Reducing Corneal Abrasions During Surgery Through Utilization of Bio-Occlusive Dressings:

A Quality Improvement Project

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Author Note

This paper is based on data from the DNP Project completed as partial fulfilment of the Doctor of Nursing Practice degree with the guidance and supervision of the following:

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Abstract

The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, leading to an increase in patient discomfort, length of stay and health care cost collectively. A review of the literature revealed conflicting recommendations regarding the optimum medium by which to protect the eye, but current consensus guidelines suggest the use of a bio-occlusive dressing applied prior to laryngoscopy may substantially reduce the occurrence of this preventable eye injury. A pre-implementation chart review was performed to determine current practice regarding the use of bio-occlusive dressings and the incidence of corneal abrasions during surgery. Following an educational module, monthly chart reviews were performed to measure bio-occlusive compliance documentation and the incidence of corneal abrasion in the surgical population. Lewin's 3-Step Model of unfreezing, moving, and refreezing was used as the theoretical framework to translate evidence into practice. Results indicated perioperative use of bio-occlusive dressings significantly reduced perioperative corneal abrasions from 1.79 (20 of 11,173 cases) pre-implementation to 0.78 (1 of 1,276 cases) post-implementation. Compliance rates on use of the bio-occlusive dressing during general anesthetic cases had increased from 19 percent prior to the addition of the checkbox within the electronic health record to 95 percent after the addition of the checkbox. The purpose of this project was to increase compliance on use of bio-occlusive dressings through an educational intervention to reduce the incidence of corneal abrasions during a three-month implementation period.

Keywords: corneal abrasion, surgery, general anesthesia, education, bio-occlusive dressing

Chapter One: Introduction and Overview of the Problem of Interest

Introduction

The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, leading to an increase in patient discomfort, length of stay and health care cost collectively, as stated by Lichter, Marr, Schilling, Hudson, Boretsky, Barad, and Chelly (2015) and O'Driscoll and White (2017). The average cost of a corneal abrasion can be as high as twenty-five thousand dollars with a median payment of three thousand dollars, as stated by Morris, Bonnano, and Bennet (2018). Corneal abrasions are the most common ophthalmologic complication that occurs during general anesthesia for non-ocular surgery (Grixti, Sadri, & Watts, 2013), as well as the most common ocular injury during robotic surgery (Maerz, Beck, Sim, & Gainsburg, 2017). Untold events during the operative period have been the subject of much research, and the search for best practices since the publication of the Institute of Medicines (IOM) "To Err is Human" was published in 1999 (IOM, 1999). Despite several published articles in the literature, until recently, the recommendations have been inconsistent in terms of the best method for protecting the cornea during surgery.

Background and Significance

There are a variety of techniques that can be utilized to protect the eyes during general anesthesia but achieving the most effective method can be challenging. Anesthesia is provided by anesthesiologists, CRNAs and SRNAs who employ varying eye taping techniques. This inconsistency has led to an increase in the number of corneal abrasions during all types of general anesthetic surgery. The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, while the incidence of

corneal abrasions at a local community hospital in fiscal year 2019 was 1.79 (20/11,173). The high incidence of 1.79 per 1,000 cases is of great concern to the organization, suggesting the need for standardized care through a quality improvement project. Maerz et al., (2017) states that reduction of the total volume of fluids perioperatively to two liters and utilization of a bio-occlusive dressing to protect the eyes would decrease the incidence of corneal abrasions. Anesthesia itself also poses a direct threat to the cornea, as it decreases the production and stability of tears, abolishes the normal blink reflex, and abolishes the normal Bell's phenomenon that innately protects the cornea during sleep (Ely, Goerlitz-Jessen, Scott, Lehman, Ali, Kerchner, & Liang, 2019). During normal sleep, the orbicularis muscle keeps the eyelid closed, however during general anesthesia, contraction of this muscle is prevented and can lead to involuntary eyelid opening.

Anesthesia providers have difficulty utilizing consistent technique for eye protection when current standard practice guidelines are vague. The American Association of Nurse Anesthetists (AANA, 2016) states that placement of unspecified tape for eye protection and assurance that the eyelids are closed prior to laryngoscopy are the only ambiguous guidelines provided. The lack of clear practice recommendations regarding eye protection during surgery has led to the publication of more recent clinical guidelines which suggests the use of bio-occlusive dressings will decrease the incidence of corneal abrasions (Maerz et al., 2017). The community hospital in which this DNP project will ensue has many per diem and locum staff members, which has led to the inconsistency on eye protection procedures amongst anesthesia providers. Anesthesia providers are of the belief that their eye protection techniques adhere to best practice and patient safety, but the increased incidence of corneal abrasions indicates that may not be entirely accurate.

The implementation of an evidence-based practice guideline with the use of a bio-occlusive dressing will in fact decrease the number of corneal abrasions in clinical practice, as stated by Drzymalski, Ward, Hernandez, Hoot, Au, Yang, and Azocar, R, (2020). Ely et al., (2019) states the implementation of an educational intervention that focuses on corneal injury awareness, understanding of risk factors, and presentation of an algorithm designed to prevent perioperative corneal injuries statistically reduced the incidence of perioperative corneal injury from 0.37 percent (36 of 9,745 cases) pre-initiative to 0.19 percent (19 of 9,991 cases) post-initiative (p¼0.012). The utilization of a quality improvement project will ensure all anesthesia providers have consistent education, knowledge, and understanding to decrease corneal abrasion incidence.

System and Population Impact

Ely et al., (2019) states that risk factors for perioperative corneal injury include prone and lateral positioning, head and neck surgery, surgery greater than 90 minutes, early practitioner training level, presence of diabetes mellitus, thyroid disease, or obesity, intraoperative sustained hypotension, and anemia. Patients with diabetes mellitus or obesity, as well as anesthesia providers who are per diem or locum were shown to have increased occurrences of corneal abrasions. The pre-implementation chart review revealed approximately 77 percent of patients undergoing general surgery were obese. The specified clinical site employs approximately 13 per diem staff members and has an average of three SRNAs present at any given time.

Corneal abrasions affect health systems collectively by leading to a decrease in patient satisfaction, while increasing costs and hospital length of stay, as stated by Lichter et al., (2015). Palte (2018) states that postoperative eye complaints remain a source of patient distress and contribute to lower patient satisfaction scores. Segal et al., (2014) states that discharge from the

hospital can be delayed as the patient waits for an ophthalmology consultation before diagnosis can be made and treatment initiated. Furthermore, Hofer, Evans, and Warner, (2019) states postoperatively, patients suffering a perioperative ocular injury had a longer hospital stay (median, 7.2 d *vs* 2.4 d; $P < 0.001$) and were more likely to require admission to the intensive care unit. Definitive diagnosis is confirmed with a cobalt-blue filtered light with the application of fluorescein (Palte, 2018). Increased costs come at a price for both the patient and employer. The average cost of a corneal abrasion can be as high as twenty-five thousand dollars with a median payment of three thousand dollars, as stated by Morris, Bonnano, and Bennet (2018). As previously stated, the local community hospital in which this DNP project ensued, had a total of 20 corneal abrasions in fiscal year 2019.

This project site had implemented the use of a bio-occlusive dressing within the previous months, but compliance had been lacking. The use of an online educational intervention with cognitive aids within the operating room will impact anesthesia providers in a positive way to increase compliance and knowledge, while decreasing the incidence of corneal abrasions during general anesthesia surgery. Barriers that may be encountered include anesthesia staff members that believe taping of the eyes is sufficient or those who resist practice change. This educational intervention will positively impact anesthesia providers by increasing knowledge and awareness on bio-occlusive dressings, which will lead to a reduction in corneal abrasions. Furthermore, hospital length of stay and overall costs will decrease, which in turn will lead to an increase in patient satisfaction scores.

PICO Question Guiding Inquiry

The increased incidence of corneal abrasions during all surgical procedures is a significant concern to this local community hospital. The implementation of an educational

quality improvement project on the increased use of bio-occlusive eye protective dressings and the reduction of corneal abrasions amongst surgical patients is the focus of this DNP project. Education was provided to all anesthesia providers, including anesthesiologists, CRNAs, and SRNAs. The PICO question is as follows: “Amongst anesthesia providers, does the implementation of an education and corneal abrasion prevention intervention employing bio-occlusive dressings in surgical procedures, as compared to current practice, demonstrate an increase compliance of bio-occlusive dressing utilization and a reduction in corneal abrasion incidence during surgery?”

The DNP project approach consisted of cognitive aids and a voiceover PowerPoint presentation regarding risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, and patient related risk factors regarding all surgical procedures. As previously mentioned, Ely et al., (2019) states that risk factors for perioperative corneal injury include prone and lateral positioning, head and neck surgery, surgery greater than 90 minutes, early practitioner training level, presence of diabetes mellitus, thyroid disease, or obesity, intraoperative sustained hypotension, and anemia. Patients with diabetes mellitus or obesity, as well as anesthesia providers who are per diem or locum were shown to have increased occurrences of corneal abrasions. The pre-implementation chart review revealed approximately 77 percent of patients undergoing general surgery were obese. The specified clinical site employs eight per diem staff members and has an average of three SRNAs present at any given time. In addition, according to Maerz, et al., (2017), bio-occlusive dressings applied to the eyes prior to laryngoscopy has shown to reduce the incidence of corneal abrasions.

Cognitive aids were utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The cognitive aid has addressed specifics regarding the use of bio-

occlusive dressings, such as “Did you use the bio-occlusive dressing prior to laryngoscopy?”, “Did you chart that the eyes have been taped in the positioning flowsheet?”, “Did you state the use of the bio-occlusive dressing in the comments section?” The cognitive aid was laminated and placed on the anesthesia machine for the provider to view during surgery.

