

## Educating Family Physician Residents for Anesthetic Preoperative Evaluation and Assessment

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### ABSTRACT

**Introduction.** Encounters for preoperative assessments are common within primary care offices, so it is imperative that family medicine residents learn how to perform preoperative evaluations. We assessed family medicine residents' knowledge of preoperative evaluation in preparation for surgery by providing a pre- and post-test alongside a didactic seminar.

**Methods.** A didactic seminar on preoperative evaluations was presented at a family medicine resident didactics session by two senior anesthesiology residents. A 16-question, multiple choice test was used as both a pre-test and post-test to assess family medicine residents' knowledge.

**Results.** A total of 31 participants took the pre-test (residents = 24; medical students = 7), and 30 participants took the post-test (residents = 23; medical students = 7). Mean scores and standard deviations were calculated for both tests with an average score of  $37.50\% \pm 10.58\%$  and  $45.42\% \pm 11.12\%$  on the pre- and post-test, respectively. Using the Kruskal-Wallis test, residents showed a significant improvement in test scores following the didactic presentation ( $p = 0.041$ ), while overall results (residents and medical students) also reported a significant difference ( $p = 0.004$ ).

**Conclusions.** Our results demonstrated that educating family medicine residents and medical students on preoperative evaluation showed significant, quantifiable gains in knowledge following a brief didactic presentation. Given the current gap between guidelines and practice, our results emphasize the need for a formal medical school and residency-based curriculum related to preoperative patient evaluation.

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### INTRODUCTION

Encounters for preoperative assessments are common within the typical primary care office. The aim of such an evaluation is to determine factors that may alter or affect risk assessment, perioperative and postoperative anesthetic management, or optimization of comorbidities

in patients.<sup>1</sup> Assessing perioperative risk is multifactorial and relies on the medical condition of the patient, the invasiveness of the surgical procedure, and the type of anesthetic administered.<sup>2</sup> Once these elements are known, the physician obtains the medical history, a physical examination, pertinent and indicated lab work and other testing, calculates the patient's oral intake prior to the procedure, and determines which medication(s) the patient may need to hold in advance of the procedure.

Routine lab testing, which typically focuses on tests that are not indicated based on patient history or type of surgery but hit a broad spectrum of maintenance-type tests, generally have no effect on risk assessment or anesthetic management.<sup>3,4</sup> In fact, Brown et al.<sup>5</sup> reported that up to 93% of preoperative tests are routine and not ordered due to indications. Despite this, routine testing is still used widely during preoperative evaluations due to the efficiency and availability of modern laboratory testing.<sup>6</sup> Although it may be tempting to utilize available resources, Karim et al.<sup>7</sup> indicated that specific preoperative testing reduced patients' costs by 80-90%, while also reducing hospital visits by 50% compared to patients that were pre-evaluated using routine testing. Therefore, it is imperative that family medicine residents learn the components necessary for an adequate preoperative assessment during the post-graduate phase of their training. Thus, instruction of effective and efficient pre-evaluation by anesthesiology residents could reduce risk, promote ideal anesthetic management during surgery, and reduce costs to patients.

In this study, we assessed family medicine residents' knowledge of preoperative evaluation in preparation for surgery through a pre- and post-test provided alongside a didactic seminar. The seminar was orchestrated using senior anesthesiology residents and by evaluating the family medicine residents' knowledge both before and after the seminar. We hoped that the anesthesiology residents' instruction on preoperative evaluation would facilitate multidisciplinary communication of pertinent information, thereby improving patient processes between the preoperative evaluation and the perioperative period.

### METHODS

This study was approved by the Via Christi Hospitals Wichita, Inc Institutional Review Board. A group of family medicine and anesthesia residents met to determine important aspects of preoperative evaluation, areas of confusion, and questions that arose while performing these evaluations in the family medicine clinic, emphasizing the anesthesiology perspective (Table 1). With the information from these sessions, a didactic seminar was developed for presentation at a family medicine resident didactics session. A 16-question, multiple choice test was developed to assess family medicine residents' knowledge of preoperative evaluations (Appendix; only available online at [journals.ku.edu/kjm](https://journals.ku.edu/kjm)) and was used as both a pre-test and post-test. Family medicine residents and medical students attending the didactics session the day of the presentation took the pre-test, were given the presentation regarding preoperative evaluations which lasted approximately 45 minutes, and then took the post-test. The results of the tests were scored and the pre- and post-tests were compared in R (v4.1.1)<sup>8</sup> using the Kruskal-Wallis test. Figures were developed using the ggplot2 package in R (v3.4.0).<sup>9</sup>

