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## Concurrent and Overlapping Surgery:

### Perspectives From Parents of Adolescents Undergoing Spinal Posterior Instrumented Fusion for Idiopathic Scoliosis

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#### Abstract

**Study Design**—Prospective cross-sectional survey.

**Objective**—To determine the perspectives of parents of patients undergoing posterior instrumented fusion for adolescent idiopathic scoliosis (AIS) regarding simultaneous surgery and trainee participation.

**Summary of Background Data**—Simultaneous (“at the same time”) surgery is under scrutiny by the public, government, payers, and the medical community. The objective of this study is to determine the perspectives of parents of patients undergoing posterior instrumented fusion for adolescent idiopathic scoliosis. Our goal is to inform the national conversation on this subject with real patient and family voices.

**Methods**—A survey was prospectively administered to 31 consecutive parents of patients undergoing posterior instrumented fusion for adolescent idiopathic scoliosis at a large academic medical center. “Overlapping” was defined as simultaneity during “noncritical” parts of an operation. “Concurrent” was defined as simultaneity that includes “critical” part(s) of an operation. Participants were asked to provide levels of agreement with overlapping and concurrent surgery and anesthesia, as well as with trainee involvement.

**Results**—On average, respondents “strongly agree” with the need to be informed about overlapping or concurrent surgery. They “disagree” with both overlapping and concurrent scheduling, and “disagree” with trainees operating without direct supervision, even for “noncritical” parts. Informing parents about the presence of a back-up surgeon or research demonstrating safety of simultaneous surgery did not make them agreeable to simultaneous scheduling.

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**Conclusion**—Parents have a strong desire to be informed of simultaneous spinal surgery and anesthesia as part of consent on behalf of their children. Their disagreement with simultaneous surgery, as well as with trainees operating without direct supervision, suggests discordance with current guidelines and practice and should inform the national conversation moving forward.

### Keywords

adolescent idiopathic scoliosis; concurrent; overlapping; patient; perspectives; simultaneous; surgery

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Simultaneous (“at the same time”) surgery is under scrutiny by the public, government, payers, and the medical community.<sup>1–3</sup> An investigation of simultaneous surgery at a large academic medical center, including a patient who awoke paralyzed after cervical decompression and instrumented fusion, found that patients were uninformed of the practice before operation, and would not have consented had they known.<sup>4</sup> Public disquiet has been elevated by additional media coverage revealing that the practice is widespread and without explicit patient consent.<sup>5,6</sup> The response from the Senate Finance Committee, which oversees the Center of Medicare Services, and the American College of Surgeons highlighted a need for routine disclosure of such scheduling to patients.<sup>7,8</sup>

Two studies have sought to assess the public’s perception of simultaneous surgery; however, neither of these theoretical studies included patients, or their family members, who were actually undergoing an operation.<sup>9,10</sup> The objective of this study is to determine the perspectives of parents of patients who underwent posterior instrumented fusion for adolescent idiopathic scoliosis regarding simultaneous surgery and trainee participation. Our goal is to inform the national conversation on this subject with the voices of real patients, who will be the primary stakeholders in the impending initiatives and regulations being developed to address this key issue.

## MATERIALS AND METHODS

We performed a prospective cross-sectional survey of 31 consecutive parents of patients scheduled for posterior instrumented fusion and instrumentation for adolescent idiopathic scoliosis. The study was performed at a large academic medical center in a metropolitan area, with residents and fellows routinely participating in patient care. The survey was approved by our Institutional Review Board, and involved patients of a single surgeon (MD). Adolescent was defined as 12 to 18 years of age. Idiopathic scoliosis was defined as having no identifiable cause in a patient with normal neural function. All operations were primary.

We defined overlapping surgery as when “noncritical” parts occur at the same time, such as at the beginning (*i.e.*, spine exposure) and at the end (*i.e.*, wound closure). We defined concurrent surgery to include “critical” part(s) of the operations. The definition of “critical” is deferred to the attending surgeon, *per* guidelines from the Centers for Medicare & Medicaid Services (CMS)<sup>11</sup> and the American College of Surgeons (ACS);<sup>8</sup> in spirit, it encompasses the part that requires maximum surgeon skill and experience.

