these variables is recommended and could yield more extensive and conclusive results. A larger sample size and longer period of duration in future studies could strengthen the study and is recommended as well.

## Conclusion

AWS is complex and the condition can vary case by case. Furthermore, an individual's health history, medical conditions, and alcohol usage are diverse and can fluctuate, which complicates AWS treatment in a hospital setting. This study explored the use of the PAWSS tool to screen patients for their risk of more moderate to severe AWS and analyzed treatment and patient outcomes with and without its use. The results demonstrated a decreased length of overall stay and time needed in the ICU/IMU. The tool led to faster identification and prophylactic treatment, less utilization of as-needed and riskier medications, and an overall decrease in AWS severity as indicated by lower CIWA-Ar scores. The recommendation is that future research be executed with the following variables (a) a larger sample size, (b) a longer duration and identification, and (c) the consideration of demographic factors and medical conditions that could influence the dependent variables.

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Maldonado, J. R., Sher, Y., Das, S., Hills-Evans, K., Frenklach, A., Lolak, S., Talley, R., & Neri, E. (2015). Prospective validation study of the prediction of alcohol withdrawal severity scale (PAWSS) in medically ill inpatients: A new scale for the prediction of complicated alcohol withdrawal syndrome. *Alcohol and Alcoholism*, *50*(5), 509–518. https://doi.org/10.1093/alcalc/agv043

Maldonado, J. R., Sher, Y., Ashouri, J. F., Hills-Evans, K., Swendsen, H., Lolak, S., & Miller, A. C. (2014). The “Prediction of alcohol withdrawal severity scale”

(PAWSS): Systematic literature review and pilot study of a new scale for the prediction of complicated alcohol withdrawal syndrome. *Alcohol*, *48*(4), 375–390. https://doi.org/10.1016/j.alcohol.2014.01.004

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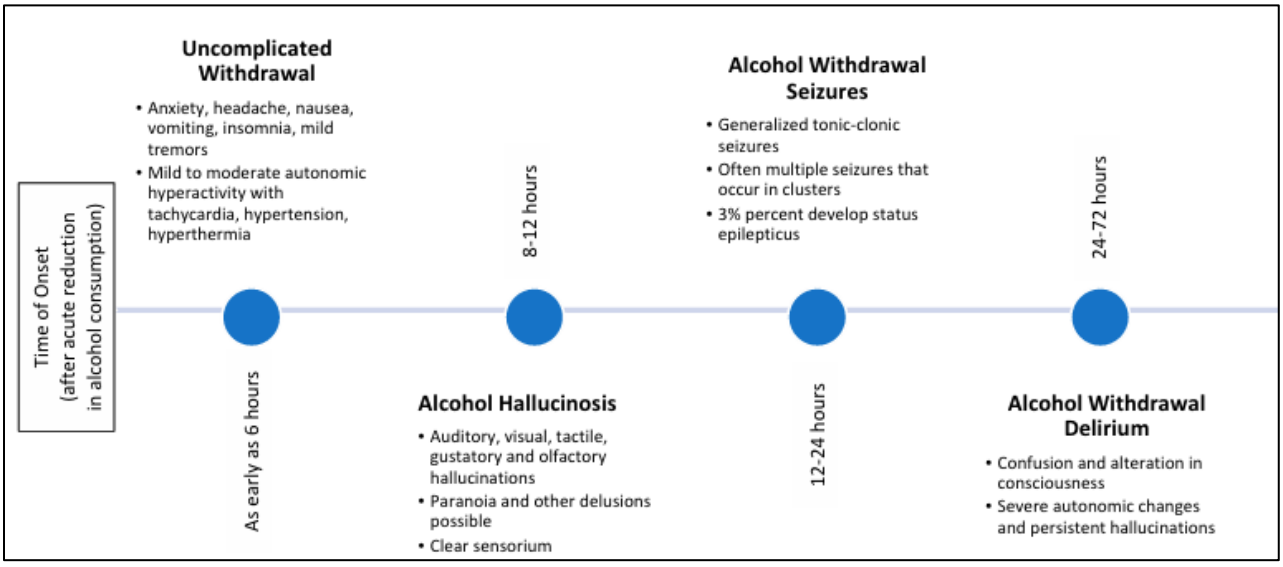
## Appendix A

**Figure 1:**

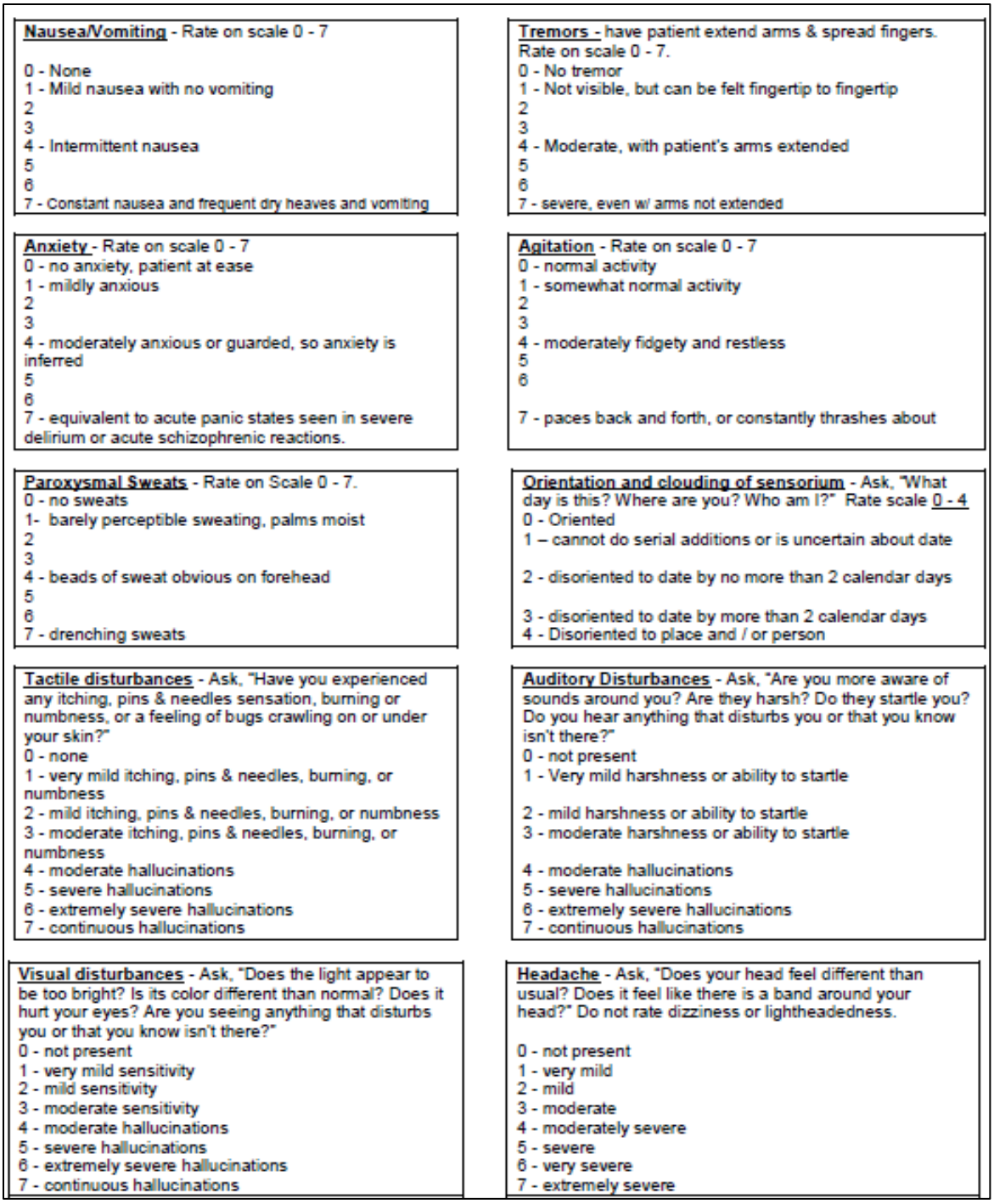
*Timeline of AWS Example*




## Appendix B

**Figure 2:**

*Example of the CIWA-Ar Protocol*



**Nausea/Vomiting** - Rate on scale 0 - 7

0 - None
1 - Mild nausea with no vomiting
2
3
4 - Intermittent nausea
5
6
7 - Constant nausea and frequent dry heaves and vomiting

**Tremors** - have patient extend arms & spread fingers. Rate on scale 0 - 7.
0 - No tremor
1 - Not visible, but can be felt fingertip to fingertip
2
3
4 - Moderate, with patient's arms extended
5
6
7 - severe, even w/ arms not extended

**Anxiety** - Rate on scale 0 - 7
0 - no anxiety, patient at ease
1 - mildly anxious
2
3
4 - moderately anxious or guarded, so anxiety is inferred
5
6
7 - equivalent to acute panic states seen in severe delirium or acute schizophrenic reactions.

**Agitation** - Rate on scale 0 - 7
0 - normal activity
1 - somewhat normal activity
2
3
4 - moderately fidgety and restless
5
6
7 - paces back and forth, or constantly thrashes about

**Paroxysmal Sweats** - Rate on Scale 0 - 7.
0 - no sweats
1- barely perceptible sweating, palms moist
2
3
4 - beads of sweat obvious on forehead
5
6
7 - drenching sweats

**Orientation and clouding of sensorium** - Ask, "What day is this? Where are you? Who am I?" Rate scale 0 - 4
0 - Oriented
1 – cannot do serial additions or is uncertain about date
2 - disoriented to date by no more than 2 calendar days
3 - disoriented to date by more than 2 calendar days
4 - Disoriented to place and / or person

**Tactile disturbances** - Ask, "Have you experienced any itching, pins & needles sensation, burning or numbness, or a feeling of bugs crawling on or under your skin?"
0 - none
1 - very mild itching, pins & needles, burning, or numbness
2 - mild itching, pins & needles, burning, or numbness
3 - moderate itching, pins & needles, burning, or numbness
4 - moderate hallucinations
5 - severe hallucinations
6 - extremely severe hallucinations
7 - continuous hallucinations

**Auditory Disturbances** - Ask, "Are you more aware of sounds around you? Are they harsh? Do they startle you? Do you hear anything that disturbs you or that you know isn't there?"
0 - not present
1 - Very mild harshness or ability to startle
2 - mild harshness or ability to startle
3 - moderate harshness or ability to startle
4 - moderate hallucinations
5 - severe hallucinations
6 - extremely severe hallucinations
7 - continuous hallucinations

**Visual disturbances** - Ask, "Does the light appear to be too bright? Is its color different than normal? Does it hurt your eyes? Are you seeing anything that disturbs you or that you know isn't there?"
0 - not present
1 - very mild sensitivity
2 - mild sensitivity
3 - moderate sensitivity
4 - moderate hallucinations
5 - severe hallucinations
6 - extremely severe hallucinations
7 - continuous hallucinations

**Headache** - Ask, "Does your head feel different than usual? Does it feel like there is a band around your head?" Do not rate dizziness or lightheadedness.

0 - not present
1 - very mild
2 - mild
3 - moderate
4 - moderately severe
5 - severe
6 - very severe
7 - extremely severe

**Figure 3:**

*Severity of AWS Based on CIWA-Ar Scores*

**TABLE 1.** Alcohol Withdrawal Severity.

| Severity Category | Associated CIWA-Ar Range* | Symptom Description |
|---|---|---|
| *Mild* | CIWA-Ar < 10 | Mild or moderate anxiety, sweating and insomnia, but no tremor |
| *Moderate* | CIWA-Ar 10-18 | Moderate anxiety, sweating, insomnia, and mild tremor |
| *Severe* | CIWA-Ar ≥19 | Severe anxiety and moderate to severe tremor, but not confusion, hallucinations, or seizure |
| *Complicated* | CIWA-Ar ≥19 | Seizure or signs and symptoms indicative of delirium – such as an inability to fully comprehend instructions, clouding of the sensorium or confusion – or new onset of hallucinations |

**Figure 4:**

*Example of a Medication Protocol for the CIWA-Ar Protocol*

| | |
|---|---|
| Symptom-triggered benzodiazepines | Oxazepam 15mg (or diazepam 10mg) q30m prn CIWA 8–15 and 30mg (diazepam 20mg) q30m prn CIWA >15 for 48 hours[88]<br>Oxazepam 30mg (diazepam 20mg) q1h prn CIWA ≥10[61]<br>Lorazepam 2mg q2h prn CIWA >15, q6h prn CIWA 8–15, stop when CIWA <8 for 24h[89] |
| Fixed benzodiazepine taper | Chlordiazepoxide 50mg po q6h x24h then 25mg po q6h x 48h[90]<br>Diazepam 10mg po q6h x24h then 5mg po q6h x48h[90] |
| Novel anticonvulsants | Carbamazepine 200mg q6h x7d[91]<br>Divalproex 500mg po q8h x7d (adjunctive)[61]<br>Gabapentin 400mg q8h x3d then 400mg q12h x1d[92]<br>Gabapentin 1200mg loading then 800mg q8h x4d then 600mg q8h x2d then 300mg q8h x2d; consider continuing 600mg q8h ongoing for relapse[58] |
| Baclofen | Baclofen 10mg q8h x72h (adjunctive)[93] |
| Barbiturates | Phenobarbital 10mg/kg IV x one dose[52] Phenobarbital 260mg IV x one plus 130mg IV x one 48h later "at discretion of treating physician"[50] |

**Abbreviations:** CIWA, Clinical Institute Withdrawal Assessment; IV, intravenous; po, per os; prn, pro re nata.

## Appendix C

*Evidence Matrix Table*

| **CITATION** Author(s), Date, Title, Journal Information, doi | **Level of Evidence** | **PURPOSE / BACKGROUND** Purpose & Outcome Measures or Goals (Aims) | **PARTICIPANTS / SETTING** Sample & Setting | **METHODS / DESIGN** Study Design & Interventions | **RESULTS / LIMITATIONS / RECOMMENDATIONS** Results, Strengths/Weaknesses, Limitations, & Recommendations |
|---|---|---|---|---|---|
| Bregger, M., Steed, M., Griffith, E., Ghuman, J., Alexander, K., Seifert, T., Triggs, N., Raiker, N., & O'Leary, K. | Level III: Quasi-experimental prospective | To implement PAWSS screenin | Patients with AUD admitted to | Pre-intervention data collected from | Results: patients with PAWSS screening |

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| (2020). Implementation of the PAWSS Protocol to Screen For Patients at Risk For Complicated Alcohol Withdrawal. *Journal of Hospital Medicine*, *432*. https://doi.org/https://shmabstracts.org/abstract/implementation-of-the-pawss-protocol-to-screen-for-patients-at-risk-for-complicated-alcohol-withdrawal | control study w/o randomization | g in patients with alcohol use disorder (AUD) to detect patients at high-risk for complicated alcohol withdrawal syndrome (AWS). To limit CIWA-Ar monitoring to only those patients with positive PAWSS screening, thereby reducing unnecessary CIWA-Ar usage, and inappropriate benzodiazepine exposure and associated complications. | medicine units from March 2018 to September 2019 at a single, large, urban academic medical center, N=1190 | 03/2018 - 06/2019<br><br>PAWSS screening given to patients from 06/2019 - 09/2019 with AUD with a reflex CIWA-Ar if PAWSS scores was > 4. | had decreased benzodiazepine exposure (57% vs 63%), decreased mortality (2.38% vs 3.87%), decreased ICU admissions (9.52% vs 18.15%), decreased delirium (2.38% vs 3.95%), decreased falls (0 vs 2.77%), and decreased length of stay (4.21 days vs 5.61 days)<br>Strengths: data analyses utilized, large sample size,<br><br>Limitations: intervention was only implemented at one site affecting generalizability, does not say data analysis used<br><br>Recommendations: further research needed, especially in multiple settings |

