

Running Head: PRE-ANESTHESIA EDUCATION FOR MRI

**Effect of Pre-Anesthesia Education on Rates of Same Day Cancellations in Magnetic
Resonance Imaging**

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Abstract

The Anesthesia Department at Mayo Clinic in Rochester, MN, provides services for patients having studies in the Magnetic Resonance Imaging (MRI) suite. Same-day cancellations of patients scheduled for anesthesia for these procedures is a frequent problem, quantified as a cancellation rate of 18% by data collected by the Certified Registered Nurse Anesthetists (CRNAs) in the Neurosurgery Department in 2013/2014. A quantitative study using an experimental design, specifically a between- group quasi-experimental design, was used to compare the cancellation rates between two groups having anesthesia for an MRI. Group I consists of patients who did not receive pre-anesthesia education, with a known incidence of same-day cancellations, and Group II had pre-anesthesia education. Group II patients were contacted via phone in the week preceding their scheduled MRI. They were given NPO education, as well as education required for specific patient conditions that may impact their suitability for general anesthesia. A total of 122 phone calls were made for the purpose of pre-anesthesia patient education and screening. Forty-three of the 122 (35.2%) patients were removed from the anesthesia list prior to their scheduled appointment due to information disclosed in the pre-anesthesia phone call. Four of the patients receiving education, or 3.3%, did not complete the scan. The research question addressed in this study: Will pre-anesthesia education, delivered to patients having an MRI under anesthesia, reduce the common causes of cancellations, resulting in fewer same-day cancellations when compared to the current practice of minimal patient education, was answered in the affirmative. The previously established cancellation rate of 18% was reduced to a cancellation rate of 3.3%, an overall reduction in the same-day cancellation rate of 14.7%.

Keywords: pre-anesthesia evaluation, MRI, same-day surgical cancellations

Introduction

Cancellation of surgery or procedures on the day of surgery is a widely recognized problem that has been addressed extensively in the literature.¹⁻¹¹ The rates of same-day cancellations of elective surgery can vary from as low as 1% to as high as 25% for outpatient cases, and as high as 66% of inpatient cases.¹ Not only do the last-minute cancellations cost the hospital time and money, they negatively affect patient satisfaction.^{2,9,12-14}

The Anesthesia Department at Mayo Clinic in Rochester, MN, provides services for patients having studies in the Magnetic Resonance Imaging (MRI) suite. At this institution, the provision of anesthesia to this population continues to expand. In 2009, 1,691 patients were provided a general anesthetic for an MRI scan, and by 2014 that number had increased to 2,106. Same-day cancellations of patients scheduled for anesthesia for these procedures is a frequent problem, quantified by data collected by the Certified Registered Nurse Anesthetists (CRNAs) in the Neurosurgery Department at the Mayo Clinic.

In the months of December of 2013 and January of 2014, there were 214 Neuro (brain and spine) MRI cases scheduled to be performed under general anesthesia. Of the 214 procedures scheduled, five (2.3%) were cancelled because of patient fasting (Nil Per Os or NPO) violations, four (1.9%) were cancelled because of an inability of the patient to lie flat without pain, 10 (4.7%) patients did not arrive for the appointment, and 19 (8.9%) procedures were cancelled because patients were able to complete the scan without anesthesia. Combined, these cancellations totaled 17.8% of the scheduled patients. Many of the cancellations were due to factors that could have been addressed with pre-anesthesia patient education (Appendix A).

According to Mayo Clinic's website (2016), the Mayo Clinic Health System currently employs 4,200 physicians, 2,400 residents, and 52,900 allied staff. Many of these providers have

the capability of ordering MRIs under anesthesia. The provider ordering the scan indicates the need for anesthesia via a computer program. The ordering providers are not required to answer any questions regarding the patient's suitability for general anesthesia before the order is placed.

Currently no means exist to pre-determine if the patient is a candidate for general anesthesia or to safely prepare patients for a scan under anesthesia. NPO guidelines are included in a letter that is mailed to the patient for the purpose of confirming the appointment, however, that vital information is frequently missed, or is confusing to the patient. The letter is often read only far enough to confirm the date and time of the appointment, leading to a failure of the patient to comply with the instructions provided. Frequently, patients arrive for an MRI appointment expecting to have general anesthesia, and are not candidates, or are not medically optimized.

Many patients present to Mayo Clinic with complex health problems. Patients with complex cardiac problems, severe respiratory impairment, or a history of infectious or febrile illnesses, are examples of patients who require clearance or optimization, prior to receiving a general anesthetic. It is not uncommon, however, for this type of poorly optimized patient to be scheduled for MRI prior to having their medical issues appropriately addressed and managed. Patients who present with back pain and are unable to lie flat during an MRI scan may expect to have general anesthesia in order to complete the test. These patients may be unaware of the risks involved with receiving general anesthetic. There are several case reports of patients experiencing lasting paralysis after being anesthetized in order to complete an MRI in a position that would have been intolerable to the patient while awake.¹⁵

Patients have arrived at the MRI suite at this institution with an active "Do Not Intubate" order, which is not compatible with a general anesthetic. Patients experiencing dementia are

unable to give informed consent for general anesthesia, and may not present with an appropriate advocate. Lack of following hospital policies and procedures leads to procedure delays, patient and staff frustration, and procedure cancellations. Lack of provider, staff, and patient education regarding the administration of general anesthesia for this population, has contributed to several problems for the anesthesia staff offering services in the MRI setting.