**Table 1. Family medicine didactic presentation topics overview, presented by senior anesthesiology residents.**

Overview of a Preoperative Evaluation	Necessary Preoperative Tests
1. Past medical history 2. Preoperative testing 3. Physical exam 4. Risk stratification	1. Cardiac testing 2. Pulmonary testing 3. Lab testing
Pertinent Past Medical History	Physical Exam
1. Full systems-based history 2. Recent illnesses 3. Substance use	1. Pertinent history 2. Surgical history 3. Upcoming surgery
Home Medications	Final Risk Stratification
1. What medications to hold 2. When to hold medications 3. Specialist input to hold	1. Revised cardiac risk index 2. ASA classification 3. ACS surgical risk calculator

ASA = American Society of Anesthesiologists; ACS = American College of Surgeons

## RESULTS

Family medicine resident preoperative evaluation knowledge was evaluated using a 16-question, multiple choice test (Appendix; only available online at [journals.ku.edu/kjm](http://journals.ku.edu/kjm)). Participants took the test before the preoperative evaluation lecture and an identical test after the lecture. Both the pre-test and post-test were anonymously taken except for being labeled as “resident” or “student” by the participants. A total of 31 participants (Residents = 24; Medical students = 7) took the pre-test, and 30 participants (Residents = 23; Medical students = 7) took the post-test. Mean scores and standard deviations were calculated for both tests with an average score of  $37.50\% \pm 10.58\%$  and  $45.42\% \pm 11.12\%$  on the pre- and post-test, respectively (Table 2). Median scores were 37.50% and 43.75% on the pre-test and post-test, respectively. The minimum scores were 12.50% on both the pre-test and post-test. Maximum scores were 56.25% and 62.50% on the pre-test and post-test, respectively.

**Table 2. Descriptive statistics from before and after the preoperative evaluation lecture and divided results for residents and medical students.\***

	Pre-Test			Post-Test		
	Resident	Student	Total	Resident	Student	Total
Participants (n)	24	7	31	23	7	30
Mean score (%)	37.76	36.61	37.50	44.02	50.00	45.42
Standard deviation	10.98	9.83	10.58	11.38	9.55	11.12
Median score (%)	37.50	31.25	37.50	43.75	50.00	43.75
Minimum score (%)	12.50	25.00	12.50	12.50	37.50	12.50
Maximum score (%)	56.25	50.00	56.25	62.50	62.50	62.50

\*Mean, median, minimum, and maximum scores are reported as percentages.

Results of the pre-tests and post-tests for residents were compared using the Kruskal-Wallis test which showed a significant difference ( $p = 0.041$ ; Figure 1). While a subgroup analysis comparing residents to medical students was not performed due to the low student sample size

( $n = 7$ ), students showed a lower mean score than residents for the pre-test ( $36.61\% \pm 9.83\%$  vs  $37.76\% \pm 10.98\%$ ), but a higher mean score than residents for the post-test ( $50\% \pm 9.55\%$  vs  $44.02\% \pm 11.38\%$ ; Table 2). Overall results of the pre-tests and post-tests, including student results, were also compared using the Kruskal-Wallis test, showing a significant difference ( $p = 0.004$ ). This analysis showed that there was significant improvement in test scores after the brief preoperative evaluation lecture.

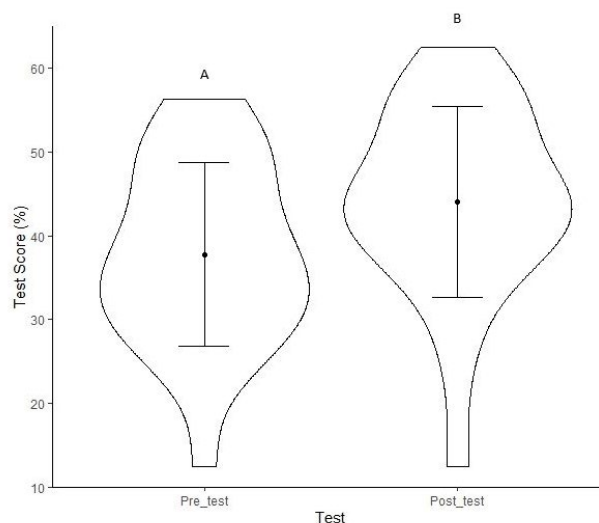


Figure 1. Violin plot of test results for family medicine residents before and after the preoperative evaluation lecture. Mean scores are represented as the point in each plot. Error bars represent standard deviation. The width of the violin plot represents the frequency of test scores.

