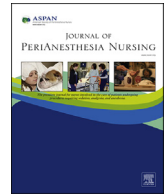




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Clinical

Preventing Surgical Delay and Cancellation with Patient-Centered Interventions

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A B S T R A C T

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Delay and cancellation can significantly impact cost and outcomes among surgical patients. While the causes of delay and cancellation are not fully enumerated, possible reasons include delivery-related causes such as facility, equipment, and provider availability as well as patient-related issues such as readiness and health status. Despite limited research explaining patient-related causes, there are many studies that evaluate patient-centered interventions to decrease delay and cancellation. This article highlights patient-centered interventions including preoperative clinics, preoperative screening, and focused education that have been shown to reduce delay and cancellation. This information provides perianesthesia nurses and advanced practice nurses ideas to maximize their roles in improving efficiency by prevention of delay and cancellation. This article should also stimulate additional research to help better understand the causes and the role of the nurse in the implementation of evidence-based practice projects that use patient-centered interventions.

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Background

With the increasing costs of health care, providers are under pressure to become more efficient. With operating room (OR) costs accounting for 48% of the \$387 billion that is spent in hospitals annually in the United States,¹ maximum efficiency is essential while still optimizing patient outcomes. Within the OR, efficiency is primarily measured by time. Cost and patient outcome are secondary measures, but they are ultimately dependent on time as well. Measures of timeliness in the OR that are especially relevant and measurable are the number of day-of-surgery (DOS) delays and cancellations. Staff, equipment, and room availability are commonly cited as reasons for delay and cancellation.²⁻⁴ Interventions directed at these causes include proper scheduling, flow and accurate identification of facility, or equipment-related causes of delay to improve timeliness.^{5,6}

To date, research does identify the patient as a factor in delay and cancellation, but studies do not describe exactly what the

patient-related causes are. In other words, the patient is known to have a role in delay and cancellation, but it is not known whether the contributing factors to patient-related delay and cancellation are health-related or something else such as access to transportation or lack of understanding of preoperative instructions. Despite this gap in the research explaining patient-related causes, there are many studies that evaluate interventions to prevent patient-related causes of delay and cancellation (Table 1). Some areas of study include preoperative clinics, routine screening, and focused education before surgery. To better understand patient-related causes and how best to manage them, the following study will review patient-centered interventions to prevent delay and cancellation, focusing on the role of the nurses in implementation of these interventions.

Review of Patient Causes

Patient-related causes of delay and cancellation can be divided into two categories. The first category includes no-shows, being late, having questions, or not being ready for surgery if preoperative instructions were not followed or understood. The second category includes problems related to a patient's health status. Unfortunately, studies do not categorize patient-related causes uniformly, making it very difficult to comprehend the problem or compare

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Table 1
Patient-Centered Interventions and Examples to Decrease Surgical Delay and Cancellation

Patient-Centered Intervention	Examples
Preoperative clinic	Run by 1) Anesthesiologists collaborating with nurses 2) Hospitalists collaborating with advanced-practice nurses 3) Nurses or nurse practitioners <i>May consider provider-focused education to improve quality of patient assessments</i>
Telephone/telehealth	1) Presurgical assessment and screenings 2) Reminders 3) Patient-focused education
Presurgical protocols	1) Centralized point for information dissemination/education 2) Screenings for health conditions such as sleep apnea at clinic appointments 3) Day-of-surgery screening protocols such as toxicology screenings/laboratory testing

studies. Some of the confusion stems from the use of the electronic health record as a source of data for the analysis. Van Winkle et al⁷ found that owing to the complexity of electronic health records with duplication and cross-referencing information as well as a large amount of missing data, making meaningful use of the available data on causes of surgical delay in their facility was extremely difficult. When comparing studies, more problems arise as some studies group all patient-related causes under 1 category, whereas others may divide them into separate categories, some of which are not inherently related to the patient. For example, in a study of 4,492 cases by Deldar et al³ that evaluated the implementation of a lean performance improvement process to improve surgical delays, patient-related delays fell under two categories; a category entitled “patient” included being late and having questions, whereas another category entitled “preoperative assessment” included difficult IV placement, delayed imaging, late medication orders, and further workup needed. Qualifying the role of the patient in surgical delays in this sample is very challenging as patient-related causes concerning workup are lumped together with other causes that may not be caused by the patient, such as late orders or imaging.

