Developing a Corneal Abrasion Prevention Protocol

In Robotic Assisted Procedures

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Dedication and Acknowledgments

I would like to dedicate this project to my friends and family who have supported me throughout these past three years. This accomplishment would not have been possible without your constant and unconditional love and support.

Abstract

Background: The rapid emergence of robotic-assisted surgery has provided patients with an abundance of benefits including reduced postoperative pain, faster recovery time, reduced hospital stays, and improved cosmetic outcomes. However, robotic-assisted surgery places the patient at a higher risk for intraoperative corneal abrasions. Anesthesia providers are the first line of defense in protecting the patient against ocular injury in the perioperative setting. Therefore, it is important for anesthesia providers to become aware of the etiologies surrounding this increased incidence, as well as the optimal methods of ocular protection to minimize corneal abrasions in robotic assisted surgeries.

Purpose: The purpose of this research project is to increase knowledge on the increased incidence of corneal abrasions in surgical patients undergoing robotic assisted procedures. Additionally, the purpose is to increase anesthesia providers' confidence in corneal abrasion prevention and increase their readiness to change in adapting a comprehensive eye care protocol.

Methods: An educational intervention with simulation was presented to a sample of 20 CRNAs at a rural hospital in North Carolina. Pre- and post- intervention surveys were utilized to analyze the change in knowledge, confidence, and readiness to change. Wilcoxon signed-ranked tests were performed using SPSS software to evaluate for statistically significant changes in mean scores after the educational intervention.

Results and Conclusion: Educational intervention and simulation resulted in a statistically significant ($p<0.001$) increase in CRNA knowledge, confidence, and readiness to change. Corneal abrasion education should be implemented into onboarding and ongoing anesthesia training programs.

Background and Significance

The popularity of robotic-assisted surgery (RAS) has been rising compared to traditional laparoscopic surgery due to its improvements in minimally invasive techniques, better mobility, and control (Maerz et al., 2017). The choice to use RAS over the laparoscopic procedure is based on the premise that it offers benefits such as shortening hospital stay, faster recovery time, reduced postoperative pain, and improved cosmetic outcome (Maerz et al., 2017; Sampat et al., 2015). General anesthesia (GA) and robotic-assisted surgery come with their own risks and benefits. Patients that are under GA are at a higher risk for developing corneal abrasions from the loss of corneal reflex, decreased tear production, and incomplete eyelid closure (Morris et al., 2018). Corneal abrasion (CA) is an ocular condition where the epithelial layer of the cornea is removed from the underlying membrane that results in a defect in the corneal epithelia surface (Young et al., 2021). Additionally, these risks can be even higher in robotic surgeries which involves abnormal positions, instilling CO2 into the peritoneum, and potential eye trauma related to the patient proximity to the provider and hemodynamic monitoring cables (Gkegkes et al., 2014; Maerz et al., 2017).

Corneal abrasion is the most common ocular injury in the perioperative period for patients undergoing general anesthesia with the incidence ranging from 0.17%-0.44% (Segal et al., 2014; Morris et al., 2018; Gkegkes et al., 2014). Ocular injuries account for 3-8% of anesthesia-related malpractice claims with GA accounting for 83% of the CA claims (Moos & Lind, 2006). Currently, there are no clear guidelines or standard practices to best protect patients from corneal abrasion during general anesthesia. Although one of the common methods of corneal abrasion protection is to close the eyelids with adhesive tape, there have been reports of various types of eyelid injuries upon removing the tape (Drymalski et al., 2020). Furthermore, lid taping masks direct observation of the eye, and mechanical trauma to the cornea can happen if the tape is improperly placed (Gitrix et al., 2013). While there are several methods to prevent corneal abrasion, there has not been a consensus as to which protection method is the most effective (Lee et al., 2016). Methods such as closing the eyelid with bio-occlusive dressings and applying water-based 4% methylcellulose have been shown to have consistently positive results along with also providing unit-based educational programs on corneal protection to anesthesia providers (Gitrix et al., 2013; Carninicu et al., 2017).

Relevance to Clinical Site

A total of 832 robotic-assisted surgical procedures were performed in 2021 at the clinical site of interest. These procedures include prostatectomies, hernia repairs, hysterectomies, partial and full nephrectomies, and cholecystectomies. 34 patients who underwent a robotic assisted procedure were treated for corneal abrasion in the post-anesthesia care unit. This reveals a current incidence of corneal abrasion during robotic assisted procedures at 4%. Currently, there is no comprehensive intraoperative eye care protocol at the clinical site. Furthermore, the clinical site plans to further expand their robotic surgery program with the introduction of colorectal and urological procedures in the robotic approach. This information was obtained by the Chief CRNA at the clinical site. The patient population at this clinical site is at increased risk for developing intraoperative corneal abrasions. The risk for intraoperative corneal abrasions is increased in robotic surgeries which involves abnormal positions, instilling CO_2 into the peritoneum, and potential eye trauma related to the patient proximity to the provider and hemodynamic monitoring cables (Gkegkes et al., 2014; Maerz et al., 2017).

Purpose

The aim of this DNP project is to increase knowledge and awareness on the increased incidence of corneal abrasions in surgical patients undergoing robotic assisted procedures. Additionally, this project recommended a comprehensive corneal abrasion prevention protocol based on existing evidence. With the recent surge of surgical procedures being performed with a robotic assisted approach, it is vital for anesthesia providers to have a strong understanding of the etiologies and physiology attributed to the increased incidence of corneal abrasions. Furthermore, anesthesia providers need to be aware of the optimal methods of ocular protection in effort to minimize the incidence of corneal abrasions in robotic assisted procedures.

Review of Current Evidence

The focus of the evidence in this literature review is to determine the most effective protection methods to formulate a standardized Evidence Based Practice protocol for reducing the incidence of corneal abrasions perioperatively during robotic assisted surgical procedures. A literature search was performed using the keywords: *general anesthesia, corneal abrasion, procedures, prevention, eyelid tape, ointment, bio-occlusive dressing, intraoperative and methods*. The search databases included were CINAHL, PUBMED, and SCOPUS. Initial inclusion criteria for the literature review were randomized controlled trials, systemic reviews, and meta-analysis, retrospective and prospective studies. Articles pertaining to corneal abrasions on in-patient units were excluded as the focus of the project is aimed towards quality improvement methods for the anesthesia provider during the perioperative setting. Articles greater than 10 years old were excluded unless they provided vital information that would serve beneficial to this research project. Literature regarding corneal abrasions during ocular procedures also were excluded as the operating surgeon is responsible for perioperative ocular care. Of the 455 articles yielded from the initial database search, twenty-five sources that met the inclusion criteria were utilized in this literature review.

Corneal abrasions and general anesthesia

White & Crosse (1998) found that the etiology of corneal abrasions in general anesthesia can be attributed to reduced tear production and stability, increased frequency of lagophthalmos, and the inhibition of the blink reflex. Though this is an older article, these findings are supported by more recent studies suggesting that general anesthesia profoundly reduces basal tear production (Grixti et al., 2013; Moos & Lind, 2006). Furthermore, the investigators identified independent risk factors that increase the risk of corneal abrasions. These include operations on the head and neck, surgical procedures that exceed ninety minutes in duration, advanced age, and procedures that require positioning that is not supine (Grixti et al., 2013; Moos & Lind, 2006; Papp et al., 2019; Segal 2014 et al., 2014). Patients are at high risk for corneal abrasion with comorbidities of hypertension, diabetes, obesity, history of smoking, and atherosclerosis (Ely et al., 2019; Martin et al., 2009; Young et al., 2021)

Corneal abrasions in robotic procedures

While the emergence of robotic assisted procedures has provided immense benefits to surgical patients, including decreased pain, bleeding, and recovery time, it also presents an increased risk for corneal abrasions. Danic et al. (2007) reported that before the implementation of a new eye care protocol in a retrospective investigation, corneal abrasion is the most common anesthesia related complication in robotic assisted prostatectomy with an incidence of 3%. Similarly, Gandhi et al. (2016) found that in the review of 21 patients who sustained a corneal abrasion at a tertiary cancer surgical center, 11 had undergone a robotic assisted procedure.