The current practice in the MRI setting is lacking a system for the consistent provision of patient education and adequate patient preparation that allows anesthesia providers to administer a safe anesthetic. The research question that this project is intended to address is: Will pre-anesthesia education, delivered to patients having an MRI under anesthesia at Mayo Clinic in Rochester, MN, reduce the common causes of cancellations, resulting in fewer same-day cancellations when compared to the current practice of minimal patient education.

Literature Review

Research indicates that the common causes of same-day surgical cancellations include: lack of operating room space, shortage of time, shortage of staff, lack of available hospital beds, failure of patients to arrive as scheduled, changes in the surgical plan, and unanticipated patient medical conditions.^{3,4,10} Medical causes for cancellations accounted for between 11.6% to 40% of the cases.^{3,4,10} A 2011 study investigated 978 same-day surgical cancellations over a five year period and discovered that 80% of the cancellations were preventable.¹⁰

Same day surgical cancellations are largely avoidable. A prospective audit over a time period of two months in 2009 was undertaken to determine the cause of same-day surgical cancellations. It was discovered that 22% of the 55 recorded cancellations occurred because the patient was unfit for anesthesia or because the patient required input from other medical or surgical specialties before safely having surgery.¹⁶

Implications for Cancellations

The financial costs of same- day surgical cancellations can be significant for the institution. A study at the Helsinki University Hospital in Finland found that over a 10-week period, the Department of Otorhinolaryngology cancelled a total of 6.3% of the scheduled cases on the day of surgery. These cancellations cost the hospital 24340€ (\$26,423.50) in wasted hours of personnel, as well as 76 hours and 38 minutes of lost operating room revenue .¹¹ The cost to the hospital of one minute of operating room time is generally calculated to be between \$15 and \$20, and the amount that is charged to the patients is between \$29 and \$80 per minute, a figure which does not include the cost for anesthesia services.¹³ In the United States, it is estimated that each cancelled surgery costs the hospital between \$1,430 and \$1,700 plus the variable cost of performing the case.¹⁴

The consequences of same- day surgical cancellations are not only limited to financial costs for the institution. The cancellation of surgery on the same day can cause anxiety and depression for the patient. A 2002 study determined that 61% of cardiac surgical patients whose procedures were cancelled on the day of surgery suffered a higher rate of depression, as measured with The Hospital Anxiety and Depression scale, than those who were not cancelled.² Another group of researchers found that a total of 18.9% of cancelled pediatric cases occurred on the day of surgery. A questionnaire addressing the effects of those same- day cancellations on families found:

38.5% of mothers and 50.0% of fathers missed a day of work and, of these, 53.3% and 42.1%, respectively, went unpaid for the work day missed. The mean number of miles driven (round trip) to the hospital for a cancelled operation was 158.8 miles (ranging from 8 to 1,350 miles). Additional testing and new appointments were ordered in 25.2%

of the cancelled cases. 45% of parents and 16% of children were disappointed by the cancellation; 16% of parents were frustrated by the cancellation, and 3.3% were angry.^{9(p215)}

Value of Preoperative Preparation

The suggested value of the pre-operative clinic has been discussed in the literature as far back as 1949.¹² The practice of a pre-operative evaluation to identify and deal with potential problems before the day of surgery has been shown to decrease delays and cancellations.⁶⁻⁸ While a 2015 study found that the factors affecting the cancellation of pediatric outpatient MRIs under anesthesia were most likely to be socioeconomic reasons, such as a lower median income rather than medical concerns, there is not a robust quantity of studies that have focused specifically on MRI cancellations, and best practices to decrease that number.⁵

A 2005 study looked at 5,083 patients that were assessed in a pre-operative clinic over a three-month time period. This study determined that 647 study participants had medical issues requiring further information or management. Of those 647 patients, 115 (10.7%) of them had new medical problems that likely would have resulted in delays or cancellations if they had been discovered on the day of surgery.⁶

A preoperative preparation clinic has been shown to decrease the number of same day cancellations by nearly 50%, as well as contribute to a three-fold decrease in the number of patients who did not arrive as scheduled for their surgery.⁸ Six separate studies between 1996 and 2009 have reviewed and compared the rates of same-day surgical cancellation between patients who did, and who did not receive a pre-operative evaluation. While the decrease in the percentage of same- day surgical cancellations varied from 1.1% to 22%, all six studies found

that the use of a pre-operative anesthesia evaluation clinic significantly reduced the rate of same day- surgical cancellations.^{8, 17-21}

The 1996 study compared a six month time period before the introduction of a pre-operative evaluation (POE) clinic to a six month time period after its introduction, and found that the outpatient surgical cancellations decreased by nearly 20% while inpatient surgical cancellation rates remained stable.¹⁷ A study conducted in 2002 resulted in less striking numbers, but still found that the rate of same- day surgical cancellations due to medical reasons fell by 1.1% over the three years after the introduction of an outpatient preoperative evaluation clinic.¹⁸

