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## Monitoring for Delirium in the Intensive Care Unit Following the Introduction of the Confusion Assessment Method for the Intensive Care Unit

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Final DNP Project Report:

Monitoring for Delirium in the Intensive Care Unit Following the Introduction of the Confusion  
Assessment Method for the Intensive Care Unit

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Fall, 2016

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## MONITORING FOR DELIRIUM IN THE INTENSIVE CARE UNIT

### Dedication

I would like to thank my family and friends who have been there for me during this journey. I have relied on them to keep me sane and motivated during this time and without their support I would not be where I am today. A special thanks goes to Angie Reynolds for editing my many long papers during these last three years of graduate school. To everyone else thank you for listening to me complain and pushing me to see the light at the end of the tunnel, I am forever indebted to you.

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## Abstract

**PURPOSE:** The goals of this study were to: improve delirium recognition by implementing the Confusion Assessment Method for the ICU (CAM-ICU), evaluate adherence to routine delirium monitoring, measure the incidence of CAM-positive patients, and measure the use of analgesic and sedative medications in ICU patients.

**METHODS:** This study was a single-center post-implementation retrospective medical record review examining the adherence and incidence of delirium after the introduction of the CAM-ICU assessment on the surgical ICU. Prior to the beginning of the study the surgical ICU nurses were educated on how to assess for delirium using the CAM-ICU instrument. During the six week study the following data were collected: adherence to delirium monitoring through documentation, incidence of CAM-positive patients, and sedation and analgesic medication usage. The sample consisted of seventy-six patients that were admitted to the surgical ICU between September 6, 2016 and October 18, 2016.

**RESULTS:** Thirty-two (58.1%) patients had the CAM-ICU assessment completed once a shift at the 48-hour evaluation and twenty-two (81.4%) patients during the 96-hour evaluation. Five (9%) patients were CAM-positive at the 48-hour and one (3.7%) at the 96-hour evaluation. The 48-hour time interval had the highest average number of dosages for analgesic medications at 2.3 (29.4%) for CAM-negative patients. CAM-positive analgesic medications usage increased progressively, peaking at the 72-hour interval with the average dose at 3.6 (32.1%). With regards to sedative medications, CAM-negative patients had the highest average number of dosages, 1.9 (30.2%), at the 48-hour interval. For CAM-positive patients the use of sedative medications peaked at the 24-hour interval and then decreased at the 48-hour time frame; after which sedative medication usage rose steadily from the 48 through 96-hour interval.

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**CONCLUSION:** Required routine delirium monitoring should occur per evidence-based practice guidelines for all ICU patients. The incidence of delirium in this study was found to be low, at 9%, when compared to previous studies on delirium. No statistically significant conclusions could be drawn from this study. Factors that could have contributed to this low incidence of delirium in these specific patients could have been the relative young age of the patients (mean age of 53.2) and the possible lower severity of illness, both of these factors influence the risk of delirium development. In conclusion, this single study may have found a low incidence of delirium among these specific ICU patients but many previous studies have determined that the incidence of delirium is much higher.

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## Monitoring for Delirium in the Intensive Care Unit Following the Introduction of the Confusion Assessment Method for the Intensive Care Unit

### **Introduction**

As the population ages, more people will require treatment of acute conditions in the hospital. This increased encounter of the aging population with a more intensive treatment of medical problems is believed to result in an increase in the prevalence of delirium among this population (Angus, Kelley, Schmitz, White, & Popovich, 2000). One of the major objectives for improvement in the quality of care for the aging adult population is the improvement of recognizing, treating and preventing delirium (Vincent et al., 1998). This objective was identified almost twenty years ago but delirium still remains an enormous issue that is often not recognized and treated within the health care system (Barr et al., 2013). Pandharipande, Jackson, and Ely (2005) identified a high incidence of delirium among intensive care unit (ICU) patients. Current evidence-based practice recommends routine delirium monitoring using a valid and reliable diagnostic tool once a shift (every twelve hours) for all ICU patients (Barr et al., 2013). Therefore, the goals of this study were to: improve delirium recognition by implementing the Confusion Assessment Method for the ICU (CAM-ICU), evaluate adherence to routine delirium monitoring, measure the incidence of CAM-positive patients, and measure the use of analgesic and sedative medications in ICU patients (see figure 1 for CAM-ICU assessment flowsheet).

### **Background**

Delirium is defined as an “acute, fluctuating change in mental status, with inattention and altered level of consciousness” (Pandharipande et al., 2005, p. 360). In the past this condition was viewed as a normal occurrence brought about by the ICU environment, which resulted in providers failing to recognize delirium as a serious medical diagnosis (Pandharipande et al.,

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2005). This study also concluded that “delirium is not only a marker of end-organ damage but also acts directly as a promoter of other organ systems dysfunctions” (p. 360). The typical ICU patient has 10 or more risk factors, e.g. age, severity of illness, and the use of sedatives/analgesics medications, for the development of delirium (Pandharipande et al., 2006).

Delirium is unrecognized in up to 66% of ICU patients and has an estimated incidence up to 80% (Arend & Christensen, 2009; Pandharipande et al., 2005). These studies found that a failure to recognize and/or treat delirium appropriately in the ICU has led to negative patient outcomes. Specifically, Pandharipande et al. (2005) found an “increased mortality of 25 to 33% and a three times greater risk of discharge to a nursing home” (p. 363). While increased medical costs, a 49% increased length of stay (LOS) compared to non-delirious patients, and increased stress for family members and medical staff have also been linked to delirium (Arend & Christensen, 2009; Robinson et al., 2008).

Pandharipande et al. (2006) point out, patients are commonly being prescribed a benzodiazepine, like Lorazepam, which has been linked to further exacerbation of delirium. This study included 198 ICU patients and found that “Lorazepam was an independent risk factor for daily transition to delirium” and “the probability of the transition to delirium is 100%”, when 20mg or more is given in a 24-hour period (p.23). Additionally, this study investigated Versed, Morphine, Fentanyl and Propofol all of which were associated with delirium development but the findings were not statistically significant like Lorazepam.