These findings exceed the overall incidence of perioperative corneal abrasions as current literature suggests an incidence of between 0.013% and 0.15% per 1,000 procedures (Martin et al., 2009). Additional retrospective studies demonstrate an increased incidence of corneal abrasions in robotic assisted procedures in comparison to open and laparoscopic approaches (Gainsburg et al., 2010; Gandhi et al., 2016; Samat et al., 2015). The common use of pneumoperitoneum and steep Trendelenburg positioning are likely etiologies of the increased risk of corneal abrasions in robotic procedures. Pneumoperitoneum, the insufflation of the abdominal cavity with carbon dioxide for greater surgical exposure, causes increases in intraocular pressure while compromising ocular perfusion pressure, leading to corneal injury (Gandhi et al., 2016; Samat et al., 2015). Steep Trendelenburg positioning causes an increase in intraocular pressure and central venous pressure, which stresses the eyes via direct pressure from increased fluid and pressure, potentially causing the eye to open intraoperatively and increasing the risk for injury (Gandhi et al., 2016; Samat et al., 2015).

Current ocular protection methods

Common methods of corneal prevention during general anesthesia include the use of eyelid closure with hypoallergenic tape, the use of lubricating ointment in combination with eyelid tape, and passive closure of the eyelid without tape. Review of the literature revealed that utilizing passive closure of the eyelid as the sole method of ocular protection places the patient at a higher risk for sustaining a corneal abrasion during general anesthesia and thereby discourages its use the primary preventative measure (Grixti et al., 2013; Grover et al., 1998). A common method for ocular protection is the use of lubricating ointments in combination with closing the eyes via hypoallergenic tape. There are various lubricating ointments currently in practice, including polyacrylic acid liquid gel, paraffin-based ointment, aqueous based methylcellulose-based products, and artificial tears (Grixti et al., 2013; Grover et al., 1998; Moos & Lind, 2006; George et al., 2017). Studies have revealed that while using a lubricating ointment in combination with hypoallergenic tape has been shown to reduce the incidence of corneal abrasions versus passive closure of the eyelid, the difference is not statistically significant in demonstrating superior effectiveness in prevention versus using hypoallergenic tape only (Gangdali et al., 2004; Grover et al., 1998). However, studies did reveal that aqueous based methylcellulose-based products for eye lubrication caused minimal patient discomfort and fewer side effects such as dry eyes (Grixti et al., 2013; Moos & Lind, 2006; George et al., 2017). Therefore, it can be concluded that eye closure via taping of the eyelid, with or without the use of lubricating ointments, is superior in preventing corneal abrasions versus passive closure of the eyelid.

The use of transparent dressing in robotic assisted surgeries

The use of transparent occlusive dressings is a growing trend in corneal abrasion prevention during robotic assisted surgeries. A retrospective investigation conducted by Danic et al. (2007) shows a decrease from 3% to a 1% incidence in corneal abrasion in 1,500 patients undergoing robotic prostatectomy in steep Trendelenburg after switching from tape with lubricating ointment to a transparent occlusive dressing. A similar study by Lavery et al. (2010) supports these findings, revealing there were no reports of corneal abrasions in the 814 patients undergoing robotic prostatectomy when receiving transparent occlusive dressings as the primary intervention for ocular protection versus 214 patients had an abrasion rate of 2.3% with lid taping and ocular lubricants. Furthermore, a case control study by Vetter et al. (2012) reported a decrease in corneal injury rate from 1.20/1,000 to 0.09/1,000 cases at a major academic medical center after implementing a protocol that utilizes transparent occlusive dressings. This marked reduction was sustained for 45 months during the implementation of the protocol (Vetter et al., 2012). Grixti et al. (2013) reviewed existing literature to reveal that bio-occlusive dressings may be more effective in preventing corneal abrasions during higher risk procedures, such as robotic surgery. Additionally, Young et al. (2021) conducted a recent study of utilizing carboxymethylcelluose sodium 0.5% and Tegaderm transparent dressing in a total of 670 hip and knee arthroplasty procedures and found only one incidence of corneal abrasion. In conclusion, current literature supports that the use of transparent occlusive dressings to be superior in the prevention of corneal abrasion in patients undergoing robotic procedures.

Barriers to evidence-based practice change

Three common themes regarding barriers to evidence-based practice changes emerged during this literature review. Studies revealed that time constraints, due to high demands on the job and during personal life, limits the opportunity to review current literature and guidelines (Brown et al., 2009; Khammarnia et al., 2015; Wallis, 2012). Lack of knowledge due to scarce recent education opportunities as well as the perceived difficulty to adequately review and understand research articles limits the implementation of newer guidelines (Brown et al., 2009; Khammarnia et al., 2015; Wallis, 2012). Studies show that organizational culture creates barriers through peers and superior faculty being unsupportive, unaware, or resistant to current research and change of practice (Brown et al., 2009; Khammarnia et al., 2015; Wallis, 2012). Additional barriers to implementing evidence-based practice include identified that negative attitude, lack of motivation, and lack of resources and training (Correa et al., 2020; Dagne & Beshah, 2021; Fischer et al., 2016). These barriers are often categorized as internal and external factors. Internal factors include provider knowledge and attitudes, and external factors include resources, support, and organizational support (Fischer et al., 2016; Correa et al., 2020). In two meta-analysis studies, one of most common methods to address the external barrier at an institutional level was to facilitate educational programs tailored to specific setting and target groups (Fischer et al., 2016; Correa et al., 2020).

Education

Advancing the knowledge and proficiency of evidence-based practice is important for improving patient outcomes, safety, and staff satisfaction (Mollon et al., 2012). While providers have reported positive attitudes towards evidence-based practice, educational interventions are needed for providers to successfully implement newer guidelines (Lehane et al., 2018; Mollon et al, 2012; Moore, 2017). Obtaining initial knowledge on providers' current practices, attitudes, knowledge, and skills relating to evidence-based practice is a vital step in determining the feasibility and planning of proposed interventions within the organization (Lehane et al., 2018; Mollon et al., 2012). In addition, the fundamental steps in overcoming knowledge barriers and implementing evidence-based practice include five steps of 'Ask', 'Acquire', 'Appraise', 'Apply', and 'Assess' (Albarqouni et al., 2018; Lehane et al., 2018). However, current literature reveals that the majority of evidence-based practice teaching interventions primarily focus on the critically appraising evidence step and often exclude the steps of applying and assessing (Albarqouni et al., 2018; Lehane et al., 2018). Therefore, it can be concluded that the construction of successful evidence practice instruction requires a multimodal and pragmatic approach in effort increase provider knowledge, competency, and compliance with the proposed guidelines.

