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The Effect of Patient Reminders on Patient Engagement With Digital Preoperative Education

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The Effect of Patient Reminders on Patient Engagement With Digital Preoperative Education

A DNP Project

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Abstract

Preoperative education improves surgical outcomes (Burgess et al., 2019). The current standard of care for patients undergoing endoscopic sinus surgery is verbal preoperative education at the office visit supplemented with printed material. Utilizing digital education customized to the surgical procedure is an effective way to improve patient knowledge, engagement, satisfaction, and health outcomes and should be integrated into healthcare guidelines (Golinelli et al., 2020). Our healthcare institution partnered with Independence Health's Quil to provide patients with access to digital tools for education and preparation, with a goal for patients to have a better experience before and after surgical procedures and be able to manage long-term health conditions (Otto, 2020). Having a member of the healthcare team send messages to patients in the form of a reminder can serve to increase engagement and open the door for continued interactions. Therefore, we decided to send reminders to patients via the electronic medical record (EMR) about the importance of participating in the digital preoperative education. The results of this study show that patients who were sent reminders had increased engagement compared to patients who were invited to participate in digital preoperative education without getting a reminder from the healthcare team. Therefore, the clinical question that was answered is that for adults undergoing endoscopic sinus surgery, receiving a reminder notification to complete preoperative education increased patient engagement with digital preoperative education.

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Chapter 1: Introduction and Background

Engaging patients in healthcare education and empowering them to manage and control their disease processes can lead to increased health quality and satisfaction (Ellen et al., 2018). Addressing health literacy improves patient engagement and provides the knowledge needed to self-manage and monitor chronic illnesses and prevent complications. This level of patient education is complex, and many patients and caregivers lack the skills to fully comprehend the instructions provided by the healthcare team. Health literacy can be influenced by patient skill level and how the information is delivered; there is no one teaching method that addresses all patients' needs (Yadav et al., 2019). However, teaching methods that engage patients with their input are found to be the most useful (Ellen et al., 2018).

Digital patient education platforms used in the home on smart devices (such as smartphones, tablets, televisions and desktops) can be customized by including patients' input to address their individual needs and help navigate their own targeted educational journey from beginning to end. There are currently several digital applications available for patient education, and a systematic review of technology-based educational programs shows that the majority (over 80%) improve patient engagement; these platforms are still in the beginning stages and are not yet focused on patient-centered care and engagement (Ellen et al., 2018). Additionally, healthcare organizations are slow to adopt digital patient education platforms due to lack of funding and incompatibility with existing electronic medical records. If the technology does not meet the patient and healthcare team's needs, it is less likely to be used (Ghafur & Schneider, 2019). Utilizing digital education platforms allows patients to

continue their healthcare education in their homes on smart devices after leaving the hospital or provider's office, leading to continued empowerment. The future of patient education will include personalized digital patient education journeys, and healthcare organizations should embrace, support and promote this technology (Ellen et al., 2018).

There are examples of the current development of customized digital education platforms to enhance patients' education in the home to maintain engagement and increase empowerment. One involves designing a digital health platform using input from patients and providers to ultimately prevent new injuries and increase confidence in patients who are status post hip fractures. The development of this platform uses established theoretical frameworks for the main build, and then provider and patient input are acquired to customize the program based on individual needs. With this protocol, patients are asked to actively participate in deciding how to manage their recovery process, and education is targeted accordingly. For example, some patients may have an underlying condition such as osteoporosis requiring complex interventions. Patients can decide which intervention and rehabilitation path suits them, which is then included in their education journey. The goal is to create comprehensive educational content that goes beyond the specifics of hip fractures to ensure patients have all the information needed to support their recovery and improve their quality of life (Yadav et al., 2019).

For patients undergoing surgical procedures, preoperative education improves patients' ability to cope with surgery and enhances surgical outcomes (Burgess et al., 2019). Utilizing digital education customized to the procedure is an effective way to improve patient knowledge, engagement, satisfaction, and health outcomes and should be integrated into healthcare guidelines (Golinelli et al., 2020). The current standard of care for patients

undergoing endoscopic sinus surgery is verbal preoperative education at the office visit supplemented with printed material. One study comparing this standard type of education to digital education found that patients were more engaged and satisfied with the digital format (Ma et al., 2018). Patient engagement is a crucial part of the preoperative education process.

Significance

In 2018, our healthcare institution partnered with Independence Health's Quil to provide patients with access to digital tools for education and preparation, with a goal for patients to have a better experience before and after surgical procedures and be able to manage long-term health conditions (Otto, 2020). The Department of Otolaryngology worked with Quil to develop digital preoperative education for patients undergoing procedures within the subspecialties of rhinology and head and neck cancer. Within the Division of Rhinology, the education was made specifically for patients undergoing endoscopic sinus surgery to prepare them for surgery and to monitor their progress postoperatively. The educational materials were created by nurse practitioners and surgeons in the department based on consistent standards of practice for the field. In reviewing the digital education data after implementation of the digital preoperative education, we noticed that not all of the patients were engaging in the education despite being sent an electronic invitation. It is necessary to increase patient engagement in the preoperative preparation in order to decrease risk factors that can lead to complications (Jansson et al., 2020).

Reminders to participate in preoperative education sent from the healthcare team increase patient engagement with electronic information (Lu et al., 2018). Utilizing digital tools should enhance, but not replace, personal interactions. Having a member of the healthcare team send messages to patients in the form of a reminder can serve to increase

engagement and open the door for continued interactions. Therefore, we decided to send reminders to patients via the electronic medical record (EMR) about the importance of participating in the digital preoperative education. This study compared patients receiving digital preoperative patient education without getting a reminder from the healthcare team to patients receiving the same education with reminders sent.

Clinical Question

The clinical question that guided this project is: For adults undergoing endoscopic sinus surgery (patient population), how does receiving a reminder notification to complete preoperative education (intervention) compared to not receiving a reminder (comparison) affect patient engagement with digital preoperative education (outcome) before surgery (time)?

Change Model

The conceptual model for this project is the Donabedian Model. This model emphasizes the importance of structures and processes on outcomes. Basically, structures include inputs from people (patients and healthcare team), places (setting), and things (resources, policies, etc.). Processes involve utilizing the structures in place to provide patient care. Finally, outcomes are the results obtained from implementing care delivery; the impact of the structures and processes in place is measured by outcomes (Kaiser, 2022). Ironically, this conceptualization is sometimes oversimplified. Donabedian himself expressed that systems are only the enabling mechanisms, and that each individual ethical contribution is essential to successful healthcare delivery (Berwick & Fox, 2016). Therefore, it is important to understand the impact each individual involved has on the desired outcomes as well as the industrial concept of this model.

For increasing patient engagement in preoperative education specifically, the structure implications include the setting, population, resources and development of preoperative education by the healthcare team in a surgical setting and the willingness of the patient to engage in that education. Processes include the IRB process and protection of subject privacy, the utilization of the Quil app and the ability to interface with the electronic medical record for data collection. The outcome will involve data analysis to reflect the supported hypotheses of increased engagement and increased completion rates of the preoperative education measured via the Quill app, ultimately resulting in improved surgical outcomes as demonstrated in the literature review.

Goals of Project

The main goal of this project is to improve patient engagement with digital preoperative education, which has been shown to improve surgical outcomes. Specifically, the project was designed to determine if sending patient reminders from a member of the healthcare team affects completion rates of digital preoperative education. Therefore, the goals of the project are:

1. Patient engagement in preoperative education, measured by completion rates, will be greater in patients who were sent a reminder from the healthcare team compared to patients who did not receive a reminder.
2. Determine if there is a difference in patient engagement with preoperative digital education based on patient age, gender or race.