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| Burkhardt, G., Adorjan, K., Kambeitz, J., Kambeitz-Ilankovic, L., Falkai, P., Eyer, F., Koller, G., Pogarell, O., Koutsouleris, N., & Dwyer, D. B. (2020). A machine learning approach to risk assessment for alcohol withdrawal syndrome. *European Neuropsychopharmacology*, *35*, 61–70. https://doi.org/10.1016/j.euroneuro.2020.03.016 | Level III: Quasi-experimental prospective control study w/o randomization | To develop accurate machine learning tools to predict alcohol withdrawal outcomes at the individual subject level using information easily attainable at patients' admission. | 445 patients admitted to a psychiatric detoxification unit<br><br>812 patients admitted to the Department of Clinical Toxicology of the Technical University of Munich | An observational machine learning analysis using nested cross-validation and out-of-sample validation was applied to alcohol dependent patients at two major detoxification wards<br><br>Did not pre-select any variables due to statistical independence but extracted all possible predictors readily available at the day of patients' admission: including blood tests, urine drug screenin | Results: Models increased accuracy—compared with pre-test outcome probabilities in our population—in predicting moderate to severe alcohol withdrawal and identifying patients at risk of DT<br><br>Strengths: strong analyses; significant prediction models for two meaningful outcomes of alcohol withdrawal that—if further validated—could inform clinical decisions;<br><br>Limitations: retrospective nature of our data contains the risk of potential biases due to inadequate documentation; predictions did not consider other |

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| | | | | g, breath alcohol concentration, sociodemographic measures, and self-reported daily alcohol consumption; information on prior withdrawals and comorbidities | important populations with high AWS prevalence (e.g., patients in surgery, intensive care patients, or out-patient settings); not able to externally validate the full predictor sets of our main classifiers<br><br>Recommendations: more research needed with this framework to achieve a more naturalistic model with reliable prediction performance and high clinical applicability in future prospective studies across less controlled treatment sites |
| Butt, P. R., White-Campbell, M., Canham, S., Dowsett Johnston, A., Indome, E. O., Purcell, B., Tung, J., & Van Bussel, L. (2020). Canadian guidelines on alcohol use disorder among older adults. *Canadian Geriatrics* | Level I: systematic review of previous published best practice guidelines | To examine the literature to find evidence-based best practice to create guidelin | literature from 2008–2018 regarding AUD in adults<br><br>515 articles | A systematic review of English language literature from | Results: 22 recommendations were created, including Use the Prediction of Alcohol Withdrawal Severity Scale |

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| *Journal*, *23*(1), 143–148. https://doi.org/10.5770/cgj.23.425 | | es for the prevention, screening, assessment, and treatment of AUD in older adults. | | 2008–2018 regarding AUD in adults was conducted. Previously published guidelines were evaluated using AGREE II, and key guidelines updated using ADAPTE method by drawing on current literature. Recommendations were created and assessed using the GRADE method. | (PAWSS) to screen for those requiring medical withdrawal management. [GRADE: evidence: High; strength: strong]<br><br>Limitations: Research mostly focused on older adults affecting generalizability<br><br>Recommendations: Clinician needs to remain engaged through screening, assessment and treatment, to support both harm reduction and the potential transition into recovery |
| Claus, B. (2022). Alcohol Withdrawal Syndrome: Early Screening Equals Early Intervention. *MedSurg Nursing*, *31*(6). | Level III: Quasi-experimental prospective controlled study, no randomization | To improve patient screening for risk of alcohol withdrawal and initiation of withdra | 171-bed community hospital in upstate New York<br><br>Pre-impleme | Prediction of Alcohol Withdrawal Severity Scale (PAWSS) used to identify patients | Results: Implementation of an alcohol withdrawal protocol reduced lorazepam dosage, transfers to intensive care, and |

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| | | wal protocol by 25% | ntation, N=279<br><br>Post-implementation, N=381 | at risk for moderate to severe alcohol withdrawal<br><br>alcohol withdrawal clinical assessment (AWCA) used for initial and ongoing assessment of symptom severity | overall hospital lengths of stay in at risk patients<br><br>Strengths: long-term, support from stakeholders, statistical analyses used<br><br>Limitations: does not say type of data analysis done<br><br>Recommendations: Further research to develop interventions to support healthcare providers caring for this population is needed. Future research should be done to validate findings of this project. |
| Davis, C. R., Keen, A., Holly, V., Balaguras, J., & Miller, W. R. (2018). Alcohol withdrawal assessment tool. *Clinical Nurse Specialist*, *32*(6), 307–312. https://doi.org/10.1097/nur.0000000000000408 | Level III: controlled trial (no randomization) | To validate a tool to assess alcohol withdrawal in acute care patients. Aims included establish content | 51 participants, with 32 males and 19 females | Validation was conducted using an expert panel to determine content validity. The Clinical Institute Withdra | Results: Interrater reliability was supported by a k statistic range of 0.61 to 0.6957, and content validity was supported by a content validity |

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| | | validity, examine criterion-related validity, test interrater reliability, and assess nurse usability. | | wal Assessment for Alcohol Revised was used as comparison for the criterion related validity. Interrater reliability was determined by having 2 investigators simultaneously complete the assessment on the same patients. Usability was determined using a Likert scale survey | index of 1.0. Criterion-related validity was supported with a Pearson r correlation of 0.665 (P G.000). Of nurses surveyed, all answered agree or strongly agree to the usability survey.<br><br>Limitations: small sample size, only one site affecting generalizability; lack of diversity in the participants assessed, with the majority of participants being white men<br><br>Recommendations: he Alcohol Withdrawal Assessment Tool may be an effective tool to assess signs and symptoms of alcohol withdrawal (not meant to be diagnostic, but a risk |

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| | | | | | assessment tool).<br>It is easy to use and drives frequency of assessment and appropriate pharmacologic treatment. further testing is needed, considering strength of the results; in other settings, with larger more diverse samples. |
| Day, E., & Daly, C. (2021). Clinical management of the alcohol withdrawal syndrome. *Addiction*, *117*(3), 804–814. https://doi.org/10.1111/add.15647 | Level VII: clinical review/ expert opinion | To discuss key elements of the clinical management of medically assisted withdrawal (MAW), likely outcome of an episode of MAW, factors that might prevent completion of the MAW process, ways of overco | N/A | N/A | Results: The Prediction of Alcohol Withdrawal Severity Scale (PAWSS) is useful in predicting a severe AWS (LR = 174, 95% CI = 43–696) when scoring 4 or more and LR = 0.07 (95% CI = 0.02–0.26, when scoring 3 or less)<br><br>Recommendations: Instruments such as PAWSS can be helpful to screen for |

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| | | ming barriers to ongoing treatment of alcohol use disorder, and the use of benzodiazepines in MAW. | | | those requiring MAW |
| Desai, V., Lamba, W., de Almeida, J., & Goldstein, D. (2023). Approach and management of alcohol withdrawal syndrome in operative head and Neck Cancer patients. *Otolaryngology–Head and Neck Surgery*, *168*(5), 1258–1260. https://doi.org/10.1002/ohn.164 | Level VII: clinical review/ expert opinion | To synthesizes key principles of addiction medicine and current strategies that Otolaryngology–Head and Neck Surgery surgeons can consider in their perioperative assessment and management of alcohol withdrawal syndrome in their patient | N/A | N/A | Recommendations: Completion of the PAWSS scale can determine the risk a patient has of developing alcohol withdrawal at the time of surgery. If the PAWSS score is ≥4, the patient is at high risk for complicated AWS then subsequent use of the CIWA-Ar tool in the postoperative period can be used for symptom-triggered treatment to quantify AWS severity and inform benzodiazepine treatment |

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| | | | | | for alcohol withdrawal. |
| Eloma, A. S., Tucciarone, J. M., Hayes, E. M., & Bronson, B. D. (2017). Evaluation of the appropriate use of a CIWA-ar alcohol withdrawal protocol in the General Hospital Setting. *The American Journal of Drug and Alcohol Abuse*, *44*(4), 418–425. https://doi.org/10.1080/00952990.2017.1362418 | Level VI: Retrospective descriptive study | To evaluate the prescribing patterns and appropriate use of the CIWA-Ar protocol in a general hospital setting by implementing the Prediction of Alcohol Withdrawal Severity Scale (PAWSS) to retrospectively evaluate the appropriateness of initiated CIWA-Ar protocol. | all patients hospitalized from August 1, 2014 to July 31, 2015 in any setting (e.g., medical, surgical, psychiatric) who were initiated on a CIWA-Ar protocol.<br><br>118 encounters total, 102 patients total | The PAWSS was used to retrospectively evaluate the appropriateness of initiated CIWA-Ar protocol. Data were collected from the electronic medical record by one data abstractor to provide accurate and consistent retrieval of information. | Results: Results: 57% of patients who started on a CIWA-Ar protocol had either zero or one documented risk factor for AWS (19% and 38% respectively). 20% had no documentation of recent alcohol use. 14% were unable to communicate. 19% of medical records lacked documentation of provider awareness of the ordered protocol. Benzodiazepine associated adverse events were documented in 15% of encounters<br><br>Limitations: Both AWS risk factors and adverse events associated with benzodiazepines may have been under- |

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| | | | | | estimated, due to lack of adequate documentation and lack of inclusion of all side effects; this study focused on the potential weaknesses of using CIWA-Ar in a general medical setting, and does not capture the benefits that patients may have received from the CIWA-Ar protocol in controlling alcohol withdrawal symptoms<br><br>Recommendations: The judicious use of CIWA-Ar protocols in general hospitals requires mechanisms to ensure assessment of validated alcohol withdrawal risk factors and continuity of care during transitions. |
| Halder, A., Nagda, P., Harshe, D., & Ravindran, N. (2023). Study of socio- | Level II: Longitudinal RCT | To assess the socioec | 100 patients admitted for | Participants were assessed | Results: CAGE, AUDIT, and CIWA |

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| economic, biochemical and clinical predictors of alcohol withdrawal and delirium tremens in patients of alcohol dependence in Indian population. *Annals of Indian Psychiatry*, *0*(0), 0. https://doi.org/10.4103/aip.aip_193_22 | | onomic, biochemical, and clinical predictors of alcohol withdrawal and delirium tremens with alcohol dependence patients. | alcohol withdrawal | for detailed history, physical and mental state examination, CAGE scale (Cut down, Annoyed, Guilty, Eye-opener), AUDIT scale (Alcohol Use Disorders Identification Test), PAWSS scale (Prediction of Alcohol withdrawal severity Score), MINIPLUS (Mini-International Neuropsychiatric Interview) scale and CIWA scale (Clinical Institute withdrawal Assessment of Alcohol) scoring | scores has significant association (P<0.001) with development of delirium and PAWSS showed good prediction (P<0.007) with patients having severe alcohol withdrawal<br><br>Limitations: small sample size, a tertiary care center, some cases of milder presentations of alcohol withdrawal might have been missed out due to nonreferral, and hence, this data lack some strengths in extrapolation to the community at large<br><br>Recommendations: Predictors can be considered for early diagnosis of severity of alcohol withdrawal and delirium tremens |

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| | | | | along-with biochemical and hematological investigations. Statistical analysis was done by using SPSS version 20 | |
| Jaworowski, S., Breuer, G. S., Tal, M., Bdolah-Abram, T., Gropp, C., & Mergui, J. (2019). Hospitalized Patients with Unplanned Alcohol Withdrawal Syndrome: Time until Diagnosis as a Determinant of Hospital Duration. *Isr J Psychiatry*, *56*(3), 47–52. | Level III: analytical, retrospective and observational case controlled study | To determine whether there is a relationship between the time taken to make a diagnosis of AWS and the duration of hospitalization. | patients who had been hospitalized between the years 2013-2018 at Shaare Zedek Medical Center, a 1,000-bed university-affiliated hospital<br><br>117 subjects divided into two groups: Group I included 26 consecutive patients who were diagnosed with alcohol withdra | Twenty-six consecutive patients diagnosed with AWS by means of DSM-5 criteria over the last five years were retrospectively found through perusal of medical files in a general hospital. They were compared to a control group of 91 patients with a similar date of admission and | Results: There was a significant relationship between the elapsed period of time until a diagnosis of alcohol withdrawal was made and the length of hospitalization: the shorter the time to diagnosis, the shorter the hospitalization ($p < 0.001$)<br><br>Limitations: small sample size, patients in the control group were not matched for age because of the limited number in the available patient group; |

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| | | | wal syndrom e. Group II included 91 consecut ive patients who were defined as a control group matched by date and ward of admissio n with no AWS. No correctio n for age or gender was made | ward of admissi on with no AWS. Length of hospitali zation was compare d To test for a relations hip between the time taken to make the diagnosi s and the length of hospitali zation. | retrospectiv e design of the study did not allow for discriminati on between the time to AWS and the time to diagnosis of AWS by the clinician<br><br>Recommend ations: Medical and nursing staff should have a high index of suspicion of those medically ill patients who are likely to develop AWS, use of standardized instruments such as the Prediction of Alcohol Withdrawal Severity Scale (PAWSS) may be used to promote this goal |
| Jesse, S., Bråthen, G., Ferrara, M., Keindl, M., Ben-Menachem, E., Tanasescu, R., Brodtkorb, E., Hillbom, M., Leone, M. A., & Ludolph, A. C. (2016). Alcohol withdrawal syndrome: Mechanisms, manifestations, and management. *Acta Neurologica Scandinavica*, *135*(1), 4–16. | Level I: Systematic review | To increase the awarene ss of the early clinical manifest ations of AWS and the appropri ate identific ation and | 104 articles between 1985 and 2016. | PubMed was utilized along with referenc es from relevant articles. . The search terms “alcohol withdra wal,” “alcohol | Results: Many intervention s reviewed and recommend ations made; The PAWSS represents a new tool helping clinicians to identify those patients at |

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| https://doi.org/10.1111/ane.12671 | | management of this important condition in a neurological setting | | withdrawal seizures," "alcohol withdrawal diagnosis," "alcohol withdrawal therapy," "alcohol abstinence syndrome," "abstinence treatment," "delirium tremens," "alcohol withdrawal EEG," and "alcohol withdrawal MRI" were used. | risk for developing severe AWS and allowing for timely prophylactic treatment<br><br>Limitations: older article, no meta-analysis<br><br>Recommendations: PAWSS should be utilized to rapidly assess for risk of AWS and prevent delay of treatment |
| Lenik, J., Satiya, J., Kansara, T., Prince, Y., Bergasa, N. V., & Mercado, J. (2021). Prevention of alcohol withdrawal by the use of the prediction of alcohol withdrawal severity scale in hospitalized patients. *Gastroenterology & Hepatology: Open Access*, *12*(5), 131–133. https://doi.org/10.15406/ghoa.2021.12.00472 | Level VI: Single descriptive, retrospective study | To investigate the value of the PAWSS for risk recognition and preventive treatment of AW in hospitalized patients | 29 patients identified<br><br>patients with a history of alcohol use admitted from December 1st of 2019 and April | A retrospective medical records review of hospitalized patients with a history of alcohol use admitted from Decemb | Results: The majority of the patients who had a PAWSS score within the realm that predicts AW and received preemptive treatment did not develop AW.<br><br>Limitations: small |