After a three-month implementation period, data collection through post-implementation monthly chart reviews were obtained to assess increased use of bio-occlusive dressings amongst anesthesia providers as evidenced by documentation of bio-occlusive dressing use in the comments section of the positioning flowsheet within the anesthesia patient record. Data collection related to the incidence of corneal abrasion amongst surgical patients was assessed following the educational intervention from the monthly quality report.

Organizational “Gap” Analysis of Project Site

Current standard practice guidelines related to perioperative eye protection states that taping of the eyes is crucial prior to laryngoscopy (AANA, 2016). Evidence-based literature has shown that the use of a bio-occlusive dressing has led to a reduction in corneal abrasions (Drzymalski, et al., 2020). The clinical site in which the DNP project was pursued had shown a lack in compliance with the use of a bio-occlusive eye protective dressing. A needs assessment had been performed and anesthesia providers have attributed this to the lack of knowledge related to use of bio-occlusive dressings during surgery. Many anesthesiologists and CRNAs have emphasized the need for additional education related to bio-occlusive dressings. The implementation of an online educational voiceover PowerPoint related to corneal injury awareness and protection was provided to close this organizational “gap”.

Purpose and Objectives

The goal of this DNP project was to increase the compliance rates on use of bio-occlusive eye protective dressings during general anesthetic cases, which in turn, would lead to a reduction in corneal abrasions. The goal was achieved by implementing a quality improvement online educational intervention with the inclusion of cognitive aids within the operating rooms. The DNP student offered quality improvement education amongst anesthesia providers over a three-month implementation period, which ended March 17th, 2022. The use of the bio-occlusive dressing was measured by compliance with documentation in the positioning flowsheet within the anesthesia patient record by the following three items: checking the box that eyes were taped; stating the use of a bio-occlusive dressing; and that the dressing was applied prior to laryngoscopy. The total number of corneal abrasions pre-implementation was compared to the total number of corneal abrasions post-implementation time frame.

The overarching goal of this DNP project was to achieve a clinically significant (p-value < 0.05), increase n documentation and compliance with use of the bio-occlusive dressing, as well as a cumulative risk difference in the incidence of corneal abrasions. The use of bio-occlusive dressings was measured by reviewing documentation in the electronic health record verifying that anesthesia providers documented the use of eye protection in the comments section. A second goal would be that 75 percent of anesthesia providers would document the use of a bio-occlusive dressing prior to laryngoscopy. Lastly, the incidence of corneal abrasion post intervention was assessed through monthly quality reports and documented as an exact number. Given the pre-implementation incidence of corneal abrasions at 1.79, it is crucial that anesthesia providers receive consistent education to reduce this preventable complication. The purpose of this DNP project was to effect change in current anesthesia practice; the education to providers

regarding the use of a bio-occlusive dressing to prevent corneal abrasions during surgery was therefore imperative.

Chapter Two: Review of the Evidence/Literature

Search Methodology

The literature search was performed using the keywords *corneal abrasion; surgery; general anesthesia; education; bio-occlusive dressing.* Multiple databases, including CINAHL, ScienceDirect, Google Scholar, Wiley Online Library, PubMed, and Springer Link, were utilized to gather data to support this project. A total of 457 results populated from Google Scholar and a total of 204 results populated from the remaining search engines. Fifty-five abstracts were reviewed from the accessed databases. Twenty-two articles met inclusion criteria which included "surgical procedures", "education", and/or use of "bio-occlusive dressings". The remaining 33 articles were excluded because they did not address specific eye protection interventions, surgical procedures, or the incidence of corneal abrasions.

Findings

Drzymalski, et al., (2020) and Grixti, Sadri, and Watts, (2013) demonstrate the utilization of a bio-occlusive dressing reduced the incidence of corneal abrasions. Grixti et al., (2013) further evaluated the use of a bio-occlusive dressing during robotic surgery demonstrating a reduction in the incidence of corneal injury in this patient population. The systematic review presented by Kepekci and Kepekci (2020) found that patients with increased risk of corneal pathology from diabetes mellitus, protection with eyelid banding or lubricating ointment may not be optimal. In such cases, the use of bio-occlusive dressings should be considered. Collectively, this literature formed the foundation upon which this DNP project was undertaken.

Research demonstrates the use of bio-occlusive dressings leads to decreased incidence of corneal abrasions. An educational intervention on risk factors related to corneal abrasions, corneal abrasion awareness, and application and removal process of a bio-occlusive dressing

would determine if anesthesia providers were more compliant with the use of a bio-occlusive dressing following this education. Martin, Weingarten, Gunn, Lee, Mahr, Schroeder, and Sprung, (2009) evaluated corneal injury and provided education to anesthesia providers to decrease corneal abrasion incidence. Corneal injuries were assessed at baseline, during education, and as a follow up. During the baseline period, the rate of corneal injury was 1.51 (95 percent CI 1.1 to 2.1) per 1,000 surgeries; during the 10-month education period the rate of corneal injury was 0.79 (95 percent CI 0.6 to 1.1) per 1,000 surgeries; and during the follow-up period an observed injury rate of 0.47 per 1,000 anesthetics, which was significantly lower than the rate observed during the education phase (P=0.018). Furthermore, Martin et al., (2009) states that increased anesthesia provider awareness regarding perioperative corneal injury coupled with educational initiative was associated with substantial reduction of corneal injury rates.

O'Driscoll and White (2017) states that perioperative corneal injuries can be reduced by implementing a performance improvement initiative which consists of a lecture to all anesthesia providers on the causes and prevention of perioperative corneal injuries. Furthermore, emphasis was employed by fully closing the eyes with occlusive dressing immediately after induction of anesthesia, before airway management, which led to the reduction in corneal injuries from 0.15 percent to 0.079 percent. The use of a bio-occlusive dressing had led to advantages which include protection of the eye from exposure keratopathy, chemical injury, or trauma, and has been reported as the most effective method of preventing corneal abrasions for patients who are mechanically ventilated (O'Driscoll & White, 2017). A pre-implementation chart review was performed to determine baseline compliance with bio-occlusive dressing application. Results in documentation revealed that anesthesia providers check the box that the eyes have been taped

prior to laryngoscopy, but there is no indication on use of a bio-occlusive dressing, which demonstrates current practice at the clinical site.

Data collection has occurred from nine operating rooms, in which approximately 1,200 surgical procedures took place during the three-month implementation period. The participants for this project consisted of all anesthesia providers, including anesthesiologists, CRNAs, and SRNAs, that have direct patient impact in proper eye closure prior to laryngoscopy. All anesthesia providers for the nine operating rooms were encouraged to use and document the application of the bio-occlusive eye dressing to reduce the incidence of corneal abrasions.

Education and training can improve evidence-based practice (EBP) skills and knowledge among nursing staff, thereby facilitating clinical implementation, as stated by Hsieh and Chen (2020). The discussions evaluated by Ely et al., (2019) and Maerz et al., (2017) revealed that the utilization of education on preventative measures and corneal abrasion risk factors led to the reduction in corneal abrasion incidence. Ely et al. (2019) further states that following the quality improvement initiative the incidence of perioperative corneal injury decreased from 0.37 percent (36 of 9,745 cases) pre-initiative to 0.19 percent (19 of 9,991 cases) post-initiative (p¼ 0.012). The use of cognitive aids, a PowerPoint presentation, application process of the bio-occlusive dressing, and risk factors related to corneal abrasions were discussed to increase compliance amongst anesthesia providers.

Limitations

There are several limitations present within the literature and the confines of this DNP project. Patient populations differed between studies, with some investigating the use of bio-occlusive dressing during general surgery, while others investigated the use during robotic surgery. The total number of surgical procedures performed at the given clinical site within the

three-month implementation period were far less than the total number of surgical procedures performed within the literature. The given time frame within the literature was performed over several months to a year, as compared to three months for the implementation period of this DNP project.

Conclusions

In conclusion, corneal abrasions are the most common ophthalmologic complication that occurs during general anesthesia for non-ocular surgery (Grixti, Sadri, & Watts, 2013), as well as the most common ocular injury during robotic surgery (Maerz et al., 2017). Education was provided to all anesthesia providers, including anesthesiologists, CRNAs, and SRNAs, since these providers have direct patient impact on bio-occlusive dressing application process during all surgical procedures. Martin et al (2009) states that increased anesthesia provider awareness regarding perioperative corneal injury coupled with educational initiative was associated with substantial reduction of corneal injury rates. Despite several published articles in the literature, until recently, the recommendations have been inconsistent in terms of the best method for protecting the cornea during surgery. With the implementation of this DNP project, anesthesia providers gained knowledge and increased compliance through evidence-based literature for the use of bio-occlusive eye protective dressings during surgical procedures to reduce corneal abrasions.

Chapter Three: Organizational Framework or Theory

Conceptual Definition of Theory

The use of conceptual and theoretical frameworks provides a foundation from which generalizable implementation knowledge can be advanced (Moullin et al., 2020). The guiding theoretical framework used throughout this DNP project was the Lewin's Change Theory. Hussain et al., (2018) states that theories of change describe the effectiveness in which organizations can modify their strategies, processes, and structures using Lewin's change model. Kurt Lewin incorporated his Field Theory, Group Dynamics, and Action Research into a three-step model to facilitate change within an organization (Burnes, 2019). Manchester et al., (2014) further mentions that the Lewin model provides sequential anchors for discussing inevitable contextual changes with project stakeholders in advance of implementation, which is beyond the more linear effects of typical logic models.

Lewin's Change Theory is comprised of three stages: unfreezing, moving, and refreezing (Manchester et al., 2014). The first stage is unfreezing which is the ability to recognize the disequilibrium of procedures or behaviors within the organization. The driving forces to create equilibrium can be done through education or by creating problem awareness, as stated by Manchester et al., (2014).

