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Evaluating Pre-Anesthesia Telehealth Visit Outcomes in Cardiac Surgery Patients at a Tertiary-level, Private, Academic Hospital

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Abstract

Telehealth is a dynamic, growing field in healthcare. Research has alluded to the potential of telemedicine in the pre-anesthesia area. With infection risk concerns brought to the forefront of healthcare due to the COVID pandemic, telemedicine offers an alternative evaluation method. Telehealth extends care to patients who otherwise would not have access to more comprehensive pre-anesthetic care and surveillance. Although studies show telemedicine's potential and positive effects, institutions have not extended virtual visits for all cardiac surgery pre-anesthesia patients. This retrospective evaluation study aimed to assess the impacts of telehealth on cardiac surgery pre-anesthesia assessments in a tertiary-level, private, academic hospital. The study evaluated the intervention effects of 160 cases over 90 days, using Chi-square tests of independence to compare the traditional vs. telehealth means after the intervention to compare the impact that telehealth pre-anesthesia visits have on cardiac surgery cancellations and delays on the day of surgery. There were no significant differences between telehealth and face-to-face pre-anesthesia visits, indicating that this intervention can replace face-to-face where there is an option to do so with no increase in day-of-surgery cancellations that are costly and can result in inefficiencies. The results indicate the same conclusion for day-of-surgery cancellation impacts: the visit type was independent of the cancellation rates. Future exploration of telehealth evaluations can expand to other presurgical patients and specialty areas.

Keywords: Telehealth, virtual visits, telemedicine; pre-anesthesia; cardiac surgery; evaluations, assessments; in-person evaluations

Evaluating Cardiac Surgery Patients with Telehealth Pre-Anesthesia Visits

The coronavirus pandemic, since March 2020, has been one of the biggest drivers of healthcare change internationally (Perrin et al., 2020). The epidemic has exposed the limitations of the current in-person health care delivery system, such as decreased access to care and increased risk of diseasetransmission (Perrin et al., 2020). Elective surgeries and pre-anesthesia visits were some of the clinical areas most impacted by COVID-related changes (Jain et al., 2020). To reduce patient andprovider infection risk, the United States Centers for Medicare & Medicaid Services and state agencies placed a hold on elective surgeries from March 2020 to May 2020 (Jain et al., 2020). The elective surgery hiatus created a backlog of delayed elective procedures, failing to provide timely patient care (Jain et al., 2020). Elective surgeries are "optional" surgeries; however, this is where most surgeries fall, between essential preventative measures, such as colonoscopies, and crucial surgeries, such as cataract extractions (Jain et al., 2020). The temporary ban's objective was to conserve essential healthcare assets, including intensive care unit bed availability, personal protective equipment, and ventilators (Jain et al., 2020).

Many elective cardiac surgeries fall within this category, such as cardiac ablations. Literature review and research show that delayed treatments lead to higher healthcare costs and unfavorableoutcomes (Jain et al., 2020). With the lifted elective surgery restrictions, providers need to address the growing backlog of patient care needs. With Medicare offering the same incentives for in-person and telehealth appointments, providers have an opportunity to expand virtual visits to cardiac surgery patients and facilitate the closure of the patient care gap (Centers for Medicare& Medicaid Services, 2020). Extending virtual visits to cardiac surgery pre-anesthesia patients can address disparities in health-related access. Efforts to limit disease spread

and implement strict hygiene measures have spearheaded healthcare delivery changes (Perrin et al., 2020). Institutions worldwide are extensively remodeling their healthcare systems to restrict and even eliminate in-person clinic visits to address the disease transmission issues of COVID-19 (Hollander & Carr, 2020). Telemedicine for cardiac surgery patients offers a promising solution to the challenges presented by COVID-19. Telehealth allows for continual patient care and evaluations without increasing the risk of disease transmission and patient barriers to traveling for in-person appointments.