Summary

For patients undergoing surgical procedures, preoperative education improves patients' ability to cope with surgery and enhances surgical outcomes (Burgess et al.,

2019). Although preoperative education standards vary, teaching methods that engage patients with their input have been found to be the most useful (Ellen et al., 2018). Increased patient engagement in the preoperative preparation can decrease complications (Jansson et al., 2020). Sending reminders from the healthcare team to participate in preoperative education has been shown to increase patient engagement with electronic information (Lu et al., 2018). The main goal of this project is to improve patient engagement with digital preoperative education using the Donabedian Model as a change model. The outcome will reflect the supported hypotheses of increased engagement and increased completion rates of the preoperative education, ultimately resulting in improved surgical outcomes as demonstrated in the literature review.

Chapter 2: Literature Review

The literature review for this Doctor of Nursing Practice (DNP) project examines relationships among preoperative education, surgical outcomes and patient engagement. Particularly the purpose is to discover if preoperative education affects surgical outcomes, how digital education compares to standard preoperative education, and how sending electronic reminders to patients affects patient engagement. The significance to nursing is to ascertain if implementing reminders to patients regarding preoperative digital education in a specific setting can enhance patient engagement to improve surgical outcomes.

Terms, Concepts and Definitions

For this study, preoperative education is defined as standard practices of informing patients about the surgical process, including verbal, written, and digital education. Digital education is the innovative use of technology during education, such as videos and web-based platforms. Surgical outcomes are multifaceted for this study and include the presence or absence of physical and psychosocial postoperative complications. Patient reminders are electronic messages sent to patients, and patient engagement is the active choice to participate in care. The patient population to be studied will be adults undergoing endoscopic sinus surgery; however, the literature review includes adults undergoing any outpatient elective surgery. The differences are the intervention group being sent electronic reminders to complete the preoperative education, the number of patients who registered for the digital education, and the completion rates. The clinical question that guided the literature search is: For adults undergoing endoscopic sinus surgery (patient population), how does receiving a reminder notification to complete preoperative education (intervention) compared to not

receiving a reminder (comparison) affect patient engagement with digital preoperative education (outcome) before surgery (time)?

Search Strategy

The search for literature for this DNP project began in the fall of 2021 and continued through the fall of 2022. The databases searched included PubMed, Cochrane, and CINAHL via the University of Pennsylvania's Franklin Library. A research librarian from the University of Pennsylvania also assisted in the search. Search terms included: *surgical outcomes, preoperative education, digital patient education, electronic patient reminders, patient engagement, adults, endoscopic sinus surgery,* and *functional endoscopic sinus surgery (FESS).* The search terms were used together in different combinations to create search strings to determine how preoperative education affects surgical outcomes (235 studies found, 19 considered, 11 included in review); to compare standard preoperative education to digital education (38 studies found, 6 considered, 4 included in review); and to investigate how reminders affect surgical patient compliance (71 studies found, 8 considered, 6 included in review). Of the 21 studies included in this review, there are a nearly equal number of randomized clinical trials (RCT) and cohort studies, with one controlled trial that was not randomized. There are three systematic reviews; the remainder are qualitative or descriptive studies.

Inclusion criteria varied for each search string but always included studies and systematic reviews of studies of a higher level of evidence regarding the study population of adults having surgery. Search parameters included articles within the past seven years. One article that is outside the date delimitations was included in the review because it applied specifically to the patient population (Henney et al., 2014). The variations were in the type of

surgery (elective and then, more specifically, endoscopic sinus surgery) and education included (standard current practices or digital). Excluded were studies involving children and studies regarding outcomes (surgical or educational) that did not include psychological outcomes. There was no literature specifically related to the effects of digital vs. standard preoperative education on preoperative anxiety and surgical outcomes after endoscopic sinus surgery; one article explored this but did not include a validated measurement tool (Ma et al., 2018).

Findings

Preoperative Education and Effects on Surgical Outcomes

Consistent preoperative education can improve patients' abilities to cope with surgery, thus enhancing surgical outcomes (Burgess et al., 2019). All studies reviewed in this category showed a significant improvement in psychosocial states (including anxiety) and other surgical outcomes. Six of these studies demonstrated that preoperative education improved psychosocial outcomes, including decreased anxiety (Andersson et al., 2020; Burgess et al., 2019; Liao et al., 2018; Ma et al., 2018; Sepulveda-Plata et al., 2018; Wu et al., 2019). Other studies within the review showed a correlation with preoperative education affecting other surgical outcomes, such as shorter length of stay (Cavallaro et al., 2018; Gadler et al., 2016; Liao et al., 2018; Schenkel et al., 2020; Wu et al., 2019). Other affected outcomes include lower cost (Liao et al., 2018; Schenkel et al., 2020; Wu et al., 2019) and lower pain level (Liao et al., 2018; Wu et al., 2019). Additionally, the literature demonstrates increased patient knowledge (Henney et al., 2014; Ma et al., 2018) and increased patient satisfaction (Gadler et al., 2016; Ma et al., 2018; Sepulveda-Plata et al., 2018).

Three studies reviewed specifically regarding preoperative anxiety and surgical outcomes showed a statistically significant correlation between the two variables (Andersson et al., 2020; Lumb et al., 2020; Torres et al., 2020), including increased surgical complications and decreased patient experience with the presence of preoperative anxiety. One study found a significant difference in marital status, educational level, and awareness of postoperative education; patients who were single with a higher education level and an awareness of postoperative complications were more likely to experience preoperative anxiety (Amiri et al., 2020). Interestingly, there was no correlation found between clinical sympathetic activity and reported anxiety levels in a mixed methods observational cohort study (Lumb et al., 2020); however, there was evidence in one randomized clinical trial of a correlation between preoperative anxiety level and decreased biometric measures, specifically C-reactive protein (Wu et al., 2019). Additional studies, reviewed while focusing on the effects of preoperative education on preoperative anxiety levels, also showed evidence that preoperative anxiety decreases surgical outcomes, including patient satisfaction (Gadler et al., 2016; Liao et al., 2018).

There is a consensus that preoperative education is beneficial for surgical outcomes, with no studies citing evidence of negative outcomes. One of the main variations within these studies was the type of education delivered to preoperative patients. Only two studies (Henney et al., 2014; Ma et al., 2018) implemented some form of digital education.

Standard vs. Digital Education

The most commonly used mode of preoperative education is verbal education, written pamphlets, or a combination of the two. As mentioned, two studies included digital education; one RCT used website-based education (Henny et al., 2014) and the other used

videos to deliver the educational piece (Ma et al., 2018). When reviewing the literature regarding digital education specifically, two systematic reviews, a pilot study, and a quality improvement project all show promising results for this mode of education. The systematic reviews show that digital platforms have been shown to improve health, increase patient engagement and be helpful with prevention and surveillance (Golinelli et al., 2020; Sawesi et al., 2016). At the same time, one systematic review found that the majority of articles that assessed usability considered digital education usable, only one-third (57 out of 170) assessed usability (Sawesi et al., 2016), and the other systematic review found that problems related to usability remain (Golinelli et al., 2020).

The standard of care for functional endoscopic sinus surgery (FESS) education is verbal communication supplemented by printed handouts. An RCT compared multi-media education vs. standard education for preoperative FESS patients and found that patient satisfaction was significantly more positive with the former (Ma et al., 2018). A quality improvement project for patients undergoing a prostatectomy showed similar patient satisfaction results and no difference in patient knowledge retention (Gadler, 2016). The pilot study implementing digital monitoring and education over two years showed decreased readmission rates and decreased costs (Schenkel et al., 2020). There were no negative effects of digital education platforms across studies regarding outcomes. Since digital platforms can be viewed at the patient's leisure without taking up clinic time, it seems the more beneficial option.