A key factor in improving delirium recognition is engagement of nurses and providers to routinely monitor for delirium using a reliable and valid bedside diagnostic instrument (Pandharipande et al., 2005). The Society of Critical Care Medicine recommends the use of the CAM-ICU because it is the most specific and reliable diagnostic instrument, with a specificity of

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96% and sensitivity of 80% (Gusmao-Flores, Figueira Salluh, Chalhub, & Quarantini, 2012; Luetz et al., 2010; Olson, 2012). However, Eastwood, Peck, Bellomo, Baldwin, and Reade (2012) found that only 20% of ICU nurses knew that there was a diagnostic instrument to detect delirium, and even then, only 7% sometimes assessed for delirium using the instrument. Therefore, implementing the CAM-ICU assessment in the ICU can improve delirium recognition among ICU patients.

### **Purpose**

According to Barr et al. (2013) the current evidence-based practice is to routinely monitor patients for delirium using a standardized diagnostic tool in the ICU setting. The purpose of this study was to implement delirium monitoring for ICU patients using a standardized diagnostic tool in the surgical ICU. Adherence and incidence of CAM-positive patients will be measured along with the type, route of administration, and frequency of sedative and analgesia medications administered at 24, 48, 72, and 96-hours following admission. Currently, the University of Louisville Hospital does not use a standard diagnostic tool to assess for delirium. For this study, the nurses on the surgical ICU were educated on the CAM-ICU instrument for routine monitoring of delirium among surgical ICU patients. The specific aims of this study were:

- 1) To provide nurses with a standardized delirium diagnostic tool to monitor for delirium
- 2) To evaluate adherence to routine delirium after the introduction of the CAM-ICU assessment
- 3) To evaluate the incidence of CAM-positive patients on the surgical ICU at 48 and 96 hours post admission

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- 4) To determine the type, route of administration, and frequency of sedative and analgesic medications administered at 24, 48, 72, and 96 hours post admission.

### **Methods**

Prior to the study beginning, approval was obtained from the University of Kentucky Institutional Review Board (IRB) and the University of Louisville IRB. Authorization to conduct the study on the surgical ICU was acquired from the clinical manager. This study was a single-center, post-implementation, retrospective descriptive medical record review examining the impact of delirium monitoring, via the CAM-ICU tool, on patients admitted to the surgical ICU at the University of Louisville Hospital. After education was given to the surgical ICU nurses on how to assess for delirium using the CAM-ICU instrument, daily delirium assessments were conducted on each patient admitted to the surgical ICU for a six week period. The following data were collected during the six week study time frame: adherence to delirium monitoring through documentation, incidence of CAM-positive patients, and sedation and analgesic medication usage.

### **Setting**

The University of Louisville Hospital is a level one academic medical center located in downtown Louisville, Kentucky. This is a 404-bed acute care hospital that admits patients from all over Kentucky and southern Indiana. The focus of this study was the ten-bed surgical ICU, which typically treats surgical patients, i.e. vascular, colorectal, elective surgery, and surgical oncology. Trauma patients are also commonly admitted to this ICU with injuries occurring from gunshot wounds, motor vehicle accidents, motorcycle accidents, and falls. In addition to those patients, this ICU admits overflow medical and neurosurgery ICU patients.

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### **Sample**

This sample contained the medical records of 78 patients admitted to the surgical ICU post implementation of the CAM-ICU assessment tool. Since delirium can affect any ICU patient, the population of interest for this study was any ICU patients admitted to the surgical ICU. Included in this study were: those patients, at least 18 years of age, who were admitted to the surgical ICU between September 6, 2016 and October 18, 2016. Any patient under the age of 18 was excluded from the study. One patient was removed due to being under the age of 18 and one was excluded due to being discharge from the surgical ICU on the day the study began, resulting in a total of 76 patients in the sample.

### **Data Collection**

After the six-week period was complete, a retrospective chart review was conducted. Patients for the study were identified by electronically searching for patients admitted to the surgical ICU on the study dates. The patients' medical record numbers were then used to extract data from the electronic medical record (EMR) and the data were then transposed into an electronic spreadsheet. No patient identifiers were contained within this spreadsheet; all patients were assigned numbers (1-76) for the protection of protected health information (PHI). Demographic variables such as age, sex, race and admitting service were obtained from the data.

### **Implementation of Delirium Monitoring**

One aim of this study was to implement routine delirium monitoring for ICU patients on the surgical ICU at the University of Louisville Hospital. The week prior to the initiation of the study, all of the surgical ICU nurses on both shifts were instructed by the principle investigator (PI) on how to detect delirium using the CAM-ICU assessment tool. The EMR used by the hospital allowed for documentation of the CAM-ICU assessment within the patient's EMR. The

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nurses were instructed, by the PI, on where documentation of the daily delirium assessments needed to be recorded. Signs were placed around the unit to remind the nurses to conduct a delirium assessment once a shift, along with flowsheets on how to assess patients using the CAM-ICU assessment. Delirium monitoring continued for the next six weeks once a shift (8 a.m. and 8 p.m.) for all patients admitted to the surgical ICU (see figure 1 for CAM-ICU assessment flowsheet).

### **Adherence to Delirium Monitoring**

By reviewing the EMR the PI verified delirium monitoring occurred once a shift at the 48 and 96-hour post admission to the surgical ICU time intervals in all patients whose EMR were reviewed. The data were broken down into four categories: documentation occurred twice in the 24-hour period within 48 and 96-hour following admission to the ICU, documentation only once in a 24-hour period, no documentation of delirium assessment, or patient discharged prior to 48 or 96-hour evaluation. If the patient had a documented CAM-ICU assessment in the EMR at 8 a.m. and 8 p.m. in the 48 or 96-hour interval then the data was recorded as two out of two assessments completed. If the patient only had one document CAM-ICU assessment in the EMR at either 8 a.m. or 8 p.m. in the 48 or 96-hour interval then the data was recorded as one out of two assessment completed. If the CAM-ICU assessment was not documented within the EMR at 8 a.m. and 8 p.m. in the 48 or 96-hour interval then the data was recorded as zero out of two assessments completed. If the patient had been discharge prior to the 48 or 96-hour intervals then it was recorded that the patient was not assessed using the CAM-ICU assessment due to the patient being discharged from the surgical ICU.