While it is not entirely clear how much a patient's health status affects delay and cancellation, there is a widespread assumption that sicker patients are more often delayed or canceled, but this has not been shown consistently in the literature. This is largely due to conclusions drawn from studies that showed preoperative clinics decreased surgical delay and cancellation, possibly by catching health-status issues with ample time to correct them.⁸ Contradicting this assumption, a retrospective study of medium-community hospitals that included 497,205 cases by Gabriel et al⁹ found that patients with a higher acuity as measured by the American Society of Anesthesiologists (ASA) classification had decreased odds (odds ratio 0.88; 95% confidence interval, 0.86 to 0.89) of being delayed versus patients with a lower ASA classification. Furthermore, there is no research to explain the specific medical issues that are associated with delay and cancellation. In other words, it is unknown whether particular chronic conditions or medications are responsible, or if it is the combination of issues causing increased acuity overall that makes a patient more prone to being delayed or canceled.

The Preoperative Clinic

Preoperative clinics are widely accepted as interventions that prevent or decrease delay and cancellation despite the lack of

research explaining the precise role of the patient's health status in timeliness of surgery. Preoperative evaluation existed for some time before anesthesia providers began to recognize that preoperative evaluation practices needed improvement to prevent delay and cancellation. To combat the lack of standardization or evidence-based practice, anesthesiologists began implementing anesthesiologist-run preoperative clinics to focus on patient optimization rather than blanket testing all surgical patients with the same laboratory tests. Initially, the focus was cost savings by eliminating unnecessary testing.¹⁰ Now, improved efficiency and patient outcomes are seen as benefits of these streamlined preoperative clinics.^{8,11-14}

Research is now also showing that preoperative clinics may prevent DOS delay and cancellation. In a retrospective study comparing patients who attended an anesthesiologist-run preoperative clinic with those who did not, Ferschl et al⁸ found there were half as many cancellations in the group who went to preoperative clinic (8.4%) versus those who did not go to the clinic (16.2%, $P < 0.001$), despite the fact that the patients in the clinic group tended to be older and have a higher acuity as per the ASA classification. The value of preoperative clinics in preventing DOS delays or cancellations has been confirmed in subsequent studies.^{11,12} Correll et al¹² demonstrated the value of preoperative clinics in not only addressing known conditions that could potentially delay or cancel a procedure but also the ability of clinics to identify new medical problems that had not yet been diagnosed or treated. Identification of new-onset health care concerns improved DOS efficiency by eliminating delays that would have resulted from the discovery of the new conditions on the DOS. Accordingly, new problems had a higher probability of resulting in a delay (10.7%) or cancellation (6.8%) versus known, preexisting problems resulting in a delay (0.6%) or cancellation (1.8%). Of known preexisting problems, 15.8% required changes to the patients' health care regimen, whereas 27.2% of those with newly diagnosed issues incurred new treatment requirements. These preoperative visits effectively created opportunities to improve patient care by fine-tuning treatment plans.