Quil Tool

In 2018, our healthcare organization partnered with Independence Health's Quil to provide patients with access to digital tools for education and preparation. The goal is for

patients to have a better experience before and after surgical procedures and be able to manage long-term health conditions. The first pilot was with the Department of Orthopedic Surgery, enrolling more than 900 total hip and knee replacements, resulting in decreased length of stay and increased rate of being discharged home instead of a rehab facility (Otto, 2020). The Department of Otolaryngology began to work with Quil in the fall of 2021 to develop an educational journey to prepare patients for endoscopic sinus surgery and to monitor their progress postoperatively. The educational materials were created by nurse practitioners and surgeons in the department based on consistent standards of practice for the field.

Electronic Reminders

There is a need for proactive interventions to increase patients' engagement in preoperative education and preparation to decrease preoperative risk factors and improve postoperative care at home (Jannson et al., 2020). Patient reminders can be sent via written message (by letter or electronically), by telephone, or in person to increase engagement and adherence; however, all studies reviewed in this section included electronic delivery. Two systematic reviews were included; the first systematic review of 15 articles using electronic communication for preoperative and postoperative education included six articles using electronic reminders, with two specifically related to patient education. The review showed that reminders increase engagement in the electronic delivery of information (Lu et al., 2018). Another systematic review looked at eight articles involving electronic communication with surgical patients, with one specifically mentioning reminders about preoperative information, which showed that digital healthcare applications are an important tool for patient engagement in education (De La Cruz & Mosahebi, 2019).

One RCT and three cohort studies showed how sending reminders increases adherence and engagement (Jansson et al., 2020; Stewart et al., 2019; Sybil et al., 2021) and that reinforcement of education improves adherence (Lee et al., 2019). Interestingly, one study showed that using a perioperative care tool with reminders built in not only improved compliance with engagement, but also led to a significant difference in surgery cancellations (Stewart et al., 2019).

Gaps in Literature and Summary

The literature review establishes compelling evidence that preoperative anxiety exists and that it can negatively affect surgical outcomes (Amiri et al., 2020; Burgess et al., 2019; Liao et al., 2018; Lumb et al., 2018; Torres et al., 2020). There is also solid evidence that preoperative education can positively impact postoperative anxiety (Gadler et al., 2016; Liao et al., 2018; Sepulvada-Plata et al., 2018) and other surgical outcomes (Cavallaro et al., 2018; Liao et al., 2018; Schenkel et al., 2020; Wu et al., 2019). In further exploring preoperative education, the literature strongly suggests that digital education results in the same or better than standard education regarding patient satisfaction (Gadler et al., 2016; Sawesi et al., 2016; Schenkel et al., 2020), patient knowledge (Henney et al., 2014; Ma et al., 2018) and health outcomes (Golinelli et al., 2020; Sawesi et al., 2016; Schenkel et al., 2020). Patient reminders can be sent to improve patient engagement with digital preoperative education to maximize the surgical outcomes (De La Cruz & Mosahebi, 2019; Jannson et al., 2020; Lu et al., 2018).

There were limitations found in this literature review; some studies had data missing or potentially compromised due to time constraints of staff and patients in busy, fast-paced perioperative environments (Anderson et al., 2020; Golinelli et al., 2020; Lumb et al., 2020;

Ma et al., 2018; Sepulveda-Plata et al., 2018). While there is a consensus that preoperative anxiety can hinder surgical outcomes and that preoperative education can improve both preoperative anxiety and surgical outcomes, and even evidence that digital education can be more effective than standard preoperative education, there is little data specifically related to the digital preoperative education effects on preoperative anxiety and surgical outcomes after endoscopic sinus surgery. Only one article touched on this (Ma et al., 2018), but surgical outcomes other than patient knowledge and satisfaction were not assessed. Barriers to implementing digital education, including usability and reimbursement, were discussed in the results sections of some of the articles focusing on digital education (Golinelli et al., 2020; Sawesi et al., 2016; Schenkel et al., 2020); however, solutions for increasing usability and implementation in outpatient surgical practices needs more attention. Another area needing more attention is a multi-institutional study to demonstrate the cost savings of using digital applications with reminders (Stewart et al., 2019).

Implications and Conclusion

From the literature, the following implications for a surgical practice were emphasized. Decreasing anxiety may be most beneficial in single, educated patients, and decreased anxiety can increase patient satisfaction (Amiri, 2020). Anxiety not alleviated preoperatively carries over postoperatively (Andersson 2020); if not addressed before surgery, postoperative recovery may be delayed or complicated (Torres, 2020). Consistent preoperative education can improve patients' ability to cope with surgery and enhance surgical outcomes (Burgess et al., 2019). Evidence shows that using digital education for preoperative education can improve patient knowledge, engagement, satisfaction, and health outcomes and should be integrated into healthcare guidelines (Gadler et al., 2016; Golinelli

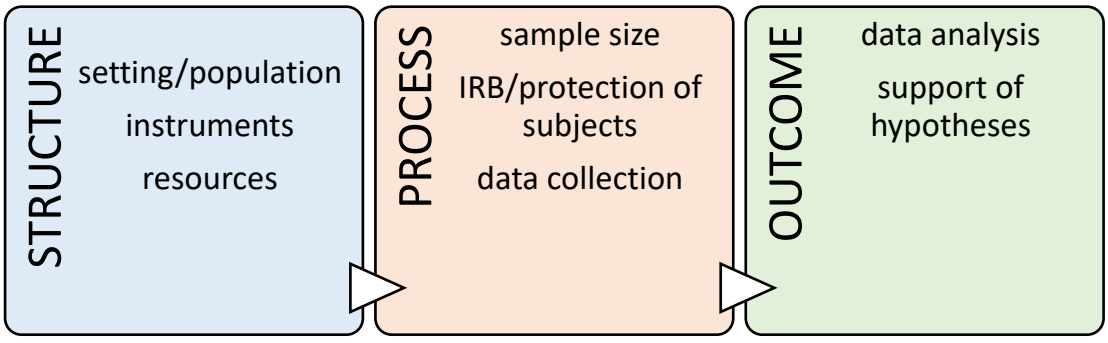
et al., 2020; Sawesi et al., 2016). Current policies do not promote digital solutions and should focus on expanding digital platforms to improve care (Schenkel et al., 2020). Finally, sending reminders can increase adherence and engagement in digital applications (De La Cruz & Mosahebi, 2019; Jannson et al., 2020; Lu et al., 2018).

Based on personal clinical observations and the literature review findings, it is evident that there is a need for consistent preoperative education, preferably digital, to improve surgical outcomes. Therefore, the purpose of this project is to increase patient engagement with the implemented digital education platform for patients undergoing elective surgery, specifically adult patients undergoing endoscopic sinus surgery. Engagement metrics such as registration and completion rates will be used to answer the research question proposed: For adults undergoing endoscopic sinus surgery (patient population), how does receiving a reminder notification to complete preoperative education (intervention) compared to not receiving a reminder (comparison) affect patient engagement with digital preoperative education (outcome) prior to surgery (time)?

Chapter 3: Methods

For this project, digital preoperative education platforms were developed by nurse practitioners and surgeons to prepare patients for endoscopic sinus surgery in the Department of Otolaryngology in collaboration with Quil. The healthcare institution partnered with Independence Health's Quil to provide patients with access to digital tools for education and preparation. Every patient who was scheduled for this surgery in our department was invited by Quil to participate in the journey. In an effort to increase patient engagement and completion rates of the education, reminder messages were sent from the healthcare team via the patient electronic medical record (EMR) portal about the importance of this education. The study took a prospective cohort approach to compare two groups, the patients who were invited to participate in the digital preoperative education by Quil, and the patients who were invited to participate in the digital preoperative education by Quil and sent a reminder of the importance of the education by a member of the healthcare team via the EMR portal. The Donabedian Model was applied for this project (see Table 1).