Moving is the second stage of the Lewin's model. This stage seeks alternatives, demonstrates benefits of change, and decreases the forces that affect change negatively (Manchester et al., 2014). The change process can involve employee resistance and the willingness to change, which are two important factors to consider during the moving stage.

Furthermore, Manchester et al., (2014) states that this stage can encourage people to perform the proposed change, with attitudes more favorable towards the change while resistance decreases.

The third stage is refreezing which is the ability to integrate and stabilize a new equilibrium into the system as it becomes habit and resists further change, according to Wojciechowski et al., (2016). Reinforcing the change is crucial to the sustainability of the proposed implementation over time. Manchester et al., (2014) states that if the change is not adopted as the organization's new normal, it can revert to the status quo found at the beginning of the project. Utilizing the Lewin's Change Theory is therefore imperative to ensure the project's success.

Relationship of Theory to Scholarly Project

Lewin's Change Theory was utilized as a guide throughout this DNP Project. Unfreezing is the first stage of the Lewin's Change Theory, according to Nursing Theory (2020). The core concept involved a needs assessment by communicating with anesthesia providers on establishing a new method to reduce the incidence of corneal abrasions with the use of a bio-occlusive dressing for eye protection. Demonstration of the continued concern of corneal abrasions and analyzing patterns to change was the foundation to implementation.

Change, or "moving", is the second stage which involved implementation and stakeholder engagement, according to Wojciechowski et al., (2016). The implementation of the educational module was delivered amongst anesthesia providers through cognitive aids within the operating room and a voiceover PowerPoint presentation. The online educational intervention allowed anesthesia providers to gain knowledge and willingness to adopt change for better patient outcomes regarding the use of bio-occlusive dressings. An additional cognitive aid was

utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The cognitive aid addressed specifics regarding the use of bio-occlusive dressings, such as “Did you use the bio-occlusive dressing prior to laryngoscopy?”, “Did you chart that the eyes have been taped in the positioning flowsheet?”, “Did you state the use of the bio-occlusive dressing in the comments section?” The cognitive aid was placed on the anesthesia machine for the provider to view during surgery. The efficacy of the educational intervention was measured by increased compliance on the use of a bio-occlusive dressing during all surgical procedures. The incidence of corneal abrasion post-implementation was accessed through the monthly quality report and documented as an exact number. The total number of corneal abrasions was compared to the total number of surgical cases pre-implementation, followed by the total number of corneal abrasions to the total number of surgical cases post-implementation.

The final stage of the Lewin’s Change Theory involves refreezing or sustaining the change. Re-education, evaluation, communication, and monitoring are key concepts to the refreezing stage, as stated by Wojciechowski et al., (2016). The education was sent via email allowing the anesthesia providers to view at any given time. Posters containing pertinent information from the education, as well as the cognitive aids displayed on the nine anesthesia machines was also available for everyday use. The goal of this educational module was to break the habits developed by providers and enhance their knowledge on this evidence-based practice. Refreezing these changes have allowed for sustainability on the use of a bio-occlusive dressing during surgical procedures to reduce corneal abrasions.

Chapter Four: Project Design

Institutional Review Board (IRB) Approval

IRB approval was obtained from Cedar Crest College (Appendix A) on November 8th, 2021, and approval from St. Luke's Allentown (Appendix B) was obtained on December 13th, 2021. A written letter of support from the anesthesia department was also acquired (Appendix C). Additionally, informed consent (Appendix D) and a research description supplement (Appendix E) were approved by the IRB committee and was distributed to participants prior to viewing the educational PowerPoint. There were no anticipated risks during the participation of this DNP project. The participants would not receive extra credit or monetary incentives for viewing the educational module. The intent of the education was to increase knowledge and awareness of corneal abrasion incidence.

Implementation Plan

A literature search identified the use of bio-occlusive eye protective dressing prior to laryngoscopy has led to a reduction in corneal abrasion incidence. The key stakeholders at the local community hospital gave their support quickly for this DNP project. Current standard practice guidelines related to perioperative eye protection states that taping of the eyes is crucial prior to laryngoscopy (AANA, 2016). Evidence-based literature has shown that the use of a bio-occlusive dressing has led to a reduction in corneal abrasions (Drzymalski, et al., 2020). The clinical site in which the DNP project ensued was lacking in compliance with the use of a bio-occlusive eye protective dressing. A needs assessment had been performed and anesthesia providers have attributed this to the lack of knowledge related to use of bio-occlusive dressings

during surgery. Many anesthesiologists and CRNAs have emphasized the need for additional education related to use of bio-occlusive dressings.

The implementation of an online educational voiceover PowerPoint related to corneal injury awareness, risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, patient related risk factors regarding all surgical procedures, and the application process of the bio-occlusive dressing provided closure of this organizational "gap". An additional cognitive aid was utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The cognitive aid addressed specifics regarding the use of bio-occlusive dressings, such as "Did you use the bio-occlusive dressing prior to laryngoscopy?", "Did you chart that the eyes have been taped in the positioning flowsheet?", "Did you state the use of the bio-occlusive dressing in the comments section?"

Data Collection Tools

A pre-implementation chart review was obtained prior to the implementation of education to determine the use of the bio-occlusive dressing during surgical procedures to corneal abrasion incidence. Specific procedure and patient risks were evaluated during the preliminary chart review and found an increase incidence of corneal abrasions for those with diabetes mellitus, obesity, and providers who are per diem staff. Ely et al., (2019) states that risk factors for perioperative corneal injury include prone and lateral positioning, head and neck surgery, surgery greater than 90 minutes, early practitioner training level, presence of diabetes mellitus, thyroid disease, or obesity, intraoperative sustained hypotension, and anemia.

After a three-month implementation period, data collection through post-implementation monthly chart reviews were obtained to assess increased use of bio-occlusive dressings amongst

anesthesia providers as evidenced by documentation of bio-occlusive dressing use in the comments section of the positioning flowsheet in the anesthesia patient record. Data collection related to the incidence of corneal abrasion amongst surgical patients were assessed following the educational intervention from the monthly quality report.

Data collection was stored on an excel spreadsheet on the hospital computer. Patient health information was not utilized during the collection process and disposal of the excel spreadsheet occurred after data collection and analysis. The DNP student did not need permission to collect this data.

Resources Needed

The local community hospital had allotted the number of bio-occlusive dressings prior to the implementation of this DNP project. Creation of the educational module was accomplished using a laptop with internet access, Microsoft Office 365™, and Screencast-O-Matic™. The use of the hospital computer with Microsoft Excel™ was used for data collection, as well as Epic electronic health record to collect data. Lastly, the use of SPSS Statistics™ was utilized for data analysis once implementation was complete.

Budget Justification

A budget was employed to oversee the needed resources and cost to implement this DNP project. The projected clinical site had budgeted the use of bio-occlusive dressings prior to the implementation of this DNP project. The community hospital continued to stay within their allotted budget of bio-occlusive dressings for each patient undergoing surgery, even with the increased use of this product. The resources that were purchased to create and implement this project included a Windows 10 laptop with Microsoft Office 365™. Screencast-O-Matic™ was

utilized to create a voiceover PowerPoint presentation but was a free version. The use of SPSS Statistics™ for data analysis was also a free version. The timeline of the educational intervention was closely monitored to stay within the three-month implementation period. Since the education was provided online, the expected budget for the laminated cognitive aids will be less than 100 dollars. No monetary benefits were gained from the creation or participation in this project. Potential benefits included increased anesthesia provider knowledge and awareness of corneal abrasion and prevention strategies with the use of bio-occlusive dressings prior to laryngoscopy.

Chapter Five: Implementation Procedures and Processes

Implementation of this DNP project was accomplished by a Cedar Crest College doctoral student via an online educational module on the increased use of bio-occlusive eye protective dressing in relation to a reduction in corneal abrasion incidence during surgery. Topics within the educational voiceover PowerPoint included corneal injury awareness, risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, patient related risk factors regarding all surgical procedures, and the application process of the bio-occlusive dressing. Creation of the educational module was accomplished using a laptop with internet access, Microsoft Office 365™, and Screencast-O-Matic™.

An additional cognitive aid was utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The laminated cognitive aid placed on each anesthesia machine addressed specifics regarding the use of bio-occlusive dressings, such as “Did you use the bio-occlusive dressing prior to laryngoscopy?”, “Did you chart that the eyes have been taped in the positioning flowsheet?”, “Did you state the use of the bio-occlusive dressing in the comments section?” The cognitive aids remain in place prior to the distribution of education through the duration of the implementation of this DNP project until one year after completion. The DNP student utilized the hospital computer with Microsoft Excel™ for data collection, as well as the electronic health record to retrieve the documented data by the anesthesia providers. Monthly quality reports were obtained to record the exact number of corneal abrasions. Lastly, SPSS Statistics™ was used for data analysis once implementation was complete.

Inclusion criteria for participation consisted of anesthesia providers with direct patient contact which included anesthesiologists, CRNAs, and SRNAs from the local community hospital. Participants were recruited via personal email addresses and invited to complete the

educational module voluntarily and anonymously, as well as the right to withdraw from participation at any time. Informed consent, research description, and the educational voiceover PowerPoint was included in the email. The PowerPoint could be viewed multiple times if necessary and documentation on use of the bio-occlusive dressing was completed by the anesthesia provider for every patient undergoing general surgery. The implementation period ended March 17th, 2022.