## DISCUSSION

Preoperative evaluations for surgery are common occurrences, so it is imperative that primary care physicians (PCPs) learn the components necessary for an adequate assessment. Our results demonstrated that educating family medicine residents on validated risk scoring tools, relevant medications, and the indications for obtaining diagnostic tests resulted in significant, quantifiable gains in knowledge of preoperative evaluation and assessment (Figure 1). This increase in knowledge could lead to less extraneous testing and improved surgical outcomes. This improvement in knowledge was also observed among more novice medical learners at our institution, signifying the importance of including early instruction in perioperative management (Table 2). The greater improvement seen in medical students over family medicine residents may be due to a lack of base knowledge compared with the residents, or their learning styles diverge from residents’ learning styles, giving them an advantage in didactic environments.<sup>10</sup>

PCPs abilities to perform preoperative outpatient evaluation is of considerable importance and can decrease patients’ length of hospital stay and reduce interruptions to surgical care.<sup>11</sup> However, excessive and unneeded testing may increase the risk of unintended harm related to follow-up of false-positive test results and added costs.<sup>15,12</sup> According to the Choosing Wisely campaign, most preoperative testing does not influence patient management, including the decision for surgery and more intensive perioperative monitoring.<sup>13</sup> In the absence of

specific historical or examination indication, routine preoperative testing is therefore not indicated.<sup>14</sup> Specifically, chest x-ray, electrocardiogram, and urinalysis are often unnecessary and infrequently change a patient's management or the decision for surgery or perioperative monitoring.<sup>15</sup> Despite these guidelines, approximately \$10 billion of testing are done annually in preparation for surgery.<sup>5,12</sup> One possible alternative to laboratory studies is the use of validated risk stratification tools which categorize patients by potential risk.<sup>16</sup> Clinical tools such as the Revised Cardiac Risk index, American Society of Anesthesiologists classification, and assessment of a patient's capacity to perform metabolic equivalents should be used to categorize a patient's cardiovascular risk.

Because PCPs are often required to perform preoperative assessments,<sup>17</sup> it is imperative to properly educate providers on evidence-based perioperative care. In doing so, patients will be more informed of their individualized surgical risks while subject to less unnecessary testing. Although improved preoperative evaluation does not abolish surgical risk, it informs surgical shared-decision making and contributes to preparation for the peri- and postoperative period.<sup>11</sup> For instance, drug dosages may need to be changed, or certain medications temporarily suspended. Our results make the case for greater educational efforts across the spectrum of medical trainees which may lead to the delivery of more appropriate care in the preoperative period. The need for more education on preoperative evaluations is further emphasized by the overall low post-test scores observed in our study, despite the significant difference from the pre-test results.

**Limitations.** The limitations of our study include a small sample size and lack of direct applicability to patient care. While the results demonstrated an improvement in test scores (Figure 1), this does not necessarily translate into improved patient care or a lower incidence of surgical or anesthetic morbidity. Thus, a follow-up study could include measuring patients' postoperative outcomes after their providers completed a formalized preoperative educational course. The results are also subject to recency bias as the pre- and post-test were taken within one hour of each other. Similarly, long-term retention of the preoperative course was not measured, so a follow-up investigation could include a retention-based test at least three months following the educational course.

## CONCLUSIONS

Our results showed that multidisciplinary instruction of family medicine residents by anesthesia residents is effective at improving the understanding of appropriate preoperative evaluation. Having formalized education that properly and effectively conveys the importance of preoperative assessment demonstrates an increased knowledge base with respect to key risk factors and comorbidities, and their impact on how a provider should clinically assess their medical needs prior to surgery. While we aimed to improve understanding, it is difficult to know how this may affect clinical practice, surgical outcomes, and the utilization of healthcare resources at this stage. Designing a more standardized

training system which includes a formal pre- and post-assessment of residents' clinical practice may facilitate the translation of knowledge into practice and from practice into improved patient safety and outcomes. Given the current gap between guidelines and practice, our results emphasize the need for a formal medical school and residency-based curriculum related to preoperative patient evaluation.

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