While anesthesia providers traditionally cover most preoperative clinics, other types of health care providers can effectively assess and optimize preoperative patients for surgery. In 1 Veterans Health Administration hospital, Vazirani et al¹³ studied the transfer of oversight in the preoperative clinic from anesthesia providers to hospitalists who supervised physician assistants and nurse practitioners (NPs) with a general medical background. Some improvements were demonstrated including a decreased length of stay for inpatient surgical patients with ASA classifications of 3 or more ($P < 0.0001$), but there were no statistically significant changes in the number of delays or cancellations. This illustrates that while preoperative clinics run by hospitalists do not reduce delay and cancellation any more than clinics run by providers with anesthesia training, they are as effective and therefore demonstrate an efficient workforce balance, especially when considering the participation of NPs. An additional benefit of these preoperative clinics is that their scope of practice allows them to change long-term patient medications to improve chronic illness management, whereas anesthesia providers' scope is focused on management in the immediate perioperative period. An anesthesia provider may have to refer a patient back to the primary care provider, whereas providers with a more generalized scope such as hospitalists and NPs can make changes at the preoperative appointment, effectively eliminating the need for an additional appointment.

Preoperative clinics run by nurses and NPs have also been shown to be effective alternatives to anesthesiologist-run clinics and in some cases able to improve efficiency over other methods. Preoperative clinics run by NPs have been found to be especially

useful in the orthopedic populations, reducing not just cancellations but also lost revenue.¹⁴ A systematic review of nurse-led clinics for elective surgery covering multiple surgical services by Hines et al¹⁵ showed that nurse-led clinics can decrease cancellation rate, improve outcomes such as length of stay and morbidity and mortality, and improve patient preparation and satisfaction, although the level of evidence is considered weak owing to the lack of experimental design. When cases are delayed or canceled, resources allocated for those cases are lost. These resources could include unused staff, equipment, or facility time. Additional benefits of NP-run preoperative clinics are the potential cost savings over physicians and consistently high level of patient satisfaction without compromising patient safety or outcomes.¹⁶ Additional studies with experimental methodologies may help demonstrate the efficacy of nurses and NP-run preoperative clinics.

For nonanesthesia providers performing preoperative evaluations who do not have a background or the training necessary to focus on anesthetic and surgical considerations, additional interventions may be necessary to ensure that adequate assessments and follow-ups are performed on preoperative patients. Focused training of nonanesthesia providers is one method cited in the literature that has been shown to be effective in improving the quality of preoperative evaluations. In a study of a nonanesthesia nurse-led preoperative clinic by Muckler et al,¹⁷ structured training that focused on anesthetic and surgical considerations improved delay and cancellation rates. A computer-based training platform, called Focused Anesthesia Interview Resource, which was developed by anesthesia providers, delivered the training to 33 perianesthesia nurses in 1 facility. According to the authors, cancellation rates decreased from 3.33% to 2.3% ($P < 0.05$). This is an example of a very simple and cost-effective intervention that provided significant results while improving the practice of nurses.

Another way to prevent delay and cancellation within the preoperative clinic is to include routine screening of high-risk conditions in the presurgical assessment. Identification of new health problems benefits the patient in two ways: it brings awareness to issues that require treatment and also reduces any delay or cancellation. The latter is a benefit to the organization as well.¹³ Screening protocols can be implemented to standardize practice and capture the most applicable conditions. An example of an applicable condition that should be included in screening protocols is obstructive sleep apnea (OSA). OSA is one condition that is becoming more common with growing obesity rates.¹⁸ In addition, OSA can be extremely dangerous in combination with anesthesia and postoperative pain medications and is therefore relevant to surgical patients.¹⁹ Tabet and Lopez-Bushnell²⁰ found 10% of patients in a preoperative clinic in an ambulatory surgery center possibly had undiagnosed OSA when routine OSA screening was implemented. Furthermore, the identification of patients with OSA resulted in case cancellation of 16% of surgeries at the preoperative clinic appointment because of the risk of performing surgery on a patient with possible OSA in an ambulatory setting. Identification in the preoperative clinic prevented surgeries from being canceled on the DOS and allowed them to be rescheduled in a safer environment capable of managing potential complications.

