7-6-2022

Eye Care Protocol in Critically Ill Pediatric Patients on Neuromuscular Blockage

Jinnie Tkach
University of Missouri-St. Louis, jastg6@umsystem.edu

Eye Care Protocol in Critically Ill Pediatric Patients on Neuromuscular Blockage

Jinnie A. Tkach

A.S.N., Jefferson College, 2015

B.S.N., Central Methodist University, 2017

A Dissertation Submitted to The Graduate School at the University of Missouri- St. Louis

in partial fulfillment of the requirements for the degree

Doctor of Nursing Practice with an emphasis in Pediatric Acute Care

August 2022

Advisory Committee

Elise Schaller, DNP, MHA, APRN, CPNP-PC Chairperson

Cathy Koetting, DNP, APRN, CPNP-PC, PMHS, FNP-C Committee Member

Emily Mallette, DNP, CPNP-AC Committee Member

Abstract

Problem: Patients admitted to the pediatric intensive care unit (PICU) are at increased risk for the development of ocular surface disease (OSD) due to impaired ocular mechanisms while intubated, sedated, and on continuous neuromuscular blockade. The purpose of this project is to prevent OSD and vision impairments by increasing the frequency of eye care in accordance with a PICU eye care protocol.

Methods: An observational descriptive study was conducted utilizing retrospective and prospective chart review. Comparisons were drawn between the 2021 pre intervention group and the 2022 post intervention group regarding the impact of linking lubricating eye ointment orders to neuromuscular blockade orders for PICU patients who are on continuous neuromuscular blockade.

Results: A total of 47 (N=47) patients met inclusion criteria, with 25 patients in the 2021 pre-group (n=25) and 22 patients in the 2022 post-group (n-22). Results yielded a significant positive correlation between the mean eye ointment application rate and eye ointment ordering. After the intervention was implemented, patients with artificial tear ointment orders increased by 40% and the mean application adherence rate increased by 72%.

Implications for Practice: The implementation of linking scheduled artificial tear ointment orders to neuromuscular blockade infusion orders in the EMAR yielded a clinically and statistically significant increase in provider eye ointment order rates and in eye ointment application rates.

Critically ill children admitted to intensive care units (ICUs) are an especially vulnerable population. Reliant on quality nursing care and close monitoring, developments in technology have led to the availability of more invasive monitoring devices, procedures, and treatment methods. Consequently, children in intensive care units are at much greater risk for development of hospital acquired conditions (HACs) (Montgomery et al., 2019). HACs are complications or conditions which develop during a hospital stay, were not present on admission, and preventable with hospital level process changes (The Centers for Medicare and Medicaid Services [CMS], 2020). CMS (2020) closely track HACs, as there is a HAC payment provision impacting payouts on these preventable conditions (CMS, 2021). There are 14 categories of HACs, including subcategories, closely monitored nationwide (CMS, 2020). Examples of HACs include foreign objects retained after surgery, blood incompatibility, catheter-associated urinary tract infections, surgical site infections, stage three and four pressure ulcers and falls (CMS, 2020).

Priority of nursing care for a critically ill child often centers on hemodynamic stability with a focus on the etiology of hemodynamic instability or the underlying diagnosis, as well as a universal consideration for HAC prevention. A HAC that is not nationally tracked by CMS, but greatly impacts pediatric intensive care unit (PICU) patients, is the development of ocular surface disease (OSD). Ocular surface disease encompasses various disorders impacting the cornea, conjunctiva, tear film, the eyelid, lacrimal glands, and meibomian glands (Craig et al., 2017). OSD can present as: 1) direct injury to the cornea, 2) exposure keratopathy, 3) chemosis, and 4) microbial conjunctivitis and keratitis (Hearne et al., 2018). Defense mechanisms of the eye, such as

eyelid closure, blink reflex, and tear production are inhibited when patients are mechanically ventilated, sedated, or on neuromuscular blockade (Kocaçal Güler et al., 2018). Ocular conditions tend to arise with development of lagophthalmos, or incomplete closure of the eyelid, and can then progress to exposure keratopathy, the leading cause of OSD in PICU populations (Kocaçal Güler et al., 2018; Kousha et al., 2018). While ocular diagnoses account for only a small percentage of admitting diagnoses in intensive care units, approximately 42% of patients in the intensive care unit will develop OSD due to impaired ocular protective mechanisms (Sayeed & Hossain, 2019).