Table 1
Use of Donabedian Model for Project



Note. Structure included inputs from people, places, and things. Process involved utilizing the structures in place. Outcome references the results obtained from implementing care delivery (Kaiser, 2022).

Structure

Setting

The study was conducted in a surgical outpatient setting within a prestigious academic center located in West Philadelphia. The site had almost two million outpatient visits in fiscal year 2021, serving adult patients locally, nationally and internationally (Penn Medicine, 2022). The specific department involved in the study is the Department of Otolaryngology, evaluating and treating adult patients with ear, nose and throat disorders and/or head and neck cancers, locally, nationally and internationally.

Population

The target population includes adult patients undergoing endoscopic sinus surgery within the Department of Otolaryngology. All patients were invited to participate in preoperative education once they scheduled their surgery. Patients under 18 were excluded because they cannot be enrolled in the electronic patient portal. There was no recruiting or enrollment; the invitation to participate in the preoperative education was standard of care.

Instrument

The planning and implementation of this project took place from December 2020 until October 2022. Our department was contacted by the healthcare institution's administration about partnering with Quil to provide digital education for our patients. A task force was created by the EMR facilitator which consisted of two attendings (one specializing in rhinology and one in head and neck cancer) and two nurse practitioners (one specializing in rhinology and one in head and neck cancer). The task force looked at current preoperative education materials, evidence-based literature regarding the procedures, and collaborated with all surgeons involved in these surgical cases to develop preoperative education materials

based on the surgery CPT codes. The task force then met with Quil to develop interactive educational journeys to be delivered to patients electronically via email. The educational journey discusses preoperative, intraoperative and postoperative considerations customized to patients based on the type of surgery they are having. All patients having either sinus or head and neck cancer surgeries were given access to the educational material via email. This project focuses on patients who received the sinus surgery education; a PDF version is attached (see Appendix A).

After the educational journeys were implemented, it was noticed that not all patients who were invited registered to participate. Therefore, the rhinology division of the task force decided that a reminder message from a member of the healthcare team would be sent to the patients via the EMR. The message was sent a week after the Quil education invitation was sent to patients, and states:

Dear [NAME],

The Quil preoperative education journey has useful information about what to expect before, during, and after your upcoming surgery. This is a reminder to complete your journey prior to surgery; please check your email for the invitation from Quil.

Thank you,

[SIGNATURE]

Outcomes for digital preoperative education in the rhinology and head and neck patients will be measured by improvement of surgical outcomes measured by validated outcome scores, length of admissions, readmission and complication rates (not in the scope of this project but ongoing in the department). For this project, outcomes will include patient

engagement with the preoperative education, measured by registration rates and completion rates.

Resources, Personnel and Technology

The patient population was within the Division of Rhinology under the Department of Otolaryngology; the Rhinology Division currently has five attending physicians, two fellows, four residents, two nurse practitioners, two registered nurses, two scribes, one medical assistant and one surgery scheduler. The task force for the Quil education (as described above) included a rhinology attending and rhinology nurse practitioner.

There was no budget needed for implementing the education and intervention. The healthcare system partnered with Quil and those financial metrics are not publicly available; however, our department did not incur any costs to implement the preoperative educational pilots. Likewise, a budget for personnel time was not needed, as there was no cost to implement the reminder messages that were sent "off the clock" as part of the DNP project. At the end of the project, the education was made available by Quil to our department as a PDF that can be continually sent to future patients.

Process

Sample Size

In terms of statistical power regarding the dependent variable *Percentage of Compliance*, the G*power software indicated that within a multiple linear regression model with 4 explanatory variables, a medium effect size (Cohen's f=.15) between the explanatory and dependent variable, with power set at .80 and alpha set at .05, would require a sample size of 85 study participants. Thus, the current sample of 100 study participants would provide sufficient statistical power for the current analysis.

In terms of statistical power regarding the dependent variable *Registration (Yes/No)*, the Power and Precision software program indicated that a medium effect size effect (OR=3.34) would be detected between a dichotomous independent and dependent variable (with a projected event rate of .26 and .54 among the 2 groups) using a binary logistic regression model with power set at .80 and alpha set at .05, using a sample size of 100 study participants. Thus, the current projected sample of 100 study participants would provide approximately sufficient statistical power for the current analysis.

Protection of Human Subjects/IRB

Quil had de-identified data regarding the number of patients who are sent the preoperative education, the number of patients who register, and the completion percentages. The study data was stored and secured in the Quil Health instance of Snowflake Enterprise Cloud database. Quil and the healthcare institution signed a business relationship in September 2019 under a HIPAA Business Associates Agreement. In October 2020, Quil and the healthcare institution expanded their business relationship signing an Enterprise Strategic Alliance Agreement of which Quil is responsible for regular security/risk assessments to ensure the security and privacy of the healthcare institution's patients. The latest security assessment in March of 2022 found Quil to have no issues or non-conformities to the healthcare institution policies.

This project was submitted as an exempt research study with the healthcare institution’s IRB and West Chester University’s IRB. The design was a prospective cohort study, comparing two groups of patients within the Quil app; those that received a reminder message are compared with those that didn’t. No informed consents were required. The study

was deemed exempt by both the healthcare institution (see Appendix B) and WCU's IRB (see Appendix C).

Data Collection

Data was collected via the healthcare institution's EMR. Quil interfaces with the healthcare institution's EMR, showing all patients that were scheduled for endoscopic sinus surgery and invited to participate in the digital preoperative education under one tab. The data collected includes patient initials, surgeon, date of surgery, gender, age, race, ethnicity, geographic location (zip code, county, state), registration status (yes, no), completion rate (percentage computed by dividing total completed by total available) and if a reminder was sent (yes, no). Data was collected weekly by the principal investigator. There was a total of 110 charts reviewed, including 55 charts prior to the intervention and 55 charts with the intervention. The total span is from June 27, 2022 to October 31, 2022.

Outcome

Data Analyses Plan

All data analyses were performed using the latest version of SPSS (SPSS 28.0). The data analysis was planned to be conducted in three phases. First, all study variables were presented using descriptive statistics, such as means, standard deviation, and minimum/maximum values for continuous variables (Interval/Ratio level) and frequencies and percentages for categorical variables (Nominal/Ratio level). Second, a series of bivariate tests were planned to be used to produce inferential findings between the dependent variables and the independent variable *Study Group*, as well as the relationships between the covariate variables (age, gender, race) with the dependent variables. However, the dependent variable *Registration (Yes/No)* was a constant (100% were in the *Yes*

category), so *Registration* (Yes/No) was not examined as a dependent variable. Subsequently, only the dependent variable *Percentage of Compliance (0%-100%)* was related (via bivariate analysis) to the independent variable *Study Group*, as well as the covariate variables (age, gender, race).

Analyses Plan for Support of Hypotheses

The third planned phase of data analysis was multivariate analysis, where multivariate regression would be used to model a dependent variable as a function of the independent variable *Study Group*, while controlling for the covariate variables significantly related to that dependent variable in bivariate analysis. However, there were not any covariate variables significantly related to the dependent variable *Percentage of Compliance* at a statistically significant level ($p<.05$), so multivariate modeling was not necessary. Subsequently, the final results of the analysis between analysis independent variable *Study Group*, with the dependent variable *Percentage of Compliance* were presented at the bivariate using a non-parametric independent samples *t*-test (Mann-Whitney U). A non-parametric independent samples *t*-test (Mann-Whitney U) was used for this analysis rather than a parametric independent samples t-test because of the low level of variance (the parametric independent samples t-test is based on an analysis of variance) provided by the small number of study participants in the experimental group ($n=16$) and control group ($n=16$).