A questionnaire (SDC Material, <http://links.lww.com/BRS/B363>) was developed with the following sections: demographics, knowledge of medical training, perspectives on overlapping surgery, perspectives on concurrent surgery, comfort with trainee involvement, and perspectives on simultaneous anesthesia practices. Detailed descriptions of “overlapping,” “concurrent,” “critical” and trainee levels were provided. A Likert agreement/likelihood scale was used to grade each response, which was captured as a continuous variable on a scale of 0 (completely disagree/ unlikely) to 100 (completely agree/ likely). The survey was piloted with five subjects and deemed to be length appropriate and understandable.

Recruitment occurred from June 2016 to September 2017. Patients and their parents were recruited in clinic during the preoperative visit (typically ~1 week before operation). Patients and their parents were informed that participation was voluntary, and that participation status would have no influence on care provided: every family approached wished to participate. No incentive for participation was provided. Surveys were administered either electronically or by paper, and completed by one parent. Responses were captured in a REDCap database.

Descriptive statistics (*e.g.*, means and standard deviations [SDs] for continuous variables and frequencies for categorical variables) were used to summarize the data. Agreement scale responses were termed “strongly disagree” for scores 0 to 20, “disagree” for scores 21 to 40, “neither agree nor disagree” for scores 41 to 60, “agree” for scores 61 to 80, and “strongly agree” for scores 81 to 100. The paired *t* test was used to compare responses to questions from the same participant.

## RESULTS

Participants had difficulty discriminating between the terms “resident,” “fellow,” and “attending,” but were consistently able to define “medical student” (Table 1). They thought it was “very likely” (mean likelihood score 86, SD 13) that trainees would be in the operating room during their child’s operation, but were much less certain that trainees would actually operate directly (mean likelihood score 59, SD 32).

Participants “strongly agree” with the need to be informed about overlapping scheduling prior to surgery (mean agreement score 92, SD 12). Subjects “disagree” with the statement that overlapping scheduling is acceptable (mean agreement score 25, SD 25). When a back-up surgeon was described and guaranteed during the overlapping portion, participants’ agreement with overlapping scheduling did not improve (mean agreement score 33, SD 28). Participants were asked whether their perspectives of overlapping surgery would be different if research demonstrated patients undergoing overlapping surgery did equally well and did not have increased complication rates: they continued to “disagree” with overlapping scheduling (mean agreement score 35, SD 27). Participants “agree” that they would cancel surgery if they were informed of overlapping scheduling on the day of surgery, even if the next available time may be several months away (mean agreement score 63, SD 29). Participants “agree” to pay a premium to avoid overlapping scheduling (mean agreement score 66, SD 32).

When the same statements were provided regarding concurrent scheduling, participants' responses were similar (Figure 1). Participants "strongly agree" with the need to be informed about concurrent scheduling (mean agreement score 96, SD 5), and "strongly disagree" with the statement that concurrent scheduling is acceptable (mean agreement score 14, SD 22). Participants more strongly disagree with concurrent scheduling than with overlapping scheduling ( $P = 0.005$ ).

Participants were asked about their willingness to agree to various degrees of trainee participation. Participants "strongly agree" that the surgeon is obligated to inform them about trainee participation during informed consent (mean agreement score 92, SD 13). They "disagree" with residents performing a supervised critical part (*e.g.*, instrumentation) of an operation (mean agreement score 24, SD 25), or operating unsupervised for noncritical (*e.g.*, wound closure) parts (mean agreement score 32, SD 32). When participants were informed that the attending surgeon had the utmost confidence in the trainee's skill and judgment, agreement to trainees performing critical parts of an operation under direct supervision significantly improved (mean agreement score 44, SD 32;  $P < 0.0001$ ). Disclosure of attending confidence did not significantly improve agreement to residents operating noncritical portions unsupervised (mean agreement score 30, SD 30;  $P = 0.81$ ).