A pre-implementation chart review was obtained prior to the implementation of education to determine the use of the bio-occlusive dressing during surgical procedures to corneal abrasion incidence. Specific procedure and patient risks were evaluated during the pre-implementation chart review and found an increase incidence of corneal abrasions for those with diabetes mellitus, obesity, and providers who are per diem staff. The pre-implementation chart review revealed approximately 77 percent of patients undergoing general surgery were obese. The specified clinical site employs 13 per diem staff members and has an average of three SRNAs present at any given time.

After a three-month implementation period, data collection through monthly post-implementation chart reviews were obtained by the DNP student to assess increased use of bio-occlusive dressings amongst anesthesia providers as evidenced by documentation of bio-occlusive dressing use in the comments section of the positioning flowsheet within the anesthesia patient record. Data collection related to the incidence of corneal abrasion amongst surgical patients was assessed following the educational intervention from the monthly quality report. The total number of corneal abrasions pre-implementation was compared to the total number of corneal abrasions during the post-implementation time frame. Data collection was stored on an excel spreadsheet on the hospital computer. Patient health information was not utilized during

the collection process and disposal of the excel spreadsheet occurred after completion of data collection and analysis. The DNP student did not need permission to collect this data.

SPSS Statistics™ was utilized for data analysis with an expected goal of post implementation chart review with a *p*-value less than 0.05, which would indicate an increase on the use of the bio-occlusive dressing, as well as a cumulative risk difference in corneal abrasions. The DNP student utilized a Chi square analysis in SPSS Statistics™ to interpret data collection. The excel spreadsheet had been deleted with completion of data collection and analysis.

Chapter Six: Evaluation and Outcomes

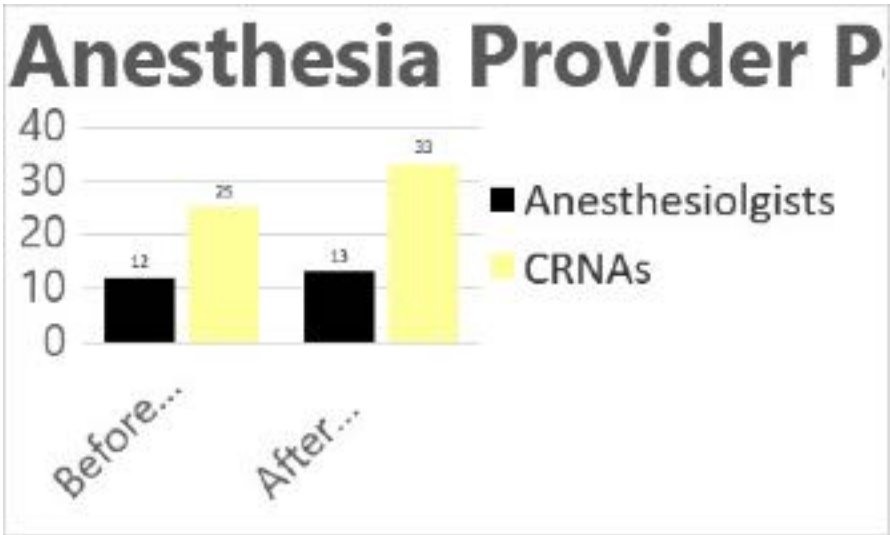
Data was collected over a three-month time frame following the education of anesthesia providers at the practice site regarding the nature of the project which included a voiceover PowerPoint presentation related to risk factors for corneal abrasion development, and prevention strategies, specifically the use of a bio-occlusive dressing. In addition, providers were educated on the appropriate documentation procedure in the patients' electronic health record in Epic. Data collection included demographic information from providers who participated in the education, total number of general anesthetic cases per month, documentation compliance with eye taping, use of the bio-occlusive dressing, and the incidence of corneal abrasions. Data collection through Epic electronic health record continued until the end of the implementation period of March 17th, 2022. Data analysis utilized the Chi square statistical analysis with the use of SPSS Statistics™.

Demographics

The educational PowerPoint was sent via email to all members of the anesthesia provider team (n=48) at the local community hospital. An initial participation rate of 77 percent (n= 37) prior to the Epic charting additions increased to 95 percent (n=46) after the addition of the Epic checkbox which indicated the eyes have been taped with the bio-occlusive dressing (Figure 1). Participation included the use of the bio-occlusive dressing, as well as documentation of use within the electronic health record. The education was offered to three SRNAs during the implementation period, however, documentation was completed by employed anesthesia providers, which included 13 anesthesiologists and 33 CRNAs.

Figure 1

Anesthesia Provider Participation



Evaluation

During the implementation period there were 1,276 general anesthetic cases. The DNP student and DNP mentor worked closely with the Epic information technology team for the addition of a checkbox that states the eyes have been taped with Eyepro™, which is the specific bio-occlusive dressing used at this facility and was added on January 11th, 2022. The addition has led to increased compliance rates on use and documentation of use for the bio-occlusive dressing during general anesthesia. An initial participation rate of 77 percent (n= 37) prior to the Epic charting additions increased to 95 percent (n=46) after the addition of the Epic checkbox.

Results of the pre-implementation chart review for the month of October included a total of 380 general anesthetic cases, a 94 percent compliance rate on clicking the checkbox for eyes taped, a 19 percent compliance rate on the comment on use of the bio-occlusive eye dressing during general anesthesia, and one recorded corneal abrasion. The corneal abrasion incidence

occurred during a general anesthetic case in which the use of the bio-occlusive eye protective dressing was not specified in the comments section.

Data collection for the month of December began on December 17th, 2021, after the voiceover PowerPoint educational module was sent to anesthesia providers at the local community hospital. There were a total of 178 general anesthetic cases, a 98 percent compliance rate on clicking of the checkbox for eyes taped, an 89 percent compliance rate on the comment for use of the bio-occlusive dressing during general anesthesia, and zero recorded corneal abrasions.

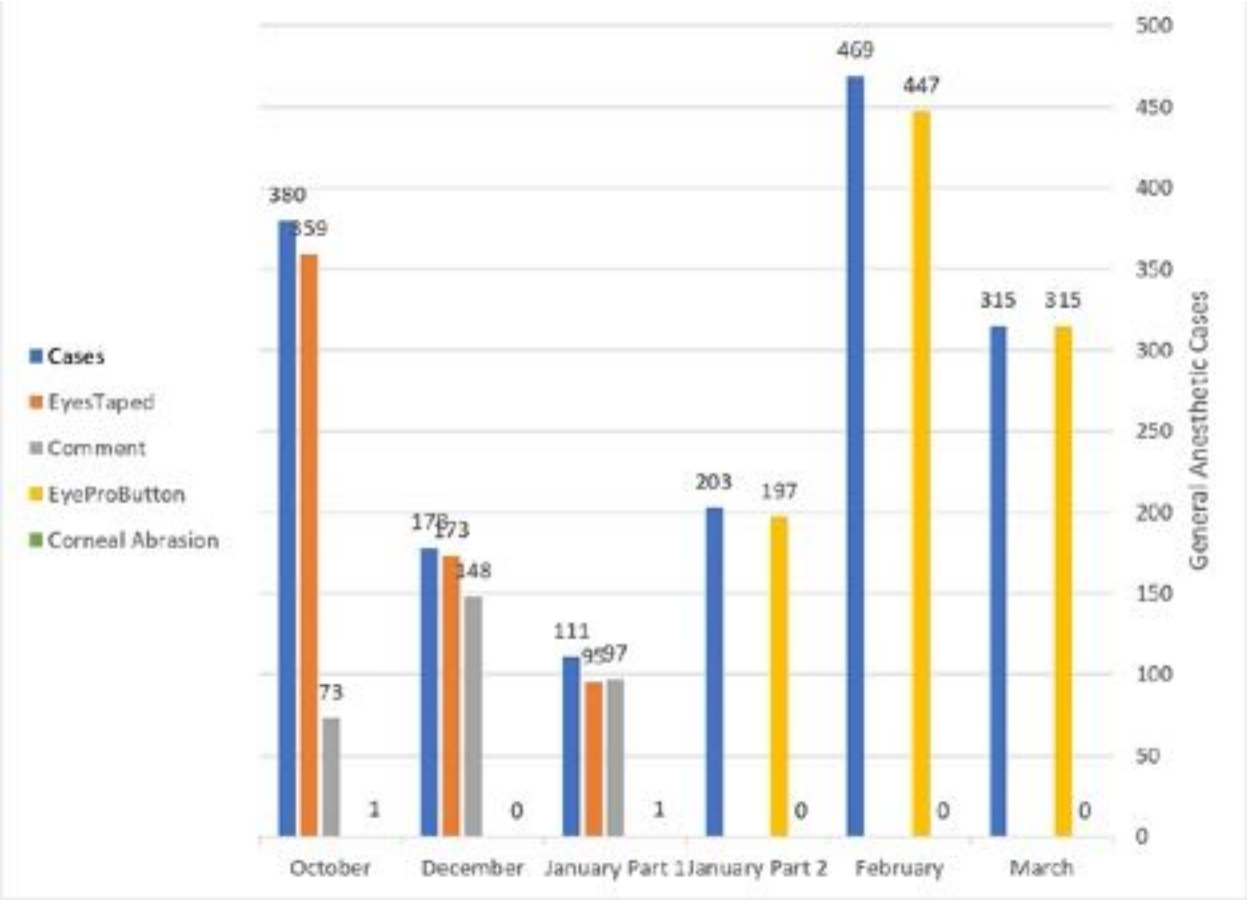
Data collection and analysis for the month of January contained two sections due to the addition of the checkbox in the electronic health record. The first 10 days included 111 general anesthetic cases, an 85 percent compliance rate on clicking of the checkbox for eyes taped, an 87 percent compliance rate on the comment for use of the bio-occlusive dressing, and one recorded corneal abrasion in which the use of the bio-occlusive dressing was not specified in the comments section. The last 21 days of the month included 203 general anesthetic cases with a 97 percent compliance rate for clicking the checkbox that the eyes have been taped with Eyepro, and zero recorded corneal abrasions.