Summary

In an effort to increase patient engagement with preoperative education developed for rhinology patients in our department in collaboration with Quil, reminder messages were sent from the healthcare team via the EMR. The theoretical framework for this project is the

Donabedian Model. The study was conducted in a surgical outpatient setting within a prestigious academic center located in West Philadelphia and the target population includes adult patients undergoing endoscopic sinus surgery there. Data was collected via the healthcare institution's EMR, and all data analysis was performed using the latest version of SPSS (SPSS 27.0). The project was submitted as an exempt research study with the healthcare institution's and West Chester University's IRB. Personnel includes members of the Division of Rhinology and the Quil education task force. There are no departmental expenses and therefore no budget required. Patient engagement outcomes will be measured by registration rates and completion rates.

Chapter 4: Results

The total number of patients who were sent an invitation to register for Quil's digital preoperative education during the months of June through November of 2022 was 110. Patient reminders to engage in the preoperative education were sent to patients having surgery September through November of 2022; of the 110 patients who were sent the invitation, 55 patients were sent a patient reminder to engage in the preoperative education. The total number of patients who registered with Quil via the invitation and were included in the Study Group was 32; of those 32 patients, 16 patients were in the control group (no reminder sent) and 16 patients were in the experimental group (reminder sent). Among the 32 study participants included in the inferential analysis for hypothesis testing, there were no missing data values, which facilitated a complete case analysis. In terms of statistical power, regarding the dependent variable Percentage of Compliance, the G*power software indicated that within an independent samples *t*-test, a large effect size (Cohen's d=1.1) between the mean scores of two groups with power set at .80 and alpha set at .05, would require a sample size of 30 study participants. Thus, the current sample of 30 study participants would provide sufficient statistical power for the current analysis.

Statistical Results

There was a significant difference in engagement measured by the percentage of completion, as the average percentage of *Percent Complete* within the experimental group was significantly higher than that within the control group (See Table 2).

Table 2
Bivariate Analysis Between the Dependent Variable *Percent Completed* by the Independent Variable *Study Group* (*n*=32)

Variable	n	M (SD)	Mann-Whitney U	Z	p
Study Group			**75.50**	**-1.98**	**.047***
Experimental (Reminder Yes/No)	16	70.63 (30.76)			
Control (Reminder NA)	16	58.19 (20.19)			

*Cohen's d effect size = .75 (approximately large).

Table 2 presents a bivariate analysis between the dependent variable *Percent Complete* and the independent variable *Study Group*. The non-parametric independent samples *t*-test (Mann-Whitney U) indicated that the average percentage of *Percent Complete* within the experimental group (*M*=70.63, *SD*=30.76) was significantly higher than that within the control group (*M*=58.19, *SD*=20.19), Mann-Whitney U= 75.50, *Z*=-1.98, *p*<.05. This difference in means scores reflects an approximately large effect size (Cohen's *d* = .75).

Descriptive Analyses

A descriptive analysis of demographic and patient characteristics was done for the *Study Group* (See Table 3). Data indicated that the sample was about two-thirds female (*n*=21, 65.5%), predominantly of a White racial identity (*n*=27, 84.4%), of a non-Hispanic ethnicity (*n*=32, 100.0%), and had a registration status of *Registered* (*n*=32, 100.0%). A reminder was only sent to the experimental group (*n*=16). The study groups were evenly split between the experimental (*n*=16, 50.0%) and control (*n*=16, 50.0%) groups.

Table 3
Descriptive Analysis of Demographic and Patient Characteristics (*n*=32)

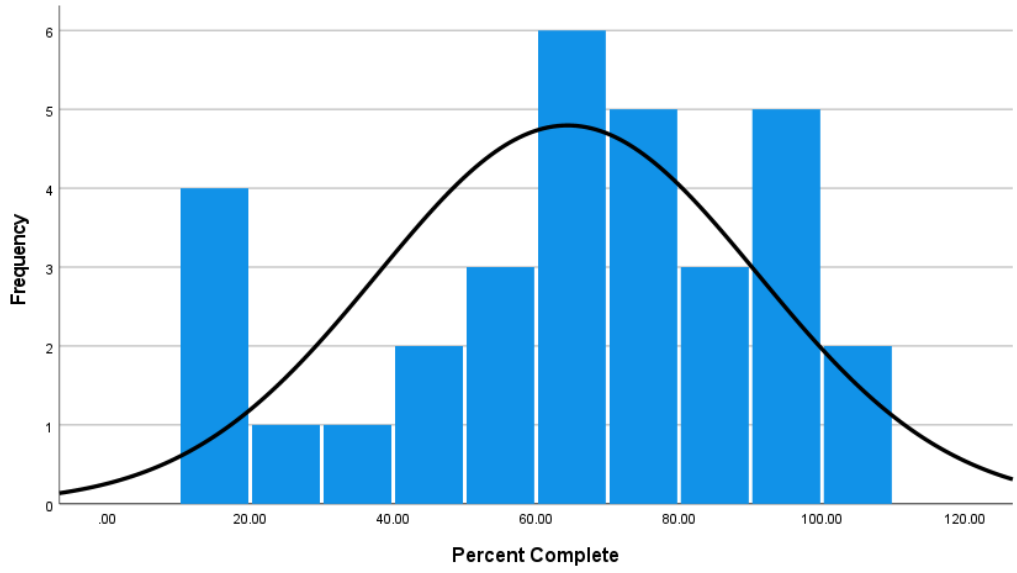
Variable	N	%
Gender		
Male	11	34.4
Female	21	65.5
Race/Ethnicity		
White	27	84.4
Black	1	3.1
Other	3	9.4
Unknown	1	3.1
Ethnicity		
Hispanic	0	0.0
Non-Hispanic	32	100.0
Registration Status		
Not Registered	0	0.0
Registered	32	100.0
Reminder Sent (n=16 in the Experimental group)		
No	3	9.4
Yes	13	81.3
N/A (Control group)	*16*	
Study Group		
Control (Reminder Sent N/A)	16	50.0
Experimental (Reminder Sent Yes or No)	16	50.0

A descriptive analysis of the continuous study variables, age and the dependent variable *Percent Complete* was done for the *Study Group* (See Table 4). Data indicated that the average study participant was 58.63 (*SD*=12.74, MIN/MAX=30.00-84.00) years old. The average *Percent Complete* score was 64.41% (*SD*=26.61, MIN/MAX=13.00-100.00). The distribution of all the scores was approximately normal as the skewness and kurtosis were not approximately two times the standard error of each value. Figure 1 presents a histogram of the dependent variable *Percent Complete* scores.

Table 4
Descriptive Analysis of Age and Percent Complete (*n*=32)

Variable (SE)	M (SD)	Minimum/ Maximum	Skew (SE)	Kurtosis
Age	58.63 (12.74)	30.00-84.00	-.47 (.41)	.25 (.81)
Percent Complete	64.41 (26.61)	13.00-100.00	-.61 (.41)	-.65 (.81)

Figure 1
Histogram of the Dependent Variable *Percent Complete* Scores



Bivariate Analyses

An examination of bias between *Registration Status* (Registered/Not Registered) by gender, race, and age was completed (See Table 5). Chi-square analysis indicated that there was a significantly higher percentage of males within the Not Registered group (*n*=43, 55.1%), relative to the Registered group (*n*=11, 34.4%), $X^2(1)=3.91$, $p<.05$. Race was not significantly related to *Registration Status*, $X^2(1)=1.30$, $p=.26$. Lastly, *Registration Status* was significantly related to study participant age, $t(78.47) = 2.52$, $p<.05$, with a significantly

lower age among the Not Registered group (*M*=51.08, *SD*=17.49) relative to the Registered group (*M*=58.63, *SD*=12.73).