Implications of Pre-anesthesia Evaluations and Telemedicine

Pre-anesthesia evaluations are essential for positive surgical and anesthesia patient outcomes. Pre-anesthesia provides the preparation necessary for surgery cases and scheduling to run smoothly on the day of surgery (Epstein et al., 2017). Assessing the patient with an anesthesia evaluation provides transparency to the anesthesia and surgical case. A retrospective observational study reviewing a large teaching hospital's electronic health records showed that cases that bypassed pre-anesthesia before the surgery resulted in increased delays of first case surgeries and prolonged turnover times in the operating room (Epstein et al., 2017).

Barkley (2017) and her colleagues recognized the value of pre-anesthesia visits before surgery at Sharp Memorial. Barkley (2017) and her colleagues streamlined the pre-anesthesia assessment process for 17,000 patients utilizing the lean six-sigma approach. Patients undergoing new procedures were assessed at least one week before surgery (Barkley et al., 2017). This new process increased pre-anesthesia evaluations by 40% for patients before surgery (Barkley etal., 2017). Pre-anesthesia assessments are imperative to a successful day of surgery procedures, and institutions need to utilize them to their full potential for patients to retrieve the most significant benefits.

For the past decade, anesthesiologists have used telemedicine for a portion of preoperative consultations (Kamdar & Jalilian, 2020). Some institutions have used digital cameras mounted on stand-alone units with a remote operator to assist patients with virtual visits. Other clinics have used a mobile phone-based telehealth portal for evaluations (Kamdar & Jalilian, 2020). A retrospective review by Mullen-Fortino (2019) and colleagues compared the effects of telemedicine vs. in-person pre-anesthesia assessment. Out of 7,803 total patient cases, 361 telemedicine cases (4.7% of the cases) demonstrated benefits in 1) access (evaluation duration), 2) experience (patient perspective), and 3) effectiveness (surgical case cancellation rates). Overall, patient satisfaction improved without sacrificing the quality of care or increasing surgery cancelation rates (Mullen-Fortino et al., 2019).

Telemedicine Processes and Effectiveness

The implications of widespread telemedicine implementationcan also impact patients globally (Firth & Joseph, 2017). Although patients travel worldwide for surgeries and specialized care, patients are not inclined to travel for pre-anesthesia visits required for these procedures. Firth and Joseph (2017) shine a light on the potential of using telemedicineto address health disparities that influence the diverse patient populations in the clinic. Many patients come from rural areas in the United States and California, and their communities lack sufficient anesthesia capacity and specialty. Insufficient resources and pre-anesthesia evaluations result in numerous preventable deaths due to surgical complications (Firth & Joseph, 2017).

Lozada (2016) and his colleagues studied the patient pre-anesthesia evaluation preferences at a university hospital. Results showed that most patients (97%) favored telephone pre-anesthesia appointments (Lozada et al., 2016). Patients residing close to the hospital also preferred telephone evaluations, and telephone appointments also did not cause an increase in

surgical cancellations or delays (Lozada et al., 2016). Virtual evaluations were as effective as in-person appointments and favored amongst most patients.

Telehealth extends care to the population of patients who otherwise would not have access to more comprehensive pre-anesthetic care and surveillance. Although these studies show telemedicine's potential and positive effects, institutions have not extended virtual visits for all cardiac surgery pre-anesthesia patients. Due to the infection risks and impacts of COVID, providers can utilize virtual visits for patients to limit unnecessary disease exposure before surgery (Mihalj et al., 2020). With extended virtual visits to all cardiac surgery patient populations, cardiac surgery pre-anesthesia patients can easily reap the benefits of comprehensive evaluations before surgery without the barriers of travel and infection transmission. Despite evidence supporting telehealth visit interventions for pre-anesthesia visits, telemedicine has not been implemented consistently for cardiac surgery patients. This Doctorate of Nursing Practice (DNP) project aimed to expand virtual visits to all cardiac surgery patients and evaluate the effect on the day of surgery processes and anesthesia and surgical outcomes. The investigator assessed the impact of telehealth assessments on cardiac surgery patients at a Level I trauma teaching hospital in Northern California.