Data collection for the month of February included a total of 469 general anesthetic cases, a 95 percent compliance rate for the eyes taped with Eyepro checkbox, and zero recorded corneal abrasions.

Data collection for the month of March concluded on March 17th, 2022. There was a total of 315 general anesthetic cases, 100 percent compliance rate for the eyes taped with Eyepro checkbox, and zero recorded corneal abrasions (Figure 2).

Figure 2

Monthly Chart Reviews



Outcomes

The key goals for this project were to increase compliance on use and documentation of the bio-occlusive eye protective dressing during general anesthetic cases to reduce corneal abrasion incidence. Successful implementation of an online, on-demand educational PowerPoint for anesthesia providers as well as the addition of a check box within the positioning flowsheet of the electronic health record led to an increase in compliance documentation of the use of a bio-occlusive dressing during general anesthetic surgery which resulted in a reduction in corneal abrasion incidence during the three-month implementation period.

The pre-implementation chart review indicated 19 percent of anesthesia providers were documenting use of the bio-occlusive dressing, as compared to post implementation chart reviews indicating an increase to 95 percent of use and documentation of the bio-occlusive dressing during general anesthetic cases (Table 1). Chi square tests were used to compare pre and post data points to determine if the results represented an improvement in documentation compliance, bio-occlusive dressing use and a reduction in corneal abrasion incidence that would be attributable to the educational implementation and the electronic health record change with a *p*-value less than 0.05.

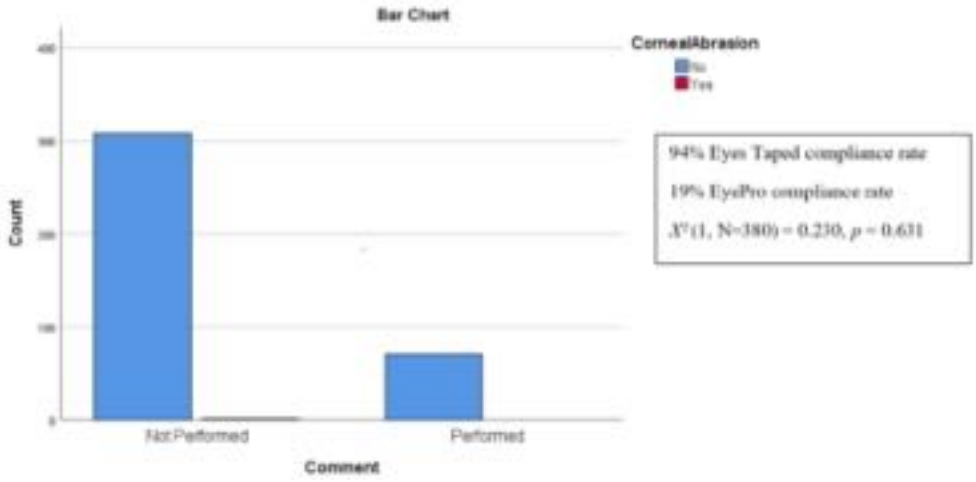
Table 1

Chi Square Test for Pre-Implementation Chart Review

		Comment		
		Not Performed	Performed	Total
CornealAbrasion	No	308	71	379
	Yes	1	0	1
Total		309	71	380

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.230[a]	1	.631		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.414	1	.520		
Fisher's Exact Test				1.000	.813
N of Valid Cases	380				



The data analysis for December indicated an increase in compliance for documentation of bio-occlusive dressing use in the comments section after the education was viewed by anesthesia providers (Table 2).

Table 2

Chi Square Test December Results

EyesTaped * Comment * CornealAbrasion Crosstabulation

Count

CornealAbrasion			Comment: Not Performed	Comment: Performed	Total
No	EyesTaped	Not Performed	5	0	5
		Performed	25	148	173
	Total		30	148	178
Total	EyesTaped	Not Performed	5	0	5
		Performed	25	148	173
	Total		30	148	178

Chi-Square Tests

CornealAbrasion		Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
No	Pearson Chi-Square	25.380[a]	1	.000		
	Continuity Correction[b]	19.642	1	.000		
	Likelihood Ratio	18.548	1	.000		
	Fisher's Exact Test				.000	.000
	N of Valid Cases	178				
Total	Pearson Chi-Square	25.380[a]	1	.000		
	Continuity Correction[b]	19.642	1	.000		
	Likelihood Ratio	18.548	1	.000		
	Fisher's Exact Test				.000	.000
	N of Valid Cases	178				

The DNP student and DNP mentor worked closely with Epic information technology for the addition of a checkbox that states the eyes have been taped with Eyepro, which was added on January 11th, 2022. The addition has led to increased compliance rates on use and documentation of use for the bio-occlusive dressing during general anesthesia. The data analysis for January has been broken down into two sections to include the data analysis before the change in the electronic health record and the data analysis after the change (Table 3 & 4). The anesthesia providers no longer had to comment on the use of the bio-occlusive dressing as the checkbox was added stating the eyes were taped with Eyepro.

Table 3

Chi Square Test for January Results Part 1

		CornealAbrasion		
		No	Yes	Total
EyesTaped	Not Performed	4	1	5
	Performed	106	0	106
Total		110	1	111

		CornealAbrasion		
		No	Yes	Total
Comment	Not Performed	15	1	16
	Performed	95	0	95
Total		110	1	111

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.991[a]	1	.014		
Continuity Correction[b]	1.036	1	.309		
Likelihood Ratio	3.929	1	.047		
Fisher's Exact Test				.144	.144
N of Valid Cases	111				

Table 4

Chi Square Test for January Results Part 2

CornealAbrasion * EyesTapedWithEyePro Crosstabulation

Count

		EyesTapedWithEyePro		
		Not Performed	Performed	Total
CornealAbrasion		2	0	2
	Did not occur	0	8	195	203
Total		2	8	195	205

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	205.000[a]	2	.000
Likelihood Ratio	22.500	2	.000
N of Valid Cases	205		

The data analysis for the month of February had shown an increase in compliance of use and documentation of the bio-occlusive dressing (Table 5). Random audit trails were performed twice during the month with positive outcomes regarding the use and documentation of bio-occlusive dressings during general anesthetic cases.

Table 5

Chi Square Test for February Results

		EyesTapedWithEyepro		
		Not Performed	Performed	Total
CornealAbrasion	Did not occur	22	447	469
Total		22	447	469

Chi-Square Tests

	Value	df	Asymptotic Significance (2 sided)
Pearson Chi-Square	469.000[a]	1	.000
Likelihood Ratio	4.9	1	.000
N of Valid Cases	469		

The data analysis for the month of March continued to show a rise in general anesthetic cases, a further increase in compliance of use and documentation of the bio-occlusive dressing with zero recorded corneal abrasions (Table 6). The objective for this project was to increase compliance on use and documentation of bio-occlusive dressing, which was achieved by an increase of 76 percent with a *p*-value of 0.014 during the month a corneal abrasion had occurred. Even with this occurrence, the *p*-value was less than 0.05, which indicated clinical significance regarding the use of bio-occlusive dressing and a reduction in corneal abrasion incidence.

Table 6

Chi Square Test for March Results

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	319.000[a]	1	.000		
Continuity Correction[b]	243.349	1	.000		
Likelihood Ratio	42.981	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	319				

Post-implementation data analysis was aggregated into two parts. Post-implementation part 1 included data collection and analysis from the start of implementation on December 17th, 2021, to January 10th, 2022, in which the addition of the checkbox to the electronic health record was installed (Table 7). Post-implementation part 2 included data collection and analysis from January 11th, 2022, to the conclusion of data collection on March 17th, 2022 (Table 8). Chi-square analysis indicated clinical significance for the use and documentation of bio-occlusive dressings during general anesthesia has in fact decreased corneal abrasion incidence. Pre-implementation *p*-value of 0.631 compared to post-implementation part one *p*-value of 0.021 and post-implementation part two *p*-value of 0.000, are indicative of clinical significance due an overall *p*-value less than 0.05.

Table 7

Post-Implementation Part 1

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.301[a]	1	.021		
Continuity Correction[b]	.871	1	.351		
Likelihood Ratio	3.694	1	.055		
Fisher's Exact Test				.159	.159
N of Valid Cases	289				