The Joint Standards Committee of the Intensive Care Society (ICS) and Faculty of Intensive Care Medicine (FICM) recommend the utilization of an ICU eye care protocol for standardized assessment and intervention of OSD (Hearne et al., 2018). Protective measures and necessary components of eye care protocols include manual closure of eyelids and use of ocular lubricants for ICU patients (Hearne et al., 2018). In addition to these measures, education regarding development, identification, and prevention of OSD and the role of critical care nursing staff and providers caring for patients who are high risk for the development OSD can aid in the prevention of OSD. The routine application of ocular lubricants for intensive care patients with decreased defensive ocular mechanisms, an intervention in compliance with eye care protocols (Hearne et al., 2018), requires a provider order. In ICU settings, eye care protocol orders should be considered if the patient is intubated, sedated, or on neuromuscular blockade, as the risk for OSD increases in these instances (Hayakawa et al., 2020). Linked orders, or order sets, can act to prompt the provider to order other pertinent orders simultaneously, ensuring all necessary components of evidence-based clinical care is being followed appropriately

(GSK for US Healthcare Professionals, 2020). Order sets reduce errors and improve compliance with standards of care (Washburn et al., 2020). Linking orders for prophylactic ocular lubricants is a potential opportunity for increasing compliance with eye care protocol measures for critically ill patients at an increased risk for OSD.

The purpose of this quality improvement initiative is to prevent OSD and vision impairments in PICU patients on neuromuscular blockade. The aim of this project is to increase frequency of eye care with an eye care protocol in PICU patients on neuromuscular blockade by 10% in a three-month period. For the purpose of this project, "eye care" is defined as application of artificial tear ointment every four hours. The primary outcome of interest is number of artificial tear ointment administrations in PICU patients on neuromuscular blockade. The secondary outcome measure is the number of artificial tear ointment orders for PICU patients on neuromuscular blockade. The question of this quality improvement initiative is: What is the impact of linking scheduled artificial tear ointment orders to neuromuscular blockade infusion orders in the electronic medication administration record (EMAR) on administrations of artificial tear ointment in PICU patients?

Literature Review

A systematic literature review was conducted to explore the effect of order sets and the linkage of orders on PICU eye care protocol compliance. A search was performed using the English language through electronic databases: Summon, Nursing and Allied Health Literature (CINAHL), PubMed, and critical care medicine journals. The keywords *order set*, *compliance*, *eye care*, *PICU*, and *neuromuscular blockade* were utilized in the search as well as the Boolean operator AND. Results (n = 912) were refined to include

only peer reviewed journals**,** randomized controlled trials (RCT), research articles, systematic reviews, meta-analyses, and clinical guidelines published between the year 2016 to 2021. Studies prior to 2016 were excluded, except for one seminal 2015 reference. The refined search generated 33 results. After full review of the articles, an ancestry approach was taken and 9 were selected for final inclusion in this literature review.

Consensus in the literature indicates the need for all PICUs to have evidence-based eye care protocols in place for prevention and early identification of OSD. While a national or universally accepted eye care protocol is lacking, Boal and Corkin's 2019 leading-edge peer reviewed PICU eye care protocol for the mechanically ventilated child outlines essential protocol components as: 1) eye care every four hours, 2) application of eye lubricating ointment on a four hourly basis and 3) ongoing monitoring of eyelid closure (Boal & Corkin, 2019). A prospective cohort study done in a 2,300-bed tertiary care hospital was conducted to determine incidence and risk factors of OSD in critically ill patients. Investigators found within the first 24 hours of ICU admission, 16.3% of patients developed exposure keratopathy (Kuruvilla et al., 2015). It found the duration of ventilation and length of ICU stay were significantly associated with development of OSD. While the duration of sedation was not associated with development of ocular disease, use of neuromuscular blocking agents was significantly associated with development of OSD (Kuruvilla et al., 2015).

Similarly, investigators in a retrospective cohort study conducted within a 16-bed PICU at Royal Hospital for Sick Children aimed to assess the impact of a PICU eye care protocol. Components of the novel protocol, in this study, include application of eye

lubricating ointment every six hours, manual eyelid closure when necessary, and close eye monitoring (McCall et al., 2016). Investigators found use of an eye care protocol combined with an interdisciplinary team-based approach to eye care led to formal eye care being performed at a rate of 96%, improved from a rate of 19%, and a subsequent decrease in the incidence of OSD from 39% to 11% (McCall et al., 2016). A prospective cohort study in a tertiary care medical surgical PICU aimed to evaluate incidence of OSD in PICU patients and distinguish risk factors for development of OSD revealed implementation of a PICU based eye care protocol, with formal eye care completed at a minimum of every four hours, decreased incidence of OSD from 15% to 8.6% (Niemi et al., 2020).