Over the last several decades, preoperative patient preparation has transformed from surgeon-directed laboratory screening to patient-focused evaluation and optimization directed by health care providers who are trained in anesthesia- and surgery-specific clinical considerations. Nurses and NPs have been shown to be particularly effective in the implementation of these clinics.¹⁴⁻¹⁶ This patient-centered approach to preoperative preparation has been shown to improve efficiency by reducing delay and cancellation; however, there are other interventions that may also be effective.

Other Interventions

Preoperative clinic appointments are not always necessary for healthy patients undergoing routine procedures. Phone-based evaluations may serve to screen patients going to surgery and identify those who need to come to the health care facility for a face-to-face diagnostic evaluation. Yen et al²¹ found that nurse-led phone-based preoperative screenings were an effective way to perform an initial presurgical assessment when an algorithm was followed to ensure proper and standardized oversight by anesthesia providers collaborating with the screening nurses. Using the study's algorithm, nurses would perform the evaluation without input from an anesthesiologist for healthy patients undergoing routine procedures. For moderately sick patients based on the ASA classification and moderately complex procedures, it was up to the discretion of the nurse to involve an anesthesiologist. For very sick patients and complex procedures, the anesthesiologist would review the record. As a result of the study's algorithm utilization, this multidisciplinary and collaborative approach resulted in an extremely low cancellation rate of 0.07% at this facility. Capitalizing on the training and expertise of nurses gave flexibility to anesthesiologists to perform other duties if needed.

In addition to completing a preoperative evaluation by telephone, technology such as phone calls or e-mail reminders can be used to reiterate or follow up with patients in the days before surgery. In a study of nurse-led phone follow up 3 days before surgery by Haufler and Harrington,²² cancellation rate was reduced by 53%. The setting previously had a unit secretary phone patients the day before surgery. The success of the intervention was attributed to the utilization of a clinician with the appropriate training and education to identify clinical issues that could have resulted in a delay or cancellation if not addressed.

Another approach to prevent delay and cancellation is centralization of preoperative preparation, especially as it relates to patient education. After introducing a standardized preoperative pathway that focused on patient-centered interventions and standardization, Hovlid et al²³ saw a decrease in the cancellation rate at their hospital from 8.5% to 4.9% (95% confidence interval for mean reduction 2.6 to 4.5, $P < 0.001$) and a 17% increase in the number of surgeries performed ($P = 0.004$). Turunen et al²⁴ saw a decrease in delay and cancellation after the implementation of a protocol where education was disseminated from a centralized point, the preoperative nurse, to patients instead of having information come from multiple different members of the surgical team.

Certain problems cannot be addressed until the DOS, such as toxicology screenings. While protocols that address toxicology screenings are institution-dependent, it is worth considering the impact that these protocols, or lack thereof, have on the ability to provide patient-centered care. Cocaine intoxication must be screened on the DOS because acute intoxication can increase the risk of poor outcomes when combined with general anesthesia.²⁵ In a survey of Veterans' Health Administration anesthesia providers, Elkassabany et al²⁶ described wide variability in the standard practice for substance abuse screening for routine surgical procedures. In addition, only about 10% of the respondents reported that their facility had a formal policy on how to deal with a positive drug screen. Lack of a protocol can lead to delay and cancellation when a provider is forced to navigate a decision tree every time a patient has a positive drug screen. Having a standardized practice not only improves patient care but can improve efficiency, especially in a setting where there is a high incidence of a particular condition. Certain patient populations have a high incidence of substance use and routine cancellation effectively reduces patients' access to care. Having a protocol with multiple options allows for a more patient-centered

approach that may help avoid a delay or cancellation of a needed procedure.

Screening, education, and DOS protocols are effective patient-centered interventions that reduce delay and cancellation, are cost-effective and relatively easy to implement. Furthermore, nurses are particularly suited to roles in patient education and assessment and should seek opportunities to expand this field. Addressing issues early streamlines processes and decision-making on the DOS.