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| | | | 30th of 2020, in whom the PAWSS had been completed. | er 1st of 2019 and April 30th of 2020, in whom the PAWSS had been completed. Demographics, comorbidities, pertinent laboratory results, PAWSS score, use of benzodiazepine, and hospital course were recorded. Chi-square statistics were used to calculate unadjusted associations between predictors and the symptom status outcome. | sample size, no control<br><br>Recommendations: We propose the system-wide use of the PAWSS in all hospitalized patients with AUD. |
| Mahabir, C. A., Anderson, M., Cimino, J., Lyden, E., Siahpush, M., & | Level II Randomized, | To develop a tool to predict | 2038 patients All patients | In order to study the Alcohol | Results: The use of the 8 factors that can be |

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| Shiffermiller, J. (2020). Derivation and validation of a multivariable model, the Alcohol Withdrawal Triage Tool (AWTT), for predicting severe alcohol withdrawal syndrome. *Drug and Alcohol Dependence*, *209*, 107943. https://doi.org/10.1016/j.drugalcdep.2020.107943 | retrospective analysis | the need for hospital admission in patients at risk for alcohol withdrawal using only objective criteria that are typically available during the course of an ED visit | admitted to the hospital during the study time that could speak English and were willing to participate were screened | Withdrawal Triage Tool (AWTT) 8 different predictors of severe AWS were studied with a retrospective analysis. Patients were randomly divided into two cohorts: the "Derivation cohort" and the "Validation cohort. Within the "derivation cohort" 908 patients were analyses and in the "Validation cohort" 461 patients were analyzed The participants were followed for three | collected from the electronic medical record can predict SAWS with high sensitivity.<br><br>Limitations: research time was blinded, statistical analyses utilized; population randomized<br><br>Recommendations: Predictive alcohol withdrawal severity tools could be useful as part of a standardized admission protocol |

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| | | | | days with the research team blinded to results from other assessments. A logistic regression model was constructed using the derivation dataset to create the alcohol withdrawal triage tool (AWTT). | |
| Maldonado, J. R. (2017). Novel algorithms for the prophylaxis and management of alcohol withdrawal syndromes–beyond benzodiazepines. *Critical Care Clinics*, *33*(3), 559–599. https://doi.org/10.1016/j.ccc.2017.03.012 | Level I: systematic literature review | To review the literature and develop an alternative BZDP-sparing protocol for the prophylaxis and treatment of AWS; The ultimate goal was to | 42 articles | The author's institution created a multidisciplinary taskforce, including members from all clinical departments, tasked with reviewin | Results: Using the Prediction of Alcohol Withdrawal Severity Scale (PAWSS) we could better tailor interventions and minimize excessive medication use and side effects. Patients at low risk for complicated AWS (ie, PAWSS <4) |

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| | | decrease excessive BZDPs use and its related side effects. | | g the available literature regarding AWS assessment methods and treatment algorithms. Concerns regarding potential problems with oversedation, negative neurologic sequelae, development of medication-induced delirium, and codependence issues between alcohol and BZDP sparked interest in developing a BZDP-sparing protocol. Based on the taskforce findings, | are only monitored and antihistaminic agents offered for the management of insomnia and sleep but not given active treatment. Patients scoring at high risk for complicated AWS (ie, PAWSS 4), undergo examination with a severity scale, such as the Clinical Institute Withdrawal Assessment for Alcohol, revised (CIWA-Ar)<br><br>Limitations: small sample size; no randomization<br><br>Recommendations: Larger, randomized, head-to-head studies comparing alternative medications with BZDP are necessary to assess efficacy and safety |

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| | | | | they developed an alternative BZDP-sparing protocol for the prophylaxis and treatment of AWS | |
| Maldonado, J. R., Sher, Y., Das, S., Hills-Evans, K., Frenklach, A., Lolak, S., Talley, R., & Neri, E. (2015). Prospective validation study of the prediction of alcohol withdrawal severity scale (PAWSS) in medically ill inpatients: A new scale for the prediction of complicated alcohol withdrawal syndrome. *Alcohol and Alcoholism*, *50*(5), 509–518. https://doi.org/10.1093/alcalc/agv043 | Level II: Quasi-experimental prospective study | To prospectively test and validate the Prediction of Alcohol Withdrawal Severity Scale (PAWSS), a new tool to identify patients at risk for developing complicated AWS, in medically ill hospitalized patients | 403 patients. All subjects hospitalized to selected general medicine and surgery units over a 12-month period.<br><br>Patients were grouped by PAWSS score: Group A (PAWSS < 4; considered at low risk for complicated AWS); Group B (PAWSS ≥ 4; considered at high risk for complic | They prospectively considered all subjects hospitalized to selected general medicine and surgery units over a 12-month period. Participants were assessed independently and blindly on a daily basis with PAWSS, Clinical Institute Withdrawal Assessment—Alcohol, Revised (CIWA-Ar) and | Results: The PAWSS showed good inter-rater reliability (CI of .936) indicating moderate to substantial agreement With a cut off score or 4: PAWSS has 93.1% sensitivity (95%CI) 99.5% specificity (95% CI) Positive Predictive Validity of 93.1% (95%CI) Negative Predictive Validity of 99.5% (95%CI)<br><br>Strengths: longitudinal, statistical analyses used, large sample size,<br><br>Limitations: some patients were |

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| | | | ated AWS) | clinical monitoring through out their admission to determine the presence and severity of AWS | independently suspected by their primary teams to be at high risk for complicated withdrawal on admission and were prophylactically treated for withdrawal by the primary team, and thereby never experienced the full symptom assortment of complicated alcohol withdrawal.<br><br>Recommendations: PAWSS has excellent psychometric characteristics and predictive value among medically ill hospitalized patients and can help clinicians identify those at risk for complicated AWS and allow for prevention and timely treatment of |

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| | | | | | complicated AWS. |
| Maldonado, J. R., Sher, Y., Ashouri, J. F., Hills-Evans, K., Swendsen, H., Lolak, S., & Miller, A. C. (2014). The "Prediction of alcohol withdrawal severity scale" (PAWSS): Systematic Literature Review and Pilot Study of a new scale for the prediction of complicated alcohol withdrawal syndrome. *Alcohol*, *48*(4), 375–390. https://doi.org/10.1016/j.alcohol.2014.01.004 | Level I: Systematic review | To conduct a systematic review of the published literature on AWS to identify clinical factors associated with the development of AWS, (2) to use the identified factors to develop a tool for the prediction of alcohol withdrawal among patients at risk, and (3) to conduct a pilot study to assess the validity of the tool | 233 articles | They conducted a systematic literature search using PRISMA guidelines for clinical factors associated with the development of AWS, using PubMed, PsychInfo, MEDLINE, and Cochrane Databases. Obtained data were used to develop the Prediction of Alcohol Withdrawal Severity Scale, in order to assist in the identification of patients at risk for complic | Results: A total of 10 items were identified as correlated with complicated AWS (i.e., withdrawal hallucinosis, withdrawal-related seizures, and delirium tremens) and used to construct the PAWSS. During the pilot study, a total of 68 subjects underwent evaluation with PAWSS. In this pilot sample the sensitivity, specificity, and positive and negative predictive values of PAWSS were 100%, using the threshold score of 4<br><br>Limitations: patients reporting no alcohol intake during the last 30 days were not asked the full battery of PAWSS questions and were assumed to |

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| | | | | ated AWS. | be of low risk. It is possible that some of these patients concealed their alcohol use and were thus inaccurately excluded from the full PAWSS administrati on and potentially their risk for AWS was inaccurately predicted<br><br>Recommend ations: We propose that, while adding minimal time and cost to the overall care, PAWSS will be a useful tool for the prompt and accurate identificatio n of patients at risk for complicated AWS before they develop such symptoms, allowing these patients to receive effective prophylaxis, instead of waiting for the developmen |

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| | | | | | t of AWS. This will help preserve these patients' neuropsychiatric functioning, stop further cascade of deterioration and increased risk, improve morbidity and mortality, and reduce overall costs of care |
| Melkonian, A., Patel, R., Magh, A., Ferm, S., & Hwang, C. (2019). Assessment of a hospital-wide CIWA-AR protocol for management of alcohol withdrawal syndrome. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes*, *3*(3), 344–349. https://doi.org/10.1016/j.mayocpiqo.2019.06.005 | Level II: Retrospective/prospective RCT | To determine if a hospital-wide symptom-based alcohol withdrawal protocol may result in significant clinical improvements to patient outcomes, safety, and hospital efficiency. | 276 patients in the pre-protocol group and 145 patients in the post-protocol group | Pre-protocol patients were identified retrospectively using International Classification of Diseases, 10th revision codes (F10.1, F10.2, and Z71.4). Post-protocol patients were identified by the use of a unique alcohol withdrawal order set in their | Results: There was a significant reduction found in the primary endpoint of average length of stay (7.15 6.5 days vs 5.7 5.6 days; P¼.02). There was a significant reduction in the average benzodiazepine use, use of adjunctive medications, need for ICU consultation or rapid response team, respiratory failure, average ICU length of stay, use of |

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| | | | | electronic medical record. The primary endpoint was average length of stay. Secondary outcomes included death, escalation of care as defined as requiring intensive care unit (ICU) consultation or the rapid response team, average ICU length of stay, respiratory failure, average benzodiazepine usage, and incidence of seizures | neurologic imaging, and the need for lumbar puncture<br><br>Limitations: a single-center study, patient population is extremely diverse and may not mirror that of typical institutions, nonrandomized retrospective/ prospective design may have led to unmeasured differences between the two populations<br><br>Recommendations: less conclusive. Our results suggest that implementation of a symptom-based AWS protocol in a general medical/surgical hospital may result in significant improvements to patient safety, operational efficiency, and generate |

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| | | | | | potential cost saving |
| Smith, J. T., Sage, M., Szeto, H., Myers, L. C., Lu, Y., Martinez, A., Kipnis, P., & Liu, V. X. (2022). Outcomes after implementation of a benzodiazepine-sparing alcohol withdrawal order set in an integrated health care system. *JAMA Network Open*, *5*(2). https://doi.org/10.1001/jamanetworkopen.2022.0158 | Level II: longitudinal, Retrospective/prospective RCT | To evaluate changes in outcomes after implementation of a benzodiazepine-sparing AWS inpatient order set. | 22,899 AWS adult hospitalizations from October 1, 2014, to September 30, 2019, in the Kaiser Permanente Northern California integrated health care delivery system | The revised BZD-S order set included cascading order set options based on 3 risk categories using a clinician's determination of risk of complicated AWS based on the Prediction of Alcohol Withdrawal Severity Scale (PAWSS). Patients with low risk for AWS (ie, PAWSS score < 4) and low severity (ie, CIWA-Ar score < 8) could be placed on the observation pathway | Results: BZD-S order set implementation was associated with a decrease in BZD administration and an increase in use of clonidine, gabapentin, phenobarbital, thiamine, and valproic acid. There were also favorable trends in all outcomes, with a statistically significant decrease in ICU use and LOS in our primary analysis.<br><br>Strengths: analyzed outcomes from a large, multicenter cohort of community-based adult hospitalizations in an integrated health care system with excellent longitudinal data capture; looked at outcomes from a multipart |

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| | | | | and given supportive treatment. Patients at high risk for AWS (ie, PAWSS score ≥ 4) could be placed into the prevention or active withdrawal pathway. Patients presenting with severe AWS (ie, CIWA-Ar score ≥ 15) or those not responsive to other pathways were treated based on the severe and complex withdrawal pathway in the ICU. The primary outcome was | order set designed to improve care across several domains; evaluated important clinical outcomes, including mortality, ICU admissions, and LOS, rather than only symptoms or BZD use<br><br>Limitations: findings are subject to discrepancies from inaccurate documentation and use of order sets in a heterogeneous population; order set use was not mandated, limiting our ability to ensure that groups defined based on preimplementation vs postimplementation period or order set use were similar; mechanism for observed differences in outcomes is unknown and could |

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| | | | | inpatient mortality. Secondary outcomes included hospital length of stay (LOS), ICU admission, and hospital readmission within 30 days of hospital discharge. They also examined changes in the use of AWS-related medications over the study period | be confounded by concurrent interventions to improve hospital care<br><br>Recommendation: The evaluation suggests that the order set was associated with a decrease in ICU admission and hospital LOS, but future prospective studies are needed to confirm these findings. |
| The ASAM Clinical Practice Guideline on Alcohol Withdrawal Management. Adopted by the ASAM Board of Directors. (2020). https://www.asam.org/quality-care/clinical-guidelines/alcohol-withdrawal-management-guideline | Level I: Evidence Based Clinical Practice Guidelines | To provide updated information on evidence-based strategies (hereafter referred to as the Practice Guideli | N/A | N/A | Recommendations: Provides a summary or recommendations intended to aid clinicians in their clinical decision making and patient management. |

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| | | ne) and standards of care for alcohol withdrawal management in both ambulatory and inpatient settings. | | | |
| Wolf, C., Curry, A., Nacht, J., & Simpson, S. A. (2020). Management of Alcohol Withdrawal in the Emergency Department: Current Perspectives. *Open Access Emergency Medicine*, *Volume 12*, 53–65. https://doi.org/10.2147/oaem.s235288 | Level I: systematic review | To summarize the epidemiology, pathology, and management of AWS and AUD in the emergency setting. | 93 articles | An interdisciplinary group of hospital-based emergency and psychiatric physicians with experience treating substance use disorders agreed on core clinical topics important to the emergent treatment of alcohol withdrawal. Topics included initial identification, stabilization, and determination of level | Results: The Prediction of Alcohol Withdrawal Severity Scale (PAWSS) identifies medically ill individuals who are at risk of developing severe alcohol withdrawal symptoms. PAWSS has been found to be the most accurate of predictive tools in inpatient medical settings.<br><br>Recommendations: Emergency medicine clinicians must recognize their vital role not only in treating life-threatening withdrawal |

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| | | | | of care. Based on these topics, English-language literature was searched using PubMed and Google Scholar with pertinent keywords including combinations and variations of "alcohol withdrawal," "alcohol use disorder," and "emergency department." Papers were prioritized if they were peer-reviewed, published more recently, specific to emergency practice, and/or | but also setting the patient on a path towards recovery |