A 2005 study retrospectively compared the cancellation rates from before and after the establishment of a pre-operative clinic and reported a 7.8% decrease in cancellations in the same-day surgical suites, and a 7.7% decrease in the general operating rooms following the introduction of a pre-operative clinic.²¹ In 2009 the issue of same day cancellations was again addressed with a study retrospectively comparing the cancellation rates from one year prior to the establishment a pre-operative clinic and one year after. A 22% reduction in cancellations for all reasons was found, and a 3.2% reduction in cancellations for medical reasons after beginning a preoperative clinic.¹⁹

A second 2009 prospective study looked at cardiac surgical patients over a four-month period. Of the 1,716 cases scheduled in that time period, 850 patients were sent to a pre-anesthesia clinic and 866 were not. The pre-anesthesia clinic group had a cancellation rate of 13.29% compared to a cancellation rate of 16.8% in the other group, a decrease of 3.5%, but found a significant decrease of 7% in cancellations for an incomplete medical work-up.²⁰

A 2014 study had the largest as well as the lengthiest study with 28, 928 patients reviewed over five years and found that preoperative anesthesia evaluation resulted in a 3%

reduction in same-day surgical cancellations for all reasons. In addition, the number of cancellations affected by poor or inadequate pre-operative preparation were decreased from 462 (78% of total cancellations) to 177 (42% of total cancellations) over the nine-month period immediately following the opening of the pre-operative clinic.⁸

This large body of data, spanning a large time frame in years (1996-2014), differing lengths of studies (four months to five years) and differing sizes of study participants (524-28,928), is compelling. The consistent value shown by the pre-operative clinic across these varied studies is a convincing argument for positive real-life applicability. While the rate of decrease of same-day surgical cancellations varied from 1.1% to 19.4%, all six studies showed a decrease that was considered statistically significant.^{8,17-21}

Same day cancellations and delays of surgical procedures is a well-documented problem that negatively affects patients as well as the hospital.^{1,6,15} In the current culture of ever-growing health care costs and an increasing concern over waste in the health care industry, the pre-operative clinic is a clear, attainable, and practical solution to a well-defined problem. The use of a pre-operative anesthesia clinic in order to educate and prepare patients for anesthesia results in a reduction of the number of same day surgical cancellations and is supported by the literature.

Patient Education

The pre-operative clinic is an ideal place to initiate patient education and to decrease fears about anesthesia.²²⁻²³ There are numerous studies that have addressed patient education and how it affects same day surgical cancellation. Since same day surgical cancellations are often due to anesthetic concerns, the conclusions from these studies can be reasonably applied to same day MRI cancellations.

The information regarding anesthesia will generally be imparted to an adult learner who aligns with Malcom Shepherd Knowles's 5 assumptions of andragogy. The adult learner will be self-directed, have a reservoir of experience that becomes a resource for learning, will be ready to learn information related to his/her social role, will be internally motivated to learn, and his/her learning will have shifted from being subject-centered to problem-centered.²⁴ The levels of comfort with the topic of anesthesia will be varied, but since there will be those with no experience, the information needs to be clear, basic, and assume the learner has no mastery of the topic.

The type of learner is perhaps a mismatch with the type of education provided, according to Gerald Grow's self-directed learning stages as explained by Merriam and Bierema.²⁴ The type of learner that would typically be participating in this education would be at stage four, that of being a self-directed learner that is able to plan, execute, and evaluate their own learning. The role of the educator, however, is more aligned with that of the educator at stage one- that of an authority.

The teaching strategy which will be utilized for this project aligns most closely with that of stage one of Grow's self-directed learning stages.²⁴ Stage one suggests that information is mostly introductory, there are few choices, the learner needs to see the connection between the information and its application, ^{and} there is immediate feedback in the form of the patient being able to proceed with the MRI scan. The mismatch between the type of learner and the type of education provided to them is a result of the considerably large group of learners, the necessity of simplifying complex information so that it is understandable to a diverse group, as well as the educational medium used. The size of the group and the type of learner cannot be changed, and neither can the information that needs to be presented. While not perfect, this mismatch of

learner to education seems to be the best compromise in order to achieve the goal of reducing the rates of preventable MRI cancellations.

It is clearly in the interest of efficiency, productivity, and patient satisfaction to discover and address issues before the day of surgery. The ability of pre-operative education and evaluation to address these problems has been demonstrated repeatedly and convincingly. While there is a gap in the literature that addresses pre-anesthesia evaluation for MRI scanning, the data from the studies referenced above can be interpreted as a strong indicator that similar positive results would emerge from better preparing patients to undergo a general anesthetic for their MRI scan. The ability to educate, assess, and address the common reasons that MRI scans under anesthesia are cancelled on the same day will result in a more efficient work flow, higher patient satisfaction, and safer anesthesia delivery.

Methods

Research Design

This was a quantitative study using an experimental design, specifically a between-group quasi-experimental design. The comparison was between two groups having anesthesia for an MRI scan. Group I consists of patients who did not receive pre-anesthesia education, with a known incidence of same-day cancellations, and Group II had pre-anesthesia education (Appendix B). The independent variable was the pre-anesthesia education, and the dependent variable was the rate of same-day MRI cancellations. There were no truly random assignments as it was not possible to control for extraneous characteristics of participants, match them, choose homogenous samples, manipulate the treatment conditions, control variables, or randomly assign patients to the treatment group or the non-treatment group. Outcome measures were the rates of same-day cancellations in each group.