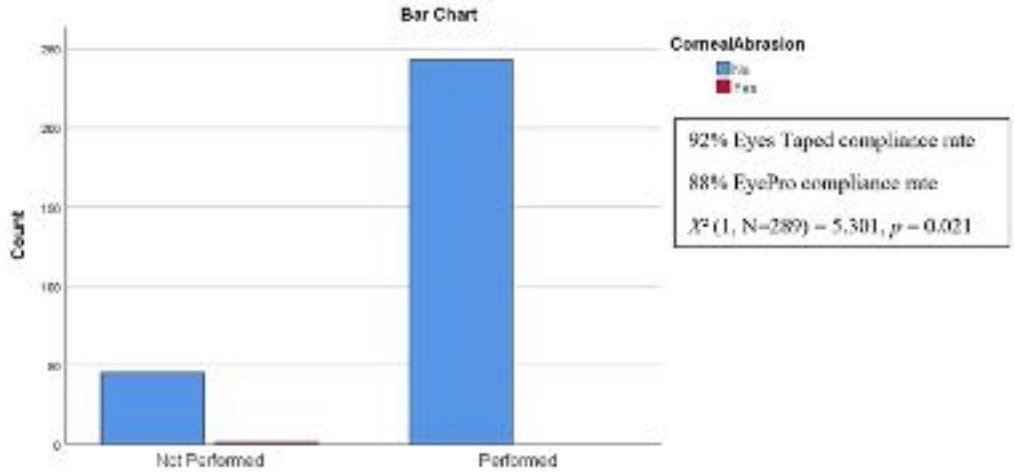
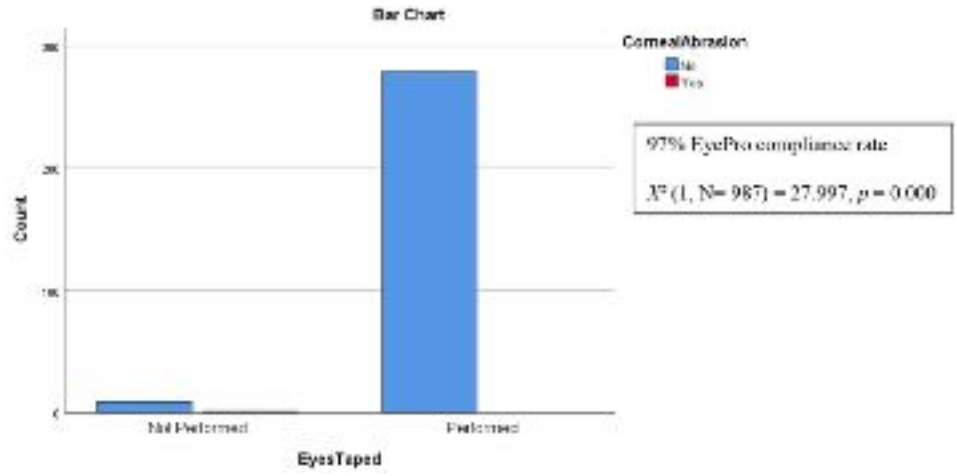


Table 8

Post-Implementation Part 2

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	27.997[a]	1	.000		
Continuity Correction[b]	6.506	1	.011		
Likelihood Ratio	6.828	1	.009		
Fisher's Exact Test				.035	.035
N of Valid Cases	987				



Discussion

There are a variety of techniques that can be utilized to protect the eyes during general anesthesia but achieving the most effective method can be challenging. Anesthesia is provided by anesthesiologists, CRNAs and SRNAs who employ varying eye taping techniques. This inconsistency has led to an increase in the number of corneal abrasions during all types of general anesthetic surgeries. The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, while the incidence of corneal abrasions at the local community hospital in fiscal year 2019 had a total of 20 corneal abrasions out of 11,173 general anesthetic cases. The corneal abrasion incidence of 1.79 per 1,000 cases indicates a high incidence and is of great concern to the organization, suggesting the need for standardized care through a quality improvement project. The implementation of an educational voiceover PowerPoint, addition of a checkbox for easier documentation for providers, and a reduction in corneal abrasion incidence has shown clinical significance evidenced by the Chi square statistical analysis. Even though a corneal abrasion had occurred during the implementation period, the ability to impact practice change with the addition of the

checkbox has made a positive impact on increased compliance and awareness on use of bio-occlusive dressings to reduce corneal abrasion incidence.

Perioperative use of bio-occlusive dressings significantly reduced perioperative corneal abrasions from 1.79 (20 of 11,173 cases) pre-implementation to 0.78 (1 of 1,276 cases) post-implementation. A risk difference calculation was then performed, which indicated a cumulative index for the risk difference of 1.01. The limitation to this risk difference calculation is the time frame disparity between pre-implementation and post-implementation. The sample size of 46 anesthesia provider participation after addition of the Epic checkbox is relatively small, as well as the 1,276 general anesthetics completed within the three-month implementation period.

The clinical significance of this project demonstrated increased knowledge and awareness related to bio-occlusive dressings and the risk of corneal abrasions during general anesthesia. This DNP project educated anesthesia providers on the importance of corneal injury awareness, risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, patient related risk factors regarding all surgical procedures, and the application and documentation process of the bio-occlusive dressing. Random audit trails have been performed throughout the implementation period with positive outcomes of anesthesia providers for both use and documentation of the bio-occlusive dressing. Monthly quality reports related to corneal abrasion incidence has continued to be recorded in relation to bio-occlusive dressing use by anesthesia providers.

Chapter Seven: Implications for Nursing Practice

The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, leading to an increase in patient discomfort, length of stay and health care cost collectively (Lichter, et al., 2015; O'Driscoll & White, 2017). The average cost of a corneal abrasion can be as high as twenty-five thousand dollars with a median payment of three thousand dollars (Morris, et al., 2018). Though the prevalence of corneal abrasions is variable, anesthesia providers are instrumental in preventing this complication from occurring.

Corneal abrasions are the most common ophthalmologic complication that occurs during general anesthesia for non-ocular surgery (Grixti et al., 2013), as well as the most common ocular injury during robotic surgery (Maerz et al., 2017). There are a variety of techniques that can be utilized to protect the eyes during general anesthesia but achieving the most effective method can be challenging. Anesthesia is provided by anesthesiologists, CRNAs and SRNAs who employ varying eye taping techniques. This inconsistency has led to an increase in the number of corneal abrasions during all types of surgeries.

Implications for Practice

Ely et al., (2019) states the implementation of an educational intervention that focuses on corneal injury awareness, understanding of risk factors, and presentation of an algorithm designed to prevent perioperative corneal injuries statistically reduced the incidence of perioperative corneal injury from 0.37 percent (36 of 9,745 cases) pre-initiative to 0.19 percent (19 of 9,991 cases) post-initiative (p¼0.012). The utilization of a quality improvement project has ensured all anesthesia providers have consistent education, knowledge, and understanding to

decrease corneal abrasion incidence. The DNP project approach consisted of cognitive aids and a voiceover PowerPoint presentation regarding risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, and patient related risk factors regarding all surgical procedures. Once the educational module was viewed, anesthesia providers were encouraged to utilize the bio-occlusive dressing, EyePro, as well as document its use in the electronic health record. Compliance rates increased from 19 percent prior to the addition of the checkbox within the electronic health record to 95 percent compliance after the addition of the checkbox.

Even though a corneal abrasion had occurred during the implementation period, the ability to impact practice change with the addition of the checkbox has made a positive impact on increased compliance and awareness on use of bio-occlusive dressings to reduce corneal abrasion incidence. The corneal abrasion occurred during a general anesthetic surgery in which the anesthesia provider had not documented the use of the bio-occlusive dressing. The clinical significance of this project demonstrated an increase in knowledge and awareness related to bio-occlusive dressings and the risk of corneal abrasions during general anesthesia. Global practice change can be attained by utilizing literature-based evidence on use of bio-occlusive dressings during general anesthetic surgery.

Strengths

This DNP project showcased many notable strengths. The implementation of an educational voiceover PowerPoint, addition of a checkbox for easier documentation for providers, and a reduction in corneal abrasion incidence has shown clinical significance as evidenced by the Chi square statistical analysis. Even though a corneal abrasion had occurred during the implementation period, the ability to impact practice change with the addition of the

checkbox made a positive impact on increased compliance and awareness on use of bio-occlusive dressings to reduce corneal abrasion incidence.

Collectively, health care costs, hospital length of stay, and patient discomfort have been decreased, with an overall increase in patient satisfaction. The impact on nursing practice has led to consistent standardized education to all anesthesia providers regarding the use of bio-occlusive dressings to reduce corneal abrasion incidence. The use of evidence-based literature was translated into practice to positively impact anesthesia providers as well as patient outcomes.

Limitations

There are several limitations present within the literature and the confines of this DNP project. Patient populations differed between studies, with some investigating the use of bio-occlusive dressing during general surgery, while others investigated the use during robotic surgery. The total number of surgical procedures performed at the given clinical site within the three-month implementation period is far less than the total number of surgical procedures performed within the literature. The given time frame within the literature was performed over several months to a year, as compared to three months for the implementation period of this DNP project.

The reduction in corneal abrasion incidence was measured per 1,000 cases, which signifies a limitation to this project as the total number of surgical cases just exceeds 1,000. A reduction in elective surgeries had decreased due to the COVID-19 pandemic. Many elective surgeries were cancelled prior to and during the implementation period. Elective surgeries were rescheduled for the months after the implementation period had ended. The total number of general anesthetic cases would have been closer to 1,500 or 2,000, as compared to the 1,276

general anesthetic cases that were performed during the implementation period. The implementation of this project was subject to the respective DNP clinical site which limits the sample size of anesthesia providers and total number of general anesthetic cases, thus inhibiting the ability to generalize the results to a broader population of providers and anesthetic cases.

Lastly, the perioperative timeframe was not well defined for this DNP project. The establishment of a timeframe during which a corneal abrasion that would be attributable to the perioperative patient course would ideally be needed to accurately identify patients with true perioperative corneal injuries based on the established literature. A future project idea would specify the perioperative timeframe from the time the patient enters the operating room and continue for two hours during the post anesthesia recovery phase. This would allow the DNP student to eliminate any potential corneal abrasions outside the perioperative timeframe.

Linkage to DNP Essentials

The DNP Essentials are the foundational capabilities and competencies vital to all advanced practice nurses, including nurse anesthetists. The eight DNP Essentials were created by the American Association of Colleges of Nursing (AACN) in accordance with contemporary health care system and complex patient needs. The DNP project must address each DNP Essential to meet the expectations of health care that focus on evidence-based practice.

Each DNP Essential was met for this project. Essential I is the use of scientific underpinnings for practice. The DNP project employs current evidence-based practice on the use of bio-occlusive dressings to reduce corneal abrasion incidence. Its effectiveness is validated through multiple high-quality studies. Lewin’s 3-Step Model was used as a guide for implementation and dissemination. Essential II is the use of organizational and systems

leadership for quality improvement. Stakeholders were identified and a needs assessment was conducted at the local community hospital to increase knowledge regarding the use of bio-occlusive dressings to reduce corneal abrasion incidence. Essential III is the use of clinical scholarship and analytical methods for evidence-based practice. A comprehensive literature review was conducted to educate anesthesia providers on best practices through a voiceover PowerPoint. IRB submission, implementation, data collection, and data analysis all contributed to meeting this DNP Essential.