Table 5
Examination of Bias Between *Registration Status* by Gender, Race, and Age (*n*=110)

	Registration Status			
	Not Registered (*n*=78)	**Registered (*n*=32)**		
Variable	**n (Row %)**	**n (Row %)**	**X^2(df)**	**p**
Gender			**3.91 (1)**	**.048**
Male (Column %)	43 (79.6) (55.1)	11 (20.4) (34.4)		
Female (Column %)	35 (62.5) (44.9)	21 (37.5) (65.6)		
Race			**1.30 (1)**	**.26**
Not White (Column %)	1 (20.0) (6.3)	4 (80.0) (25.0)		
White (Column %)	15 (55.6) (93.8)	12 (44.4) (75.0)		
Age			***t*(78.47) = 2.52**	**.014**
	M=51.08, *SD*=17.49	*M*=58.63, *SD*=12.73		

An examination of bias between *Study Group* (Experimental/Control) by gender, race, and age was completed (See Table 6). Bivariate analysis indicated that the study groups did not differ at a statistically significant level by gender, $X^2(1)=.14$, $p=.71$, race, $X^2(1)=2.13$, $p=.14$, or age, Mann-Whitney U = 117.00, $p=.68$.

Table 6
Examination of Bias Between *Study Group* by Gender, Race, and Age (*n*=32)

	Control (*n*=16) (Reminder NA)	Experimental (*n*=16) (Reminder Yes/No)		
Variable	**n (Row %)**	**n (Row %)**	**X^2(df)**	**p**
Gender			**.14 (1)**	**.71**
Male	6 (54.5)	5 (45.5)		
(Column %)	(37.5)	(31.3)		
Female	10 (47.6)	11 (52.4)		
(Column %)	(62.5)	(68.8)		
Race			**2.13 (1)**	**.14**
Not White	1 (20.0)	4 (80.0)		
(Column %)	(6.3)	(25.0)		
White	15 (55.6)	12 (44.4)		
(Column %)	(93.8)	(75.0)		
Age			**Mann-Whitney U = 117.00**	**.68**
	M=59.06, *SD*=10.40	*M*=58.19, *SD*=15.05		

A bivariate analysis between the dependent variable *Percent Complete* by gender, race, and age was completed (See Table 7). Bivariate analysis indicated that *Percent Complete* was not significantly related to gender, $t(30)=-.03$, $p=.97$, race, $t(30)=-1.26$, $p=.22$, or age, $r = -.15$, $p=.41$.

Table 7
Bivariate Analysis Between the Dependent Variable *Percent Complete* by Gender, Race, and Age (*n*=32)

Variable	**n**	**M (SD)**	**t(df)**	**p**
Gender			**-.03 (30)**	**.97**
Male	11	64.18 (22.76)		
Female	21	64.52 (28.96)		
Race			**-1.26 (30)**	**.22**
White	27	61.89 (27.29)		
Not White	5	78.00 (19.38)		
Age	32		***r* = -.15 (30)**	**.41**

Chapter 5: Discussion

This study sought to determine if sending patient reminders from a member of the healthcare team would increase engagement in digital preoperative education in patients having sinus surgery. Preoperative education is essential for surgery patients as it can decrease anxiety and enhance surgical outcomes (Burgess et al., 2019). There is a need for consistent preoperative education within the field of otolaryngology; this study focused on sinus surgery specifically. Digital preoperative education is as effective as other options for patients undergoing endoscopic sinus surgery, including the current standard of verbal or printed education (Gadler, 2016). Digital education can also increase engagement and satisfaction (Ma et al., 2018). When our facility partnered with an outside company to create digital preoperative education for this population, not all patients engaged in the opportunity. This led to the identification of the need to improve participation and engagement with this education.

The Donabedian Model was used for this project, which emphasizes the importance of structures and processes on outcomes. A reminder sent from a member of the healthcare team can increase engagement (Lu et al., 2018). Therefore, reminders were sent regarding the importance of completing the digital preoperative education. The results of the study show that patients who were sent reminders had increased engagement when compared to patients who were invited to participate in digital preoperative education without getting a reminder from the healthcare team. Therefore, the clinical question that was answered is that for adults undergoing endoscopic sinus surgery, receiving a reminder notification to complete preoperative education increased patient engagement with digital preoperative education.

These results were consistent with a systematic review showing that reminders can increase engagement in delivery of electronic information (Lu et al., 2018).

Limitations of the Project

This project had a few limitations. The first limitation was that Quil stopped partnering with our facility in regard to providing digital education offering and managing data in November of 2022. Fortunately, the educational journey was already built and available to patients. The digital preoperative education was converted to a PDF format for continued use; however, data collection ceased once the education format changed to maintain consistency. Since reminders started being sent in July, there were enough patients to provide statistical power for the current analysis. If Quil access had not changed, there would be an even larger sample size. Another way to increase the sample size and include another demographic would be to study patients under the age of 18. This study did not include patients under 18 because they do not have access to the EHR at our institution, preventing them from receiving the education and reminders.

Another limitation was not including surgical outcomes in the study. By using a validated survey of sinonasal symptoms such as the Sinonasal Outcome Test (SNOT-22), effectiveness of the surgery in patients who engaged in preoperative education could be compared to patients who did not. The SNOT-22 is used frequently and consistently in studies measuring intervention for patients with sinus disease, as it is considered a convenient and high-quality tool that is recommended for use in measuring outcomes of surgical interventions for chronic sinusitis (Liu et al., 2021). Including the surgical outcome improvement with digital preoperative education would give further credence to using it as part of an Enhance Recovery After Surgery program (ERAS) to reduce complications.

Applying ERAS in the field of otorhinolaryngology yields a promising outcome and adding patient education to these protocols can be easily implemented to further improve outcomes (Cavallaro, 2018; Liao et al., 2018).

Implications for Practice, Education, and Research

This study has implications for practice and education by illustrating the need for consistent preoperative education, and by demonstrating the means to improve engagement with digital preoperative education. Digital education can be utilized with all adult demographics, as shown in the descriptive analysis of demographic and patient characteristics. Of note, there was a higher percentage of engagement for females and for patients of a higher age. To increase engagement throughout this and other patient populations, there has to be buy-in from the healthcare team. Healthcare organizations should embrace, support and promote digital patient education platforms (Ellen et al., 2018). Sending reminders is an easy way to show the importance of, and increase engagement with, this type of education. A proactive intervention like this to increase participation in preoperative education is essential for improving surgical care (Jannson et al., 2020).

There are implications for future research based on this study's results. One area needing further research is the pediatric and adolescent populations. Due to the study limitations discussed, patients under 18 did not participate in the education. Future studies at institutions can focus on making digital preoperative education in an interactive, engaging format geared toward the pediatric and adolescent populations. Another area for future research is incorporating surgical outcome data for patients undergoing sinus surgery who participated in digital preoperative education. This can lead to the addition of this type of

education in ERAS programs for endoscopic sinus surgery, as well as other surgical procedures.

Conclusion

Evidence shows that using digital education for preoperative education can improve patient knowledge, engagement, satisfaction, and health outcomes and should be integrated into healthcare guidelines (Gadler et al., 2016; Golinelli et al., 2020; Sawesi et al., 2016). If a member of the healthcare team sends a reminder message, then patient engagement with digital preoperative education will increase. The future of healthcare will embody information being delivered digitally, and providers need to embrace and support this technology. Current policies should focus on promoting digital platforms to enhance care (Schenkel et al., 2020). Patient reminders serve as a proactive intervention to successfully increase engagement in digital preoperative and therefore surgical outcomes. The results of this study confirm that patients have increased engagement after receiving a reminder to participate from a member of the healthcare team.