When asked about simultaneous anesthesia scheduling, subjects "strongly agree" with the need to be informed that their anesthesiologist is overseeing another patient's anesthesia (mean agreement score 94, SD 10), and their responses were not significantly different than those on simultaneous surgery informed consent ( $P = 0.89$ ; Figure 2). Subjects "strongly disagree" with simultaneous anesthesia scheduling (mean agreement score 20, SD 24), and their responses were not significantly different from those on simultaneous surgery scheduling ( $P = 0.08$ ). Unsupervised resident (anesthesia and orthopaedic) participation for noncritical parts was equally unacceptable. Participants found it significantly more acceptable that anesthesia residents manage the critical part of anesthesia under direct attending supervision (mean agreement score 38, SD 32) compared with the same scenario for orthopedic residents (mean agreement score 23, SD 35;  $P = 0.02$ ).

Thirty percent of participants would insist on attending surgeon presence for setup, including positioning, prepping, and draping. Eighty-five percent would insist on attending surgeon presence for incision and exposure, 86% for instrumentation, and 82% for wound closure.

## DISCUSSION

Simultaneous surgery has been promoted as a mechanism to allow patients greater access to surgeons when demand exceeds supply—of surgeon, of hospital, of time. This must be weighed against the conflict of interest that makes such practice profitable. Because of the potential for adverse outcomes, simultaneous surgery is under scrutiny by the public, government, payers, and the medical community. Results of such scrutiny include regulation of what is acceptable and how it is implemented, as well as mandates for disclosure to patients.<sup>7,8</sup> Essential to a thoughtful and comprehensive policy regarding simultaneous

surgery is the opinion of the patient; otherwise, any policy would be paternalistic and incompletely informed.

We selected spine surgery, children, and parents to raise the stakes. Spine surgery is the highest risk area in pediatric orthopedics. Parents will be stricter about what is done to their children than about what is done to themselves. We wished to raise the bar beyond equivocation in order to reach clarity on the subject. In addition, greater objectivity and authenticity may be derived from a parent who is not directly undergoing surgery, who otherwise might be incentivized to accept aspects of care that are unacceptable or undesirable on behalf of another. We surveyed real patients to reach real conclusions, rather than surveying the general public hypothetically.

That every family approached wished to participate demonstrates the importance of this issue to patients. It has become a high importance issue for the medical community, which has to include patient perceptions and expectations in any policy developed to address it.

Participants in our study “strongly agree” with the need to be informed about overlapping or concurrent surgery, which supports the findings of a prior study.<sup>9</sup> The “reasonable patient standard” for informed consent requires the provider to disclose all relevant information about the treatment that a reasonable patient would find material in making a decision.<sup>12</sup> Surgeons do not routinely disclose simultaneous surgery to patients.<sup>13,14</sup> Explanations include time constraints that limit the ability to discuss such details with patients, and the fact that trainee involvement is assumed at a teaching hospital.<sup>13</sup> Knowledge about surgical timing and trainee involvement may heighten patients’ sense of control; such increased sense of control may actually improve their recovery.<sup>15,16</sup> These results provide an opportunity for action: the consent process must include disclosure and discussion of whether simultaneous surgery was planned, as well as the participation of trainees. Participants “agree” with postponing surgery in the event that their operation would be simultaneous with that of another patient. If and when the consent process includes a discussion of potential simultaneity, the patient will have the opportunity to reschedule, and the surgeon will thereby be able to honor the patient’s wishes.

Participants “disagree” with *both* overlapping and concurrent scheduling, which was uninfluenced by how critical a part of an operation is. Our patients expected attending surgeon presence for both instrumentation and wound closure. This diverges from surgeon expectation and practice, as well as guidelines from the CMS. Such practice and guidelines have been defined on behalf, rather than with the participation, of patients, for whom they are designed to care. This paternalistic approach fails to respect patient autonomy and the empowerment that many patients receive by being included and informed.<sup>17</sup>

Disagreement with overlapping and concurrent scheduling was uninfluenced by the presence of a back-up surgeon. At many centers where policy has been formulated to address simultaneous surgery, designation of a back-up surgeon is one requirement for permitting the practice. Our results suggest that this may not meet patient expectations. Patients often seek out and develop an intense, personal relationship with a specific surgeon, for whom an unfamiliar surgeon is not a substitute, regardless of qualification.