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| | | | | demonstrated a higher level of evidence. | |
| Wood, E., Albarqouni, L., Tkachuk, S., Green, C. J., Ahamad, K., Nolan, S., McLean, M., & Klimas, J. (2018). Will this hospitalized patient develop severe alcohol withdrawal syndrome? *JAMA*, *320*(8), 825. https://doi.org/10.1001/jama.2018.10574 | Level I: systematic review | To assess the accuracy and predictive value of symptoms and signs for identifying hospitalized patients at risk of SAWS, defined as delirium tremens, withdrawal seizure, or clinically diagnosed severe withdrawal. | 530 identified studies, 14 high-quality studies that included 71 295 patients and 1355 relevant cases of SAWS (1051 cases), seizure (53 cases), or delirium tremens (251 cases) | MEDLINE and EMBASE (1946-January 2018) were searched for articles investigating symptoms and signs predictive of SAWS in adults. Reference lists of retrieved articles were also searched. Data were extracted and used to calculate likelihood ratios (LRs), sensitivity, and specificity. A meta-analysis was performed to calculate | Results: The Prediction of Alcohol Withdrawal Severity Scale (PAWSS) was most useful, with an LR of 174 (95% CI, 43-696; specificity, 0.93) when patients had 4 or more individual findings and an LR of 0.07 (95% CI, 0.02-0.26; sensitivity, 0.99) when there were 3 or fewer findings.<br><br>Limitations: only 14 high-quality articles were identified; the current evidence base was developed during an era when treatments that can change the natural history of alcohol withdrawal and prevent SAWS were available; |

| | | | | | |
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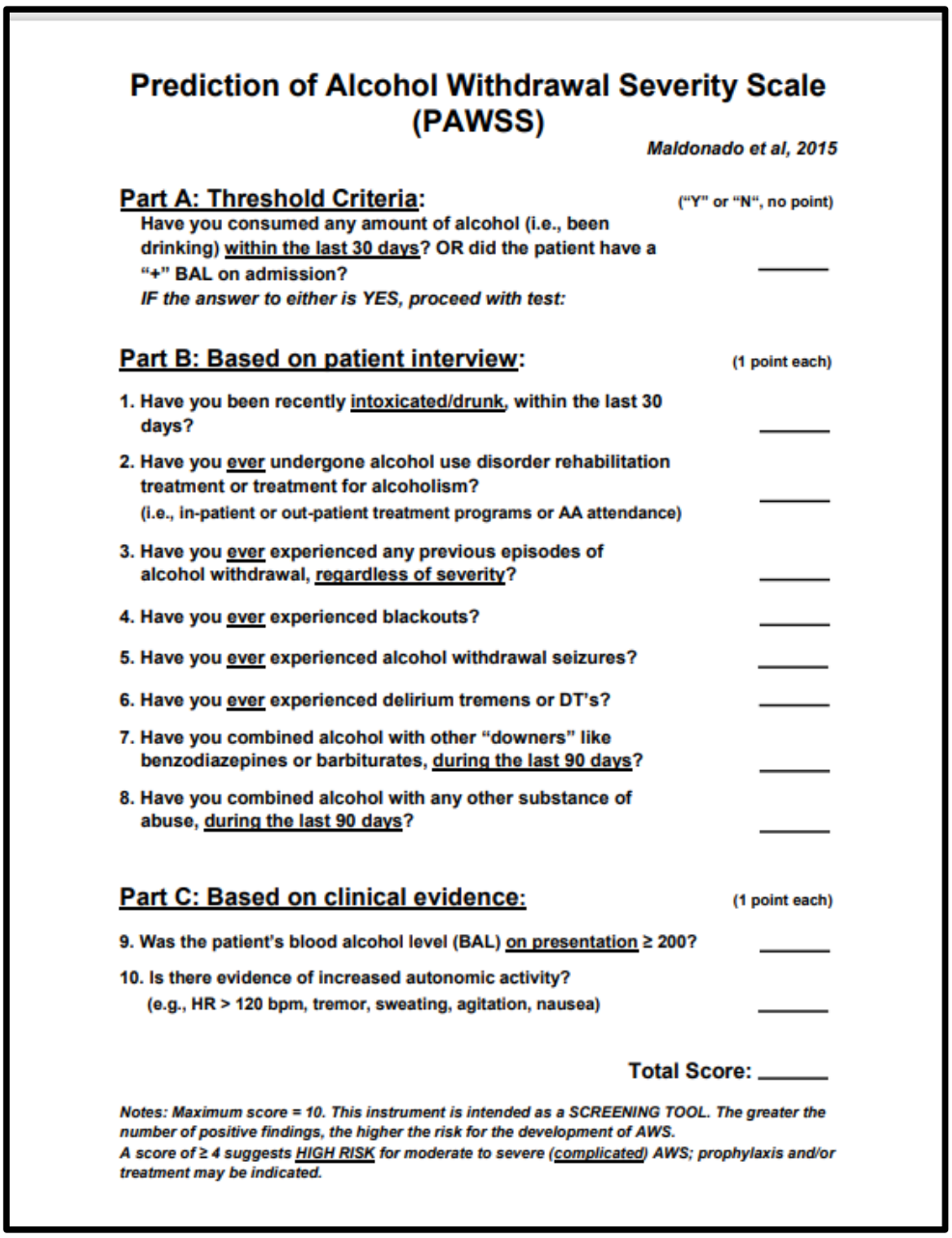
| | | | | summary LR | the criterion standard for establishing a diagnosis of SAWS was not consistent across studies assessed in this review<br><br>Recommendations: Assessment tools that use a combination of symptoms and signs are useful for identifying patients at risk of developing severe alcohol withdrawal syndrome. |

## Appendix D

**Figure 5:**

*The Prediction of Alcohol Withdrawal Severity Scale (PAWSS)*



**Prediction of Alcohol Withdrawal Severity Scale (PAWSS)**

*Maldonado et al, 2015*

**Part A: Threshold Criteria:** ("Y" or "N", no point)

Have you consumed any amount of alcohol (i.e., been drinking) within the last 30 days? OR did the patient have a "+" BAL on admission? _____

*IF the answer to either is YES, proceed with test:*

**Part B: Based on patient interview:** (1 point each)

1. Have you been recently intoxicated/drunk, within the last 30 days? _____
2. Have you ever undergone alcohol use disorder rehabilitation treatment or treatment for alcoholism? (i.e., in-patient or out-patient treatment programs or AA attendance) _____
3. Have you ever experienced any previous episodes of alcohol withdrawal, regardless of severity? _____
4. Have you ever experienced blackouts? _____
5. Have you ever experienced alcohol withdrawal seizures? _____
6. Have you ever experienced delirium tremens or DT's? _____
7. Have you combined alcohol with other "downers" like benzodiazepines or barbiturates, during the last 90 days? _____
8. Have you combined alcohol with any other substance of abuse, during the last 90 days? _____

**Part C: Based on clinical evidence:** (1 point each)

9. Was the patient's blood alcohol level (BAL) on presentation ≥ 200? _____
10. Is there evidence of increased autonomic activity? (e.g., HR > 120 bpm, tremor, sweating, agitation, nausea) _____

**Total Score:** _____

*Notes: Maximum score = 10. This instrument is intended as a SCREENING TOOL. The greater the number of positive findings, the higher the risk for the development of AWS.*
*A score of ≥ 4 suggests HIGH RISK for moderate to severe (complicated) AWS; prophylaxis and/or treatment may be indicated.*

## Appendix E

*Education Given to the Nursing Staff at the Site*

**The Prediction of Alcohol Withdrawal Severity Scale**

**COMING THIS FEBRUARY, A PROJECT WILL BE IMPLEMENTED FOR ALL INPATIENT ADMITS**

Clinical Question:

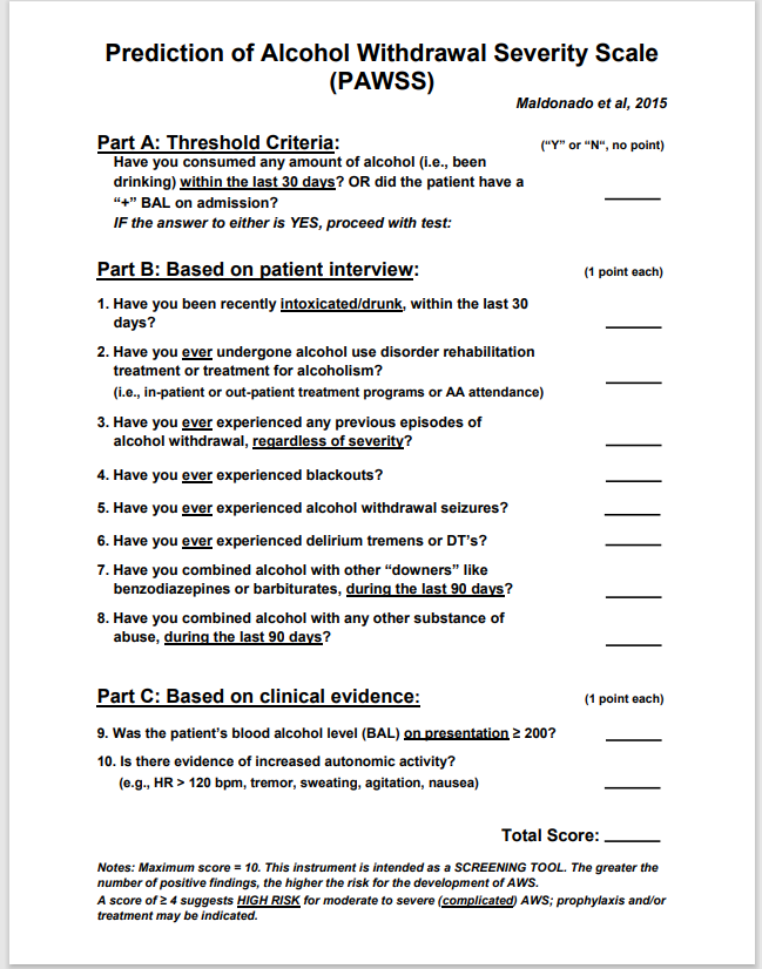
- In a population of patients admitted to a community hospital identified as alcohol users, how does implementing the Prediction of Alcohol Withdrawal Severity Scale screening tool to detect the risk for complicated alcohol withdrawal syndrome, compared to no use of a predictive screening tool, affect CIWA-Ar implementation and patient outcomes within an eight-week timeframe?

Why?

- Alcohol Use Disorder (AUD) is accurately identified in under half of cases
- At least 50% of individuals with AUD will experience alcohol withdrawal syndome (AWS) to some degree when alcohol consumption is stopped or reduced
- When individuals with AUD are hospitalized, the abrupt discontinuation of alcohol greatly increases the risk of AWS
- AWS manifests on a continuum ranging from mild to severe. Symptoms can vary from mild autonomic hyperactivity and psychomotor agitation to severe, life-threatening complications such as withdrawal seizures and delirium tremens
- CIWA-Ar is appropriately initiated in only 48% of alcohol withdrawal cases
- AUD is reported in 10–32% of medically hospitalized patients.
    - In about 80% of cases symptoms are mild, referred to as uncomplicated alcohol withdrawal syndrome (U-AWS). Although mild, it is often overtreated, which can lead to many unintended consequences.
    - Moderate to severe AWS, referred to as complicated alcohol withdrawal syndrome (C-AWS) is seen in approximately 20% of cases, but is it is often missed.
    - AWS is often not recognized in hospitalized patients until moderate to severe symptoms appear
- In the absence of effective identification and treatment of C-AWS, there is risk of increased length of hospital stay, longer ICU stays, deterioration of patient condition and increased rates of morbidity and mortality
- Conversely, patients who are inappropriately placed on alcohol withdrawal protocols such as the CIWA-Ar are likely to receive unnecessary treatment leading to unintended consequences.

What?

- The PAWSS screening tool was designed to quickly differentiate C-AWS and U-AWS in medically ill individuals to better guide treatment.
- It was validated for inpatient use with a 93.1% sensitivity and a 99.5% specificity
- The American Society of Addiction Medicine (ASAM) Clinical Practice Guideline on Alcohol Withdrawal Management recommends the use of PAWSS to predict alcohol withdrawal severity and not base risk and treatment on clinical judgment alone
- The purpose of this evidence-based practice project is to implement the PAWSS screening tool to identify patients at risk for C-AWS.
- The aim of the project is to distinguish those at risk for C-AWS versus U-AWS to manage treatment quickly, more effectively, and decrease complications.



**Prediction of Alcohol Withdrawal Severity Scale (PAWSS)**

*Maldonado et al, 2015*

**Part A: Threshold Criteria:** ("Y" or "N", no point)

Have you consumed any amount of alcohol (i.e., been drinking) within the last 30 days? OR did the patient have a "+" BAL on admission? _____

*IF the answer to either is YES, proceed with test:*

**Part B: Based on patient interview:** (1 point each)

1. Have you been recently intoxicated/drunk, within the last 30 days? _____
2. Have you ever undergone alcohol use disorder rehabilitation treatment or treatment for alcoholism? (i.e., in-patient or out-patient treatment programs or AA attendance) _____
3. Have you ever experienced any previous episodes of alcohol withdrawal, regardless of severity? _____
4. Have you ever experienced blackouts? _____
5. Have you ever experienced alcohol withdrawal seizures? _____
6. Have you ever experienced delirium tremens or DT's? _____
7. Have you combined alcohol with other "downers" like benzodiazepines or barbiturates, during the last 90 days? _____
8. Have you combined alcohol with any other substance of abuse, during the last 90 days? _____

**Part C: Based on clinical evidence:** (1 point each)

9. Was the patient's blood alcohol level (BAL) on presentation ≥ 200? _____
10. Is there evidence of increased autonomic activity? (e.g., HR > 120 bpm, tremor, sweating, agitation, nausea) _____

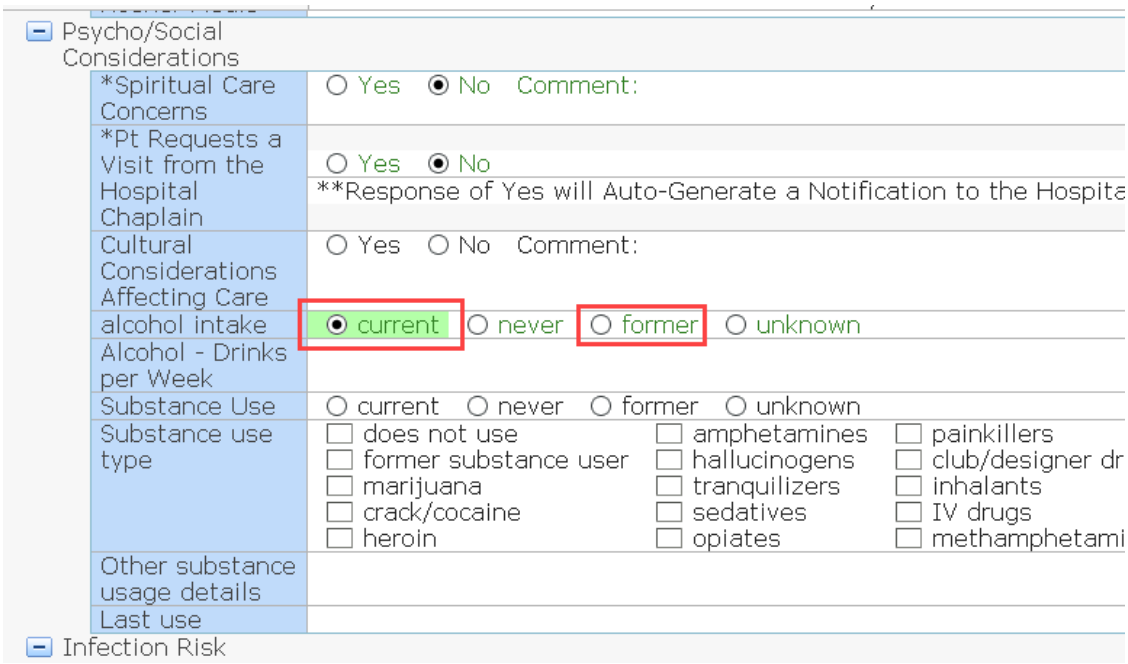
**Total Score:** _____

*Notes: Maximum score = 10. This instrument is intended as a SCREENING TOOL. The greater the number of positive findings, the higher the risk for the development of AWS.*
*A score of ≥ 4 suggests HIGH RISK for moderate to severe (complicated) AWS; prophylaxis and/or treatment may be indicated.*