Group II patients were contacted via phone in the week preceding their scheduled MRI. They were given NPO education and asked a series of questions for the purpose of determining their suitability for general anesthesia (Appendices B, C and D). Any necessary additional testing or clearance for anesthesia identified during the interview was addressed with the patient's primary care provider prior to the patient's scheduled MRI. The purpose of this study was to determine if the pre-anesthesia education, delivered before MRI appointments, would result in a lower rate of same-day cancellations.

Sampling Procedure

Patients included in this study were a convenience sample, and were chosen based solely on the MRI schedule of patients requiring anesthesia in order to complete the scan. All patients on the anesthesia schedule who received the educational phone call were included. Collected data was used to identify primarily the rate of cancellations for the group that received pre-anesthesia education compared to the previously known rate of cancellations from the group that did not receive the pre-anesthesia education

Sample Size

In order to determine an appropriate sample size for this study, an online sample size calculator at Clinicalcalc.com, was used.²⁵ A study design of one study group (pre-anesthesia education) versus a known population (no pre-anesthesia education) was chosen, along with a dichotomous primary endpoint (MRI scan cancelled or not). The study parameters were set as follows: alpha 0.05, beta 0.2, power 0.8, the incidence of cancellation for the known population was entered as 18%, and the anticipated decrease in incidence for the study group was entered as 50%. Given the preceding information, it was determined that a sample size of 122 participants would be an ideal study size.

Participants

This study included the first 122 patients who received a pre-anesthesia educational phone call after being scheduled to undergo a general anesthetic in order to complete a body or neurological MRI scan at Mayo Clinic's St. Mary's Hospital in Rochester, MN between January 18, 2018 and February 26, 2018. Patients that were not contacted before the anesthetic, such as same day add-ons, were excluded from the study.

Measurements

Factual data was collected using a modified audit form to collect patient's name, age, sex, clinic number, date of scan, date of pre-anesthesia education, reason for requiring anesthesia, whether or not the scan was cancelled, and the reason for any cancellations. Patient interviews will include a review of systems, confirmation of a responsible adult accompanying patient, as well as NPO guideline education (Appendix D). Patient identifiers were collected only in order to match any same-day cancellation occurrences with previous educational phone calls that were made. Data was collected in the same manner for each patient by only one researcher and stored in a secure location accessible only to that researcher.

Ethics

Permission was sought and given by the Neuro Anesthesia Supervisor, as well as the St. Mary's Director of Anesthesia. IRB approval was sought and granted for this study by the University of Michigan-Flint, as well as by Mayo Clinic in Rochester, MN (Appendix E).

Results

A total of 122 phone calls were made for the purpose of pre-anesthesia patient education and screening. Patient characteristics are described in Table 1.

Total	122	
Male	66/122	54%
Female	56/122	46%
Age range	22 days – 86 years	
Under 10 years	49/122	40.2%

Table 1. Patient Characteristics

Forty-three of the 122 (35.2%) patients were removed from the anesthesia list prior to their scheduled appointment due to information learned in the pre-anesthesia phone call. Reasons for removal from the anesthesia list varied (Table 2) and are as follows: fifteen patients did not require anesthesia in order to complete the MRI scan, one child was only two weeks post RSV infection and therefore did not meet the four-six weeks post infection requirement before placing an endotracheal tube electively, two patients had had an myocardial infarction (MI) in the week prior to the phone call, one patient would not have been 46 weeks gestational age and parents elected to cancel rather than have the child have an overnight hospital stay post general anesthesia, two patients were out of town, one patient was pacemaker dependent and therefore needed a scan time to be coordinated with a pacemaker RN and a physicist available, 11 patients no longer needed the scans as the scans were either done at home or the ordering provider had decided the scan was not indicated, but had neglected to cancel the appointment, one patient was

unaware of the appointment, and three patients needed to re-schedule their scan, but had not done so.

Anesthesia not required	15/43	34.8%
Scan not needed (service cancelled scan, patient completed scan closer to home)	11/43	25.5%
Ill (influenza, strep throat)	6/43	13.9%
Patient needed to re-schedule	3/43	6.9%
Recent Myocardial Infarction	2/43	4.6%
Patient out of town/ moved	2/43	4.6%
Recent Respiratory Syncytial Virus Infection	1/43	2.3%
Gestational Age under 46 weeks	1/43	2.3%
Pacemaker dependent	1/43	2.3%
Patient unaware of appointment	1/43	2.3%
<u>Total</u>	<u>43/122</u>	<u>35.2%</u>

Table 2. Reasons for Cancellations Prior to Appointment

Seventy-nine of the 122 (64.7%) were candidates for general anesthesia and were educated in accordance with the information found in Appendix B. Seventy-five of the 79 patients educated (94.9%), completed the scan with anesthesia as planned. The reasons for requiring anesthesia are shown in Figure 1. Thirty-six of the 75 patients were pediatric patients, 31 were claustrophobic adults, six were developmentally delayed adults, and two patients had a movement disorder or tremors.