Theoretical Framework

The DNP project applied the Donabedian Model framework to assess the current healthcare delivery circumstances and implement virtual visits for cardiac surgery patients. The Donabedian Model presents a framework for evaluating systems and processes, paving the way for successful procedural interventions to ensure positive patient outcomes and results (Ayanian & Markel, 2016). The Donabedian Model focuses on three central concepts: structure, process, and outcome (Ayanian & Markel, 2016).

Pre-anesthesia assessments are critical in creating favorable anesthesia and surgical results (Epstein et al., 2017). Perioperative assessments provide the necessary coordination for surgeries to proceed smoothly on the morning of surgery, ensuring patients are medically stable and appropriate for anesthesia and surgery (Epstein et al., 2017). Evaluating the current pre-anesthesia visits system, providers evaluate patients with cardiac conditions in the clinic with in-person pre-anesthesia assessments. However, this structure creates barriers for patients, as in-person visits require more coordination and resources with less flexibility. These barriers often result in the lack of an evaluation before surgery. Occasionally, patients choose not to travel to the evaluation clinic. This DNP project investigated the current system and methods to create increased accessibility for patients.

With the Donabedian Model's fundamentals, this DNP project transformed the pre-anesthesia evaluation for cardiac surgery patients to implement virtual visits. The nurse practitioner's expertise and cardiac surgery pre-anesthesia clinical evaluations would benefit from implementing virtual cardiac surgery pre-anesthesia assessments. Due to the unfortunate outcomes of COVID, including prolonged patient care delays and increased infection transmission risk, healthcare providers and institutions need to adapt to unforeseen circumstances. Creating increased access to care for all cardiac surgery patients establishes the path to optimalsurgical and anesthesia outcomes.

Methods

Design

The study design was a retrospective analysis, comparing outcomes data between the face-to-face and telehealth groups.

Setting

This academic hospital institution serves individuals mainly in Northern California; however, patients seeking specialized care within the United States and internationally seek medical care here. The ambulatory pre-anesthesia evaluation clinic extends across the Bay Area with six locations, ranging from San Jose to Emeryville. Thirty nurse practitioners, ten attending physicians, and rotating anesthesia residents and interns in the clinic provide thorough personalized pre-anesthesia evaluations through in-person and virtual consultations. Support staff, consisting of medical assistants, technicians, and schedulers, assist in patient care and confirm patient appointments.

All surgical patients requiring anesthesia are assessed by the pre-anesthesia providers before surgery, either through in-person or telehealth evaluations. Specifically, providers evaluated cardiac surgery patients with in-person pre-anesthesia assessments instead of telemedicine. On average, 15 cardiac surgeries are conducted weekly outside of COVID pandemic influences.

Subjects

Charts of study participants were adult cardiac surgery patients over 18 years old. The patient population was diverse, with various socioeconomic statuses worldwide. They were having scheduled cardiac surgery with insurance authorization and approval. Subjects included cardiothoracic surgery patients, including heart valve replacements, cardiac ablations, aneurysm repair, and coronary artery bypass graft surgeries. Cardiac surgery patients automatically had virtual pre-anesthesia visits unless they met the exclusion criteria or preferred in-person evaluations. Emergent cardiac surgery patient cases are part of the exclusion criteria. Subjects that had cardiac surgeries canceled before the day of surgery were excluded. Patients that were residing outside of California did not have telehealth evaluations. The DNP project was a quality

improvement project without meeting the definition of human subject research. Because of the lack of human subject research involved, the project did not require IRB review or approval. The privacy committee completed a project evaluation before and after to ensure no privacy concerns. The clinic manager provided a letter of approval for the project. The project participants did not need informed consent for this project.

Data

The dependent variable was the day of surgery cancellations and delays. The investigator used EPIC, the electronic medical record, to collect data and examine the number of surgery cancellations over the number of scheduled surgeries over 90 days. The investigator also studied the number of surgery delays divided by the number of surgeries scheduled over 90 days. The investigator calculated the surgery cancellation rate, the number of cancellations divided by the number of planned surgeries 90 days after the practice change. This data was collected 9-months after the onset of telemedicine evaluations to evaluate its effects on cardiac surgery pre-anesthesia patients. The further evaluation investigated whether the day-of-surgery cancellations or delays were due to inadequate pre-anesthesia evaluations through either traditional or telehealth visits.