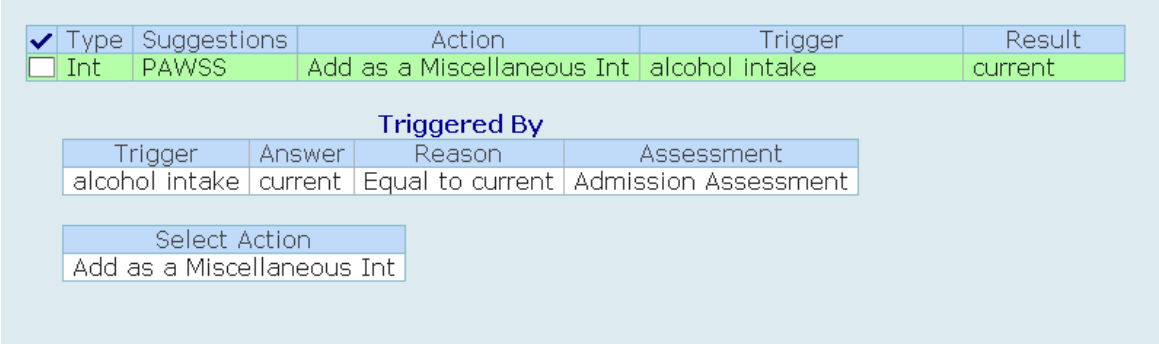
How?

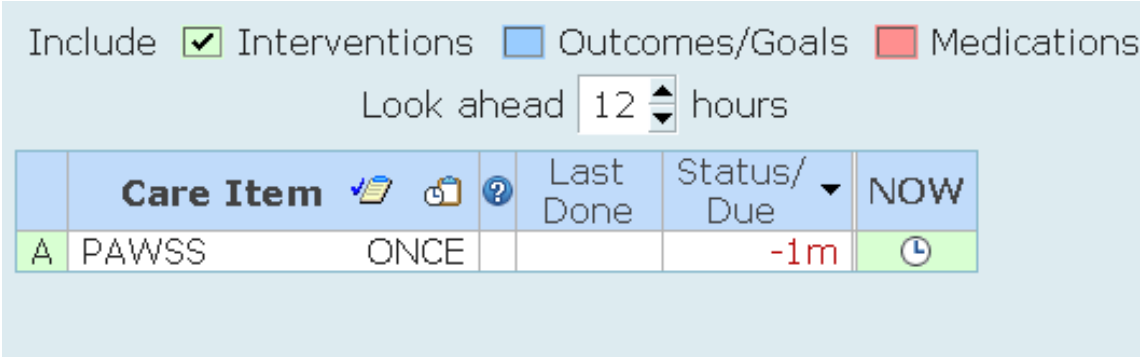
## PAWSS workflow

If current or former alcohol intake is assessed on admission…

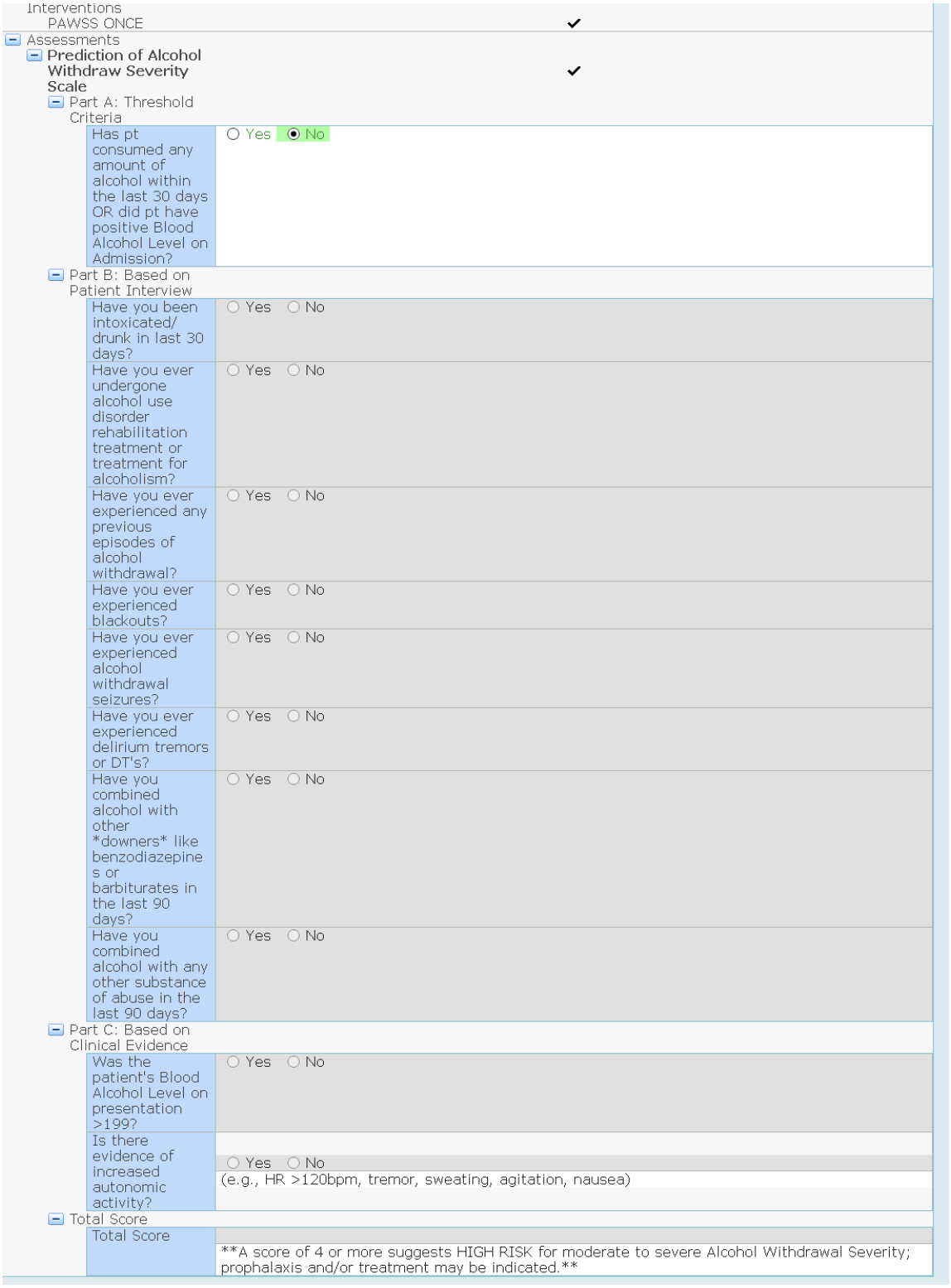



…the PAWSS assessment is triggered to the worklist:

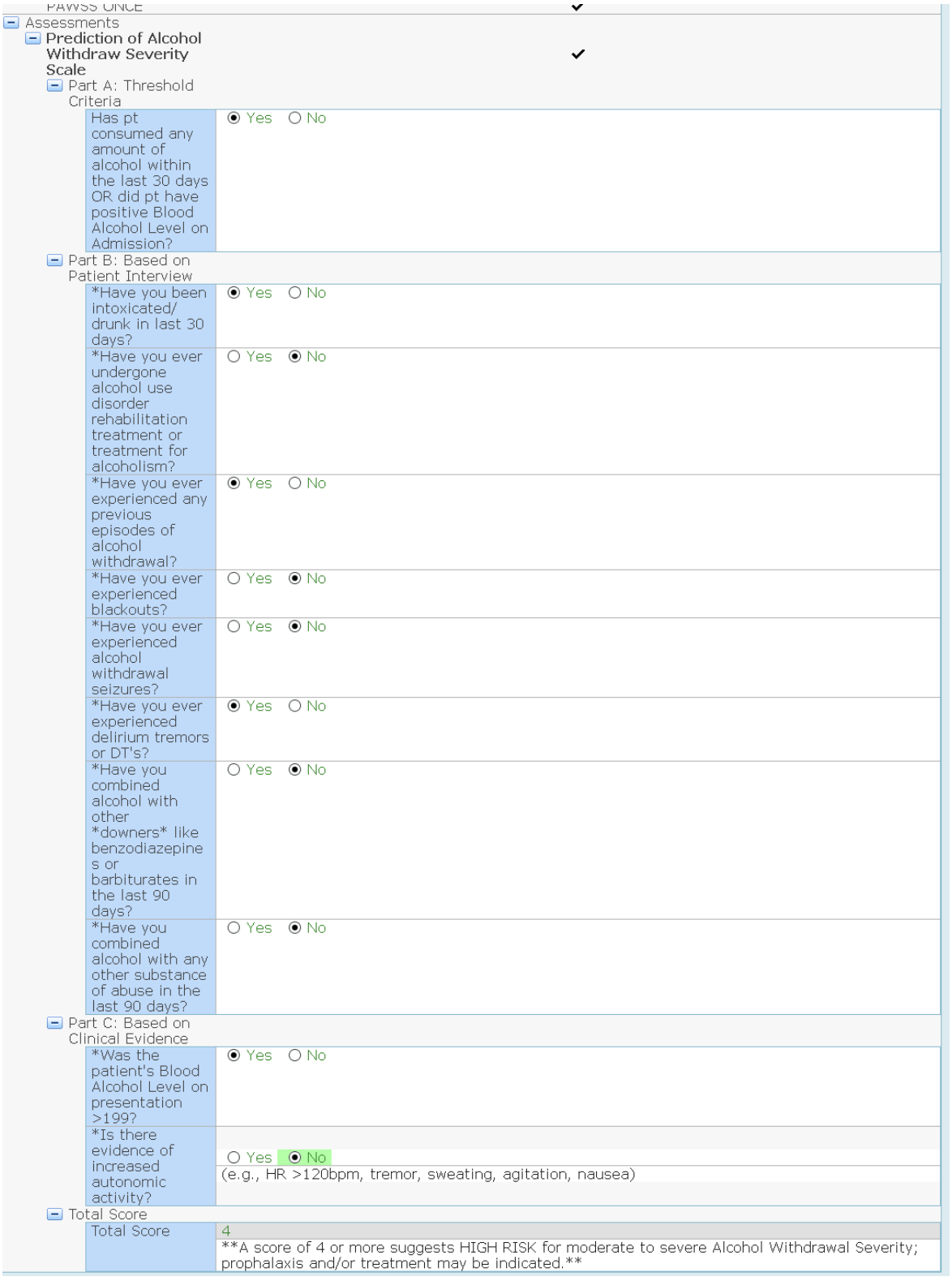



If the answer to the first query is No, the remaining queries are grayed out:




If the answer to the first query is Yes, the remaining queries are Required:



PAWSS ONCE ✔

Assessments

**Prediction of Alcohol Withdraw Severity Scale** ✔

Part A: Threshold Criteria

| | |
|---|---|
| Has pt consumed any amount of alcohol within the last 30 days OR did pt have positive Blood Alcohol Level on Admission? | ◉ Yes ○ No |

Part B: Based on Patient Interview

| | |
|---|---|
| *Have you been intoxicated/ drunk in last 30 days? | ◉ Yes ○ No |
| *Have you ever undergone alcohol use disorder rehabilitation treatment or treatment for alcoholism? | ○ Yes ◉ No |
| *Have you ever experienced any previous episodes of alcohol withdrawal? | ◉ Yes ○ No |
| *Have you ever experienced blackouts? | ○ Yes ◉ No |
| *Have you ever experienced alcohol withdrawal seizures? | ○ Yes ◉ No |
| *Have you ever experienced delirium tremors or DT's? | ◉ Yes ○ No |
| *Have you combined alcohol with other *downers* like benzodiazepines or barbiturates in the last 90 days? | ○ Yes ◉ No |
| *Have you combined alcohol with any other substance of abuse in the last 90 days? | ○ Yes ◉ No |

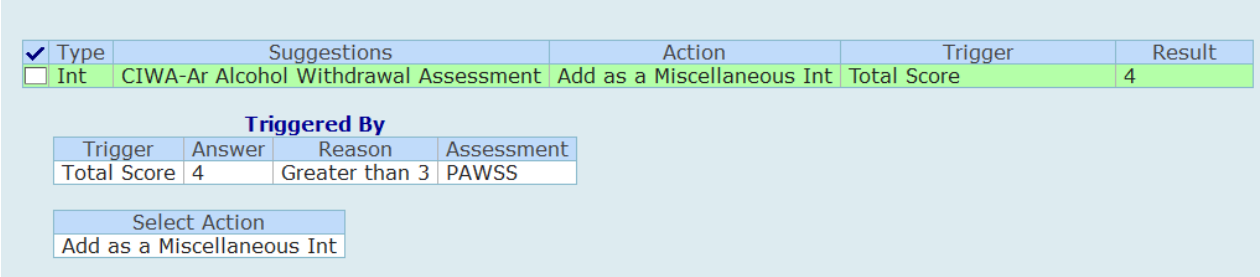
Part C: Based on Clinical Evidence

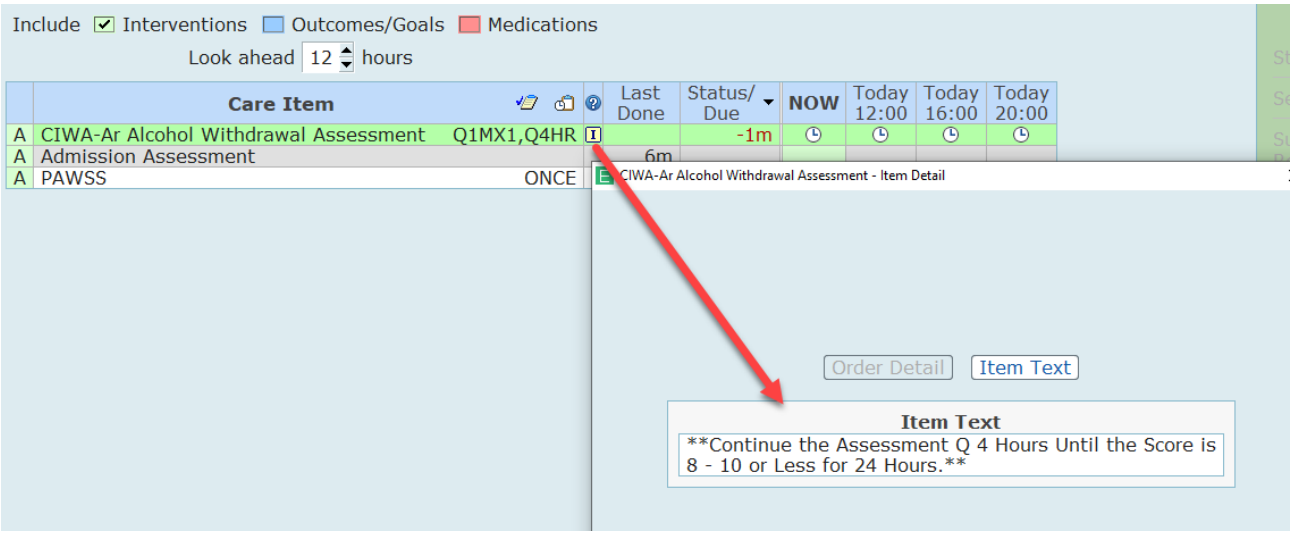
| | |
|---|---|
| *Was the patient's Blood Alcohol Level on presentation >199? | ◉ Yes ○ No |
| *Is there evidence of increased autonomic activity? | ○ Yes ◉ No<br>(e.g., HR >120bpm, tremor, sweating, agitation, nausea) |

Total Score

| | |
|---|---|
| Total Score | 4<br>**A score of 4 or more suggests HIGH RISK for moderate to severe Alcohol Withdrawal Severity; prophalaxis and/or treatment may be indicated.** |

A score of 4 or greater will trigger the CIWA Alcohol Withdrawal Assessment to the worklist:




NOTE: The CIWA-Ar is recommended to be implemented as part of the patient's plan of care for any score 4 or greater. A score of less than 4, the CIWA-Ar is not recommended to be implemented as part of the plan of care. However, the physicians ultimately hold the decision-making regarding their patients' care. They may consider the PAWSS scores in their decision-making, but it is at their discretion.