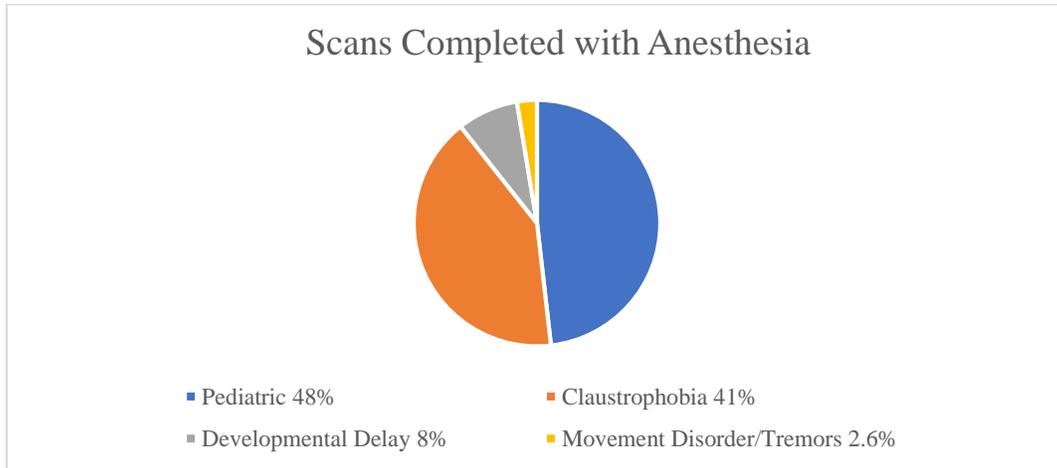


Figure 1. Scans Completed with Anesthesia

Four of the 122 patients enrolled, or 3.3%, cancelled on the same day and did not complete an MRI scan under anesthesia despite the pre-anesthesia education being completed. The four cancelled patients included two patients who did not arrive for their scheduled appointment, one who decided to complete the scan without anesthesia, and one child who contracted RSV in between the time of the phone call and the planned MRI (Table 3). The overall cancellation rate was four of the 122 patients, or 3.3%. Even with a stricter interpretation of the data, the cancellation rate is still an improvement at four of the 79 patients who were kept on the anesthesia list following the education, or 5%.

No-Show	2/79	2.5%
Respiratory Syncytial Virus Infection	1/79	1.2%
Anesthesia not required	1/79	1.2%
Total	4/79	5%

Table 3. Same Day- Cancellations

Statistical Analysis

Four of the 122 patients in the education group cancelled, or 3.3%, compared to 38 of 214 patients in the non-education group, or 17.8% (Chart 1).

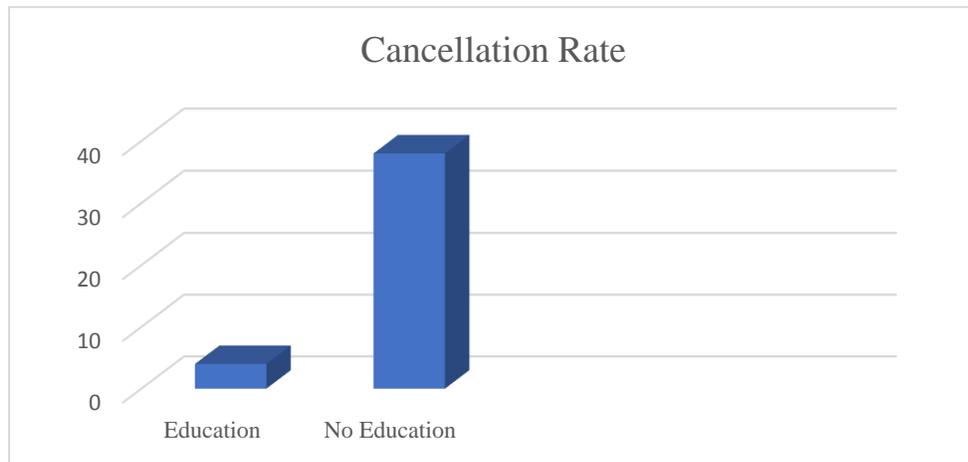


Chart 1. Cancellation Rate: Education Group vs No Education Group (P value <0.0001)

A chi square test of proportions was performed, using an online calculator at graphpad.com, to compare the same-day cancellation rates between the education group and the known cancellation rates of the non-education group (Table 4). The comparison resulted in a P value of <0.0001, which by conventional criteria is considered to be extremely statistically significant.

Category	Observed	Expected
No same-day cancellation	118	100
Same-day cancellation	4	22

Table 4. Observed vs Expected Cancellation Rates (P value < 0.0001)

A contingency table was created using a two-tailed Fisher's exact test for comparing cancellation rates between the education group and the non-education group (Table 5). The P value was statistically significant at < 0.0001 .

	Same Day Cancellations	Not Cancelled	Total
Education Group	4	118	122
No Education Group	38	176	214
Total	42	294	336

Table 5. Cancellation Rate: Education Group vs No Education Group (P value < 0.0001)

In order to interpret the data in the strictest manner possible, a second contingency table was created using a two-tailed Fisher's exact test in order to compare completion (rather than cancellation) rates between the education group and the non-education group (Table 6). Seventy-five of the 79 patients in the education group completed the scan compared to 176 of the 214 patients in the non-education group (Chart 2). This analysis effectively removes the 43 patients taken off of the anesthesia list prior to their appointment from the calculation and instead compares the completion rate of the 79 patients that received education to the completion rate of those that did not. This was also found to be statistically significant with a P value of < 0.0001 .