Procedures

Planning and Training. The investigator spread staff awareness for future virtual pre-anesthesia evaluation implementation for all cardiac surgery patients during scheduled staff meetings and shared Microsoft Teams documents to implement telehealth for cardiac surgery patients. Regular reinforcement solidifies the telemedicine intervention.

With the management and clinic medical director's agreement regarding the patient specifics, the investigator discussed rationale and processes with clinic nurse practitioners and

clinic assistant staff. Discussions at periodic meetings identified further needs. The investigator established and discussed specific patient criteria for telehealth visits with clinic providers. The clinic support staff implemented these criteria when scheduling patient visits. The pre-anesthesia clinic has used telehealth patient assessments to a certain extent. The investigator's goal was to cement the use of only evaluating cardiac surgery pre-anesthesia patients through telemedicine evaluations.

In examining the effects of telemedicine implementation for cardiac surgery patients, the treatment group received the video visit implementation compared to face-to-face pre-anesthesia visits. After nine months of virtual pre-anesthesia assessment implementation for cardiac surgery patients, the investigator gathered data through EPIC, the electronic medical record used at the institution, to evaluate the day of surgery cancellation rates and delays. Upon evaluating the results, the investigator discussed the telehealth implementation conclusions with the clinic members.

Analysis

The investigator evaluated the intervention effects over a 90-day period. The investigator used descriptive analysis, analyzing means and standard deviation, and inferential statistics through Intellectus Statistics (2021) software to store and analyze the data, then run charts examined over 90 days after intervention implementation. The investigator analyzed the data using Chi-square tests of independence to compare discrepancies sizes between the expected and actual results for the traditional vs. telehealth after the intervention to evaluate the impact telehealth pre-anesthesia visits have on cardiac surgery cancellations and delays on the day of surgery.

Results

The investigator used Microsoft Excel and Intellectus Statistics (2021) software for data analysis. Statistician consultation guidance determined that the Chi-square test of independence was the appropriate analysis manner. The investigator formulated descriptive statistics, including frequencies and percentages for all variables. Chi-square tests of independence examined if pre-anesthesia visit types caused day-of-surgery delays, cancellations, or inadequate assessments. The study collected data over three months, from August 1, 2021, to October 31, 2021.

Descriptive Statistics

The study calculated summary statistics for each interval and ratio variable. The investigator evaluated the frequencies and percentages for each nominal variable. Seven physicians operated on patients, with one-third of the sample being operated on by Dr. W (*n* = 53, 33%). The most commonly observed class of pre-anesthesia appointment types was in-person evaluations (*n* = 128, 80%). The most frequently observed category for delays was pre-op delays (*n* = 44, 28%). Table 1 presents the frequencies and percentages. Patients' age averaged 62.56 (*SD* = 12.69, Min = 22.00, Max = 85.00).

Table 1

Frequency Table for Nominal Variables

Variable	*n*	*%*
Surgeon		
W	53	33.12
F	27	16.88
M	22	13.75
L	18	11.25
B	33	20.62
H	6	3.75
A	1	0.62
Appointment Type		
In-person (I)	128	80.00
Virtual (V)	31	19.38

Missing	1	0.62
Delay Type		
Pre-op Delay	44	27.50
Intra-op Delay	27	16.88
Pre-op Delay, Intra-op Delay	6	3.75
Post-op Delay	1	0.62
No Delay	82	51.25