For more information, a complete literature review, details on the method plan, and/or a complete list of references, please contact Kristin Hagopian, BSN-RN, Candidate for Doctorate of Nursing Practice at krhagopian@gmail.com.

## Appendix F

Data Collection Instruments

**Figure 6:**

*Data Collection Prior to PAWSS Implementation*

| Data Prior to PAWSS Implementation (Group 1: PRIOR) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient # | Gender | Age | Race | Time (in hours) from Arrival to CIWA Protocol Initiation | Time (in hours) from Arrival to First Dose of Librium Given | Total Doses of Librium Given | Time (in hours) from Arrival to First Dose of Ativan Given | Total Doses of Ativan Given | Highest recorded CIWA score | Length of Hospital Stay (in days) | Length of Stay in ICU/IMU (in days) | Transfered? |
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| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

**Figure 7:**

*Data Collection with PAWSS Implemented*

| Data with PAWSS Implemented (Group 2: PAWSS) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Patient # | Gender | Age | Race | Time (in hours) from Arrival to CIWA Protocol Initiation | Time (in hours) from Arrival to First Dose of Librium Given | Total Doses of Librium Given | Time (in hours) from Arrival to First Dose of Ativan Given | Total Doses of Ativan Given | Highest Recorded CIWA Score | Length of Hospital Stay (in days) | Length of Stay in ICU/IMU (in days) | Transfered? |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

## Appendix G

Demographics

**Table 1:**

*Descriptive Statistics of Study Participants- Age by Group*

| Group | Variable | *N* | Min | Max | Mean | *SD* |
|---|---|---|---|---|---|---|
| 1 | Age | 41 | 19 | 70 | 43.07 | 10.86 |
| 2 | Age | 41 | 18 | 73 | 42.44 | 11.14 |

*Note.* Min = minimum age; Max = maximum age; *SD* = standard deviation
Group 1 = participants prior to PAWSS tool implementation. Group 2 = participants with the PAWSS implemented.

**Table 2:**

*Demographics of Study Participants- Age Ranges by Group*

| Group | Age Range | *N* | % |
|---|---|---|---|
| 1: PRIOR | 18-24 | 2 | 4.9% |
| | 25-29 | 2 | 4.9% |
| | 30-34 | 4 | 9.8% |
| | 35-39 | 6 | 14.6% |
| | 40-44 | 10 | 24.4% |
| | 45-49 | 7 | 17.1% |
| | 50-54 | 4 | 9.8% |
| | 55-59 | 3 | 7.3% |
| | 60-64 | 2 | 4.9% |
| | 65+ | 1 | 2.4% |
| 2: PAWSS | 18-24 | 3 | 7.3% |
| | 25-29 | 3 | 7.3% |
| | 30-34 | 3 | 7.3% |
| | 35-39 | 5 | 12.2% |
| | 40-44 | 11 | 26.8% |
| | 45-49 | 6 | 14.6% |
| | 50-54 | 5 | 12.2% |
| | 55-59 | 2 | 4.9% |
| | 60-64 | 2 | 4.9% |
| | 65+ | 1 | 2.4% |

**Figure 8A:**

*Demographics of Study Participants- Age for Group 1: PRIOR (N=41)*

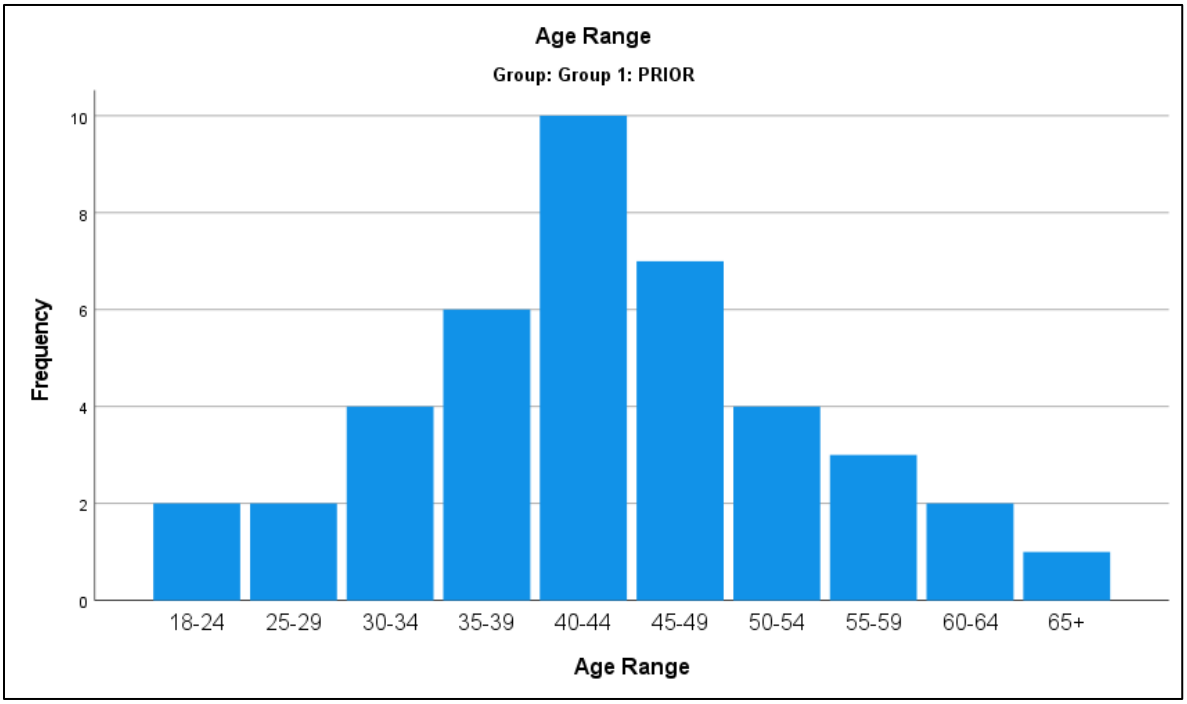



**Figure 8B:**

*Demographics of Study Participants- Age for Group 2: PAWSS (N=41)*

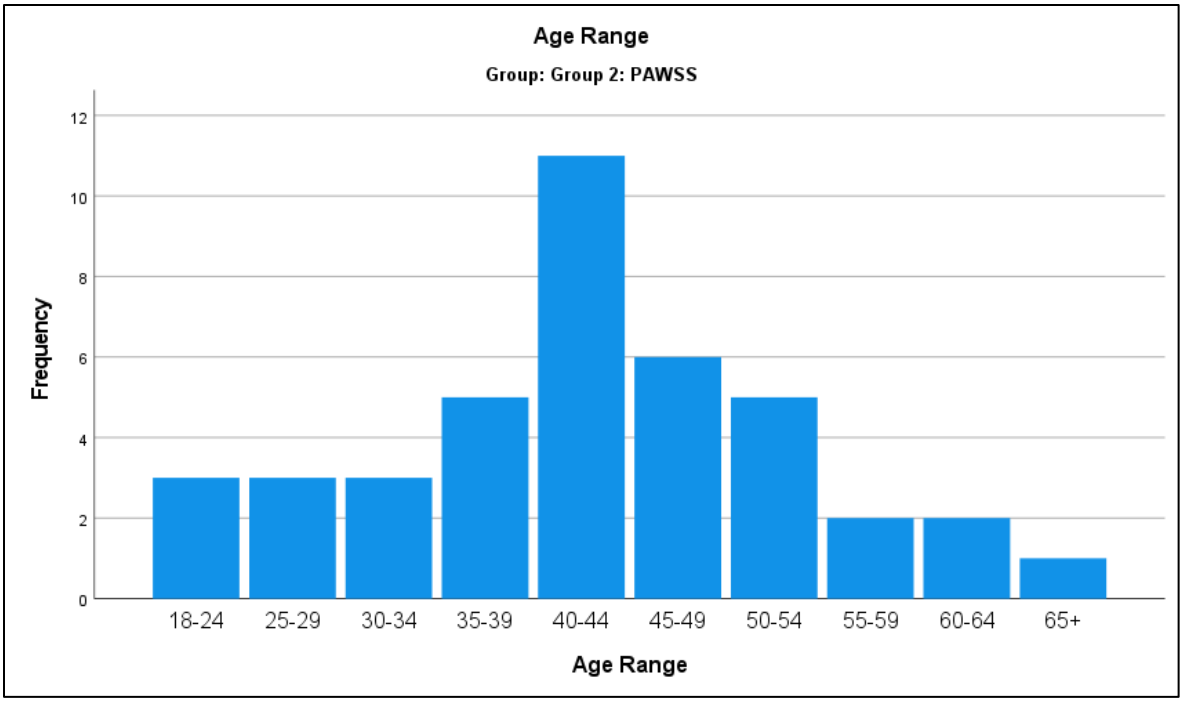



**Table 3:**

*Demographics of Study Participants- Gender by Group*

| Group | Variable | *N* | % |
|---|---|---|---|
| 1 | Female | 17 | 41.5% |
| | Male | 24 | 58.5% |
| 2 | Female | 14 | 34.1% |
| | Male | 27 | 65.9% |