	Completed	Not Completed	Total
Education Group	75	4	79
No Education Group	176	38	214
Total	251	42	293

Table 6. Completion Rate: Education Group vs No Education Group (P value < 0.0001)

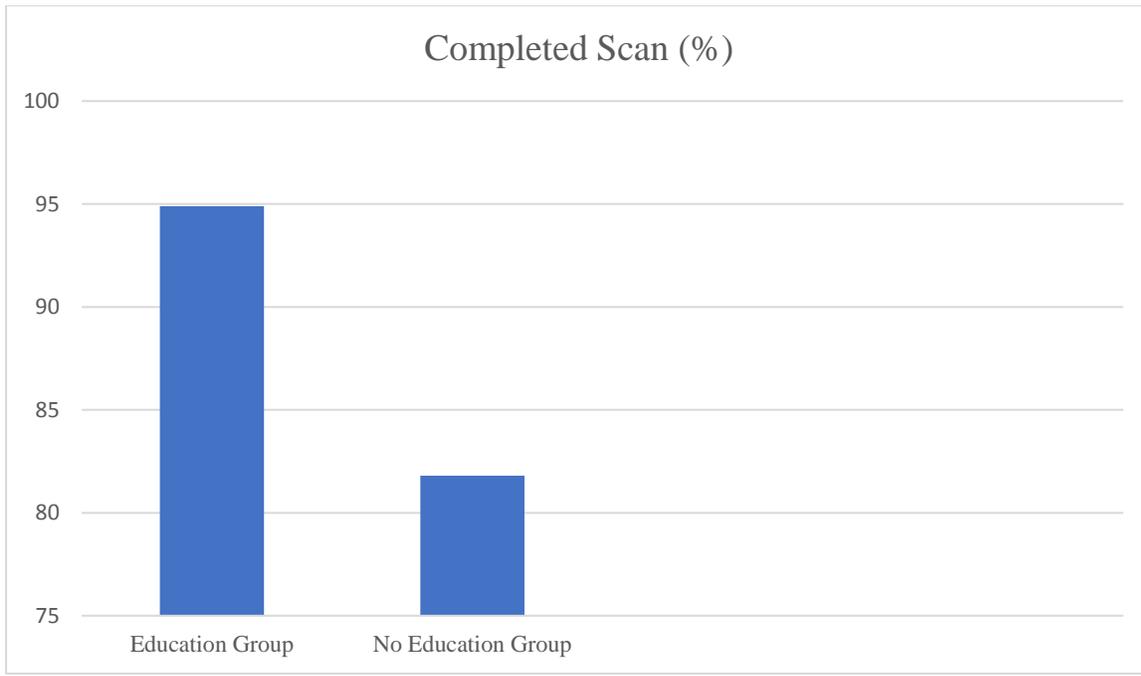


Chart 2. Completion Rate: Education Group vs No Education Group (P value <0.0001)

Discussion

The research question addressed in this study: Will pre-anesthesia education, delivered pre-appointment to patients having an MRI under general anesthesia at Mayo Clinic in Rochester, MN identify and address issues that commonly cause cancellations, resulting in fewer same-day cancellations when compared to the current practice of minimal patient education, is clearly answered in the affirmative. The previously established cancellation rate of 18% (from data collected in December of 2013 and January of 2014 by the Neurosurgical anesthesia group) was reduced to a cancellation rate of 3.3%, an overall reduction in the same-day cancellation rate of 14.7%. A full 35% of patients on the schedule for an MRI under anesthesia should not have been scheduled as such and were removed prior to their appointment date. Had the education not been implemented, the MRI scanners would have been unoccupied. Additionally the MRI

technicians, CRNAs, and anesthesiologists would have had unused time slots in their schedules. The time slots that had been assigned to those 43 patients were then available for patients who actually required anesthesia services, thus relieving some of the backlog of patients.

Study Limitations

There was no true random assignment of participants to either the education or the non-education group, making it impossible to guard against selection bias. Another concern is whether or not the 122 patients were truly representative of the whole population of patients that have MRIs scheduled at St. Mary's Hospital, as any patient that did not receive a pre-anesthesia phone call was excluded from the study. This effectively excluded all patients who were inpatient (currently admitted to the hospital) and all patients who were added to the schedule on the same day because of difficulties in making a timely phone call. These exclusions, while necessary for the design of this study, may make it difficult to generalize the findings of this study to the entire MRI practice.

When comparing the results of this study to the results of the studies discussed in the literature review, the decrease in same day cancellation rates is comparable to those found in other studies. As noted in the literature review, a preoperative preparation clinic has been shown to decrease the number of same day cancellations by nearly 50%, as well as contribute to a three-fold decrease in the number of patients who did not arrive as scheduled for their surgery, and six separate studies between 1996 and 2009 found that pre-operative education decreased the percentage of same-day surgical cancellations from between 1.1% to 22%.^{8, 17-21} The overall decrease in same-day cancellations of 14.7% that was found in this study is within that range.

Recommendations for Future Research

A larger scale study could offer a more definitive answer as to whether or not pre-anesthesia education has a place in the MRI suites. A randomized study, assigning patients to a group that either receives in-depth pre-anesthesia education that is delivered by a trained, licensed provider, or a group that receives the current standard education would give the clearest data regarding the effect of pre-anesthesia education in MRI. A larger study could take place over a longer period of time and could attempt to incorporate same-day schedule additions as well as inpatients.