Gaps in the Literature

Literature is limited regarding the development of hospital-based protocols and policies for corneal abrasion prevention. There is no established gold standard for institution based or prevention protocols for perioperative corneal abrasion (Papp et al., 2019). Several studies demonstrated that quality improvement (QI) initiatives and educational interventions among anesthesia providers have shown to significantly decrease perioperative corneal abrasions (Ely et al., 2019; Vetter et al., 2012; Martin et al, 2009). These implementation strategies correlate with systematic reviews that showed that most of the clinical guidelines are implemented utilizing educational approaches or workshops (Fischer et al., 2016; Gagliardi et al., 2015; Correa et al., 2020. In the particular study by Martin et al. (2009), they observed a significant reduction of corneal abrasion rates after anesthesia providers went through the educational phase (1.51 per 1,000 to 0.79 per 1,000). This finding was congruent with Papp et al. (2019) systemic review of perioperative corneal abrasions on educational interventions to enhance provider knowledge and decrease corneal abrasion rates.

Conceptual Framework

This research project referenced Lewin's Theory of Change. Lewin's Theory of Change, is a time-tested, easily applied field theory that is often considered the epitome of change models, suitable for personal, group and organizational change (Kaminski, 2011). Lewin's change theory consists of three distinct and vital stages: the unfreezing stage, moving to a new level or change stage, and the refreezing stage (See Appendix A).

The unfreezing stage involves identifying a problem or pattern in the organization that is deemed counterproductive or problematic. This stage also facilitates the desire to change and the recognition that change is needed (Kaminski, 2011). This research project accomplished this stage by identifying that the clinical site of interest had a problem with their corneal abrasion incidence during robotic surgeries. An exhaustive review of existing literature was then conducted to identify the optimal methods of ocular protection to create the imperative for change.

The change stage involves the process of change, such as feelings, thoughts, or behavior, in which stakeholders find the new process to be more liberating or productive than the previous process (Kaminski, 2011). During this stage, the targeted change group are convinced that the new process is better than the old (Kaminski, 2011). This stage was accomplished during the education intervention when the audience was presented with results of the literature review which included the recommended the use of bio-occlusive dressings as the primary method of ocular protection. The educational intervention also included studies which proved bio occlusive as the superior method of ocular protection in various clinical settings.

The refreezing stage consists of establishing the change or new process as the new standard of practice (Kaminski, 2011). Assessing the refreezing step around the desired change is beyond the scope of this project, due to time limitations. However, the sample group will be given a copy of the recommended comprehensive eye care protocol to reference in their future practice. Rewards, support, and champion leadership continue to be important through this stage, which is essentially ongoing until the next major change is needed (Kaminski, 2011).

Methods

Project Design.

This project utilized a quality improvement approach to assess clinical knowledge, confidence, and readiness to change in anesthesia providers adopting optimal ocular protection methods. The design included a pre- and post- survey which consisted of multiple-choice questions to assess knowledge, as well as questions to assess the anesthesia providers' level of confidence and readiness to change in adopting a new ocular protection protocol. The purpose of this project was to increase in knowledge, confidence, and readiness to change in implementing the recommended ocular protection protocol for patients undergoing robotic assisted procedures. Two Student Registered Nurse Anesthetists conducted this DNP project which involved anesthesia providers at the clinical site of interest. This manuscript will analyze and discuss the results of the knowledge and confidence variables. The co-investigator of this DNP project will analyze and discuss the readiness to change variable in their manuscript. The sample group was provided education via a PowerPoint presentation featuring the etiologies surrounding the increased incidence of corneal abrasions in robotic assisted procedures and the recommended superior methods of ocular protection to decrease this incidence. The sample was also provided with a simulation on how to properly apply and remove Tegaderm dressings. Additionally, the sample was provided with a copy of the recommended comprehensive eye care protocol to use as a reference for future practice. This comprehensive eye care protocol includes a reference on identifying patients who are at a higher risk for developing an intraoperative corneal abrasion, as well as instructions on how to properly monitor the patient to ensure optimal ocular protection. The educational interventions took place during the weekly morning meetings in the clinical site's anesthesia break room. There were two visits to the clinical sites in effort to maximize participation, as anesthesia providers have a wide variety of scheduling.

Setting.

The clinical site is located in the southeastern part of the United States. The hospital has 238 total licensed beds and is not a designated trauma center. There are 12 operating rooms, 2 cesarian section suites, and 4 endoscopy suites. This hospital is known for their use of information technology in patient care. Permission to conduct this project was obtained by the clinical coordinator at the site of interest. IRB approval was obtained at the clinical site of interest and the contact information was provided through the site coordinator. The educational aspect of the project was conducted in the anesthesia breakroom; however, anesthesia providers will conduct our guidelines in the operating room.

Sampling.

A non-randomized convenience sample utilizing CRNAs providing direct care for adult patients undergoing robotic-assisted procedures was used for this project. Inclusion criteria for this project were currently practicing CRNAs regardless of educational background, age, gender, or race. Exclusion criteria included non-anesthesia providers and anesthesia providers who do not provide direct patient care. Anesthesia providers that are currently students or in residency will be excluded from this study.

Translational Framework

For this research project, Rosswurm and Larrabee's *A Model for Change* was utilized to help guide on the practice recommendation for the use of Tegaderm transparent dressings for corneal abrasion prevention (see Appendix B). This translational model focuses on a behavioral change involving six stages: (a) assessing the need for change in practice, (b) linking the problem with interventions and outcomes, (c) linking the best evidence, (d) designing a practice change, (e) implementing and evaluating the change, and (f) integrating and maintaining the change (White et al., 2019). This research project focused on (a) assessing the need for change, (b) linking the problem with interventions and outcomes, (c) synthesizing the best evidence, and (d) designing a change in practice. This DNP project also followed Lewin's *Change Theory* that focused on three stages: unfreezing, change, and refreezing (Wojciechowski et al., 2016).

The first component of Rosswurm and Larrabee's model is the most crucial part of this project. Prioritization of the model focused on the problems with the current practice and potential improvements from best current practices for the Tegaderm tapes for corneal abrasion prevention. Lewin's unfreezing stage was utilized to identify old or outdated patterns of current practices and increase the driving forces away from the existing situation with newer evidence-based practices (Wojciechowski et al., 2016).

Synthesizing the evidence was another essential part of our theoretical framework as we reviewed various literature articles on various methods for corneal abrasion prevention and presented these findings to the target stakeholders. The benefits and risks of the current practice and of the new proposed practice recommendation were weighed based on current literature and expert opinions. The change stage of Lewin's theory was incorporated with a process of change in thoughts or behavior of stakeholders to more productive and efficient practices (Wojciechowski et al., 2016).

The goal for this framework was to be able to recommend the implementation of the new practice guidelines and change the practice of corneal abrasion prevention for robotic assisted surgery patients to enhance recovery and mitigate complications. If given the resources and time, the practice change would be implemented, integrated, and evaluated for improved patient outcomes and provider satisfaction of the anesthetic practice. The refreezing stage was to maintain the new habit and establish a new equilibrium with continuous training and monitoring of the outcomes (Wojciechowski et al., 2016).

Data Collection

Procedures.