Other investigators exploring the relationship between order sets and provider workload, clinical decision making, and efficiency, consistently revealed positive benefits of order set utilization. Order sets assist providers by serving as expert recommended guidelines (Policy Medical, 2016). A 2017 literature review found order sets enhance the process of care by improving provider performance (Jenders, 2017). Order sets offer considerable promise to influence decisions, change practice, and improve clinical care and patient outcomes (Jenders, 2017). A computational evaluational study published in 2018 examined the impact of order set utilization on provider workload found order sets were associated with reduction of provider prescribing time, increased efficiency, and led to a cognitive workload reduction for prescribing providers (Gartner et al., 2018). Workload was measured in the context of physical workload and in cognitive workload. Physical workload defined as increased mouse clicks and cognitive workload being

related to mental tasks used in the ordering of prescriptions. Order sets can support providers while ensuring the use of current best practice guidelines.

The last key theme identified in the review of literature explored the impact of order sets on protocol compliance in critical care settings. Gray and Hutchinson (2019) completed a retrospective study aiming to reduce time required to order 13 standard medications using an order set found a reduction of medication errors, reduction of time spent prescribing medications, and improved medication prescribing efficiency for providers. Prior to order set implementation, the average time to order 13 standard medications was 11.4 hours per patient. After the implementation of a population specific order set, the average time to prescribe the same medications was reduced to 2 hours per patient, a reduction of 9.4 hours per patient (Gray & Hutchinson, 2019). Electronic prescribing used to their fullest ability, along with help of a pharmacist, can lead to decreased prescribing times. Likewise, a retrospective chart review exploring the impact of order sets on adherence to protective lung protocols for acute respiratory distress syndrome (ARDS) found implementation of a protocol driven order set increased adherence to the ICU's ARDS protocol from 57% to 74% (Jonas et al., 2017).

While there was a gap in literature regarding the relationship specifically between PICU eye care protocol compliance and the use of order sets, the overall impact of eye care protocol compliance and the influence of order sets among various protocol compliance resulted in a large amount of subsequent scientific inquiry. Major themes identified include the importance of eye care mediated protocols within PICU settings, the impact of order sets on provider workload and clinical decision making, and the impact of order sets on adherence amongst various protocols and guidelines. Weaknesses

identified in the literature include single hospital-based studies, lack of control of outside variables, and limited number of eye care studies conducted in PICU settings. Additionally, there is a gap in literature regarding studies focused on PICU eye care protocol compliance and use of order sets, as well as the use of order sets for OSD prevention in PICU patients with neuromuscular blockade. The strengths in the literature include large sample sizes and the removal of interobserver variability in eye exam assessments.

In summary, OSD is an underrecognized HAC in PICU populations. Findings in literature emphasize the importance of a standardized PICU eye care protocol, the beneficial impact of order sets on providers, and improved protocol adherence resulting from order sets. Despite PICU patients being high risk for development of OSD and overwhelming literature supporting protocol driven preventative ocular care, proper eye care remains a heavily neglected area of critical care nursing.

This quality improvement project assesses the impact of linking lubricating eye ointment orders to neuromuscular blockade orders for PICU patients who are on continuous neuromuscular blockade, consistent with St. Louis Children's Hospital's PICU eye care protocol. The evidence-based framework chosen to provide a foundation, guide the project, and establish boundaries of the project is the PDSA methodology, otherwise known as the Plan-Do-Study-Act method. The PDSA cycle is a four-step cyclical process used for continuous process improvement (Christoff, 2018). This model allows for subsequent PDSA cycles to occur and allows for adjustments and continuous improvements to be made. This quality improvement study serves as phase two of an

existing PDSA cycle regarding the adoption of a PICU eye care protocol at St. Louis Children's Hospital.

Methods

Design

The study design is observational descriptive. A retrospective and prospective medical record review was conducted to evaluate compliance with PICU eye care protocol prior to, and post, implementation of a neuromuscular blockade order set that links ordering continuous neuromuscular blockade with a scheduled, every four hours, lubricating artificial tear ointment. Deidentified PICU patient data regarding eye care practices from January 15th, 2021, to April 15th, 2021, serves as the control group data for the study. Data collected from January 15th, 2022, to April 15th, 2022, was collected for analysis and comparison.