Conclusion

The problem of same-day anesthesia cancellations is a common one and is well described in the literature, as is the value of the pre-operative clinic in improving those cancellation rates. There is, however, a gap in the literature with regards to the value of pre-anesthesia education for the purposes of tests rather than procedures. The value of pre-anesthesia education in the setting of MRI was demonstrated by this study through an overall decrease in the same-day cancellation rate from 18% to 3.3%. This is a similar outcome compared to that described in the literature and validates the practice of pre-anesthesia education for tests and procedures as well as for surgery. The cost of failing to educate is too high for the patients, health care providers, and hospitals, in both economic and patient satisfaction measures.

Appendix A

Data Collected From 12/01/2013- 01/31/2014

Number on Original List	Number Completed	NPO Violations	No Show	Back Pain	Anesthesia Not Needed
214	176	5	10	4	19
	176/214 82%	5/214 2.3%	10/214 4.7%	4/214 1.9%	1 9/214 8.9%

Appendix B

Education Considerations for MRI Under Anesthesia

1. Confirmation of need for anesthesia/ reason for anesthesia
 - a. MRIs ordered under anesthesia due to a patient's inability to lie flat
 - i. Assessment of pain/paresthesia/numbness experienced while lying flat
 - ii. Anesthesia will not routinely be done due to an inability to lie flat
 1. Risk of permanent injury from lying in a position for a prolonged period that causes pain/numbness/paresthesias¹²
2. MRI will be under general anesthesia
 - a. Sedation can result in snoring, and/or jerking/startled movements that can interfere with the quality of the images²⁶
 - b. A secure airway is desirable as anesthesia personnel do not have immediate access to the airway while the patient is in the MRI scanner²⁷
3. DNR/DNI orders need to be rescinded for the duration of the anesthetic and the PACU time²⁸
 - a. A general anesthetic requires some form of airway instrumentation and a DNI order does not allow that
 - b. Medications/volatile agents used during the induction and maintenance of a general anesthetic can result changes in heart rate/rhythms and blood pressure that are reversible, and a DNR order can interfere with that management
4. Patients will need a discharge plan
 - a. Patients are not allowed to drive themselves home after a general anesthetic and will need to be discharged to the care of a responsible adult²⁹
5. Review of NPO guidelines³⁰
 - a. 2 Hours Before: Stop drinking anything.
 - i. You may drink clear liquids up until 2 hours prior to the scheduled procedure. Clear liquids include things such as: water, fruit juices without pulp (such as apple or white grape), Pedialyte, carbonated beverages, clear tea, or black coffee.
 - b. 4 Hours Before: Stop giving breast milk
 - i. Your child may drink clear liquids.
 - c. 6 Hours Before: Stop drinking non-clear liquids; baby formula
 - i. You may continue to drink clear liquids and give breast milk. Non-clear liquids include: milk and orange juice with pulp.
 - d. 8 Hours Before: Stop eating solid food.
 - i. You may drink liquids.
6. Review of Systems³⁰
 - a. Past problems with anesthesia
 - b. Cardiac

- i. Current ECG available for those older than 65
 - ii. Echocardiogram/stress tests as indicated
- c. Pulmonary
 - i. PFTs as indicated
- d. Liver/Kidneys
 - i. Review of available labs
- e. Review of medications

Appendix C

Pre MRI Assessment

Name / Clinic Number		
Age/ Sex		M F
Date of pre-anesthesia call		
Date of MRI scan		
Confirmation of need for anesthesia	Y	N
Reason anesthesia needed		
NPO guidelines reviewed	Y	N
Review of DNR/DNI orders	Y	N
Confirmation of responsible adult to accompany patient	Y	N
Review of Systems Anesthesia problems		
Cardiac		
Pulmonary		
GI/liver/kidneys		
Other concerns		
Scan cancelled?	Y	N
Reason for cancellation		

Appendix D

NPO Guidelines

1. **2 Hours Before: Stop drinking anything.**
 - a. You may drink clear liquids up until 2 hours prior to the scheduled procedure. Clear liquids include things such as: water, fruit juices without pulp (such as apple or white grape), Pedialyte, carbonated beverages, clear tea, or black coffee.

2. **4 Hours Before: Stop giving breast milk**
 - a. Your child may drink clear liquids.

3. **6 Hours Before: Stop drinking non-clear liquids; baby formula**
 - a. You may continue to drink clear liquids and give breast milk. Non-clear liquids include: milk and orange juice with pulp.

4. **8 Hours Before: Stop eating solid food.**
 - a. You may drink liquids.

Appendix E

IRB Confirmation

IRB not regulated determination

Mandeville, Mary

To: TORBENSON, AMY, HELINE, LAURIE; Motz, Jane

Wednesday, January 03, 2018 10:45 AM

Congratulations! Your IRB submission HUM00140716 **Effect of Pre-Anesthesia Education on Rates of Same Day Cancellations in Magnetic Resonance Imaging** Quality Improvement Project has received a not regulated determination.