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Appendix A

***PDF version, links disabled.**

I. GETTING STARTED

Welcome to Your Sinus Surgery Journey

Welcome!

Your care team at Penn Medicine is here to help you at each step of your sinus surgery—from getting ready for the procedure through your recovery.

Using the information as a guide will help you feel more informed, comfortable, and supported throughout the experience.

Let's get started.

Your Care Team at Penn

VIDEO: Sinus Surgery: The Medical Care Team

When you're having sinus surgery, the ear, nose, and throat (ENT) team at Penn Medicine will work closely with you—from preparation through recovery.

You'll be cared for by your ENT surgeon, the nursing team, and the anesthesiologist who will be there on your day of surgery.

Your patient portal: MyPennMedicine

When you're a Penn Medicine patient, the MyPennMedicine patient portal is the easiest way to organize and manage the various parts of your care. With MyPennMedicine you can:

- Message members of your care team
- Schedule visits and check in online
- Access and share your health information
- Get test results and notes from your doctor
- Pay your bill online

Read more here about how to manage your chart on MyPennMedicine.

II. UNDERSTANDING YOUR PROCEDURE

What Happens During Sinus Surgery?

VIDEO: What is Sinus Surgery?

Your surgery will be done under general anesthesia (you'll be asleep) and will take between tw and four hours.

During an endoscopic sinus surgery, a lighted tool called an endoscope is inserted through the nose to give the surgeon a view of the sinus cavity. There is no outside incision; instead, surgica tools are inserted into the nasal passages to carry out the removal of sinus tissues to widely open your sinus passages and ease your sinus symptoms.

If you are having a septoplasty (surgery on septum), you may wake up with a soft nasal splint in each nostril.

Read more about sinus surgery at Penn Medicine

The Benefits & Risks of Sinus Surgery

VIDEO: What Are the Risks and Benefits of Sinus Surgery?

Sinus surgery improves symptoms associated with chronic sinusitis—like nasal congestion, post nasal drainage, headaches, a decreased sense of smell, and more. Hear what experts say are the benefits, as well as the risks, of sinus surgery.

Understanding General Anesthesia

VIDEO: The Basics of General Anesthesia

General anesthesia puts you in a sleep-like state. It's more than just being asleep, but it won't feel like more than that to you.

You'll get medications through an IV line in your arm. These medicines induce sleep, relax muscles, and treat pain. You won't feel any pain because you'll be unconscious.

When you wake up after the procedure, your care team will continue giving you medication to manage pain.

What happens during sinus surgery?

Once you're asleep, the anesthesiologist may insert a tube into your mouth and down your windpipe to ensure you have enough oxygen, and to protect your lungs. Muscle relaxants will help make the insertion easier.

Someone from the anesthesia team will monitor your vital signs continuously—checking your blood pressure, heart rate, oxygen levels, temperature, and other factors to keep you safe.

When surgery is over, the anesthesiologist reverses the medications, removes the breathing tube and wakes you up in the operating room.

Specialized nursing staff will care for you in recovery, providing medications for nausea and pain. They'll also monitor you until it's safe to go to a regular room or to be discharged.

Side effects from general anesthesia

You'll likely feel groggy and a little confused when you wake up. The most common side effect is sleepiness, but you might feel a bit nauseous, have a mild sore throat, and your lips could be sore. You won't remember anything from the time you were put to sleep.

Serious complications, like a stroke or heart attack, are very rare, but your team has access to emergency medication to treat any kind of complication.

III. PREPARING FOR YOUR PROCEDURE

Pre-Op Testing

Your surgeon will require testing and medical clearance. Depending on your age and medical history, that could include bloodwork, an EKG, chest X-Ray, or other diagnostic tests. You may already have had a CT scan. If your scan was done at an outside facility, bring your disk with the images on your day of surgery.

Plan for up to two weeks off work, although most patients feel comfortable returning with light activity after a week.

If you're taking medications, including blood thinners, check with your doctor about changes ahead of surgery.

Smoking and Surgery

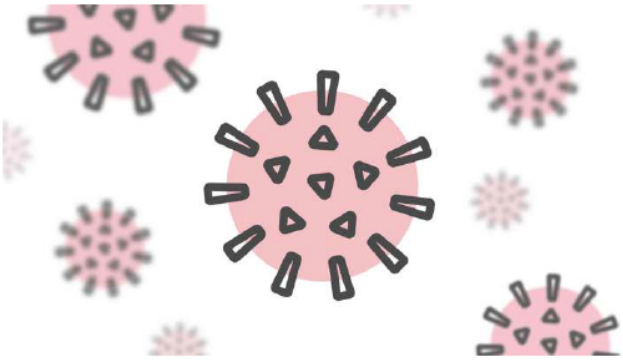
VIDEO: The Importance of Quitting Smoking

Smoking is a serious hazard to your general health—it causes immediate damage to your body and is linked to breathing problems as well as cancer and heart disease.

Research confirms that smoking also affects wound healing. Studies show that smokers experience complications like infections, increased scarring and more pain with surgery compared to nonsmokers.

If you smoke, you should try to stop at least two weeks before surgery. Ask your doctor or nurse about Penn's Smoking Treatment Program if you're having trouble quitting. Your surgery might be postponed if you do not.

Getting Tested for COVID-19



As with any surgery during the pandemic, you'll need a COVID-negative clearance before you can proceed. Find out from your surgeon's office what timeline they require, especially if your surgery is soon, as response times for the tests vary. You'll likely need the test two to three days before surgery at a Penn Medicine-approved site; find those locations here.

If your surgery is happening close to a holiday, plan very far ahead for your test, as more people may be getting tested for travel then.

Shopping for Supplies

Your at-home recovery should be easy, but there will be some steps you can take to make it better. Here's what you should shop for ahead of time or confirm you have on hand after surgery.

- A pain reliever like Extra-Strength Tylenol or similar (avoid Motrin or Advil)
- A probiotic, like yogurt or a supplement, to help with digestion
- A steroid and a narcotic pain reliever your doctor prescribes the day of surgery
- Saline nasal spray and rinse bottle, available over the counter as a kit with premixed salt packets

IV. ON THE DAY OF YOUR PROCEDURE

Things to Remember

Preparing what you'll need for the day of surgery ahead of time will give you peace of mind.

Arranging your transportation

Before the day of surgery, confirm where you need to be dropped off. Plan for transportation home, too—a friend or family member is the best option there.

What to bring

Have your insurance card and ID and bring a change of clothes and any medications you take (that have been approved) in their original bottles in case you need to stay overnight. Leave any jewelry or other valuables at home. If you have asthma, bring your own inhaler.

Confirming your surgery time

You'll get a call between 4 and 6 p.m. on the business day before surgery (for a Monday surgery, it will be on Friday). If you miss that call, please call 215-615-5599.

The night before

It's important to follow your surgeon's recommendations when it comes to fasting before surgery. Remember not to eat or drink before your procedure—that usually means fasting from midnight on the night prior.

The morning of your surgery

It's fine to brush your teeth. Skip applying any makeup. Remember to take any medications that you were instructed to take with only a small sip of water. If you have questions about what medications to take the day of your surgery, call your surgeon's office.

V. EARLY RECOVERY

At the Hospital or Surgicenter

VIDEO: What to Expect after Sinus Surgery

After surgery, you will be evaluated for discharge. You'll be monitored for a few hours after you wake up. Your medical team will evaluate you, looking out for abnormal bleeding or any other complications such as adverse reactions to the anesthesia. If all is well, you'll be discharged from the hospital. In the case of complications, you may need to stay overnight.

While most procedures are outpatient (you go home that day), there are some exceptions. Factors impacting the need for an overnight stay include age, sleep apnea, uncontrolled asthma or other medical conditions.