Data was collected using pre/post intervention surveys to pair the data for statistical analysis. Remote electronic surveys were utilized for this project using Qualtrics. The link to this survey was sent via recruitment emails and QR codes on the recruitment flyers. The pre-intervention survey was administered to assess current knowledge, confidence, and readiness to change practice regarding corneal abrasions. During the educational PowerPoint presentation, participants learned about the pathophysiology of corneal abrasions, the rate of incidence in robotic assisted procedures in comparison to the overall incidence, the etiologies attributed to the increased risk, traditional methods of corneal abrasion preventions, and recommendations for best practice guidelines for ocular protection based on existing evidence. The presentation also included a simulation on how to properly place and remove Tegaderm dressings from the eyes. The presentation took place in the anesthesia break room and lasted approximately 30 minutes in duration. The comprehensive eye care protocol based on an exhaustive review of evidence was then presented to the participants. Copies of the protocol were then given to each participant. There was time for participants to ask questions regarding the information presented after the in-service. Three weeks after the presentation, an email will be sent to the anesthesia providers with a link to complete the post-intervention survey. The surveys were paired utilizing a six-digit unique identifier. Participants were asked to provide this unique identifier in Question 1 of the pre- and post- survey. The post-intervention survey did not include the "Demographic and Experience" section as this information did not change over the course of three weeks and therefore cannot be analyzed.

Data Analysis

Data from the pre- and post-surveys were analyzed using IBM SPSS Statistics for Windows, version 29 (IBM Corp., Armonk, N.Y., USA) . First, a Shapiro-Wilks test was performed to determine the normality of the data sets. The significant value of this test will be set at 0.05. The results of the Shapiro-Wilks test revealed that the data violates the assumption that the data is distributed normally. Therefore, a Wilcoxon signed-rank test was performed to evaluate for statistical significance. The variables in the study include knowledge, readiness for practice change, and confidence in utilizing corneal abrasion methods. A UNCG school statistician was consulted throughout the data analysis.

Normality of Datasets

The Shapiro-Wilks test was performed on the datasets from all three domains from the pre- and post- surveys. The test rejects the hypothesis of normality when the p-value is less than or equal to 0.05. For the knowledge dataset, the test revealed a p-value of 0.011 for the pretest data, and <0.001 for the posttest data. Therefore, the null hypothesis that the knowledge datasets are normally distributed is rejected. For the confidence dataset, the test revealed a p-value of 0.267 for the pretest data, and <0.001 for the posttest data. Therefore, the null hypothesis that the confidence datasets are normally distributed is rejected. For the readiness datasets, the test revealed a p-value of 0.018 for the pretest data, and <0.001 for the posttest data. Therefore, the null hypothesis that the knowledge datasets are normally distributed is rejected. The Wilcoxon signed-rank test was then used to analyze statistical significance for all three domain datasets as it does not assume normality in the data and can be used when the paired t-test is inappropriate.

Instruments

The survey questions were categorized into three domains: provider knowledge, confidence using the transparent dressings, and readiness to change practice (See Appendix C). The 5-point Likert scale data was used for the confidence questions (Questions 11-16) and the readiness questions (Questions 17-22). The response choices were comprised of "strongly disagree", "somewhat disagree", "neutral", "somewhat agree", and "strongly agree". Knowledge (Questions 2-11) was assessed via multiple choice questions and scored using the standard grading system. There were general demographic and provider experience questions (See Appendix D) prior to the project implementation. All participants will also be given handouts of comprehensive protocol for corneal abrasion protection methods to reference during the implementation process and for their clinical practice. The survey was created by two SRNA investigators of this DNP project. Validity and reliability were established by a UNCG statistician.

Results

Demographics and Provider Experience

The total sample size of the study included 20 Certified Registered Nurse Anesthetists. For the 20 participants, there were 3 (15%) 18-24 years old, 5 (25%) 25-34 years old, 4 (20%) 35-44 years old, 5 (25%) 45-54 years old, and 3 (15%) 55 and older. The majority of participants (70%) have a master's degree while the rest (30%) have a doctorate degree. The majority of the CRNAs (60%) have practiced 6 or more years. Female participants made up 12 (60%) of the sample size, and the remaining eight were male (40%) participants. No physician anesthesiologists or anesthesiologist assistants participated in the study.

Figure 1

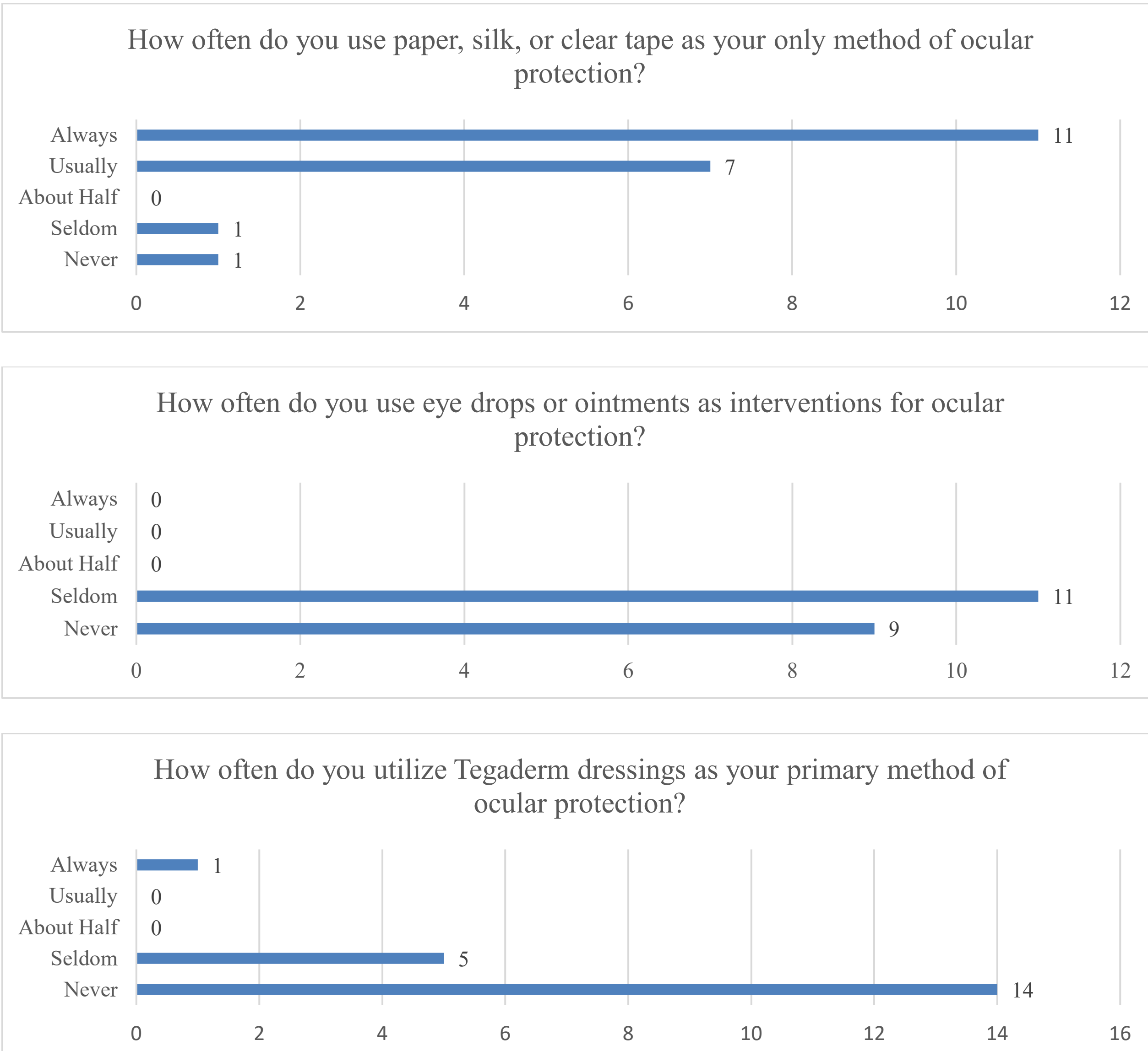
Demographics of Study Participants

Characteristic	n	%
Age in years		
18-24	3	15
25-34	5	25
35-44	4	20
45-54	5	25
55 and older	3	15
Gender		
Male	8	40
Female	12	60
Non-Binary	0	0
Other	0	0
Prefer not to say	0	0
Education Level		
Certificate/Diploma	0	0
Bachelors	0	0
Masters	14	70
Doctorate	6	30
Years of Experience		
0-2 years	5	25
3-5 years	3	15
6-10 years	6	30
11-20 years	4	20
More than 21	1	5

Most of the participants indicated using paper, silk, or clear tape for ocular protection. Almost all participants indicated that they were not utilizing or seldom utilized Tegaderm dressings or eye ointments for ocular protection methods.