**Figure 9A:**

*Demographics of Study Participants- Gender for Group 1: PRIOR (N=41)*

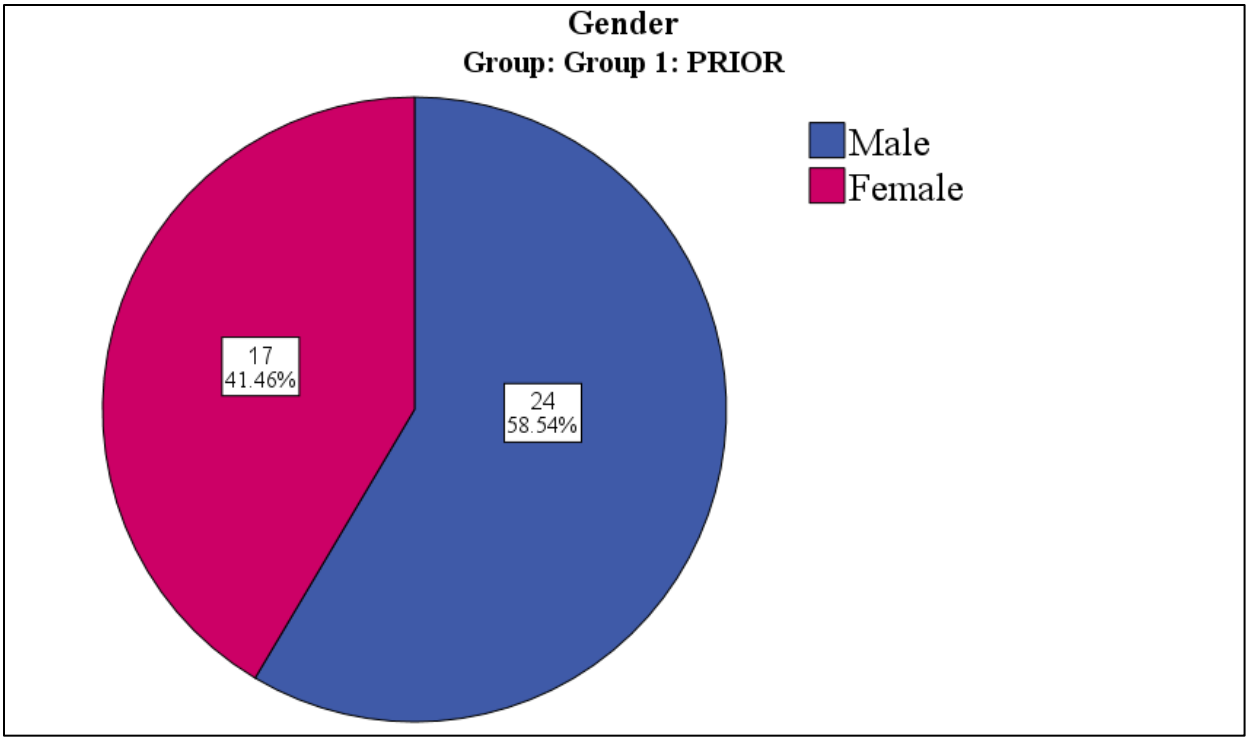



**Figure 9B:**

*Demographics of Study Participants- Gender for Group 2: PAWSS (N=41)*

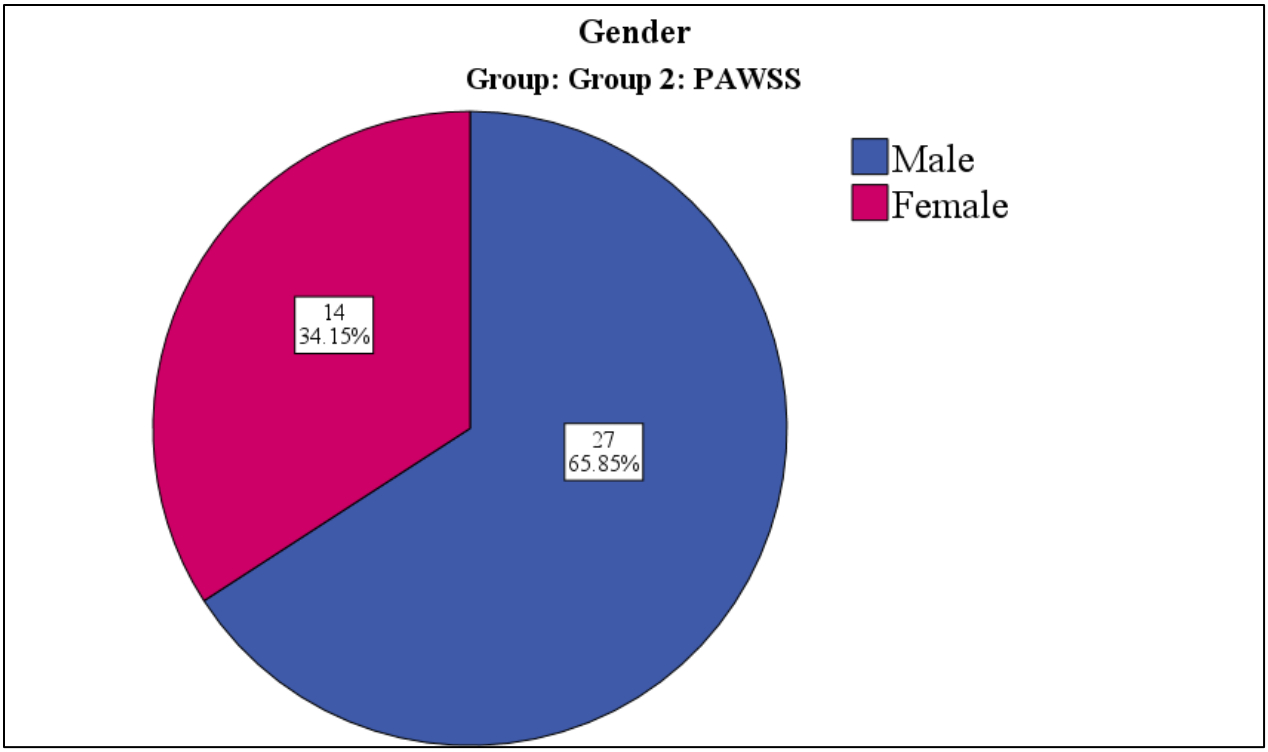



**Table 4:**

*Demographics of Study Participants- Race by Group*

| Group | Race | N | % |
|---|---|---|---|
| 1 | Caucasian | 31 | 75.6 |
| | African American | 9 | 22.0 |
| | Latino | 1 | 2.4 |
| 2 | Caucasian | 32 | 78.0 |
| | African American | 7 | 17.1 |
| | Latino | 2 | 4.9 |

*Note.* Group 1 = participants prior to PAWSS implementation. Group 2 = participants with PAWSS implementation.

**Figure 10A:**

*Demographics of Study Participants- Race for Group 1: PRIOR (N=41)*

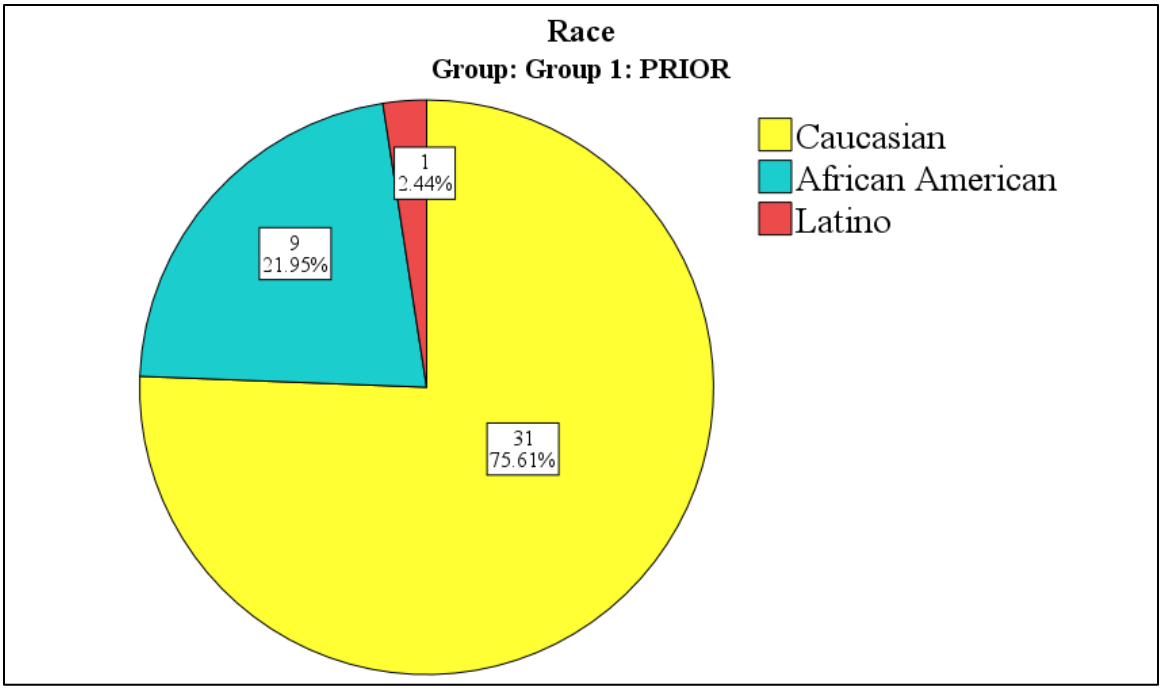
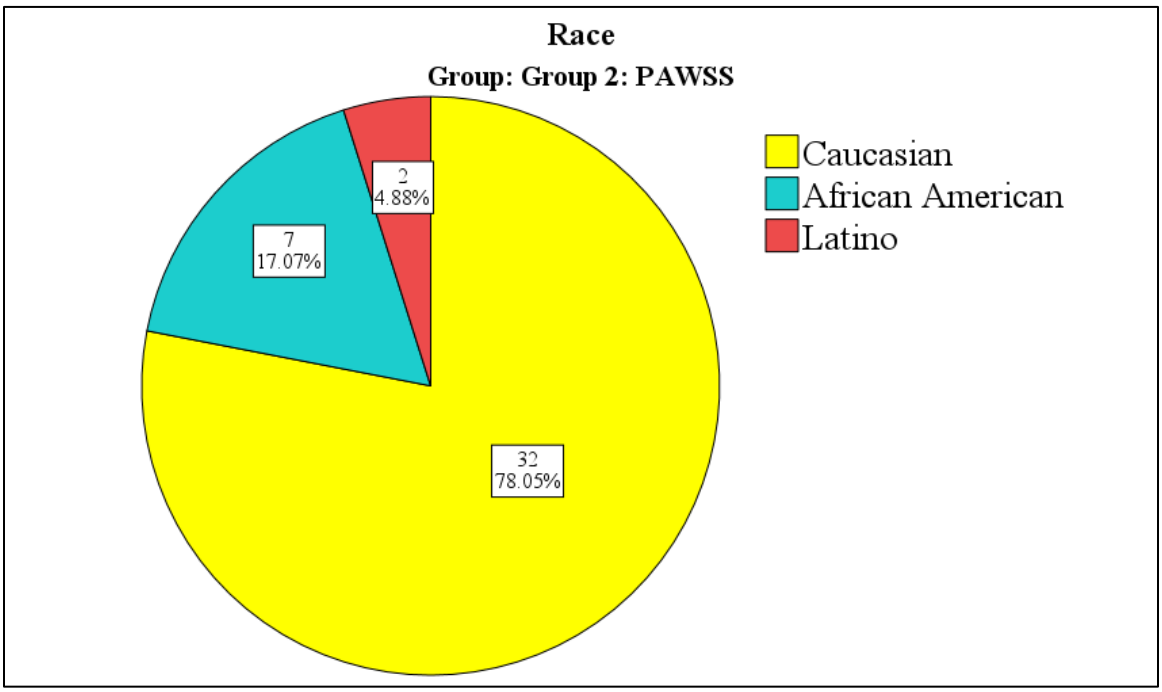



**Figure 10B:**

*Demographics of Study Participants- Race for Group 2: PAWSS (N=41)*




**Appendix H**

Data Analyses

**Table 5:**

*Group Statistics*

| Variable | Group | *N* | Mean | *SD* |
|---|---|---|---|---|
| Time to CIWA Initiation (in hours) | 1 | 41 | 6.88 | 5.75 |
| | 2 | 41 | 4.04 | 2.32 |
| Time to First Librium Dose (in hours) | 1 | 28 | 11.39 | 10.29 |
| | 2 | 24 | 4.78 | 1.69 |
| Time to First Ativan Dose (in hours) | 1 | 27 | 7.45 | 5.88 |
| | 2 | 20 | 5.39 | 2.49 |
| Length of Hospital Stay (in days) | 1 | 41 | 4.08 | 2.27 |
| | 2 | 41 | 3.23 | 1.8 |
| Length of Stay in ICU/IMU (in days) | 1 | 41 | 1.85 | 1.93 |
| | 2 | 41 | 1.06 | 1.34 |
| Total Doses of Librium Given | 1 | 41 | 5.10 | 5.79 |
| | 2 | 41 | 3.32 | 4.42 |
| Total Doses of Ativan Given | 1 | 41 | 3.29 | 4.83 |
| | 2 | 41 | 1.54 | 2.56 |
| Highest Recorded CIWA Score | 1 | 41 | 13.37 | 10.01 |
| | 2 | 41 | 8.56 | 6.34 |

*Note.* Group 1 = participants prior to PAWSS implementation. Group 2 = participants with PAWSS implementation. *M* = mean; *SD* = standard deviation.
*N* = 41 for Group 1 and Group 2 under all variables tested, except for where time is examined for Librium and Ativan administration. With these cases, not all participants received these medications, thus *N* was adjusted accordingly.

**Table 6:**

*Independent Samples Test*

| | t-test for Equality of Means | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 95% *CI* | |
| Variables | *t* | *df* | *Sig p* | *M* | *LL* | *UL* |
| Time to CIWA Initiation (in hours) | 2.93 | 80 | 0.002** | 2.83 | 0.91 | 4.76 |
| Time to First Dose of Librium (in hours) | 3.11 | 50 | 0.002** | 6.61 | 2.34 | 10.89 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Time to First Dose of Ativan (in hours) | 1.47 | 45 | 0.074 | 2.06 | -0.76 | 4.88 |
| Length of Hospital Stay (in days) | 1.87 | 80 | 0.032* | 0.85 | -0.05 | 1.75 |
| Length of Stay in ICU/IMU (in days) | 2.14 | 80 | 0.018* | 0.79 | 0.05 | 1.52 |
| Total Librium Doses Given | 1.57 | 80 | 0.061 | 1.78 | -0.48 | 4.04 |
| Total Ativan Doses Given | 2.06 | 80 | 0.021* | 1.76 | 0.06 | 3.36 |
| Highest Recorded CIWA Score | 2.6 | 80 | 0.006** | 4.81 | 1.12 | 8.49 |

*Note. M* = mean; *SD* = standard deviation; *CI* = confidence interval*; LL* = lower limit; *UL* = upper limit. *Statistically significant at the $p < 0.05$ level. **Statistically significant at the $p < 0.01$ level.

**Table 7:**

*Independent Samples Effect Sizes*

| Variable | Formula | Standardizer[a] | Point Estimate | 95% *CI* | |
|---|---|---|---|---|---|
| | | | | *LL* | *UL* |
| Time to CIWA Initiation (in hours) | Cohen's d | 4.38 | 0.65 | 0.2 | 1.09 |
| | Hedges' correction | 4.43 | 0.64 | 0.2 | 1.08 |
| | Glass's delta | 2.32 | 1.22 | 0.71 | 1.72 |
| Time to First Librium Dose (in hours) | Cohen's d | 7.65 | 0.87 | 0.3 | 1.43 |
| | Hedges' correction | 7.76 | 0.85 | 0.29 | 1.41 |
| | Glass's delta | 1.69 | 3.92 | 2.67 | 5.17 |
| Time to First Ativan Dose (in hours) | Cohen's d | 4.75 | 0.43 | -0.15 | 1.02 |
| | Hedges' correction | 4.83 | 0.43 | -0.15 | 1.00 |
| | Glass's delta | 2.49 | 0.83 | 0.19 | 1.45 |
| Length of Hospital | Cohen's d | 2.05 | 0.41 | -0.03 | 0.85 |

| | | | | | |
|---|---|---|---|---|---|
| Stay (in days) | Hedges' correction | 2.07 | 0.41 | -0.03 | 0.84 |
| | Glass's delta | 1.80 | 0.47 | 0.02 | 0.91 |
| Length of Stay in ICU/IMU (in days) | Cohen's d | 1.66 | 0.47 | 0.03 | 0.91 |
| | Hedges' correction | 1.68 | 0.47 | 0.03 | 0.90 |
| | Glass's delta | 1.34 | 0.59 | 0.13 | 1.03 |
| Total Doses of Librium Given | Cohen's d | 5.15 | 0.35 | -0.09 | 0.78 |
| | Hedges' correction | 5.20 | 0.34 | -0.09 | 0.77 |
| | Glass's delta | 4.42 | 0.40 | -0.04 | 0.84 |
| Total Doses of Ativan Given | Cohen's d | 3.86 | 0.45 | 0.01 | 0.89 |
| | Hedges' correction | 3.90 | 0.45 | 0.01 | 0.88 |
| | Glass's delta | 2.56 | 0.69 | 0.22 | 1.14 |
| Highest Recorded CIWA Score | Cohen's d | 8.38 | 0.57 | 0.13 | 1.01 |
| | Hedges' correction | 8.46 | 0.57 | 0.13 | 1.00 |
| | Glass's delta | 6.34 | 0.76 | 0.29 | 1.22 |

*Note.* a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control (i.e., the second) group.
*CI* = confidence interval*; LL* = lower limit; *UL* = upper limit.