Essential IV is the use of information systems technology and patient care technology for the improvement and transformation of healthcare. Design of web-accessible material for anesthesia providers was aided through a voiceover PowerPoint and cognitive aids on the nine anesthesia machines. Data collection tools were utilized through Epic electronic health records using Microsoft Excel™, as well as data analysis utilized by SPSS Statistics™. Information technology systems were also utilized to install a new checkbox within Epic for anesthesia providers ease of documentation on use of bio-occlusive dressings during general anesthesia. The utilization of this quality improvement project ensured all anesthesia providers have consistent education, knowledge, and understanding to decrease corneal abrasion incidence.

Essential V is the use of health care policy for advocacy in health care. This DNP project advocated for best practice on use of bio-occlusive dressings to reduce corneal abrasion incidence as supported by high quality literature. Essential VI is the use of interprofessional collaboration for improving patient and population health outcomes. This Essential was met through an initial needs assessment, which revealed the need for more consistent use and documentation of bio-occlusive dressings in relation to a reduction in corneal abrasion incidence.

Essential VII is the use of clinical prevention and population health for improving the

nation's health. Education regarding corneal abrasion risks and complications has led to an increased compliance of use and documentation of bio-occlusive dressings to reduce corneal abrasion incidence, which has led to decrease hospital length of stay and health care costs, and in turn, has led to increased patient satisfaction scores. The on-demand web-accessible education can be utilized by other anesthesia providers to increase knowledge and awareness on use of bio-occlusive dressings during general anesthesia.

A total of 48 anesthesia providers received the voiceover PowerPoint, which could be referenced at any time. The DNP student reviewed a total of 1,276 general anesthetic cases over the three-month implementation period. Weekly and monthly consultations with the DNP mentor and DNP chair led to the successful increase in compliance of use and documentation of the bio-occlusive dressing, which in turn, led to zero recorded corneal abrasions during the second part of the implementation period. Furthermore, hospital length of stay and overall costs have decreased, which in turn has led to an increase in patient satisfaction scores. Results of the project were disseminated to faculty members of Cedar Crest College as well as to anesthesia providers at the local community hospital.

Chapter Eight: Summary of Project

Summary and Conclusions

Corneal abrasions are the most common ophthalmologic complication during general anesthetic cases for non-ocular surgery (Grixti, Sadri, & Watts, 2013), The reported incidence of corneal abrasions in the published literature is variable, with increases in length of stay, health care costs and patient discomfort as common variables (Lichter et al., 2015; O'Driscoll & White, 2017). Evidence-based interventions to prevent this complication must be implemented into clinical practice by anesthesia providers to have a positive impact on patient outcomes and reduce the burden of corneal abrasions within the perioperative setting.

Anesthesia providers have difficulty utilizing the same technique for eye protection when current standard practice guidelines are ambiguous. The AANA guidelines are vague specifying that the eyelids should be closed prior to laryngoscopy, but specifics to the type of taping utilized is lacking. The implementation of an evidence-based practice guideline with the use of a bio-occlusive dressing has led to a reduction in the number of corneal abrasions in clinical practice (Drzymalski, et al., 2020). The implementation of an educational voiceover PowerPoint, addition of a checkbox within the electronic health record for easier documentation for providers, and a reduction in corneal abrasion incidence has shown clinical significance as evidenced by Chi square statistical analysis. Even though a corneal abrasion had occurred during the implementation period, the ability to impact practice change with the addition of the checkbox has made a positive impact on increased compliance and awareness on use of bio-occlusive dressings to reduce corneal abrasion incidence.

Dissemination Plans

This doctoral project has been presented to faculty at Cedar Crest College. Additionally, this project will also be presented to anesthesia providers at St. Luke's University Hospital Allentown Campus for the perioperative seminar and journal club in May.

Future Ideas

Sustainability of this project at the local community hospital can be achieved through random audit trails by anesthesia providers for both use and documentation of the bio-occlusive dressing during general anesthetic cases. Monthly quality reports related to corneal abrasion incidence can continue to be recorded in relation to bio-occlusive dressing use by anesthesia providers. The voiceover PowerPoint may be used as an onboarding education for new and current employees to continue yearly consistent education for anesthesia providers.

The bio-occlusive dressing, Eyepro, has been made available at other local hospital campuses, which also utilize Epic as the electronic health record. The addition of the checkbox that states the eyes have been taped with Eyepro could potentially be included, as well as monitoring the monthly quality reports for corneal abrasion incidence in relation to bio-occlusive dressing use during general anesthetic cases.

The perioperative timeframe was not well defined during this DNP project. A future project idea would specify the perioperative timeframe from the time the patient enters the operating room and continue for two hours during the post anesthesia recovery phase. This would allow the DNP student to eliminate any potential corneal abrasions outside the perioperative timeframe.

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Appendix A

Cedar Crest College IRB Approval

APPROVED - Reducing Corneal Abrasions During Surgery Through Utilization of Bio-Occlusive Dressings: A Quality Improvement Project - IRB Request Number 377

Cc: DocuWare Service Account

Reducing Corneal Abrasi...
4 MB

Your IRB Request has been Approved by the Project Advisor/Supervisor, the Committee Chair and the Extended Reviewer. This is the Final Approval.

Attached you'll find the IRB Request Form for this request, including any notes added by the reviewer.

If additional files were submitted the request form and additional files will be delivered together in a zipped file.

COMPLETE BY DATE: 11/8/2022

Notes:

IRB Request Number: 377

Title of Research: Reducing Corneal Abrasions During Surgery Through Utilization of Bio-Occlusive Dressings: A Quality Improvement Project

Review Type: EXPEDITED REVIEW

Lead Researcher: Melissa Lychak

Project Advisor/Supervisor: Donna Martonik

Appendix B

St. Luke's Allentown IRB Approval

An event for Protocol SLQI 2021-129 has been marked as having completed review for a 12 month period ending on 11/25/2022.

Local ID: SLQI 2021-129
Protocol: SLQI 2021-129
Title: Reducing Corneal Abrasions During Surgery Through Utilization of Bio-Occlusive Dressings: A Quality Improvement Project.
Principal Investigator: Lychak SRNA, Melissa
Type of Submission: New Studies
IRB Meeting Date: 12/07/2021
Action: Approved
Reviewed By: Expedited Review
Action Date: 11/26/2021
Agenda: Please see the attached new internal QI project for expedited review; SLQI 2021-129 Letter of Support.pdf SLQI 2021-129 IRB Application.pdf SLQI 2021-129 Abstract.pdf SLQI 2021-129 Waiver of Subject Authorization.pdf.

This approval is based on the understanding that you will: - Immediately inform the IRB of all patients serious adverse events and any changes in procedures and project status changes that may occur after this review. - Use only reproductions of the enclosed informed consent form displaying the IRB approval stamp. - Agree to comply with FDA, OPRR, and St Luke's Hospital IRB regulations. - Allow the review of research project records by the IRB as requested.

St. Luke's University Health Network has a Federal Wide Assurance [FWA 00003557] from OHRP. The Institutional Review Board is registered with OHRP [IRB 00002757] and is in compliance with 45 CFR 46, 21 CFR 50 and 21 CFR 56. To the extent these Federal regulations are in agreement with the ICH Guidelines, we are also in GCP compliance.

Review Completed By: Rebecca Jeanmonod, MD
Completed Date: 11/26/2021

Appendix C

Letter of Support

St Luke's
ALLENTOWN CAMPUS

1736 Hamilton Street
Allentown, PA 18104
610-628-8000

Cedar Crest College

Nurse Anesthesia Program

1100 College Dr

Allentown, PA 18104

RE Melissa Lychak, SRNA

June 21, 2021

Project Title: Reducing corneal abrasions during surgery through utilization of bio-occlusive dressings: A quality improvement project

To whom it may concern,

We will be supervising and guiding SRNA Melissa Lychak at St Lukes Allentown campus for her quality improvement project as titled above. We have discussed the project details and rational for initiating this research.

Sincerely,

Dr. Kenneth Andrejko

Cc: Dr. Bradley Parlin

My Health. My Hospital.

Appendix D

Informed Consent

You are invited to participate in a research study to assess the relative risk reduction in corneal abrasion incidence by utilization of bio-occlusive eye protective dressings. You were selected as a possible participant based on your involvement providing anesthesia to surgical patients. I ask that you read this form prior to participating in the study. You must be 18 years of age or older in order to participate**.**

This study is being conducted by a Cedar Crest College SRNA

-Melissa Lychak, BSN, RN, CCRN, SRNA

Background Information

The purpose of this study is to effect change in current anesthesia practice; the education of providers regarding the use of a bio-occlusive dressing to prevent corneal abrasions during surgery is therefore imperative. The utilization of a quality improvement project will ensure all anesthesia providers have consistent education, knowledge, and understanding to decrease corneal abrasion incidence. The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, leading to an increase in patient discomfort, length of stay and health care cost collectively. Increased costs come at a price for both the patient and employer. The average cost of a corneal abrasion can be as high as twenty-five thousand dollars with a median payment of three thousand dollars. The use of an online educational intervention with cognitive aids within the operating room will impact anesthesia providers in a positive way to increase compliance and knowledge, while decreasing the incidences of corneal abrasions during surgery. Participants will include anesthesia providers from St. Luke's Allentown and will receive the online education via email.