Figure 2

Sample's current ocular protection practices



Knowledge

Knowledge was assessed utilizing ten multiple choice questions in the survey. The questions were scored using a standard grading system, with 1 point being assigned for a correct answer and 0 points assigned for an incorrect answer. There was only one correct answer choice per question. Prior to the intervention, the mean score of the sample was 54.5% with a median score of 50%. After the intervention, the mean score rose to 94.5% with a median score of 100%. A Wilcoxon signed ranked test was performed to analyze for statistical significance. The null hypothesis states that there is no difference between the medians of data sets with a p-value set at 0.05. The results of the test revealed a p-value of <0.001, rejecting the null hypothesis. This shows that there is less than 0.1% probability that the difference in results were due to random fluctuations in the data. Therefore, the increase in mean scores in knowledge after the intervention is considered statistically significant.

Confidence

Confidence was assessed utilizing six 5-point Likert scale questions designed to allow the participant to rate their level of confidence in providing protection against corneal abrasions during robotic assisted procedures. The questions were scored according to their corresponding level of confidence. 1 point assigned for selecting “strongly disagree”, 2 points assigned for selecting “somewhat disagree”, 3 points assigned for selecting “neutral”, 4 points for selecting “somewhat agree”, and 5 points for “strongly agree”. Participants could only select one answer choice per question. The responses were then combined to produce an average score for each participant for statistical analysis. This was completed for both the pre- and post- surveys. Prior to the intervention, the mean score of the sample was 3.71, with a median score or 3.8. This indicates that the average confidence level for the sample prior to the intervention was in-between “neutral” and “somewhat agree”. After the intervention. The mean score of the sample was 4.86, with a median score of 5. This indicates that the average confidence level for the sample after the intervention was in between “somewhat agree” and “strongly agree”, but closer to “strongly agree”. A Wilcoxon signed ranked test was performed to analyze for statistical significance. The null hypothesis states that there is no difference between the medians of data sets with a p-value set at 0.05. The results of the test revealed a p-value of <0.001, rejecting the null hypothesis. This shows that there is less than 0.1% probability that the difference in results were due to random fluctuations in the data. Therefore, the increase in mean scores of confidence after the intervention is considered statistically significant.

Discussion

Provider Experience

The results revealed that the vast majority of participants use eye tape as their primary method of ocular protection. Furthermore, nineteen of the twenty participants stated that they never or seldomly use Tegaderm dressings as their primary method of ocular protection. Given that the clinical site's current corneal abrasion is 4% in robotic assisted procedures, these results do not come as a surprise as the current literature strongly supports that Tegaderm dressings offer superior ocular protection in comparison to traditional eye tape and ocular ointments. At 4%, the clinical site's robotic assisted corneal abrasion is higher than the national average, which is 3% (Danic et al., 2007). It can be hypothesized that the hospital's corneal abrasion rate would lower if more CRNAs utilized Tegaderm dressings for ocular protection.

Knowledge

The mean score of the sample's pre-intervention knowledge of corneal abrasion was 54.5%. This score was much lower than expected as many of the questions on the survey in the knowledge domain required only a superficial level of understanding of corneal abrasions to answer correctly. Corneal abrasion education is taught in the nurse anesthesia curriculum and ocular protection is a practice that CRNAs exercise on a routine basis. However, over half of the sample (n=11) has been practicing for greater than 6 years. This extended time away from formal education could likely explain the low pre-intervention knowledge score. After the educational intervention and simulation, the mean score in the knowledge domain increased to 94.5%. This supports the literature in that the construction of a successful evidence-based practice, that is both multimodal and pragmatic, will increase provider competence and knowledge (Lehane et al., 2018).

Confidence

Prior to the intervention, the mean score of the sample's pre-intervention confidence was 3.71. This indicates that the average confidence level for the sample prior to the intervention was in-between "neutral" and "somewhat agree". This supports the literature in that learning a new skill often requires a learning curve, which often coincides with lack of confidence in the early stages (Leopold et al., 2005). After the intervention, the mean score of the sample increased to 4.86. This indicates that the average confidence level for the sample after the intervention was in between "somewhat agree" and "strongly agree", but closer to "strongly agree". This also supports the literature in that even low-intensity forms of instruction improve individuals' confidence, competence, and self-assessment of their skill (Leopold et al., 2005). However, placing a Tegaderm dressing properly is not a complex skill to learn. Therefore, this increase in mean scores in confidence may not be feasible in interventions where more complex skill or techniques are being introduced teaching more complex skills or techniques.

Recommendations

Similar studies could be conducted at larger institutions to include a larger sample size to identify if there are any changes to the statistical significance regarding our study variables. Our study sample included only nurse anesthetists as anesthesia providers. Future studies could apply to students or trainees that deliver anesthesia such as anesthesiology residents or student registered nurse anesthetists to improve confidence and knowledge as part of the onboarding process. While our project was primally focused on preventing corneal abrasions in robotic assisted surgeries, the use of Tegaderm dressings as the primary method corneal abrasion protection could apply to other procedures that increase the risk of developing corneal abrasions or other ocular complications. Lastly, there is little existing research concerning the effectiveness of other corneal abrasion prevention methods that are often utilized in the clinical setting such as foam cradle and plastic protective googles. The creates the opportunity for future research to evaluate the effectiveness of these methods in comparison to the use of Tegaderm dressings.

Limitations

The use of a convenience sample for participation is a limitation for this DNP project as this may lead to biased opinions from the individuals who participated in the surveys and therefore may not accurately reflect how CRNAs feel about corneal abrasion prevention in robotic assisted procedures. Another limitation for this project is the smaller sample size which potentially limits the variability of responses and influence the results of this project. However, the smaller sample size is not a reflection of lack of participation from the CRNAs at the clinical site but instead is a consequence of conducting this project at smaller rural hospital. On the second visit to the clinical site to present the intervention, many of the CRNAs present that day had already participated in the project, limiting further participation. Unfortunately, additional visits to the clinical site were denied as there were extensive renovations being performed on the anesthesia break room and providing an alternative setting to accommodate the presentation was not feasible.