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### **CAM-ICU Results**

As with the adherence to delirium monitoring, the CAM-ICU results were measured at 48 and 96 hours post admission to the surgical ICU. CAM-ICU results required at least one documented CAM-ICU assessment in the patients EMR at either 8 a.m. or 8 p.m. The data were broken down into five categories: CAM-ICU negative, CAM-ICU positive, unable to assess, no documentation completed, or discharged prior to evaluation. CAM-ICU negative are patients that the CAM-ICU assessment determined that delirium was not present. These patients were determined to be CAM-ICU negative at either the 48 or 96-hour interval by a documented CAM-ICU negative assessment in the EMR at 8 a.m. and/or 8 p.m. CAM-positive patients were defined as a patient that tested positive for delirium using the CAM-ICU assessment at the 48 or 96-hour interval. These patients required CAM-ICU positive documentation in the EMR at 8 a.m. and/or 8 p.m. The unable to assess category occurred when the patient's neurological status was not suitable, either due to medications or injuries, to conduct the CAM-ICU assessment at the 48 or 96-hour interval. The nurses determined if a patient was not suitable for the CAM-ICU assessment using the CAM-ICU flowsheet; documentation that assessment was not appropriate was required in the patient's EMR at 8 a.m. and/or 8 p.m. to be included in the unable to assess category. If documentation did not occur for the CAM-ICU assessment in the EMR at 8 a.m. or 8 p.m. in the 48 or 96-hour interval then the data was recorded as no CAM-ICU results. If the patient had been discharge prior to the 48 or 96-hour intervals then it was recorded that the patient was not assessed for delirium using the CAM-ICU assessment due to the patient being discharged from the surgical ICU (see figure 1 for CAM-ICU assessment flowsheet).

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### **Administration of Sedation and/or Analgesic Medications**

Sedative and analgesic medications were specifically reviewed. Pandharipande et al. (2006) had found administering certain types of sedative and/or analgesic medication was associated with the development of delirium. Sedatives are defined as medications that depress central nervous activity, which reduces anxiety and induces sleep in patients. Typical sedative medications used in the ICU patient are classified as benzodiazepines, but others such as general anesthetics (Propofol) or alpha 2 adrenergic agonist (Precedex) can be administered. Data were collected on any benzodiazepine patients received along with continuous infusions of Propofol or Precedex. Analgesics are defined as medications that provide relief from pain. Opioids, e.g. Morphine, Fentanyl and Dilaudid, are common analgesic administered to ICU patients. Therefore, data were collected on any of these medications administered during the study. The data collected on all these medications included the type, route of administration, and frequency. Patients that were discharged prior to the 48-hour interval were excluded from this data collection because they had been discharged prior to the initial evaluation time frame for delirium using the CAM-ICU instrument. To determine the frequency of analgesic and/or sedative administration, the data were divided into four post admission time frames: 24, 48, 72, and 96 hours. From this a total number of dosages for analgesic and sedative medications for each time frame were extrapolated from the EMR.

A comparison of the number of analgesic and/or sedative medications administered to CAM-positive patients in relation to the CAM-negative patients was conducted. To compare the data the average number of dosages for CAM-negative and CAM-positive patients at each time frame was determined. Due to certain medications being linked to delirium the percentage of the following medications administered to each group were collected: Fentanyl, Morphine, Versed,

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Ativan and Propofol (Pandharipande et al., 2006). For the purpose of this comparison CAM-positive patients were defined as a patient that tested positive for delirium at any point during the 96-hour time interval.

### **Data Analysis**

Descriptive statistics, e.g. measures of central tendency and variability, were used to analyze the data from this study. For adherence to delirium monitoring percentages were determined for the number of patients that met the following categories: documentation occurred twice in the 24-hour period within 48 and 96-hour following admission to the ICU, documentation only once in a 24-hour period, no documentation of delirium assessment, or patient discharged prior to 48 or 96-hour evaluation. CAM-ICU results were measured by the percentages of patients that met each of the following categories: CAM-ICU negative, CAM-ICU positive, unable to assess, no documentation completed, or discharged prior to evaluation. Administration of sedation and/or analgesic medications were measured using percentage, mean and standard deviation.

## **Results**

### **Sample Characteristics**

A total of 76 patient EMRs were reviewed. The mean age of the patients in this study was 53.2 years old with males representing 56.6% (n=43) and females equaling 43.4% (n=33) of the total sample. The racial breakdown of the study was: 79% Caucasian (n=60), 15.8% African American (n=12), and 5.2% Other (n=4). The majority of patients (60.5%) on the surgical ICU were admitted to the trauma service. The next most frequent admitting service was the medical ICU (15.8%) and the neurosurgery service (11.8%) (see table 1 for the demographics of the sample).

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### **Adherence to Delirium Monitoring**

Twenty-one (27.6%) of the 76 patients had been discharged from the surgical ICU prior to the 48-hour evaluation. Therefore, 55 patients remained on the surgical ICU at the 48-hour evaluation. Thirty-two (58.1%) of those patients had the CAM-ICU assessment completed twice in the 48-hour period following admission. At the 96-hour evaluation, 28 (51%) had been discharged from the surgical ICU, leaving 27 patients appropriate for data review. Of those, 22 (81.4%) patients had the CAM-ICU assessment completed twice during the 96-hour evaluation (see table 2 for adherence to delirium monitoring).

### **CAM-ICU Results**

At the 48-hour evaluation, 55 of the original 76 patients were still admitted to the surgical ICU. Of those patients, 36 (65.5%) were determined to be CAM-ICU negative, while five (9%) patients tested positive for delirium using the assessment tool. When the data were reviewed for the 96-hour evaluation a total of 27 patients remained on the surgical ICU with 16 (59.2%) patients being CAM-ICU negative. In addition, one (3.7%) patient was found to be CAM-ICU positive at the 96-hour evaluation (see table 3 for CAM-ICU results).