The Future for Patient-Centered Interventions

Surgical delay and cancellation rates can be reduced as health care researchers and providers gain a better understanding of the role of the patient in the operating room. Sau-Man Conny and Wan-Yim¹⁴ found that patient-centered interventions before surgery were correlated with high patient satisfaction and a patient desire to be actively involved in their plan of care. When patients are actively engaged, they may be more likely to be supportive of the plan of care and participate accordingly, which further decreases the chance of delay or cancellation.

The concepts of patient-centered care and standardized practices are also the focus of a new concept embraced by health care providers called the perioperative surgical home (PSH). The ASA defines a key element in the PSH as an opportunity for anesthesiologists to improve health care operations by reducing delay and cancellation.²⁷ In the PSH, the anesthesiologist manages the patient throughout the perioperative period, from the preoperative clinic through surgery and into the postoperative period. By having one point of contact, many inefficiencies that occur by passing care from one service to another can be eliminated. Of note, while the PSH mentions nurses as part of the multidisciplinary care team, their role is not clearly defined. However, nurses have a vested interest in the implementation of the PSH as it directly impacts nurses' role in patient care.²⁸ This is an opportunity for nurses to carve a niche and positively influence the development of this innovative concept. By proactively participating in the implementation of the PSH and research studies that help define the role of nurses, perianesthesia nurses and advanced practice nurses can help the PSH become the multidisciplinary tool that was intended to be and subsequently ensure surgical patients are receiving efficient and optimal care.

Conclusion

The OR is a fast-paced area with many areas vulnerable to inefficiency, thus putting patients at risk for delay or cancellation of their surgical procedure. A focus on patient-centered interventions can improve efficiency in the OR. While the specific patient-related causes are not entirely understood, research has demonstrated value in adequate preoperative preparation of patient in the form of preoperative clinics, screening, education and follow-up to proactively address patient-related issues. The role of the nurse in preoperative clinics also needs further exploration as prior research has demonstrated the effectiveness of nurse-led preoperative clinics but stronger study methodologies are needed to confirm these findings. Further study is needed to identify which patient conditions are most linked to delay and cancellation so that resources and interventions can be focused on these areas. In addition, concepts such as the PSH may be the answer for many surgical patients with a patient-centered focus and increased continuity of care.