Conclusion

Corneal abrasion is the most common ocular injury in the perioperative period for patients undergoing general anesthesia. The risk for corneal abrasion increases for patients undergoing robotic assisted procedures. Tegaderm dressings have been proven to be the superior method of ocular protection in robotic assisted procedures in comparison to traditional methods such as paper tape and ocular ointments. The results of this project revealed that educational intervention with simulation increases CRNA knowledge, confidence, and readiness to change and adopt new practice. We recommend that corneal abrasion education be incorporated into both onboarding and continuing training programs. This is especially true with the continuing surge of procedures being converted to a robotic assisted approach in combination with increasing patient comorbidities. The prevention of corneal abrasions will require extra vigilance from anesthesia providers while applying the latest evidence-based practices. There are future opportunities for similar research to be conducted in larger institutions, as well as researching the effectiveness of other corneal abrasion prevention methods that currently do not exist in the literature.

References

Albarqouni, L., Hoffmann, T., & Glasziou, P. (2018). Evidence-based practice educational intervention studies: A systematic review of what is taught and how it is measured. *BMC Medical Education*, *18*(1). https://doi.org/10.1186/s12909-018-1284-1

Brown, C. E, Wickline, M., Ecoff, L., & Glaser, D. (2009). Nursing practice, knowledge, attitudes and perceived barriers to evidence-based practice at an academic medical center. *UC San Diego: Library*. Retrieved from https://escholarship.org/uc/item/47m7p92r

Correa, V. C., Lugo-Agudelo, L. H., Aguirre-Acevedo, D. C., Contreras, J. A., Borrero, A. M., Patiño-Lugo, D. F., & Valencia, D. A. (2020). Individual, health system, and contextual barriers and facilitators for the implementation of clinical practice guidelines: a systematic metareview. *Health Research Policy and Systems*, *18*(1). https://doi.org/10.1186/s12961-020-00588-8

Dagne, A. H., & Beshah, M. H. (2021). Implementation of evidence-based practice: the experience of nurses and Midwives. *PLOS ONE*, *16*(8). https://doi.org/10.1371/journal.pone.0256600

Danic, M. J., Chow, M., Alexander, G., Bhandari, A., Menon, M., & Brown, M. (2007). Anesthesia considerations for robotic-assisted laparoscopic prostatectomy: a review of 1,500 cases. *Journal of robotic surgery*, *1*(2), 119–123. https://doi.org/10.1007/s11701-007-0024-z

Ely, A. L., Goerlitz-Jessen, M., Scott, I. U., Lehman, E., Ali, T., Kerchner, D., & Liang, D. (2019). An ophthalmology resident-led quality improvement initiative to decrease the incidence of perioperative corneal injury. *Journal of Academic Ophthalmology*, *11*(02), e49-e53. https://doi.org/10.1055/s-0039-3400545

Gainsburg, D.M., Wax, D., Reich, D.L., Carlucci, J.R., & Samadi, D.B. (2010). Intraoperative management of robotic-assisted versus open radical prostatectomy. *Journal of the Society of Laparoendoscopic Surgeons, 14(*1), 1-5. doi: 10.4293/108680810X12674612014266

Gandhi, S. J., Zavala, A., Williams, U., Van Meter, A., Hsu, P., Gumbos, D. S., & Owusu-Agyemang, P. (2016). A retrospective review of corneal abrasions after oncologic surgery in a tertiary cancer center. *International Journal of Anesthetics and Anesthesiology*, *3*(2). https://doi.org/10.23937/2377-4630/3/2/1046

Ganidagli, S., Cengiz, M., Becerik, C., Oguz, H., & Kilic, A. (2004). Eye protection during general anaesthesia: comparison of four different methods. *European Journal of Anaesthesiology, 21*(08), 665-667. doi: 10.1017/S0265021504228137

George, T. A., Abraham, B., & George, N. (2017). The need for eye protection during general anaesthesia and the efficacy of various eye protection methods. *International Journal of Research in Medical Sciences*, *5*(4), 1224. https://doi.org/10.18203/2320 6012.ijrms20170988

Grixti, A., Sadri, M., & Watts, M. T. (2013). Corneal protection during general anesthesia for nonocular surgery. *The ocular surface*, *11*(2), 109–118. https://doi.org/10.1016/j.jtos.2012.10.003

Grover, V. K., Kumar, K. V., Sharma, S., Sethi, N., & Grewal, S. P. (1998). Comparison of methods of eye protection under general anaesthesia. *Canadian journal of anaesthesia = Journal canadien d'anesthesie*, *45*(6), 575–577.

IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp

Khammarnia, M., Haj Mohammadi, M., Amani, Z., Rezaeian, S., & Setoodehzadeh, F. (2015). Barriers to implementation of evidence based practice in zahedan teaching hospitals, iran, 2014. *Nursing research and practice*, *2015*, 357140. https://doi.org/10.1155/2015/357140

Kristensen, N., Nymann, C., & Konradsen, H. (2015). Implementing research results in clinical practice- the experiences of healthcare professionals. *BMC Health Services Research*, *16*(1). https://doi.org/10.1186/s12913-016-1292-y

Lavery, H.J., Samadi, D.B., & Gainsburg, D.M. (2010). 800 preventing ocular injuries during robotic prostatectomy: a simple technique. *European Urology Supplements, 9*(2), 257. doi: 10.1016/s1569-9056(10)60783-x

Lehane, E., Leahy-Warren, P., O'Riordan, C., Savage, E., Drennan, J., O'Tuathaigh, C., O'Connor, M., Corrigan, M., Burke, F., Hayes, M., Lynch, H., Sahm, L., Heffernan, E., O'Keeffe, E., Blake, C., Horgan, F., & Hegarty, J. (2018). Evidence-based practice education for Healthcare Professions: An expert view. *BMJ Evidence-Based Medicine*, *24*(3), 103–108. https://doi.org/10.1136/bmjebm-2018-111019

Leopold, S. S., Morgan, H. D., Kadel, N. J., Gardner, G. C., Schaad, D. C., & Wolf, F. M. (2005). Impact of educational intervention on confidence and competence in the performance of a simple surgical task. *JBJS*, *87*(5), 1031-1037.

Martin, D., Weingarten, T., Gunn, P., Lee, K., Mahr, M., Schroeder, D., & Sprung, J. (2009). Performance improvement system and postoperative corneal injuries. *Anesthesiology*, *111*(2), 320-326. https://doi.org/10.1097/aln.0b013e3181ae63f0

Mollon, D., Fields, W., Gallo, A.-M., Wagener, R., Soucy, J., Gustafson, B., & Kim, S. C. (2012). Staff practice, attitudes, and knowledge/skills regarding evidence-based practice before and after an educational intervention. *The Journal of Continuing Education in Nursing*, *43*(9), 411–419. https://doi.org/10.3928/00220124-20120716-89

Moore, L. (2017). Effectiveness of an online educational module in improving evidence-based practice skills of practicing registered nurses. *Worldviews on Evidence-Based Nursing*, *14*(5), 358–366. https://doi.org/10.1111/wvn.12214

Moos, D. D., & Lind, D. M. (2006). Detection and treatment of perioperative corneal abrasions. *Journal of perianesthesia nursing : official journal of the American Society of PeriAnesthesia Nurses*, *21*(5), 332–341. https://doi.org/10.1016/j.jopan.2006.08.001

Nilsen, P., Seing, I., Ericsson, C., Birken, S. A., & Schildmeijer, K. (2020). Characteristics of successful changes in health care organizations: an interview study with physicians, registered nurses and assistant nurses. *BMC Health Services Research*, *20*(1). https://doi.org/10.1186/s12913-020-4999-8

Papp, A. M., Justin, G. A., Vernau, C. T., Aden, J. K., Fitzgerald, B. M., Kraus, G. P., & Legault, G. L. (2019). Perioperative corneal abrasions after nonocular surgery: A systematic review. *Cornea*, *38*(7), 927 932. https://doi.org/10.1097/ico.0000000000001972

Sampat, A., Parakati, I., Kunnavakkam, R., Glick, D. Lee, N., Tenney, M., Eggener, S. & Roth, S. (2015). Corneal abrasion in hysterectomy and prostatectomy. *Anesthesiology, 122* (5), 994-1001. doi: 10.1097/ALN.0000000000000630.