Setting

The project took place in a midwestern urban community hospital 40-bed pediatric medical-surgical ICU, inside a 402-bed pediatric hospital. The population within the city limits is reported to be 301,578, with 19.4% of the population reported as under the age of 18 years (US Census Bureau, 2020). The hospital setting, where this project took place, serves not only as a major pediatric hospital provider within the city, but for surrounding counties as well, with approximately 275,000 patient visits occurring annually (About St. Louis Children's Hospital, 2020).

Sample

A convenience sample from a pre and post intervention group were utilized. Inclusion criteria was as follows: patients admitted to the PICU, who are intubated (for a

minimum of 12 hours), mechanically ventilated, and on continuous neuromuscular blockade. Excluded patients include patients not admitted to the PICU, intubated for less than 12 hours, patients with preexisting ocular trauma, and patients meeting criteria for brain death.

Approval Process

Approval from the facility site, PICU management, and PICU Quality and Safety Specialist have been obtained. Furthermore, approval from the University of Missouri-St. Louis College of Nursing Doctoral Committee, the University of Missouri- St. Louis Graduate School, and the Institutional Review Board (IRB) from the University of Missouri-St. Louis were obtained. An exemption from human research through Washington University's IRB was acquired. The protection of the vulnerable population involved in the study is an ethical consideration for the project. Subjects in the study are minors and are critically ill, meeting two criterions for vulnerable populations. Patient risk was minimal as all information was deidentified. Beneficence includes the potential reduction of OSD.

Data Collection and Analysis

Data collection was conducted through a retrospective chart review. Baseline deidentified patient data came from the first PDSA cycle of this project and postulates three months of data collected prior to the implementation of an order set for the use of neuromuscular blockade agents. Data was also collected utilizing prospective chart review comprising of three months of data post order set implementation. Data was extracted utilizing reports generated from an electronic health record (EHR). All patient identifiers were removed. Data analysis methods included two independent *t-tests* to

assess for a statistically significant difference between the pre and post groups in provider eye ointment ordering rate and eye ointment application adherence rate. Pearson's Correlation Coefficient was conducted to examine correlation between number of eye ointment applications and neuromuscular blockade orders. A run chart was utilized to compare the number of eye ointment administrations and eye ointment orders placed pre and post intervention.

Procedures

The intervention of interest in this study is implementation of an order set linking an order for Cisatracurium and Vecuronium infusions to an order for eye lubricating artificial tear ointment, scheduled for every four hours, consistent with the PICU eye care protocol. The order set modification went live in the EHR on July 5th, 2021. Medical record review was conducted for a time frame of three months prior to implementation and three months post implementation. Data collection was completed utilizing data reports through a cloud based EHR software system used at the study site.

Results

A total of 47 (N=47) patients on neuromuscular blockade who met inclusion criteria were identified in the 2021 and 2022 groups. Of these, 25 patients were in the 2021 pre-group (n=25) and 22 patients were in the 2022 post-group (n-22). In the 2021 pre-group, 60% (n=15) had artificial tear ointment orders; while in the 2022 post-group, 100% (n=22) had artificial tear ointment orders. The result of Welch's independent samples *t*-test was significant based on an alpha value of .05, $t(24) = -4.00$, $p < .001$, signifying the artificial tear ointment order rate was significantly different between the pre-group and post-group. Correspondingly, the mean artificial tear ointment application rate increased

from 22% in the 2021 pre-group, to 94% in 2022 post-group. The difference between the two means was statistically significant based on Welch's independent samples *t*-test ($t(31.08) = -10.57$, $p < .001$). The results are presented in Appendix A , Table 1. Based on an alpha value of .5, Pearson's correlation coefficient observed a significant positive correlation between the mean eye ointment application rate and eye ointment ordering rate with a correlation of .67, indicating a large effect size ($p < .001$, 95.00% Cl = [.48, .81]). Pearson's correlation suggests that as eye ointment ordering rate increases, administration application adherence rate tends to increase.

Discussion

Linking continuous neuromuscular blockade infusion orders with an order for scheduled, every four-hour, artificial tear ointment was associated with clinically and statistically significant increases in artificial tear ointment order rate by providers and artificial tear ointment application rate by nursing. The linking of orders removes a key barrier of relying on providers, who are often managing emergent situations when ordering neuromuscular blockade infusions, to remember to order prophylactic eye ointment, and to order the appropriate frequency. When ordered with the correct scheduled frequency, as opposed to being ordered as needed, the order serves as a timed reminder for nursing staff to give the eye ointment at the intended frequency. This is crucial in a PICU setting as nursing care typically centers on other higher priority organ systems. Implications of increased adherence to a PICU based eye care protocol include minimizing the risk of OSD and vison impairments, as well as improved patient outcomes. This study implies that the utilization of linked order sets may lead to increased protocol adherence for both healthcare providers and nursing staff.