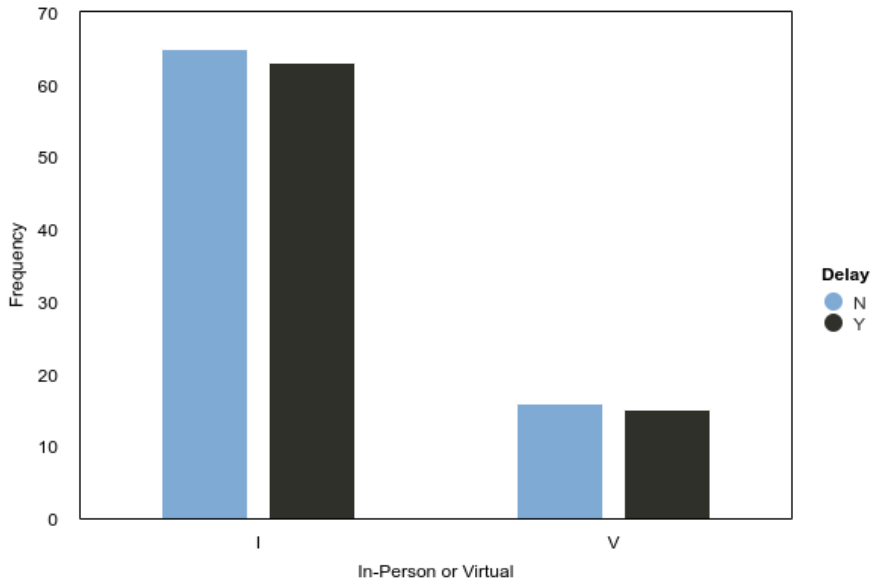
Note. Due to rounding errors, percentages may not equal 100%.

Delays

The study examined the number of cardiac surgery anesthesia delays during the three-month period. The investigator compared the number of telehealth and in-person visits within the delayed cases. The number of delays in traditional pre-anesthesia consultations was 63 cases (43% of in-person assessments) compared to 15 delayed patients (48% of virtual reviews) for virtual pre-anesthesia consultations. However, the number of overall in-person evaluations was greater than virtual assessments. Figure 1 displays the number of traditional vs. telemedicine visits with the number of day-of-surgery delays.

Figure 1

Appointment Type and Delays



Note. In-person vs. virtual pre-anesthesia assessments concerning delays on the day of surgery

A Chi-square Test of Independence examined whether pre-anesthesia appointment types and day-of-surgery delays were independent. There were two levels in pre-anesthesia appointment types: In-person (I) and Virtual (V). There were two levels of delays: No (N) and Yes (Y). The Chi-square test results were not significant based on an alpha value of 0.05, $\chi 2(1) = 0.01$, $p = .934$, suggesting that pre-anesthesia appointment types and day-of-surgery delays could be independent of one another. This outcome implies that the observed frequencies were not significantly different than the expected frequencies. Table 3 presents the results of the Chi-square test.

Table 3

Observed and Expected Frequencies

	Delay				
Appointment Type	No	Yes	χ^2	*df*	*p*
In-person (I)	65[65.21]	63[62.79]	0.01	1	.934
Virtual (V)	16[15.79]	15[15.21]			

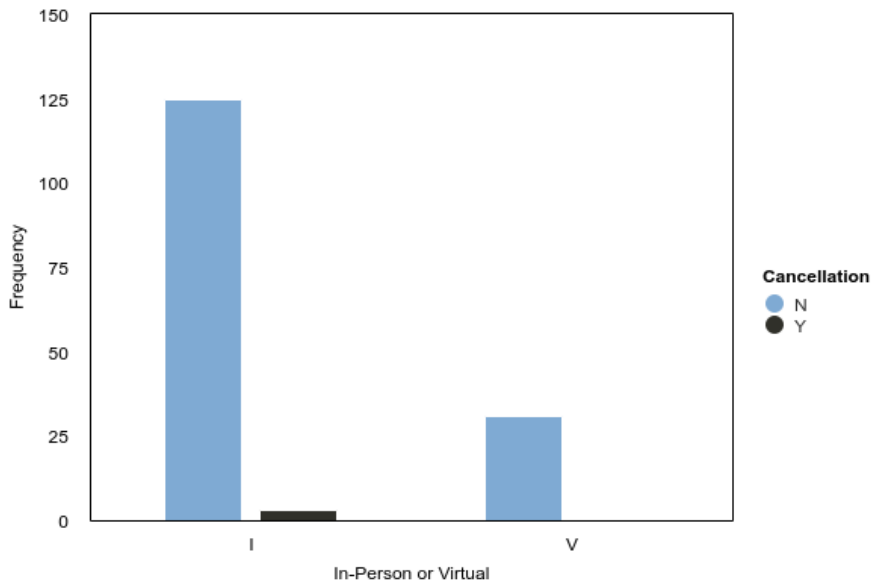
Note. Values formatted as Observed [Expected].