Getting home

Once you're discharged, you'll need a ride home. Arrange for a friend or family member to pick you up, and make sure to know in advance the correct entrance and where you'll exit.

When You Get Home

VIDEO: Short-term Recovery from Sinus Surgery

The first week

You can expect to feel stuffiness and a crusty nose, much like the symptoms of a bad head cold. If recovery goes well, most people feel well enough to go back to work after one week, though some may need up to two weeks, especially if a job involves lifting more than 10 pounds or bending over.

You should expect some stuffiness for the next two to three weeks. Post-nasal drainage can take eight weeks or more to resolve.

Your sense of smell and taste may be diminished after surgery. This typically returns within a few weeks, but in some cases can take six months or more to return.

Follow your doctor's instructions for post-operative care, changing your gauze as indicated and sleeping in an upright position for the first few nights. You can prop yourself up with a few pillows or sleep in a comfortable reclining chair.

Using a sinus rinse

You'll have some bloody discharge for a few days. Sinus rinses will help keep scar tissue from forming and blocking your nasal airways. Your doctor may recommend a sinus rinse bottle to irrigate your sinus cavity with sterile salt water.

Your doctor may also recommend a ready-made saline rinse kit, or instructions on how to make one at home. This process of flushing out the sinuses will help keep your breathing passages open and speed up recovery. It will feel strange at first, and make sure not to breathe in the saline! After a few times, you'll find the process pleasant.

Here are some irrigation basics:

- Wash your hands
- Make sure the salt water is room temperature
- Stand over a bathroom sink, or in the shower
- Tilt your chin down so your nose is facing the floor. Next, you'll remain facing down or will turn your head part way (45 degrees) to the right, before placing the nozzle in your right nostril. Check with your surgeon for their guidance. Gently squeeze the rinse bottle; that's how the saline solution can reach your sinus cavity, and not just your nose.
- Gently turn your head to the left (or remain facing down per your surgeon's orders) and repeat with the nozzle in your left nostril. About two big squeezes on each side is one full rinse.

Irrigation is an essential part of your recovery, so make sure you complete the course (typically a minimum of three times a day, maximum of eight to nine times a day) given by your doctor.

What can I do to feel better?

It's best to avoid exercising and lifting anything heavier than 10-15 pounds for the first couple of weeks. Try to walk a little bit every day if you can. When you rest, use pillows to prop your head up. Remember to get up frequently! Moving around helps with circulation and blood flow, and both will help your recovery.

- When you rest, use pillows to prop your head up. A good rule of thumb is to keep your head above your heart.
- When you cough or sneeze, try to keep your mouth open. Don't blow your nose, and don't bend to the floor to pick something up or strain too hard.

Pain management is key, and your doctor may prescribe an opioid pain reliever to use for a few days. You'll then transition to Tylenol or other doctor-recommended over-the-counter products to ease any discomfort.

For more information on irrigation, watch this demonstration

Follow-Up Visits

VIDEO: Follow-up Appointments after Sinus Surgery

You'll probably be able to return to your school or job within a week (two weeks, at most), and your normal routine within two weeks if recovery goes well.

What to expect at follow-up visits

After surgery, you'll have frequent follow-up visits for the first six weeks with your doctor to be sure you're healing well. Your first visit will happen a few days to a week after the procedure. Your doctor may do some cleaning of the sinus during the visit to remove any blood and mucus. These cleanings help prevent scar tissue from building up.

Your doctor will recommend check-up visits as needed; if you stick with your post-surgery recovery instructions and recovery goes well, you should be completely healed by three months.

Appendix B

Penn
University of Pennsylvania
Institutional Review Board
3600 Civic Center Blvd., 9th Floor
Philadelphia, PA 19104
Phone: 215-573-2540
(Federalwide Assurance # 00004028)

DATE: 25-Jul-2022
TO: Christine Reger
CC: Skinner, Ethan
Kohanski, Michael A

RE:
IRB PROTOCOL#: 851687
PROTOCOL TITLE: Completion Rates of Digital Pre-operative Education for Patients Who Received a Reminder Message Compared to Patients Who Did Not Receive a Reminder

SPONSOR: NO SPONSOR NUMBER
REVIEW BOARD: IRB #7

IRB SUBMISSION: NOTICE OF EXEMPTION

Dear Dr. Reger,

The above referenced protocol was reviewed by the Institutional Review Board on 22-Jul-2022. It has been determined that the proposal meets eligibility criteria for IRB review exemption authorized by 45 CFR 46.104, category 4.

As part of the exemption determination, a waiver of the HIPAA authorization requirement was granted as authorized by 45 CFR 164.512 (i). An expedited review procedure was used for the HIPAA authorization waiver because the research involves no more than minimal risk to the privacy of the individuals who are the subject of the protected health information for which use or disclosure is being sought. The review of the research has determined the following:

- An adequate plan has been presented to protect the identifiers from improper use and disclosure;
- An adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research exists, unless there is a health or research justification for retaining the identifiers, or such retention is otherwise required by law; and,
- An adequate written assurance has been provided that the protected health information will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research project, or for other research for which the use or disclosure of protected health information would be permitted under the law.

- That the research cannot practicably be conducted without the waiver to access and use of the protected health information.

ONGOING REVIEW:

- The IRB must be kept apprised of any and all changes in the research that may have an impact on the IRB review mechanism needed for a specific proposal. You are required to submit modifications to the IRB if any changes are proposed in the study that might alter the exemption determination, or any applicable HIPAA waiver determination. New procedures that may have an impact on the exemption determination, or HIPAA waiver determination cannot be initiated until Committee approval has been given.
- Consistent with the federal regulations, IRB approval of this protocol will not expire and no continuing reviews will be required for this protocol. The IRB may occasionally contact you to confirm that the trial is still ongoing and that you are adhering the previously stated requirement to submit modifications.

COMMITTEE APPROVALS: You are responsible for assuring and maintaining other relevant committee approvals. This human subjects research protocol should not commence until all relevant committee approvals have been obtained.

If your study is funded by an external agency, please retain this letter as documentation of the IRB's determination regarding your proposal.

If you have any questions about the information in this letter, please contact the IRB administrative staff. A full listing of staff members and contact information can be found on our website: http://www.irb.upenn.edu

***This letter constitutes official University of Pennsylvania IRB correspondence. ***

Appendix C

IRB-FY2023-41 - Initial: Initial - Exempt

do-not-reply@cayuse.com <do-not-reply@cayuse.com>

Mon 8/29/2022 8:53 AM

To: Reger, Christine <CR966860@wcupa.edu>;Owens, Jacquelyn M. <JOwens@wcupa.edu>

Office of Research and Sponsored Programs | West Chester University | Ehinger Annex
West Chester, PA 19383 | 610-436-3557 | www.wcupa.edu

Aug 29, 2022 8:53:41 AM EDT

To: Christine Reger Department: School of Nursing

Re: Exempt - Initial - IRB-FY2023-41 Completion Rates of Digital Pre-operative Education for Patients Who Received a Reminder Message Compared Patients Who Did Not Receive a Reminder

Dear Christine Reger: Thank you for your submitted application to the WCUPA Institutional Review Board. We have had the opportunity to review your application and have rendered the decision below for Completion Rates of Digital Pre-operative Education for Patients Who Received a Reminder Message Compared Patients Who Did Not Receive a Reminder.

Decision: Exempt

Selected Category: Category 4. Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:

(i) The identifiable private information or identifiable biospecimens are publicly available;

(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;

(iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "healthcare operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or

(iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C.552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of1995, 44 U.S.C. 3501 et seq.

If there are any questions, please don't hesitate to reach out to irb@wcupa.edu

Sincerely, WCUPA Institutional Review Board
IORG#: IORG0004242 IRB#: IRB00005030