Of the five patients who tested positive for delirium 48 hours post admission, one of those patients tested positive again at the 96 hour interval. Of the other four CAM-positive patients, one expired on the unit, two were determined to be CAM-ICU negative at the 96-hour evaluation, and one was discharged prior to the 96 hour interval. The demographics of these CAM-positive patients were: three female, two male, all Caucasian, two admitted to the trauma service, two to the medical ICU, and one to neurosurgery.

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### **Administration of Sedation and/or Analgesic Medications**

Twenty-one (27.6%) of the 76 patients had been discharged from the surgical ICU prior to the 48-hour evaluation. Therefore, 55 patients remained on the surgical ICU at the 48-hour evaluation. Six (10.9%) of the patients received no sedation or analgesic medication during the time intervals examined and 49 (89%) patients received some type of sedative or analgesic medication. The most common analgesics were intravenous Dilaudid and Morphine; both were equally administered to 20 (36.3%) patients. Norco represented the most common oral analgesic medication, being given to eighteen (32.7%) patients. Sedative medications were less frequently administered when compared with analgesics, 16 (13.8%) versus 100 (86.2%) respectively. Versed intravenous push was the most common sedative, with six (13.6%) patients receiving a dose during the time interval. A total of 19 (34.5%) patients received a continuous infusion of either an analgesic or sedative medication. The two most common continuous infusions administered were the analgesic Fentanyl to ten (18.2%) of the patients and the sedative Versed to five (9%) of the patients. Excluding the continuous infusions, the majority medications (84.6%) were prescribed as PRN doses giving the nurse the ability to choose the type and number of times the medications were administered. Of the total number of patients only 14 (25.5%) received a scheduled dose of an analgesic, no scheduled intravenous push or oral sedatives were administered (see table 4 for a detailed breakdown of the types of medication administered).

Overall, more dosages of analgesic medications were administered than sedative medications, 579 dosages (83.5 %) versus 114 dosages (16.5%). For analgesics, the time frame with the highest number of dosages was the 48-hour interval, with 173 (29.9%) dosages being administered. The amount of analgesics administered decreased after the 48-hour interval.

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Sedative medications were administered the most during the 48-hour period, with 36 (31.6%) dosages given (see figure 2 for a graph of total number of dosages overtime).

### **CAM-Negative versus CAM-Positive Patients**

In this study 36 (65.5%) patients were determined to be CAM-ICU negative, while five (9%) patients tested positive for delirium at the 48-hour evaluation using the assessment tool. The results for CAM-negative patients were consistent with the findings described in the previous section. The 48-hour time interval had the highest average number of dosages for analgesic medications at 2.3 (29.4%). The average number of dosages decrease after the 48-hour time interval. With regards to sedative medications and CAM-negative patients the highest average number of dosages, 1.9 (30.2%), occurred at the 48-hour interval. Sedative medication usage for this group remained comparatively low and consistent through the 96-hour time frame. In terms of specific medications that are linked to delirium development, 25% of CAM-negative patients received Fentanyl, 23.6% Morphine, 13.9% Versed, 5.6% Ativan and 8.3% Propofol (see figure 3 for the comparison of analgesic medications: CAM-positive vs. CAM-negative).

CAM-positive patients' results differed from CAM-negative patients. Their analgesic medications usage increased progressively, peaking at the 72-hour interval with the average dose at 3.6 (32.1%). The use of sedative medications peaked at the 24-hour interval then had a decreased at the 48-hour time frame; after which sedative medication usage rose steadily from the 48 through 96-hour interval. In terms of specific medications that are linked to delirium development, 20% of CAM-positive patients received Fentanyl, 100% Morphine, 40% Versed, 20% Ativan and 0% Propofol (see figure 4 for the comparison of sedative medications: CAM-positive vs. CAM-negative).

### **Discussion**

The purpose of this study was to implement the evidence-based practice of routine delirium monitoring in the surgical ICU. Current guidelines recommend delirium monitoring at least once a shift (every twelve hours) for ICU patients using a valid standardized tool (Barr et al., 2013; Pandharipande et al., 2005). The surgical ICU at the University of Louisville Hospital was chosen to conduct this study because currently this hospital does not monitor patients for delirium. It was determined that delirium assessment would occur at 8 a.m. and 8 p.m. for every patient admitted to the surgical ICU using the CAM-ICU tool. Overall adherence to once a shift delirium monitoring occurred 58.1% of the time at the 48-hour interval and 81.4% of the time for the 96-hour interval. CAM-negative patients represented 65.5% and 59.2% of the patients at 48 and 96 hour intervals respectively. While CAM-positive patients made up only 9% of the patients in the 48-hour interval and 3.7% in the 96-hour interval. Lastly, CAM-positive patients received a higher number of sedatives when compared to CAM-negative patients.

### **Delirium Monitoring**

A key factor to the improvement of delirium management and improvement in patient outcomes is adherence to routine delirium monitoring of ICU patients for delirium (Pandharipande et al., 2005). This study measured adherence to delirium monitoring and found that, especially at the 48-hour interval, it was lacking at only 58.1%. This finding did not differ from another study that looked at adherence to routine delirium monitoring. Devlin et al. (2008) found that less than half of the ICU nurses surveyed perform regular delirium assessment even though their hospital protocol expressly included routine delirium monitoring. A specific factor that could explain why adherence was not higher during this study is because this ICU is critically short staffed. This ICU must rely on staff from other ICUs and the critical care float

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pool to have an adequate number of staff during a shift. It was not feasible to provide these non-regular staff members with education on how and when to conduct the CAM-ICU assessment.

Therefore, these nurses could have skewed the results for adherence to delirium monitoring. This failure to assess for delirium could have also altered the incidence of delirium in this study.

Roughly 40% of the patients at the 48-hour interval failed to have a delirium assessment completed.

### **Incidence of Delirium**

The incidence of delirium in this study was found to be low (9%), while current research shows delirium to be much more prevalent, up to 80%, among ICU patients (Pandharipande et al., 2005). Certain risk factors have been “positively and significantly associated with the development of delirium in the ICU: preexisting dementia; history of hypertension and/or alcoholism; and a high severity of illness” (Barr et al., 2013, p. 286). One of these risk factors that could have been lower in the patients in the study was the acuity of the illness of these patients. The severity of illness can be measured using the APACHE II. However, the admitting services currently do not document the severity of illness using a scoring system, so no data was able to be compiled. A comparison of this data would have led to a greater understanding if these patients were at a lower risk for delirium than other ICU patients thus possibility explaining the low incidence of delirium found.