Vetter, T. R., Ali, N. M., & Boudreaux, A. M. (2012). A case-control study of an intraoperative corneal abrasion prevention program: holding the gains made with a continuous quality improvement effort. *Joint Commission journal on quality and patient safety*, *38*(11), 490–

496.

Wallis, L. (2012). Barriers to implementing evidence-based practice remain high for U.S. nurses. *AJN, American Journal of Nursing*, *112*(12), 15. https://doi.org/10.1097/01.naj.0000423491.98489.70

White, E., & Crosse, M. M. (1998). The aetiology and prevention of peri-operative corneal abrasions. *Anaesthesia*, *53*(2), 157–161. https://doi.org/10.1046/j.1365-2044.1998.00269.x

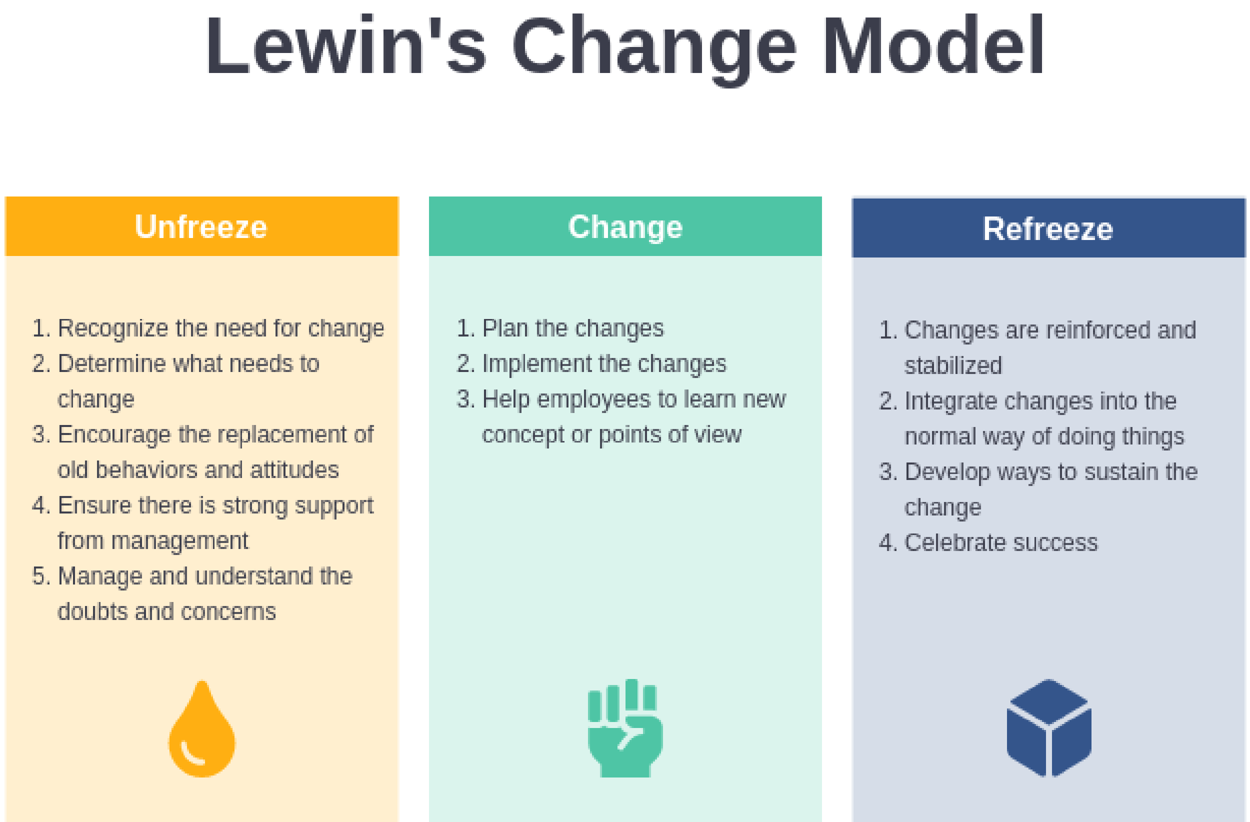
White, K. M., Dudley-Brown, S., & Terhaar, M. F. (2019). *Translation of evidence into nursing and health care* (3rd ed.). Springer Publishing Company.

Wojciechowski, E., Pearsall, T., Murphy, P., & French, E. (2016). A case review: integrating lewin's theory with lean's system approach for change. *OJIN: The Online Journal of Issues in Nursing*, *21*(2).

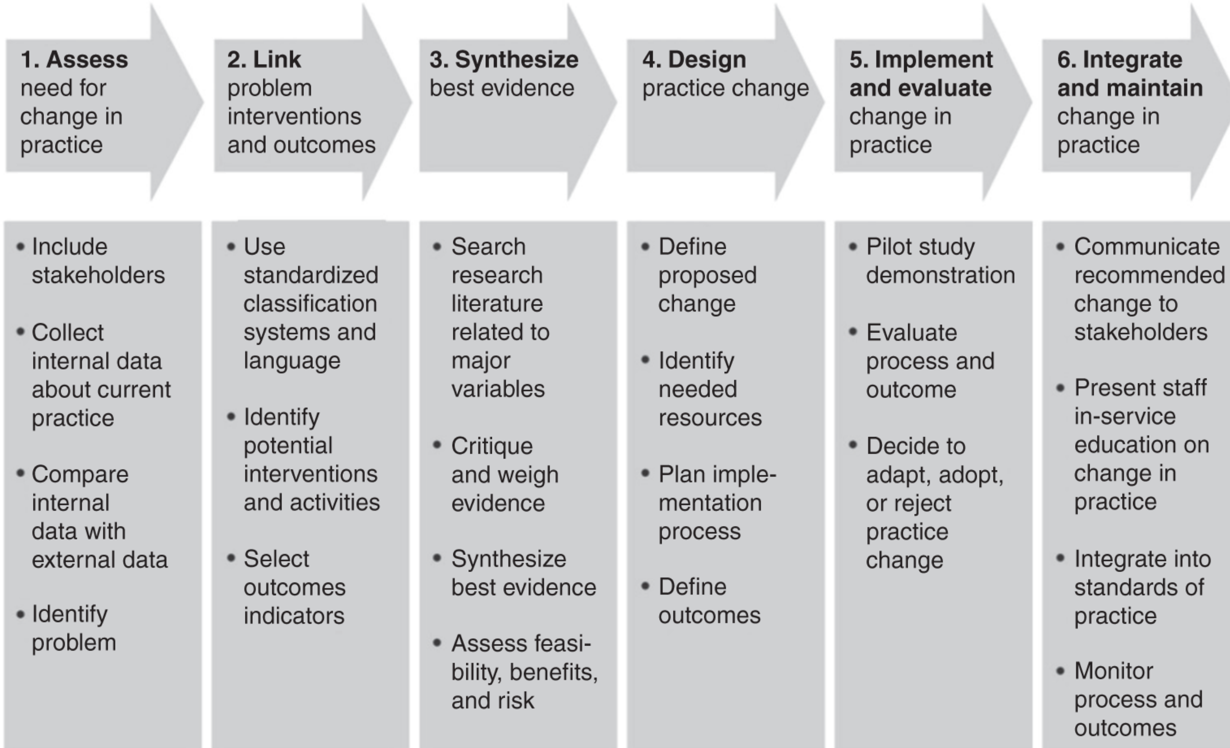
Young, M. E., Mears, S. C., Sallam, A. B., Sanders, R. N., Barnes, C. L., & Stambough, J. B. (2021). Corneal abrasions in total joint arthroplasty. *Geriatric Orthopaedic Surgery & Rehabilitation*, *12*, 215145932110601. https://doi.org/10.1177/21514593211060101