Procedures

If you agree to be in this study, we would ask you to participate in an online educational module through a PowerPoint presentation regarding risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, patient related risk factors regarding all surgical and robotic procedures, and documentation regarding the use of a bio-occlusive dressing. A cognitive aid will be utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The cognitive aid will address specifics regarding the use of bio-occlusive dressings, such as "Did you use the bio-occlusive dressing prior to laryngoscopy?", "Did you chart that the eyes have been taped in the positioning flowsheet?", "Did you state the use of the bio-occlusive dressing in the comments section?" The cognitive aid will be laminated and placed on the anesthesia machine for the provider to view during surgery. The implementation period for documentation within the electronic health record will occur over three months. The entire study should take no more than 30 minutes to view the PowerPoint presentation.

Risks and Benefits

There are no anticipated risks during the participation of this study. The participants will not receive extra credit or monetary incentives for viewing the educational module. The intent of the education is to increase knowledge and awareness of corneal abrasion incidence.

Confidentiality

Responses to all questionnaire items are anonymous, and all physical and non-electronic media data (e.g., video or audio tape) collected in this study will be stored in a secure location within the Cedar Crest College Graduate Department and all electronic data (e.g., MP4 files) will be stored in password protected computers and/or files where the passwords are known only to the researchers. Data will be stored for a period of three years, and shall be shredded, erased or otherwise destroyed on or after 5/30/24. Learner specific tracking identifiers will not be used in data collection for this DNP project.

Right to Withdraw

If you decide to participate, you are free to withdraw at any time. Your decision whether or not to participate will not affect your current or future relations with Cedar Crest College or with St. Luke's Allentown Anesthesia Department

Statement of Approval

This research was approved by Cedar Crest College's Institutional Review Board.

Proposal # 2021-377 Date: 11/8/21

Contacts and Questions

The supervising researchers conducting this study are listed below

Melissa Lychak, BSN, RN, CCRN, MALychak@cedarcrest.edu

-Chair: Donna Martonik, DNP, ANP, AGACNP

Email: Donna.Martonik@cedarcrest.edu

Appendix E

Research Description Supplement

Title of Research: **Reducing Corneal Abrasions During Surgery Through Utilization of Bio-Occlusive Dressings: A Quality Improvement Project**

a. Objective(s) of Research: The goal of this research is to effect change in current anesthesia practice; the education of providers regarding the use of a bio-occlusive dressing to prevent corneal abrasions during surgery is therefore imperative. The utilization of a quality improvement project will ensure all anesthesia providers have consistent education, knowledge, and understanding to decrease corneal abrasion incidence. The incidence of perioperative corneal abrasions during non-ocular surgery is 0.013 to 0.17 percent with some reports as high as 44 percent, leading to an increase in patient discomfort, length of stay and health care cost collectively. Increased costs come at a price for both the patient and employer. The average cost of a corneal abrasion can be as high as twenty-five thousand dollars with a median payment of three thousand dollars. The use of an online educational intervention with cognitive aids within the operating room will impact anesthesia providers in a positive way to increase compliance and knowledge, while decreasing the incidences of corneal abrasions during surgery. Participants will include anesthesia providers from St. Luke's Allentown and will receive the online education via email.

b. Researcher(s) Qualifications: This research is being carried out by the following:

Melissa Lychak, BSN, RN, CCRN, MALychak@cedarcrest.edu

-Chair: Donna Martonik, DNP, ANP, AGACNP

Email: Donna.Martonik@cedarcrest.edu

-The researcher is in satisfactory academic standing along with CITI and FCIO training completion for evidence-based research as well as the DNP prerequisite course work established by Cedar Crest DNP Graduate faculty.

c. Methods to be Used:

Participants: Participants will be Cedar Crest College student registered nurse anesthetist and St. Luke's Allentown anesthesiologists, CRNAs, and SRNAs who agree to voluntarily participate in the research. The purpose of the research will be explained to all participants and they will be asked to participate with the provision that they are free to withdraw at any time without penalty.

Procedures: Participants will be invited to view an online educational module through a PowerPoint presentation regarding risk factors for corneal abrasions, prevention strategies with the use of bio-occlusive dressings, patient related risk factors regarding

all surgical and robotic procedures, and documentation regarding the use of a bio-occlusive dressing. A cognitive aid will be utilized within the nine operating rooms as a helpful reminder to anesthesia providers. The cognitive aid will address specifics regarding the use of bio-occlusive dressings, such as "Did you use the bio-occlusive dressing prior to laryngoscopy?", "Did you chart that the eyes have been taped in the positioning flowsheet?", "Did you state the use of the bio-occlusive dressing in the comments section?" The cognitive aid will be laminated and placed on the anesthesia machine for the provider to view during surgery. The implementation period for documentation within the electronic health record will occur over three months. A preliminary chart review was obtained prior to the implementation of education to determine the use of the bio-occlusive dressing during surgical procedures to corneal abrasion incidence. After a three-month implementation period, data collection through a post-implementation retrospective chart review will be obtained to assess increased use of bio-occlusive dressings amongst anesthesia providers. Data collection related to the incidence of corneal abrasion amongst surgical patients will be assessed following the educational intervention. The incidence of corneal abrasion post intervention will be accessed through the monthly quality report and documented as an exact number. The total number of corneal abrasions will be compared to the total number of surgical cases pre-initiative, followed by the total number of corneal abrasions to the total number of surgical cases post-implementation period. The use of an excel spreadsheet on the hospital computer will be utilized, along with a de-identification certificate to protect patient information during the data collection process. The data collection will end three months after the educational module is distributed to participants.

Voiceover PowerPoint will be sent to participants

The cognitive aid will be laminated and attached to the anesthesia machine via

Velcro with the following statements:

- "Did you use the bio-occlusive dressing prior to laryngoscopy?"
- "Did you chart that the eyes have been taped in the positioning flowsheet?"
- "Did you state the use of the bio-occlusive dressing in the comments section?"

d. Recruitment Procedures: Participants for this study will be recruited through convenience of the Cedar Crest College SRNA, and fellow CRNAs, SRNAs, and anesthesiologists from St. Luke's Allentown via email. Potential participants will be contacted via email to participate in the online educational intervention.

e. Requirements for Participation: Participants must be greater than 18 years of age and enrolled in a nurse anesthesia program or actively practicing as an anesthesia provider**.** The participants give their consent by viewing the education.

f. Possible Risks and Benefits:

(Non-sensitive) It is anticipated that participants will be at no physical, psychological, or emotional risk at any time during the research. Nor is it anticipated that participation in the research will place the participants at any risk of criminal or civil liability, or damage the participants' financial standing or employability. The intent of this module is to increase knowledge and awareness of perioperative corneal abrasion with the utilization of bio-occlusive dressings.

g. Assurance of Anonymity and Confidentiality: Participants will be informed of the voluntary and confidential nature of the research verbally and/or via instructions on the data collection instruments. Participants will also be instructed not to put their name or any identifying information on the submitted form. If using an identification number for coding purposes, the number associated with a participant will not be linked to the participant by name. When collecting physical data from participants, the researcher will immediately place the data in a large envelope, and will not examine any of the data until all data have been collected. Any collected electronic data will be placed on a password protected computer where the password is known only to the researcher and faculty sponsor. All copies of the raw electronic data will be encrypted with a similar password. Any audio or video media will be stored in a locked drawer under the control of either the researcher or the faculty sponsor when not in use. The raw data will only be accessible to **Melissa Lychak and Donna Martonik**. In the event that any information provided by a participant should become known outside the research, it is unlikely that any harm would come to the participant.

h. Security of Data and Data Destruction. All physical and non-electronic media data (e.g., video or audio tape) collected in this study will be stored in a secure location within the **Cedar Crest College School of Nursing** and all electronic data (e.g., MP4 files) will be stored in password protected computers and/or files where the passwords are known only to the researchers**.** Data are stored for a period of three years, and shall be shredded, erased or otherwise destroyed on or after **5/3023.**

Appendix F

Linkage to DNP Essentials

DNP Essential		Clinical Implications
I.	Scientific Underpinnings for Practice	The project employs current evidence-based practice on the use of bio-occlusive dressings to reduce corneal abrasion incidence. Its effectiveness is validated through multiple high-quality studies. Lewin's 3-Step Model was used a s a guide for implementation and dissemination.
II.	Organizational and Systems Leadership for Quality Improvement	Stakeholders identified and a needs assessment conducted at St. Luke's Allentown to increase knowledge regarding corneal abrasions.
III.	Clinical Scholarship and Analytical Methods for Evidence-Based Practice	A comprehensive literature review was conducted to educate anesthesia providers on best practices through voiceover PowerPoint. IRB submission, implementation, data collection, and data analysis all contributed to meeting this Essential.
IV.	Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	This project was implemented through a student-designed voiceover PowerPoint to educate anesthesia providers on corneal abrasion risks to increase compliance on use and documentation of bio-occlusive dressings to reduce corneal abrasion incidence.
V.	Health Care Policy for Advocacy in Health Care	This project advocated for best practice on use of bio-occlusive dressings to reduce corneal abrasion incidence as supported by high quality literature.
VI.	Interprofessional Collaboration for Improving Patient and Population Health Outcomes	Needs assessment conducted in collaboration with anesthesia providers, who were educated via a voiceover PowerPoint on corneal abrasion risks to reduce corneal abrasion incidence.
VII.	Clinical Prevention and Population Health for Improving the Nation's Health	Education regarding corneal abrasion risks and complications can lead to increase compliance of use and documentation of bio-occlusive dressings to reduce corneal

	abrasion incidence. This will lead to decrease hospital length of stay and costs, which will increase patient satisfaction scores.
VIII. Advanced Nursing Practice	Met through initial needs assessment, evidence-based literature review, implementation, data collection and analysis, and dissemination of results.