Previous studies have shown that age is also a risk factor for the development of delirium but the patients of this study were relatively young, with a mean age of 53.2 (Pandharipande et al., 2006; Barr et al., 2013). Truman and Ely (2003) identified that with regards to age, over seventy, place a patient at risk for the development of delirium. The younger age of this study’s population could have decreased their risk factor for the development of delirium and thus the

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incidence of delirium in this study. When this relative young age was combined with the possible decreased severity of illness, an overall decrease in risk for delirium could have existed among these patients. These decreased risks could explain why this study had a lower prevalence of delirium when compared with previous studies.

### **Sedatives/Analgesic and CAM-Positive Patients**

Overall, the CAM-positive patients received a higher average number of dosages of both analgesic and sedative medications when compared with the CAM-negative patients (see figure 3 for the comparison of analgesic medications: CAM-positive vs. CAM-negative and Figure 4 for the comparison of sedative medications: CAM-positive vs. CAM-negative). Due to the small sample size of CAM-positive patients a statistical inference could not be determined. However, this finding was consistent with previous studies that found a statistical significant association between sedative medications usage and an increased incidence of delirium (Barr et al., 2013; Pandharipande et al., 2006). The increased analgesic medications usage in delirium positive patients was also consistent with previous studies, which found a correlation between those medications and delirium (Barr et al., 2013; Pandharipande et al., 2006). Also noted within this study was the under use of Precedex as an alternative to continuous benzodiazepine infusions, 1.8% versus 9% respectively. According to the current guidelines, Precedex is recommended over the use of benzodiazepines in patients not suffering for alcohol withdrawal to decrease the incidence of delirium in ICU patients (Barr et al., 2013).

Sedative and analgesic medications were mostly prescribed as PRN doses. Therefore, the nurses were highly responsible for the amount of medications the patients received during the time intervals. This ability of the nurse to influence the type and amount of medications given to a patient could have implications in terms of the development of delirium. This study did not

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evaluate the surgical ICU nurses knowledge of delirium. However, a high possibility exists that these nurses did not have an evidence-based understanding of delirium (recognition of risks and prevention). Currently, staff development on delirium is not provided by the education department at the hospital, nor has there been quality improvement initiatives on evidence-based delirium guidelines. Devlin et al. (2008) found that nurses who do not routinely monitor for delirium lack the following knowledge: “(1) delirium is an underdiagnosed problem in the ICU, (2) patients with delirium are often hypoactive, (3) nondrug therapy should be generally considered before antipsychotic therapy, and (4) delirium is often associated with fluctuating signs and symptoms” (p. 563). This lack of knowledge could lead to failure to identify delirium, especially hypoactive delirium; the over administering of medications known to increase risk of and underuse of non-pharmacological interventions to prevent/treat delirium in ICU patients.

### **Limitations**

Several limitations existed in this study. Generalization of the results from this study cannot be made because this study was a single-center study. The data were obtained from a retrospective chart review, which means the results of the study relied upon the accuracy of the documentation. The accuracy of the data also relied on the ability of the surgical ICU nurses to conduct the CAM-ICU assessment appropriately and adhere to evidence-based protocols. The acuity of the patients in the study could not be compared because the providers do not document the APACHE II score in their progress notes or in the history and physical. Data from all patients that met the inclusion/exclusion criteria were included in the study, but the sample size was small. Statistical inferences about the data could not be made as a result of the small sample size of CAM-positive patients.

### **Recommendations**

#### **Implications for Practice**

An important implication for practice would be to develop a delirium protocol that included identification of high risk patients, e.g. “preexisting dementia, history of hypertension and/or alcoholism and a high severity of illness”, routine monitoring with the CAM-ICU tool once a shift, notification of provider of CAM-ICU positive patients, and preventive measures (Barr et al., 2013, p.286). Preventive measures would be early mobilization of patients, daily sedation vacations, avoid administering continuous infusions of benzodiazepines and instead use Precedex (with the exception of patients withdrawing from alcohol), and promotion of sleep wake cycle (Barr et al., 2013). Provider notification is important because then “clinicians will be able to address reversible causes of delirium and avoid initiating treatments for agitation known to worsen delirium, e.g. benzodiazepines” (Devlin, Brummel, & Al-Qadheeb, 2012, p. 386). Even though this study specifically focused on the ICU, any patients within the hospital can experience delirium; estimating to occur in 60% of non-ICU patients when they have three or more risk factors (Truman & Ely, 2003). Therefore, it would be important to include all patients in the hospital in the delirium protocol. Implementing delirium monitoring for all patients could lead to an improvement in identification and treatment of delirium.

Prior to this study the majority of the nurses had never used the CAM-ICU assessment tool, with the expectations of the travel nurses that had monitored for delirium at other facilities. Even though education was provided on how to use the tool appropriately, the likelihood that some nurses did not accurately assess patients is a concern. Therefore, a practice implications would be to provide all nurses with extensive education on how to perform the CAM-ICU assessment. A study found that the best implementation of the CAM-ICU assessment resulted

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after extensive education was provided, as well as frequent reminders for the staff to evaluate each patient for delirium and consistent evaluations on the ability of the nurses to implement the tool (Devlin et al., 2012). This can be accomplished by having the nursing education department adapt the CAM-ICU assessment education into their new hire nursing education class and requiring current staff to attend an educational presentation during yearly competencies.

Along with the education on the CAM-ICU assessment the nurses need to be provided with evidence-based education on delirium (Gusmao-Flores et al., 2012). Delirium needs to be understood in terms of an acute cognitive dysfunction of the brain and should be given as high of a priority as any other organ dysfunction, e.g. heart, kidney, or liver (Pandharipande et al., 2005). A lack of knowledge about risk factors associated with delirium, among nurses, can further increase its incidence among patients (Arend & Christensen, 2009; Pandharipande et al., 2005). For example, in this study the nurses continued to administer medications known to exacerbate delirium even after patients tested positive for delirium.