Strengths of the study include cost effectiveness of the intervention and homogeneity between groups. Study limitations include single unit study, two relatively small sample sizes, and various uncontrolled variables. Data was not controlled for variables such as length of stay, duration of intubation, or duration of neuromuscular blockade. Proposed solutions to sustain change include continued utilization of a PICU eye care protocol and identifying and addressing barriers to protocol adherence. Additionally, the use of an eye care protocol for all intubated patients, including those admitted to the neonatal intensive care unit and the cardiac intensive care unit, would be endorsed. Recommendations for further study of OSD in the PICU include conducting a future PDSA cycle with a larger sample size, as well as linking orders for pediatric mechanical ventilation with scheduled artificial tear ointment to increase eye care compliance for all PICU patients in which the eye care protocol applies to.

Conclusion

In summary, the eye is an organ vulnerable to injury and infection, with susceptibility being amplified in PICU patient populations due to impaired consciousness, sedation, neuromuscular blockade, ventilation, and incomplete eyelid closure. However, the routine application of artificial tear ointment for PICU patients with decreased defensive ocular mechanisms prevents HACs and decreases the risk of OSD (Hearne et al., 2018). The implementation of linking scheduled artificial tear ointment orders to neuromuscular blockade infusion orders in the EMAR yielded a clinically and statistically significant increase in provider eye ointment order rates and in eye ointment application rates. Results indicate that the linking of orders reduces ordering errors and serves as an opportunity for increasing compliance with eye care protocol measures for critically ill

patients at an increased risk for OSD. The next step to improve compliance with the PICU eye care protocol is continued changes to the EHR to include linked orders impacting a broader group of all intubated patients and continued PDSA cycles for continual development, as well as efforts to bring awareness regarding the need for standardized eye care in critical care settings.

References

About St. Louis Children's Hospital. (2020). Retrieved from https://www.stlouischildrens.org/about-us#:~:text=SLCH%20has%20402%20licensed%20beds,receives%20about%2015 0%2C000%20patient%20visits.

Boal, C., & Corkin, D. (2019). The importance of protocol-based eye care in the paediatric intensive care unit. *Nursing children and young people*, *31*(4), 23–27. doi:10.7748/ncyp.2019.e1196

Centers for Medicare and Medicaid Services. (2020). *Hospital-acquired conditions*. CMS. Retrieved from https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired_Conditions

Centers for Medicare and Medicaid Services. (2021, August 8). *Hospital acquired condition Reduction Program*. Centers for Medicare & Medicaid Services | CMS. Retrieved from https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/HAC/Hospital-Acquired-Conditions

Christoff, P. (2018). Running PDSA cycles. *Current Problems in Pediatric and Adolescent Health Care, 48*(8), 198.

Craig, J. P., Nelson, J. D., Azar, D. T., Belmonte, C., Bron, A. J., Chauhan, S. K., de Paiva, C. S., Gomes, J., Hammitt, K. M., Jones, L., Nichols, J. J., Nichols, K. K., Novack, G. D., Stapleton, F. J., Willcox, M., Wolffsohn, J. S., & Sullivan, D. A. (2017). TFOS DEWS II Report Executive Summary. *The ocular surface*, *15*(4), 802–812. doi:10.1016/j.jtos.2017.08.003

Gartner, D., Zhang, Y., & Padman, R. (2018). Cognitive workload reduction in hospital information systems. *Health Care Management Science, 21*(2), 224-243. doi:10.1007/s10729-017-9406-6

Gray, J., & Hutchinson, J. (2019). P006 How can electronic order sets reduce time taken to prescribe medications on admission to PICU? *Archives of Disease in Childhood, 104*, e2 - e2.