Cancellations

Day-of-surgery cancellations were minimal. Over the three months, results reveal three cases canceled on the surgery day, 2% of the total number of in-person cases. The data showed no virtual pre-anesthesia assessment cases canceled on the day of surgery. Unforeseen circumstances triggered surgery cancellations, such as the onset of acute gout flare episodes or surgeon schedule alterations. Figure 2 demonstrates the day-of-surgery cancellations concerning in-person and virtual consultations.

Figure 2

Appointment Type and Cancellations



Note. Traditional vs. telehealth pre-anesthesia assessments relating to cancellations on the day of surgery

A Chi-square Test of Independence investigated whether pre-anesthesia consultation types and day-of-surgery cancellations were independent. There were two levels in pre-anesthesia appointment types: In-person (I) and Virtual (V). There were two levels in

cancellations: No (N) and Yes (Y). The Chi-square test results were not significant based on an alpha value of 0.05, $\chi 2(1) = 0.74$, $p = .389$, suggesting that types of pre-anesthesia consultations and cancellations on the day of surgery could be independent of one another. This consequence implies that the observed frequencies were not significantly different than the expected frequencies. Table 4 presents the results of the Chi-square test.

Table 4

Observed and Expected Frequencies

	Cancellation				
Appointment Type	No	Yes	χ^2	*df*	*p*
In-person (I)	125[125.58]	3[2.42]	0.74	1	.389
Virtual (V)	31[30.42]	0[0.58]			

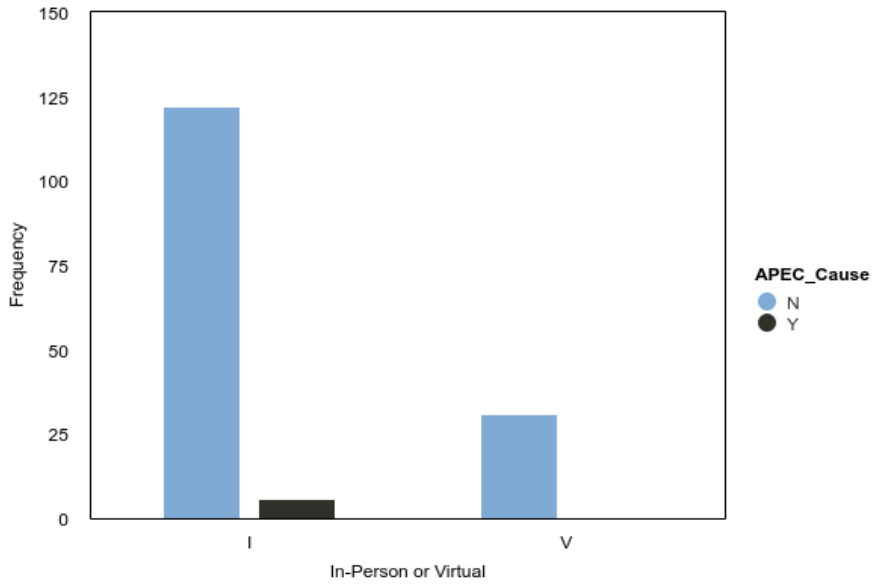
Note. Values formatted as Observed [Expected].

Inadequate Assessment

Delays and cancellations on the day of surgery due to inadequate pre-anesthesia evaluations constituted 3.75% of the total cases assessed, all of which were in-person pre-anesthesia appointments. Practitioners utilize pre-anesthesia evaluations to address patient concerns and questions; however, insufficient consultations can lead to day of surgery delays. The lack of patient education resulted in various case delays on the day of surgery. Undocumented difficult peripheral intraventricular access also caused procedural delays. Without adequate planning for challenging patient access, anesthesiologists and nurses run into unforeseen difficulties in pre-op, resulting in case delays.