Participants “disagree” with trainees being unsupervised. This informs policy. Many surgeons routinely leave exposure and wound closure to a qualified trainee. Patient expectations may be aligned with those of the surgeon by education. For example, an explanation that a trainee is as skilled in wound closure may allay concerns about this noncritical part of an operation. In fact, our data showed that the attending surgeon’s imprimatur resulted in agreement with the surgical role of the trainee, so long as supervised. There was no agreement to lack of supervision, regardless of whether the task is critical or not critical.

Participants “disagree” with simultaneous surgery regardless of literature showing no difference in complication rate. Such literature may include a selection bias toward simultaneous scheduling for younger and healthier patients. An additional bias may arise from financial incentives inherent to simultaneous surgery. No study has evaluated level of trainee or time/portion of case during which the attending surgeon was present.

There is an assumption that safety justifies the practice. The relationship between patient and surgeon is multifaceted and complex, and includes many other factors that ultimately determine satisfaction with care and good outcomes. Evidence-based practice is a dominant goal for the medical community, but may not be as prioritized by patients. Medicine is not only a science but also an art, at the center of which is the patient. Objective observations such as complication rate, no matter how compelling the data, may be insufficient to influence the personal, subjective, and human experience of surgery. In our cohort, such data made neither overlapping nor concurrent surgery acceptable.

Participants “agree” as strongly about being informed of, and “disagree” as strongly with the practice of, simultaneous anesthesia as they did about simultaneous surgery. Participants were more agreeable with trainee performance of critical parts under attending supervision in anesthesia compared with surgery. Factors accounting for this difference include the different relationship a patient has with surgeon versus anesthesiologist, and a different understanding of the two practices. Nevertheless, participants still expected the presence of the attending of both specialities during operation. This has broad ramifications, suggesting that the present review and reform of simultaneous practice in the operating room should include anesthesiologist as well as surgeon.

At 31 subjects, this study was able to detect statistically significant differences in the magnitude of agreement between perspectives on simultaneous surgery and anesthesia, as well as trainee involvement. For example, while participants agreed about trainees performing critical parts of an operation (mean score = 24), when those same participants were informed that the attending surgeon had the utmost confidence in the trainees’ skills and judgment (mean score = 44), the magnitude of the difference in agreement was 20 points higher (95% CI: 10–30, paired *t* test *P*value = 0.0003). Assuming a two-sided *P*value of 0.05 with 80% statistical power based on a paired *t* test, and because participants serve as their own control, 17 would be required to detect an effect size of 0.741 based on these study results (difference in agreement = 20, SD = 27). Assuming the same parameters (effect size of 0.741, 80% power, 2-sided alpha level of 0.05) but considering the groups independently,



such as in an unpaired two-sample t test, then 30 subjects would be required to detect this magnitude of difference.

This study has limitations. It is based upon the patients of a single surgeon at one institution. This population on average had a higher education level and higher annual household income than the overall US population. Our cohort consisted of parents consenting for their children to undergo spine surgery. Parental responsibility and the risks of spine surgery may represent one end of the spectrum that induces the most conservative position on the subject. These limitations call for research to validate broader applicability of the results.

In conclusion, an information asymmetry exists between the medical community and patients. This may provide an explanation for how subjects defined “critical”; for example, 82% marked wound closure as such. In the billing guidelines of the CMS and the ACS, the definition of critical is deferred to the surgeon. This may risk bias arising from the conflict of interest that exists in a fee for service system that compensates surgeons according to volume.<sup>3</sup> One solution involves the formation of a medical center committee to standardize critical parts by procedure type. This introduces an extensive and complex administrative layer in scheduling and oversight. In addition, such standardization may be unable to account for idiosyncratic patient factors or level/ competency of trainee, which have a direct bearing on the part of an operation requiring the presence of an attending surgeon. Because of these factors, there has been a push to include patient perspectives when defining critical.<sup>1</sup> Our study supports this approach. Patient consent must include a discussion of simultaneity, of both surgeon and anesthesiologist, as well as trainee participation. Presence of a backup surgeon, and absence of evidence in the literature that simultaneous surgery is associated with higher complications, are insufficient to meet patient expectations. Our results inform policy. We regard disclosure as an opportunity for education, which in turn is an opportunity to align the physician with the patient; such alignment is essential to optimal outcomes.