GSK for US Healthcare Professionals. (2020). *Creating SmartSets to include patient education in Epic EHR*. GSKPro for Healthcare Professionals. Retrieved from https://gskpro.com/content/dam/global/hcpportal/en_US/pdf/ehr-resources/epic-ehr-order-sets.pdf

Hayakawa, L. Y., Matsuda, L. M., Inoue, K. C., Oyamaguchi, E. K., & Ribeiro, E. (2020). Ocular surface injuries at an intensive care unit: a self-paired clinical trial. *Acta Paul Enferm, 33*, eAPE20180279. Doi: 10.37689/acta-ape/2020AO0279

Hearne, B. J., Hearne, E. G., Montgomery, H., & Lightman, S. L. (2018). Eye care in the intensive care unit. *Journal of the Intensive Care Society, 19*(4), 345-350. doi:10.1177/

Jenders R. A. (2017). Advances in clinical decision support: Highlights of practice and the literature 2015-2016. *Yearbook of Medical Informatics, 26*(1), 125–132. doi:10.15265/IY-2017-012

Jonas, E., Gold, J. A., & Nonas, S. A. (2017). A25 Critical care: How to get it done in the ICU- Tools and tricks of implementation in critical: Utilization of ehr based order-set to improve adherence to lung protective ventilation. *American Journal*

of Respiratory and Critical Care Medicine, Volume 195, A1163-A1163 doi:10.1164

Kocaçal Güler, E., Eşer, İ., & Eğrilmez, S. (2018). Nurses can play an active role in the early diagnosis of exposure keratopathy in intensive care patients. *Japan Journal of Nursing Science*, *15*(1), 31–38. doi: 10.1111/jjns.12165

Kousha, O., Kousha, Z., & Paddle, J. (2018). Exposure keratopathy: Incidence, risk factors and impact of protocolised care on exposure keratopathy in critically ill adults. *Journal of Critical Care, 44,* 413-418. doi:10.1016/j.jcrc.2017.11.031

Kuruvilla, S., Peter, J., David, S., Premkumar, P. S., Ramakrishna, K., Thomas, L., Vedakumar, M., & Peter, J. V. (2015). Incidence and risk factor evaluation of exposure keratopathy in critically ill patients: a cohort study. *Journal of Critical Care*, *30*(2), 400–404. doi:10.1016/j.jcrc.2014.10.009

McCall, K., Hussin, H. M., Gregory, M. E., Dutton, G., & Richardson, J. (2016). A bundle improves eye care in PICU. *Archives of Disease in Childhood*, 101(9), 832–835. doi:10.1136/archdischild-2015-310410

Montgomery, V. L., Tryon, C. R., & Owen, E. B. (2019). Improving safety in health care: Beyond standard hospital-acquired conditions. Current Treatment Options in Pediatrics, 5(2), 183-196. doi:10.1007/s40746-019-00161-8

Niemi, A., Geddie, B. E., Rajasekaran, S., Davis, A. T., VanDenBosch, N., Steenland, C., & Winters, J. W. (2020). Ocular Surface Disease in a PICU: Incidence and Outcomes With a Dynamic Eye Care Protocol. *Pediatric Critical Care Medicine: A Journal of the Society of Critical Care Medicine and the World Federation of*

Pediatric Intensive and Critical Care Societies, *21*(4), 357–362. doi:10.1097/PCC.0000000000002200

Policy Medical. (2016, December). *Best practices in clinical order set management for hospitals*. Policy Medical. Retrieved from https://www.policymedical.com/best-practices-clinical-order-set-management-hospitals/

Sayeed, A., & Hossain, M. F. (2019). Eye care in ICU : What an ICU doctor needs to know. *Bangladesh Critical Care Journal*, *7*(1), 1–2. doi:10.3329/bccj.v7i1.40757

U.S. Census Bureau QuickFacts: St. Louis city, Missouri; St. Louis County, Missouri. (2020). Census Bureau QuickFacts. Retrieved from https://www.census.gov/quickfacts/fact/table/stlouiscitymissouri,stlouiscountymissouri/PST045219

Washburn, N., Muniga, E., & Walroth, T. (2020). 1324: The impact of critical care order set changes on prescribing and clinical outcomes. *Critical Care Medicine*, *48*(1 Suppl 1), 639-639. doi:10.1097/01.ccm.0000645212.63423.d0

Appendix A

Table 1

Two-Tailed Independent Samples t-Test for Eye Ointment Order Rate and Administration Adherence Rate by Pre and Post Group

	Pre Group		Post Group				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Eye Ointment Order Rate[1]	0.6	0.5	1	0	-4	< .001	1.13
Administration Adherance Rate[2]	0.22	0.31	0.94	0.12	-10.57	< .001	3.01

[1] *Note.* N = 47. Degrees of Freedom for the *t*-statistic = 24. *d* represents Cohen's *d.*

[2] Note. N = 47. Degrees of Freedom for the t-statistic = 31.08. d represents Cohen's d.