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References

- Weiss AJ, Elixhauser A, Andrews RM. Characteristics of operating room procedures in U.S. hospitals, 2011: statistical brief #170. In: Pfunter A, Wier LM, Stocks C, eds. *Healthcare Cost and Utilization Project (HCUP) Statistical Briefs. Agency for Healthcare Research and Quality (US)*. 2006.
- Garg R, Bhalotra AR, Bhadoria P, Gupta N, Anand R. Reasons for cancellation of cases on the day of surgery: a prospective study. *Indian J Anaesth*. 2009;53:35–39.
- Deldar R, Soleimani T, Harmon C, et al. Improving first case start times using lean in an academic medical center. *Am J Surg*. 2017;213:991–995.
- Wright JG, Roche A, Khoury AE. Improving on-time surgical starts in an operating room. *Can J Surg*. 2010;53:167–170.
- Cima RR, Brown MJ, Hebl JR, et al. Use of lean and six sigma methodology to improve operating room efficiency in a high-volume tertiary-care academic medical center. *J Am Coll Surg*. 2011;213:83–92.
- Foglia RP, Alder AC, Ruiz G. Improving perioperative performance: the use of operations management and the electronic health record. *J Pediatr Surg*. 2013;48:95–98.
- Van Winkle RA, Champagne MT, Gilman-Mays M, Aucoin J. Operating room delays: meaningful use in electronic health record. *Comput Inform Nurs*. 2016;34:247–253.
- Ferschl MB, Tung A, Sweitzer B, Huo D, Glick DB. Preoperative clinic visits reduce operating room cancellations and delays. *Anesthesiology*. 2005;103:855–859.
- Gabriel RA, Wu A, Huang CC, Dutton RP, Urman RD. National incidences and predictors of inefficiencies in perioperative care. *J Clin Anesth*. 2016;31:238–246.
- Starsnic MA, Guarnieri DM, Norris MC. Efficacy and financial benefit of an anesthesiologist-directed university preadmission evaluation center. *J Clin Anesth*. 1997;9:299–305.
- Knox M, Myers E, Wilson I, Hurley M. The impact of pre-operative assessment clinics on elective surgical case cancellations. *The Surgeon*. 2009;7:76–78.
- Correll DJ, Bader AM, Hull MW, Hsu C, Tseng LC, Hepner DL. Value of preoperative clinic visits in identifying issues with potential impact on operating room efficiency. *Anesthesiology*. 2006;105:1254–1259.
- Vazirani S, Lankarani-Fard A, Liang LJ, Stelzner M, Asch SM. Perioperative processes and outcomes after implementation of a hospitalist-run preoperative clinic. *J Hosp Med*. 2012;7:697–701.
- Sau-Man Conny C, Wan-Yim I. The effectiveness of nurse-led preoperative assessment clinics for patients receiving elective orthopaedic surgery: a systematic review. *J Perianesth Nurs*. 2016;31:465–474.
- Hines S, Munday J, Kynoch K. Effectiveness of nurse-led preoperative assessment services for elective surgery: a systematic review update. *JBI Database Syst Rev Implement Rep*. 2015;13:279–317. Published 2015 Jul 17.
- Nicholson A, Coldwell CH, Lewis SR, Smith AF. Nurse-led versus doctor-led preoperative assessment for elective surgical patients requiring regional or general anaesthesia. *Cochrane Database Syst Rev*. 2013;11:CD010160. Published 2013 Nov 12.
- Muckler VC, Vacchiano CA, Sanders EG, Wilson JP, Champagne MT. Focused anesthesia interview resource to improve efficiency and quality. *J Perianesth Nurs*. 2012;27:376–384.
- Garvey JF, Pengo MF, Drakatos P, Kent BD. Epidemiological aspects of obstructive sleep apnea. *J Thorac Dis*. 2015;7:920–929.
- Kaw R, Chung F, Pasupuleti V, Mehta J, Gay PC, Hernandez AV. Meta-analysis of the association between obstructive sleep apnoea and postoperative outcome. *Br J Anaesth*. 2012 Dec;109:897–906. Epub 2012 Sep 6. PMID: 22956642.
- Tabet CH, Lopez-Bushnell K. Sleep, snoring, and surgery: OSA screening matters. *J Perianesth Nurs*. 2018;33:790–800.
- Yen C, Tsai M, Macario A. Preoperative evaluation clinics. *Curr Opin Anaesthesiol*. 2010;23:167–172.
- Hauffer K, Harrington M. Using nurse-to-patient telephone calls to reduce day-of-surgery cancellations. *AORN J*. 2011;94:19–26.
- Hovlid E, Bukve O, Haug K, Aslaksen AB, von Plessen C. A new pathway for elective surgery to reduce cancellation rates. *BMC Health Serv Res*. 2012;12:154.
- Turunen E, Miettinen M, Setälä L, Vehviläinen-Julkunen K. The impact of a structured preoperative protocol on day of surgery cancellations. *J Clin Nurs*. 2018;27:288–305.

25. Luft A, Mendes FF. Anesthesia in cocaine users. *Rev Bras de Anesthesiol*. 2007;57:307–314.
26. Elkassabany N, Speck RM, Oslin D, et al. Preoperative screening and case cancellation in cocaine-abusing veterans scheduled for elective surgery. *Anesthesiol Res Pract*. 2013;2013:149892.
27. Dexter F, Wachtel RE. Strategies for net cost reductions with the expanded role and expertise of anesthesiologists in the perioperative surgical home. *Anesth Analg*. 2014;118:1062–1071.
28. Odom-Forren J. Perioperative surgical home: an innovative concept. *J Perianesth Nurs*. 2016;31:109–111.