Figure 3

Appointment Type related to Inadequate Anesthesia Assessment



Note. Number of inadequate anesthesia assessments leading to delays or cancellations relative to telemedicine vs. conventional evaluations

A Chi-square Test of Independence reviewed whether pre-anesthesia appointment types were the cause of day-of-surgery delays or cancellations. There were two levels in pre-anesthesia appointment types: In-person (I) and Virtual (V). There were two levels in whether the delay or cancellation was due to inadequate pre-anesthesia evaluations: No (N) and Yes (Y). The Chi-square test results were not significant based on an alpha value of 0.05, $\chi 2(1) = 1.51$, $p = .219$, suggesting that appointment type and inadequate pre-anesthesia assessment could be independent of one another. This conclusion implies that the observed frequencies were not significantly different than the expected frequencies. Table 5 presents the results of the Chi-square test.

Table 5

Observed and Expected Frequencies

	Inadequate Pre-anesthesia Assessment				
Appointment Type	No	Yes	χ^2	*df*	*p*
In-person (I)	122[123.17]	6[4.83]	1.51	1	.219
Virtual (V)	31[29.83]	0[1.17]			

Note. Values formatted as Observed [Expected].

Discussion

COVID necessitated the rapid implementation of telemedicine (Haque, 2021). The pandemic resulted in significant shifts in the model of care from face-to-face to virtual interactions (Haque, 2021). Efforts to limit disease transmission, measures for isolation, and social distancing encouraged telehealth utilization, encouraging widespread use of this healthcare delivery model (Monaghesh & Hajizadeh, 2020). The pandemic has altered the world's economy, healthcare system, and society (Wosik et al., 2020). The utilization of telehealth for pre-anesthesia is an example of the transformation. The study findings were parallel to published telehealth literature. Patients who utilized telemedicine interventions for cardiac surgery pre-anesthesia patients had outcomes aligned with patients who used traditional assessment methods.

This quality improvement pilot assessed the impact of conventional and telehealth pre-anesthesia consultations on day-of-surgery processes. The objective was to evaluate the effects of telehealth pre-anesthesia assessment on the day-of-surgery process flow. The results noted that virtual or in-person appointments were independent of day-of-surgery delays and cancellations. Results support the null hypothesis that pre-anesthesia visit type does not affect day-of-surgery cancellations and delays. Findings suggest that telehealth visits did not contribute to higher rates of delays or cancellations on the surgery day.

For medium effect size, this 160-retrospective-chart-review study implies that telehealth and in-person pre-anesthesia consultations are equal in terms of day of surgery cancellations and delays. Currently, providers conduct most visits through in-person methods; however, the results of this study imply significance that shifting to a virtual pre-anesthesia visit platform does not have adverse day-of-surgery process impacts on cardiac surgery patients. Visit type also does not

affect the adequacy of anesthesia assessments for cardiac surgery patients.

Limitations

This study had several limitations. A 3-month snapshot of the clinic limits the sample size obtained for the data. The number of patient charts amounted to a sample size of 160, which only has a medium effect size. Power analysis for a chi-square test of independence with 1 degree of freedom indicated that the minimum sample size to yield a statistical power of at least .8 with an alpha of .05 and a medium effect size ($w = 0.3$) is 88 (McHugh, 2013). Larger sample sizes create greater statistical significance. In addition, the data collected was only over a 3-month evaluation period as the COVID pandemic slowly subsided.

Another study limitation was during the process of data collection. When deciding whether surgery is delayed or canceled, many factors can contribute to the outcome. Classifying the main factor leading to the cancellation or delay can be relatively subjective. Thus, reasons for scheduling can be misattributed to the surgical team or anesthesia team. A strategy to eliminate scheduling problems may be to allow only one reason to be selected for the delay or cancellation, forcing the nurse to identify the significant scheduling obstacle clinically. Using a standardized determination method creates concrete data compilation to minimize subjective influences, encouraging objective data collection. In addition to specifying potential bias, adjustment methods can improve healthcare practice and clinical evaluation (Althubaiti, 2016).