### **Implications for Future Inquiry**

A Future study in the area of delirium needs to be on how to decrease the incidence through non-pharmacologic preventive measures that specifically examine ICU patients that experience delirium. The current research that is available on preventive measures for delirium, with the exception of early mobilization, were conducted on non-ICU patients (Barr et al., 2013). Therefore, these findings may not be transferable to ICU patients experiencing delirium (Barr et al., 2013; Truman & Ely, 2003). Until more studies are conducted on non-pharmacologic prevention measures for delirium in the ICU, evidence-based guidelines are limited.

Future research also needs to focus on evidence-based pharmacological treatment of delirium in the ICU patient. Currently, there is a lack of randomized controlled trials (RCTs) that

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show a consistent way to treat delirium among ICU patients (Barr et al., 2013; Devlin & Skrobik, 2011). One small study found that quetiapine, an atypical antipsychotic, may reduce delirium in ICU patients but more studies need to occur to confirm whether this finding is generalizable to all ICU patients that experience delirium (Barr et al., 2013). Therefore, until more research is available evidence-based guidelines for the pharmacological treatment of delirium is extremely limited.

### **Conclusion**

Required routine delirium monitoring should occur per evidence-based practice guidelines. The incidence of delirium in this study was found to be low, at 9%, when compared to previous studies on delirium. No statistically significant conclusions could be drawn from this study. CAM-ICU positive patients received more sedative medications than CAM-negative patients in this study. This finding is consistent with previous studies that linked administration of sedative medications, specifically benzodiazepines, and the development of delirium (Pandharipande et al., 2006; Robinson et al., 2008). The next step beyond this study is to implement a set delirium protocol that will require routine delirium monitoring of patients, institute preventive measures, and limit the use of delirium exacerbating medications. Future studies will need to focus on prevention and treatment by non-pharmacological and pharmacological means, specifically for ICU patients. In conclusion, this single study may have found a low incidence of delirium among these specific ICU patients but many previous studies have determined that the incidence of delirium is much higher.

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Table 1.

### *Demographics of Sample*

<b>Demographics of Sample</b>	
	(n=76)
<b>Age, years mean</b>	53.2
<b>Sex</b>	
Male	43 (56.6%)
Female	33 (43.4%)
<b>Race</b>	
Caucasian	60 (79%)
African American	12 (15.8%)
Other	4 (5.2%)
<b>Admitting Service</b>	
Trauma	46 (60.5%)
Medical ICU	12 (15.8%)
Neurosurgery	9 (11.8%)
Other	9 (11.8%)

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Table 2.

### *Adherence to Delirium Monitoring*

<b>Adherence to Delirium Monitoring</b>		
	<b>48 hours</b>	<b>96 hours</b>
	<b>(n=76)</b>	<b>(n=55)</b>
<b>Discharged from ICU prior to 48 or 96 hour evaluation</b>	21 (27.6%)	28 (51%)
	<b>(n=55)</b>	<b>(n=27)</b>
<b>Documented at 8am and 8pm</b>	32 (58.1%)	22 (81.4%)
<b>Documented only once</b>	16 (29.1%)	3 (11.1%)
<b>Not documented</b>	7 (12.7%)	2 (7.4%)

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Table 3.

### *CAM-ICU Results*

<b>CAM-ICU Results</b>		
	48 hours post admission (n=76)	96 hours post admission (n=55)
<b>Discharged prior to evaluation</b>	21 (27.6%)	28 (51%)
	(n=55)	(n=27)
<b>Negative</b>	36 (65.5%)	16 (59.2%)
<b>Positive</b>	5 (9%)	1 (3.7%)

*Note.* Two groups excluded from this table were: unable to assess (10.9% at 24-hours and 29.6% at 96-hours) and no documentation completed (14.5% at 24-hours and 7.4% at 96-hours).

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Table 4.

### *Breakdown of Medication Administered*

<b>Breakdown of Medications Administered</b>	
	<b>Total Subjects</b>
<b>Analgesics</b>	<b>(n=55)</b>
<b>Opioids</b>	
<b>Percocet 5/325mg</b>	11 (20%)
<b>Morphine</b>	
<b>Oral</b>	1 (1.8%)
<b>Intravenous</b>	20 (36.3%)
<b>Dilaudid</b>	20 (36.3%)
<b>Fentanyl</b>	
<b>Intravenous Push</b>	6 (10.9%)
<b>Continuous</b>	10 (18.2%)
<b>Norco</b>	18 (32.7%)
<b>Oxycodone</b>	13 (23.6%)
<b>Roxicet</b>	1 (1.8%)
<b>Sedatives</b>	
<b>Precedex Infusion</b>	1 (1.8%)
<b>Ativan</b>	
<b>Oral</b>	2 (3.6%)
<b>Intravenous</b>	2 (3.6%)
<b>Propofol Infusion</b>	3 (5.5%)
<b>Versed</b>	
<b>Intravenous Push</b>	6 (10.9%)
<b>Continuous</b>	5 (9%)
<b>Valium</b>	1 (1.8%)
<b>Antipsychotic</b>	
<b>Haldol</b>	1 (1.8%)
<b>No Analgesics or Sedative</b>	6 (10.9%)