**Figure 11:**

*Bar Chart of Means for Time from Arrival to CIWA-Ar Protocol Initiation, First Dose of Ativan Administered, and First Dose of Librium Administered in Hours*

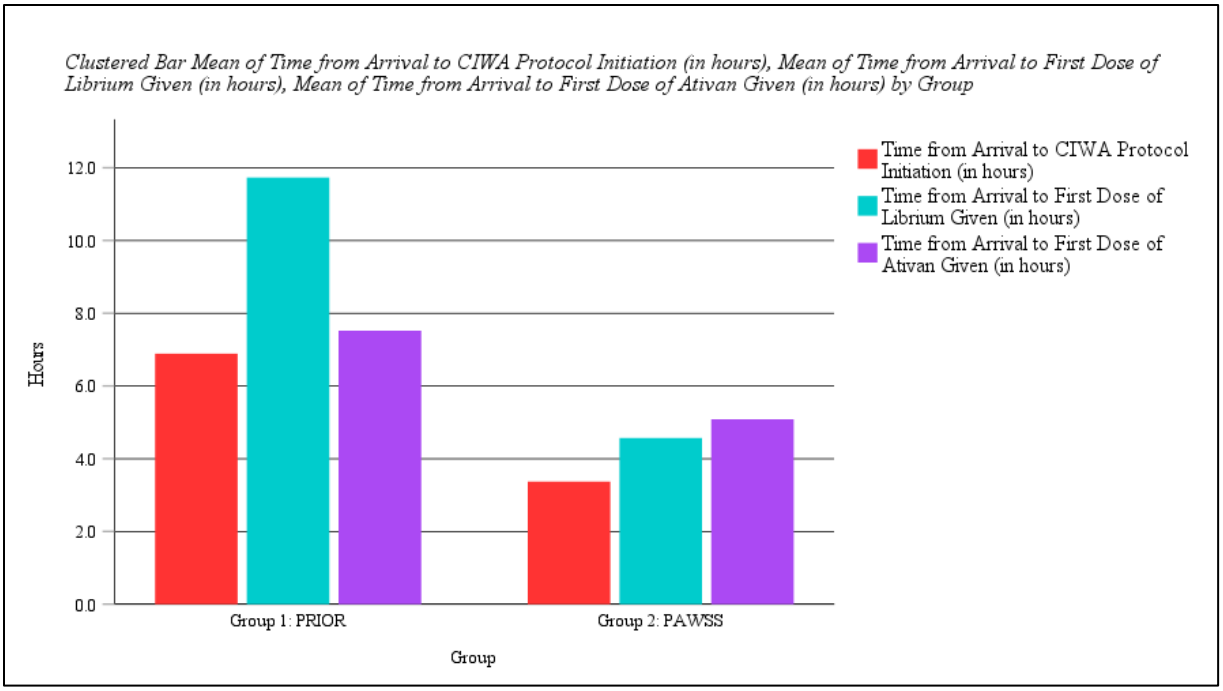



**Figure 12:**

*Bar Chart of Means for Length of Stay and Length of Stay in the ICU/IMU in Days*

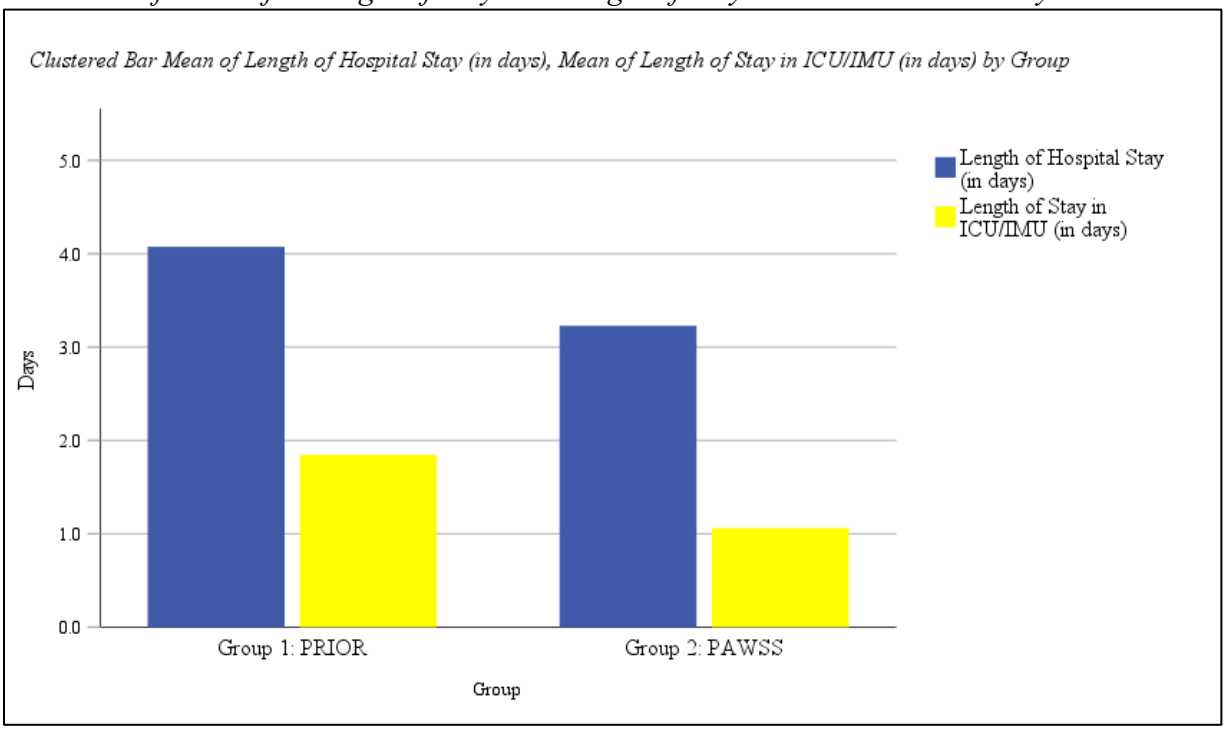



**Figure 13:**

*Bar Chart of Highest Recorded CIWA-Ar Scores, Total Doses of Librium Received, and Total Doses of Ativan Received by Group*

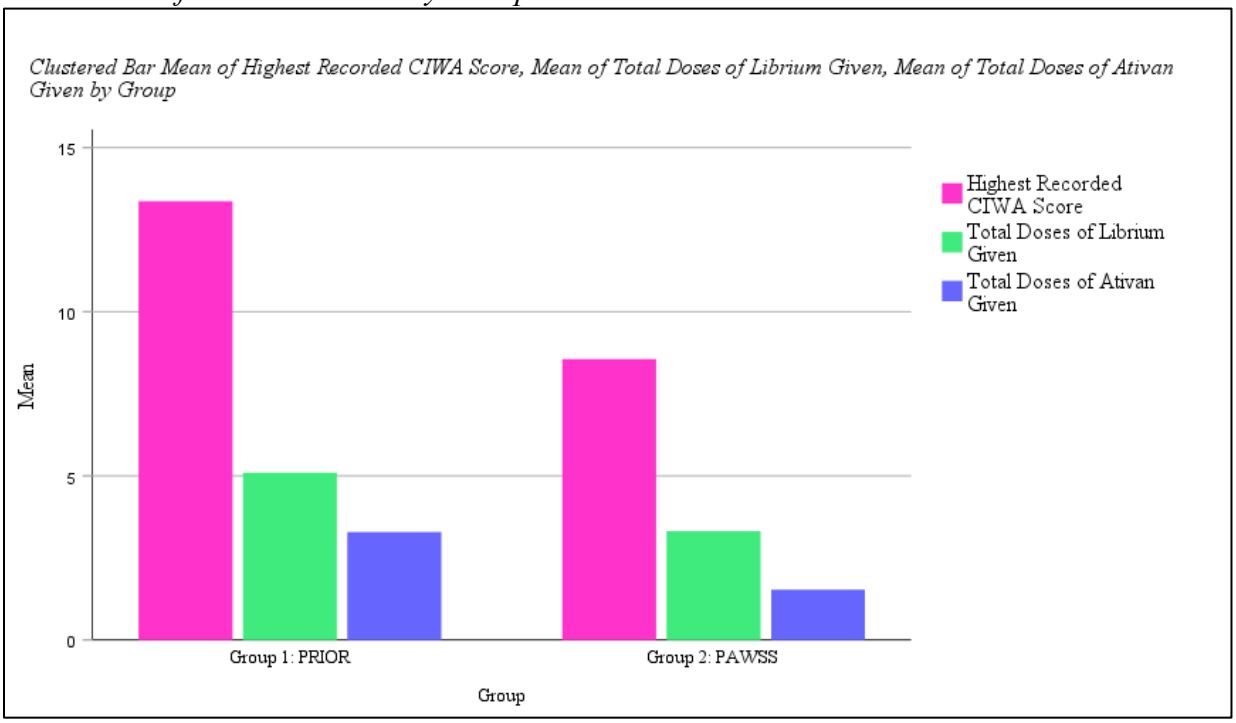
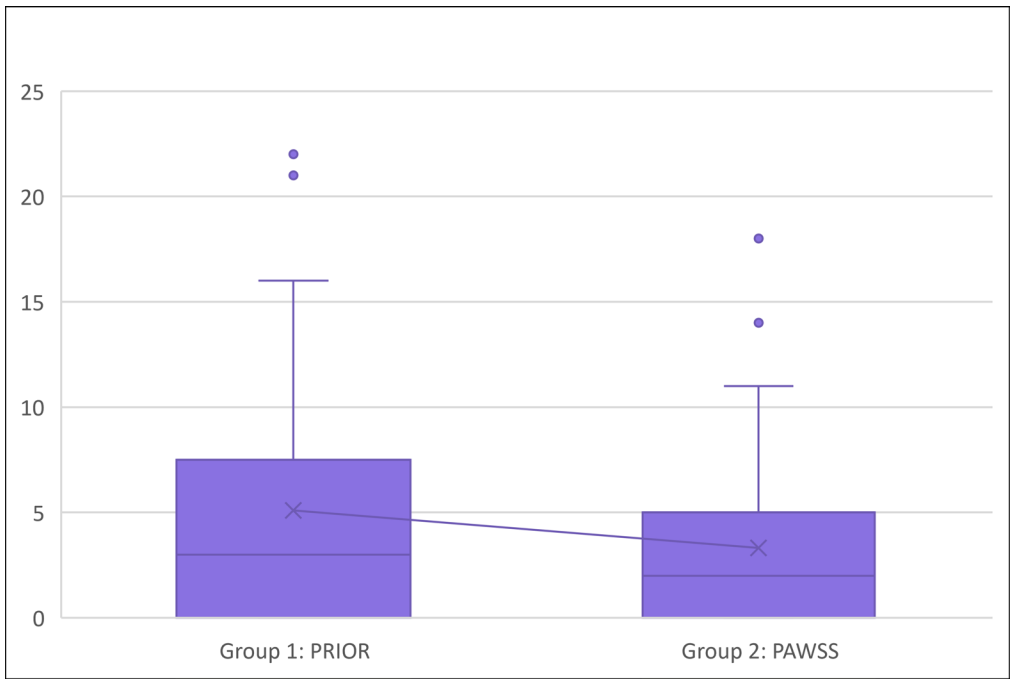



**Figure 14:**

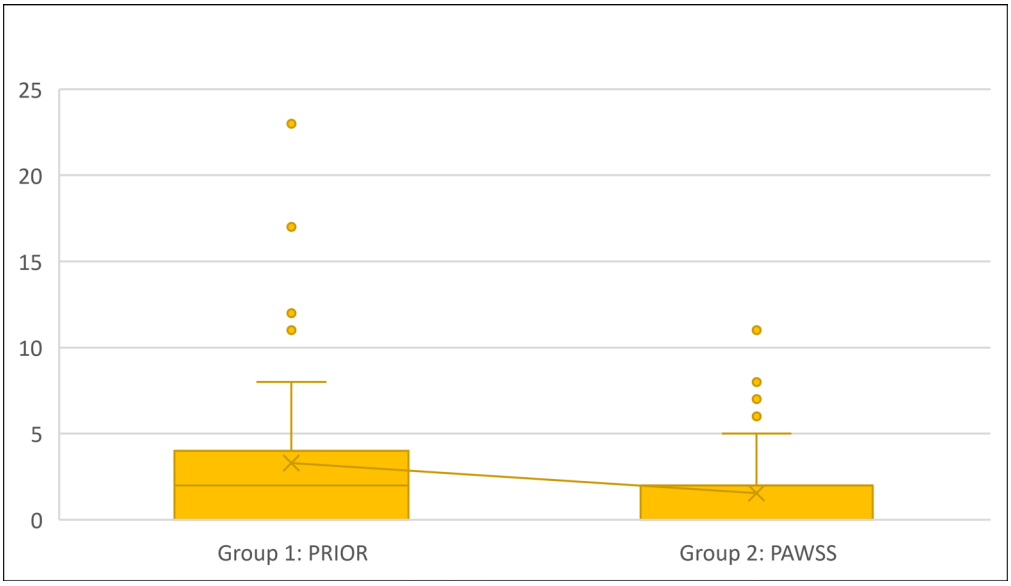
*Simple Box Plot of Total Doses of Librium Given by Group*




*Note.* Group 1 = participants prior to PAWSS implementation.
Group 2 = participants with PAWSS implementation.

**Figure 15:**

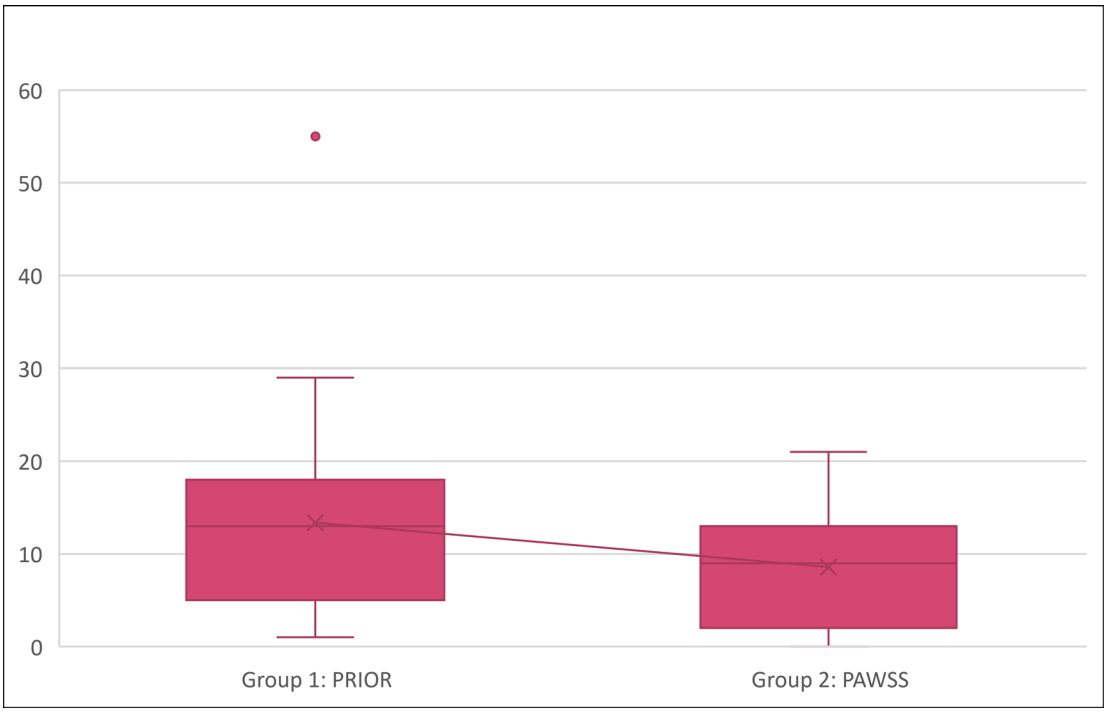
*Simple Box Plot of Total Doses of Ativan Given by Group*




*Note.* Group 1 = participants prior to PAWSS implementation.
Group 2 = participants with PAWSS implementation.

**Figure 16:**

*Simple Box Plot of Highest Documented CIWA Score by Group*




*Note.* Group 1 = participants prior to PAWSS implementation.
Group 2 = participants with PAWSS implementation.

**Table 8:**

*Transfers to Higher Level of Care by Group*

| Group | Variable | *N* | % |
|---|---|---|---|
| 1 | Yes | 5 | 12.2 |
| | No | 36 | 87.8 |
| 2 | Yes | 2 | 4.9 |
| | No | 39 | 95.1 |

*Note.* Group 1 = participants prior to PAWSS implementation.
Group 2 = participants with PAWSS implementation.