An additional limitation was a lack of staff support and engagement. Abstract ideas and plans present idealized opportunities for growth; however, concepts are not successful without the acceptance of managers and staff. Consistent collaboration with stakeholders, including management, attending physicians, nurse practitioners, office support staff, and patients, is imperative to the program's success and outcomes. Staff empowerment is essential, creating

change in a work environment through resource mobilization to achieve desired results (Gokenbach & Drenkard, 2011).

Implications for Research

With the advancement of technology and the effects of the COVID pandemic, telehealth has risen to the spotlight and rapidly grown (Monaghesh & Hajizadeh, 2020). Telemedicine affords many opportunities for advancement and research. More longitudinal studies can evaluate a longer continuous period, perhaps up to six months or one year. Prospective studies can assess the setting when the effects of COVID are not as prominently affecting healthcare delivery. Further analysis can examine patient satisfaction related to utilizing telehealth visits and reviewing patient outcomes from medical interventions, such as consultation formats, exploring patient satisfaction, and approval of medical processes. Providers should meet patients' medical needs through avenues receptive to patients. Additionally, future research can expand beyond both pre-anesthesia and cardiac surgery patients. Further studies can explore other healthcare specialties to evaluate if the results mirror the findings in this study.

Conclusions

The results indicate that pre-anesthesia visit types, whether traditional or telehealth, did not affect day-of-surgery delays or cancellation rates or the adequacy of pre-anesthesia assessments. Regular staff and management involvement is crucial to the continual implementation and success of the pre-anesthesia telehealth program. Through telemedicine, institutions and providers can increase patient healthcare access through safe remote measures. The COVID pandemic has accelerated this process, bringing telemedicine to the forefront of medical care. Further investigation of telehealth evaluations is necessary to expand the program to other surgical and medical specialties.

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Appendix A

Table 1.

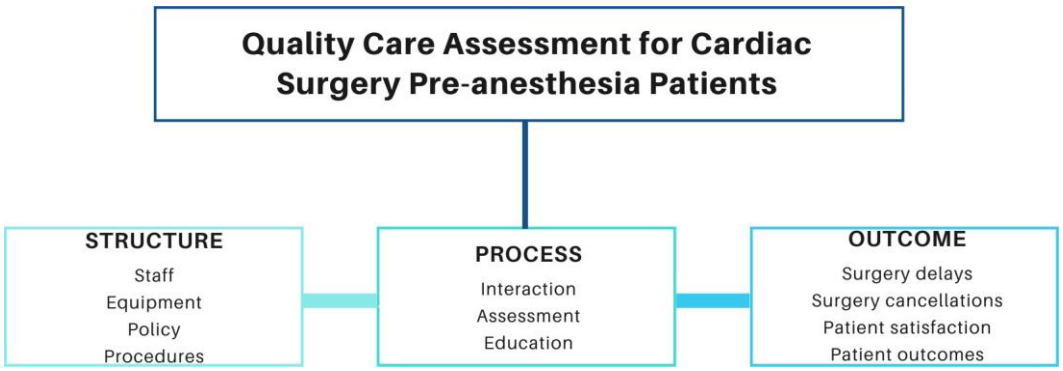
Variables and Operational Definitions

Variable	**Operational Definition**
Treatment Condition	Cardiac surgery telehealth patient charts - The number of virtual visits done for pre-anesthesia cardiac surgery patient evaluations
Surgery Cancellation	The number of surgeries canceled during the day of surgery in the 90-day intervention period
Surgery Delay	The number of surgeries delayed on the day of surgery in the 90-day intervention period

Note. Outcomes that are measured and the definition.

Appendix B

Figure 1. Donabedian Model for Quality of Care Assessment for Cardiac Surgery Pre-anesthesia Patients Illustration



Note. The assessed measurements for each category are specific to virtual visits in pre-anesthesia cardiac surgery patients.

Appendix C

Data Collection Tool

Participant Chart	Age	Surgeon	Surgery	Appointment Type? (V)Virtual or (I) In-person	Delayed on day of surgery? Yes/No	Delay Type	Reason for Delay	Delay Length	Cancelled on day of surgery? Yes/No	Reason for Cancellation	APEC Cause
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											