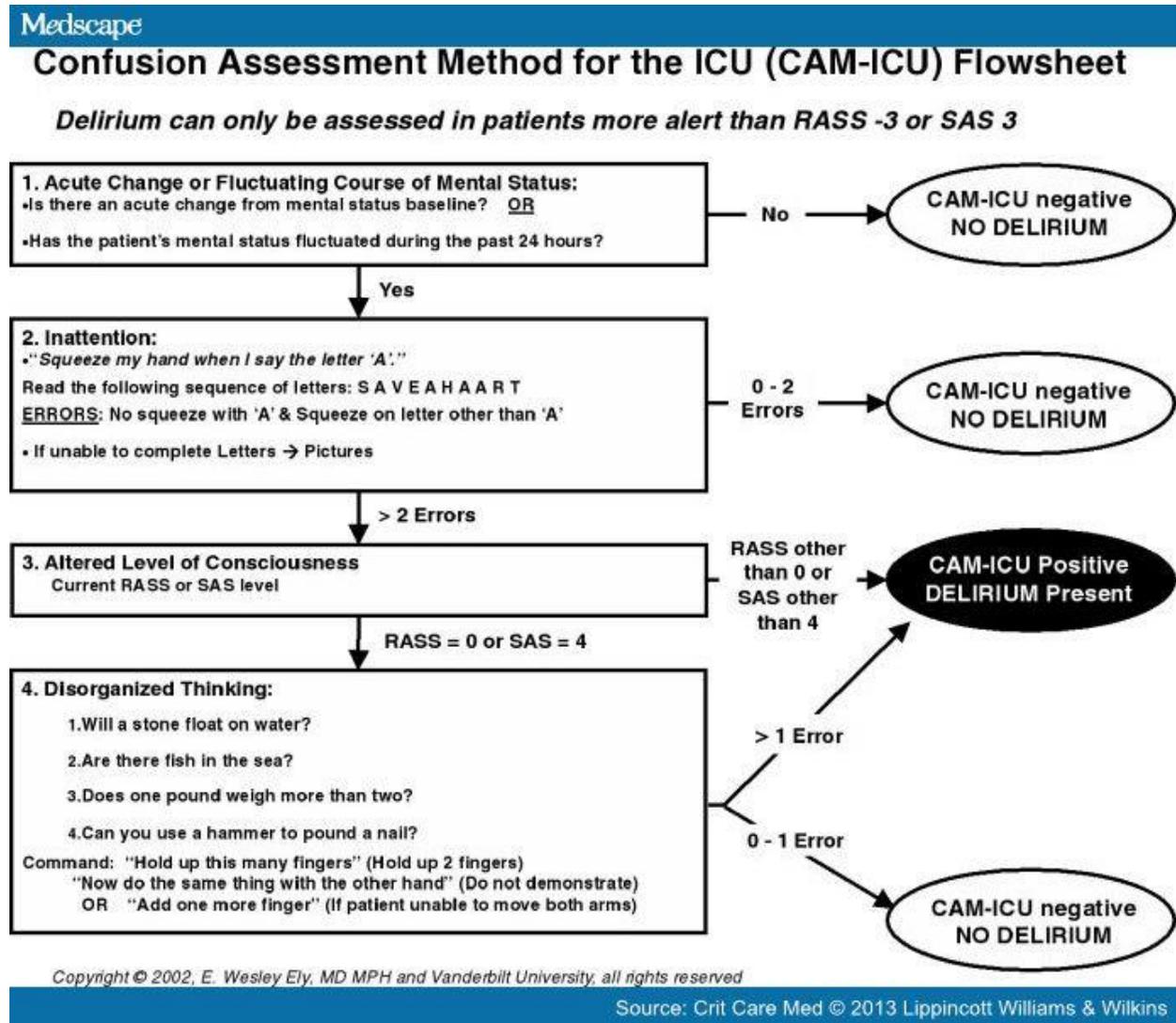


Figure 1. CAM-Assessment Flowsheet.

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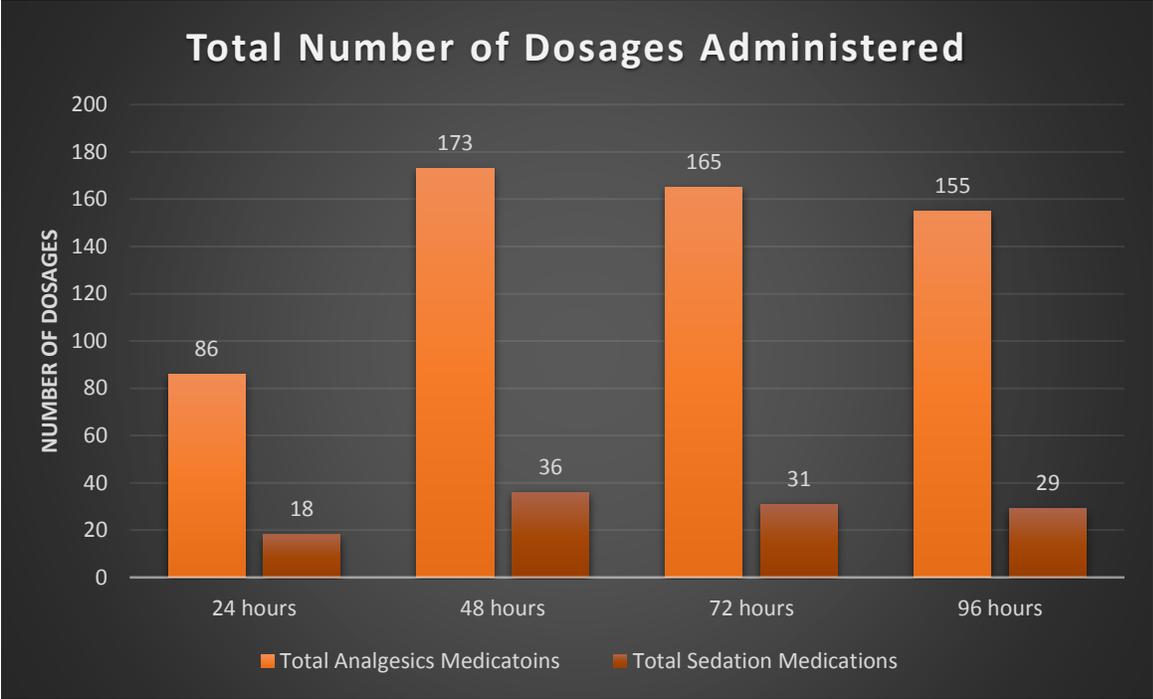
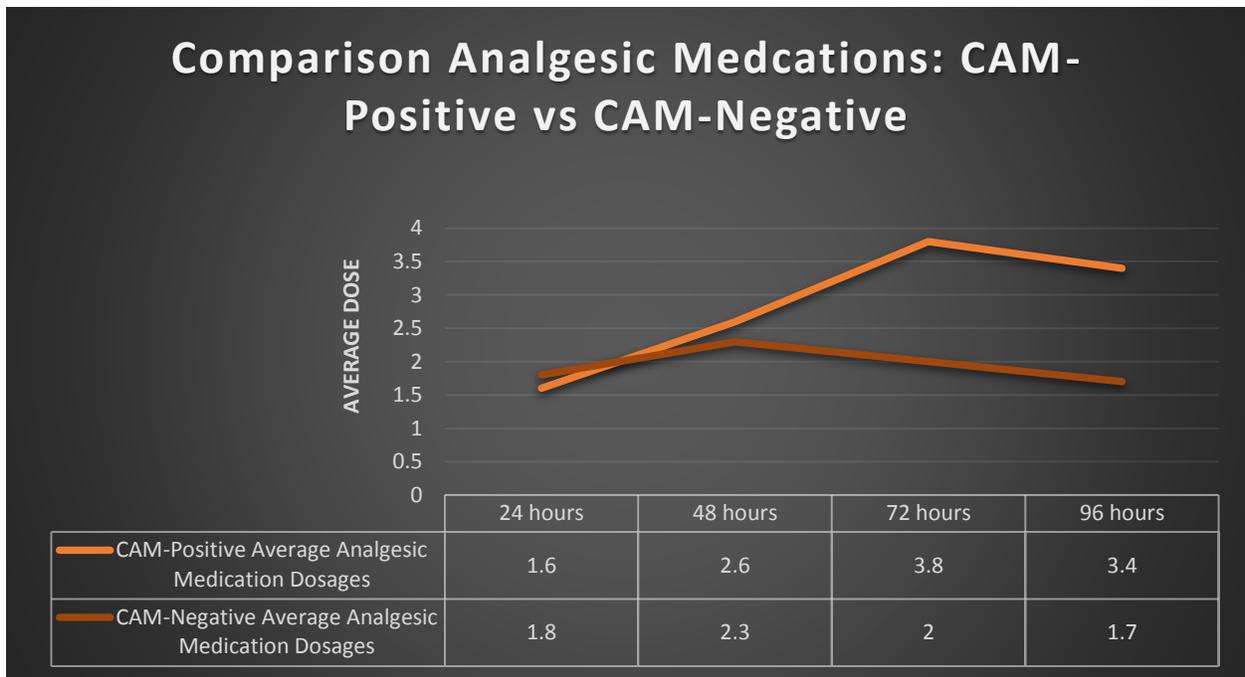