Please check with the HIPAA Officer for your institution to see if there are any additional institution specific requirements for use of the PHI. If there will be any personal identifiers recorded in your data set please use encryption to secure the data if it is taken off-site for analysis. You can access your IRB letter in your eResearch workspace. Good Luck with your study. Let me know if you have any questions.

Mary

Mary Mandeville
Research Compliance Specialist, Sr, CIP
University of Michigan-Flint
Institutional Review Board
1204 William S White Bldg.
103 E Kearsley St
Flint, MI 48502-1950
110-762-3384

Reply Reply All Forward 

17-010824 - An application has been deemed Not Research by IRB

IRBe

To: Torbenson, Amy S., APRN, CRNA

Tuesday, December 19, 2017 1:09 AM

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Principal Investigator Notification:

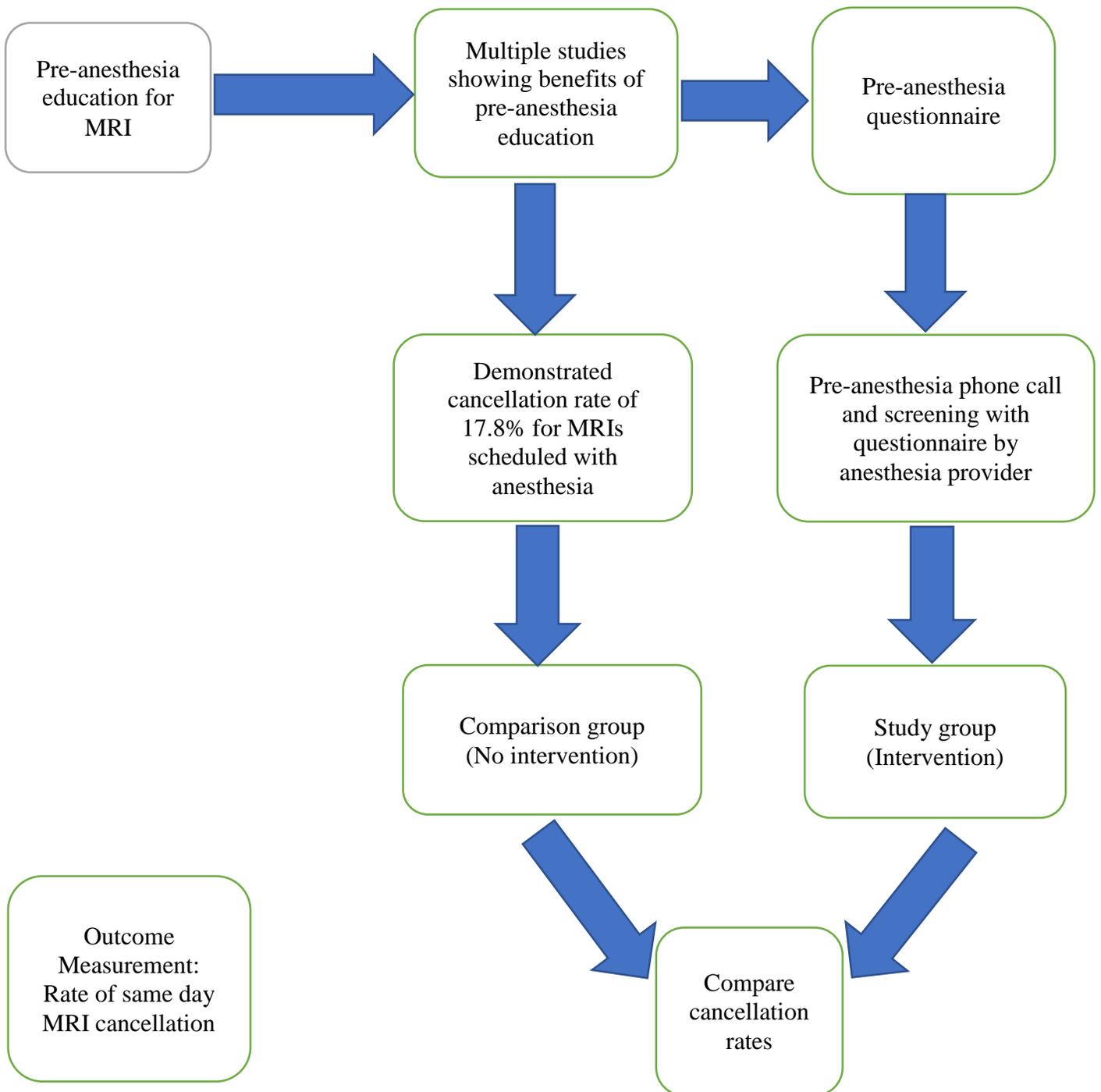
From: Mayo Clinic IRB
To: Amy Torbenson
CC: Amy Torbenson

Re: **IRB Application #:** [17-010824](#)
Title: Effect of Pre-Anesthesia Education on Rates of Same Day Cancellations in Magnetic Resonance Imaging
IRBe Protocol Version: 0.01
IRBe Version Date: 12/14/2017 6:32 AM
IRB Approval Date: 12/19/2017
IRB Expiration Date:

The IRB reviewed the above referenced application. The Reviewer noted that the application involves a Quality Improvement project and determined that it does not constitute research as defined under 45 CFR 46.102. Continued IRB review of this application is not required.
Mayo Clinic Institutional Reviewer

Appendix F

Conceptual Model



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