Yu, H.D., Chou, A.H., Yang, M.W., & Chang, C.J. (2010). An analysis of perioperative eye injuries after nonocular surgery. *Acta Anaesthesiologica Taiwanica, 48*(3), 122-129. doi: 10.1016/S1875-4597(10)60043-4

Appendix A: Lewin's Change Model



Appendix B: Rosswurm and Larrabee's Model for Evidence-Based Practice



Appendix C: Pre and Post Survey Questions

1. Please create and enter your own six-digit identifier code. Remember/save this code for the post-intervention survey:

   ____

2. What is the incidence of corneal abrasions in robotic assisted procedures?
   a. 10%
   b. 1%
   c. 3%
   d. 12%
3. Which comorbidity is at a higher risk for corneal abrasion?
   a. Atherosclerosis
   b. Hyperlipidemia
   c. Cancer
   d. Delirium
4. What is lagophthalmos?
   a. Swelling of the eye
   b. Redness of the eye
   c. Incomplete closure of the eye
   d. Secretions of the eye
5. Corneal abrasions are more likely when a procedure exceeds ___ minutes in duration?
   a. 30
   b. 45
   c. 60
   d. 90
6. Common in robotic assisted procedures, what position poses the greatest risk for corneal abrasions?
   a. Prone
   b. Lateral
   c. Sitting
   d. Trendelenburg
7. Insufflation of the abdomen increases the risk for corneal abrasions.
   a. True
   b. False
8. Steep Trendelenburg increases all of the following except?
   a. Intraocular pressure
   b. Central venous pressure
   c. Direct pressure on the eye
   d. Blink reflex
9. Eye tape in conjunction with lubricating ointments is more effective than eye tape alone.
   a. True
   b. False
10. Which ocular protection method has been proven to be most effective in preventing corneal injury in robotic assisted procedures?
    a. Paper tape
    b. Eye tape with lubricating ointment
    c. Silk tape
    d. Tegaderm dressings

11. Which of the following is true regarding the physiological effects of general anesthesia on the eyes?
    a. Reduces basal tear production
    b. Stimulates the blink reflex
    c. Decreases the frequency of lagophthalmos
    d. Decreased intraocular pressure.
12. I am confident in preventing corneal abrasions in patients undergoing general anesthesia.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
13. I am confident in corneal abrasion prevention during higher risk procedures such as robotic assisted approaches.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
14. I am confident utilizing Tegaderm dressings for ocular protection.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
15. I am confident in identifying patients at higher risk for corneal abrasion.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
16. I am confident that Tegaderm dressings provide superior ocular protection versus conventional methods (paper tape, silk tape, lubricating ointments).
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
17. I will make changes to my practice based on the evidence that was given during the presentation.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
18. I will be comfortable advocating the practice change to the leadership and management team.
    1. Strongly disagree
    2. Somewhat disagree

3. Neutral
4. Somewhat agree
5. Strongly agree

19. This corneal abrasion prevention protocol recommendation is appropriate for the targeted population.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
20. My colleagues would likely to show support for recommended corneal abrasion prevention protocol.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
21. I found this simulation to be helpful in showing the correct application of Tegaderm dressings for ocular protection
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree
22. This simulation will aid in incorporating what I learned during the presentation into my own anesthesia practice.
    1. Strongly disagree
    2. Somewhat disagree
    3. Neutral
    4. Somewhat agree
    5. Strongly agree

Appendix D: Demographics and Provider Experience

General Information

What is your age?

a. 18-24
b. 25-34
c. 35-44
d. 45-54
e. 55 and older

What is your gender?

a. Male
b. Female
c. Non-binary
d. Other
e. Prefer not to say

What is your highest level of education?

a. Certificate/Diploma
b. Bachelors
c. Masters
d. Doctor/Doctorate/Doctoral

How many years of anesthesia practice do you have?

a. 0-2 years
b. 3-5 years
c. 6-10 years
d. 11-20 years
e. More than 21 years

Provider Experience

How often do you use paper, silk, or clear tape as your ONLY method of ocular protection during a general anesthetic?

a. Never
b. Seldom
c. About half of the time
d. Usually
e. Always

How often do you use eye drops or ointments as interventions for ocular protection?

a. Never
b. Seldom
c. About half of the time
d. Usually
e. Always

How often do you utilize Tegaderm dressings as your primary method of ocular protection?

a. Never
b. Seldom
c. About half of the time
d. Usually
e. Always

Appendix E: Comprehensive Protocol for Ocular Protection During General Anesthesia

Overview: Corneal abrasions are the most common ophthalmologic complication that occurs during general anesthesia for non-ocular surgery. This complication can result in severe eye pain or soreness and may develop into inflammation by infection of bacteria or fungi. Corneal abrasions account for 3-8% of anesthesia related malpractice claims.

Purpose: To decrease the incidence of corneal abrasion by utilizing superior methods of ocular protection based on an exhaustive review of evidence based best practices regarding ocular protection and management during general anesthesia.

Target users: All anesthesia providers at Alamance Regional Medical Center providing general anesthesia for patients undergoing non-ocular surgical procedures.

High risk factors: Patients must be screened preoperatively for risk factors that increase their risk for corneal abrasion. If one or more of the following factors are present, the patient is considered to be **high risk**.

- Positioning
    - Prone
    - Lateral
    - Sitting
    - Trendelenburg
- Procedure
    - Robotic Assisted
    - Laparoscopic or use of pneumoperitoneum
    - Procedures involving the head or neck (craniotomy, ENT, dental, etc.)
- Co-morbidities
    - Hypertension
    - Obesity
    - Diabetes
    - Atherosclerotic heart disease
    - Dry Eye Syndrome
    - Hyperthyroidism
    - History of smoking
    - History of corneal abrasions.

Ocular Management during general anesthesia:

1. During induction, after loss of consciousness and prior to mask ventilation, manually close and tape eyes using paper or clear tape.
2. After successful intubation, securement of ETT, and adequate ventilation is achieved, assess the patency of the eye tape and ensure that the eyes have remained closed. Replace eye tape if necessary.
    a. If considered **high risk**, remove tape from the eyes and replace with Tegaderm dressings.
    b. Taping should be performed by first taping the upper eyelid to the lower eyelid. Do not compress the eye.
3. Periodically assess for ocular compression and inadequate closing of eyelids.
4. Prior to emergence, carefully remove the tape or dressings in a top to bottom fashion in effort to keep eyes closed.

Documentation

1. Document all ocular management interventions during the induction event. This includes closure of the eyes, methods of protection, and removal of tape/dressings at emergence.
2. Document all periodic ocular assessments.
3. If **high risk** intervention is utilized, document the rationale for use.