Figure 2. Total Number of Dosages Administered (n=49).



*Figure 3.* Comparison Analgesic Medications: CAM-Positive vs. CAM-Negative.

*Note.* SD  $\pm$  0.1(24hr), 0.2(48hr), 0.9(72hr), 0.9(96hr). CAM-negative patients n=39. CAM-positive patients n=5. CAM-positive defined as any patient that tested positive for delirium at any point during the 96-hour interval.

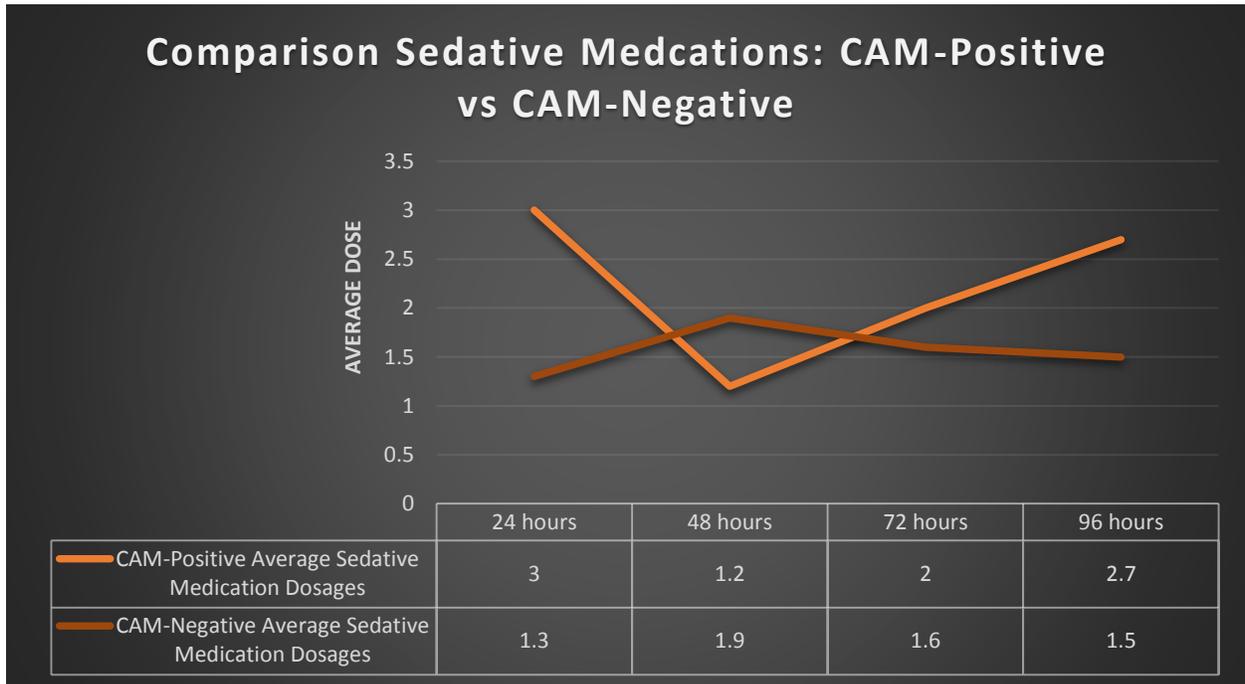


Figure 4. Comparison Sedative Medications: CAM-Positive vs. CAM-Negative.

Note. SD  $\pm$  0.9(24hr), 0.4(48hr), 0.2(72hr), 0.6(96hr). CAM-negative patients n=39. CAM-positive patients n=5. CAM-positive defined as any patient that tested positive for delirium at any point during the 96-hour interval.