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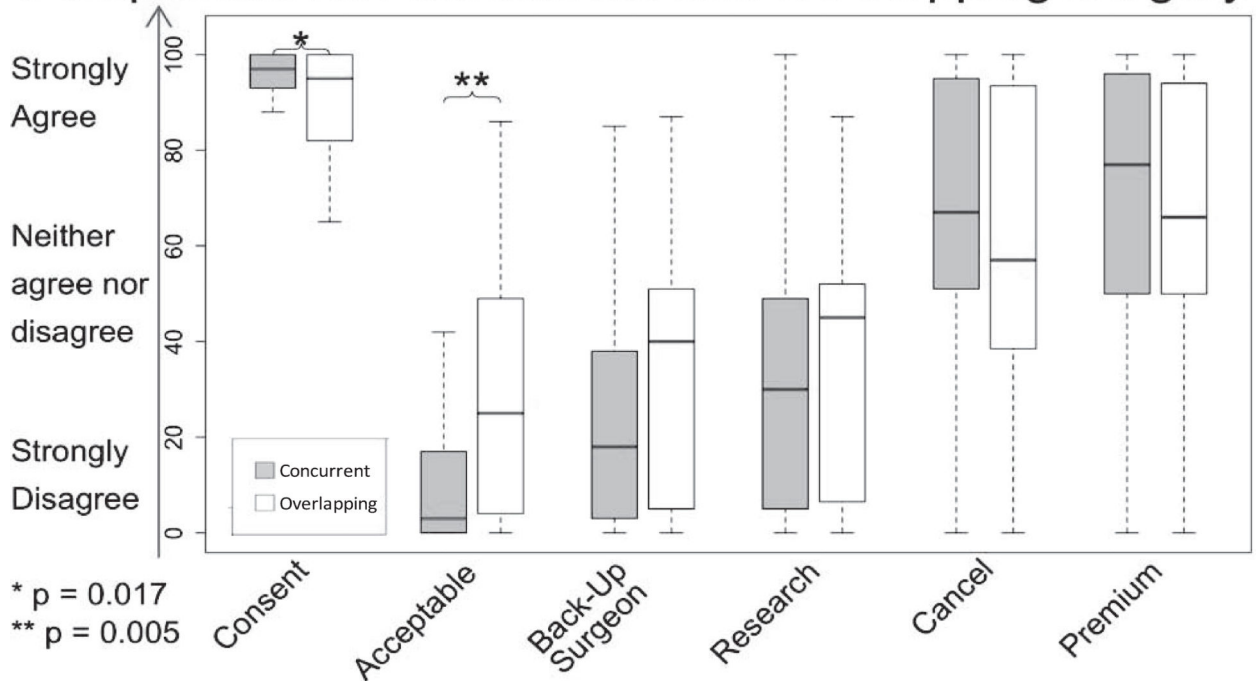


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**Key Points**

- There is a need to inform the national conversation on simultaneous surgery with real patient voices.
- Parents have a strong desire to be informed of simultaneous spine surgery as part of consent on behalf of their children.
- Their disagreement with simultaneous surgery and anesthesia, as well as with trainees operating without direct supervision, suggests discordance with current guidelines and practice, and should inform the national conversation moving forward.

## Perspectives on Concurrent and Overlapping Surgery



**Consent:** “I should be told, as part of obtaining informed consent for surgery, if my child's operation is scheduled (concurrent vs overlapping) with another operation.”

**Acceptable:** “It would be acceptable to me to have my child's surgery scheduled as (concurrent vs overlapping) surgery with another patient.”

**Back-up Surgeon:** “I would proceed with surgery if I was informed of (concurrent vs overlapping) scheduling, and my child's attending surgeon had designated another attending surgeon to be immediately available to present to the operating room if needed.”

**Research:** “If research studies showed that patients who underwent (concurrent vs overlapping) surgery did equally well and did not have more complications (i.e. infection, nerve injury, need for second operation) compared to patients who did not undergo (concurrent vs overlapping) surgery, I would agree to (concurrent vs overlapping) surgery.”

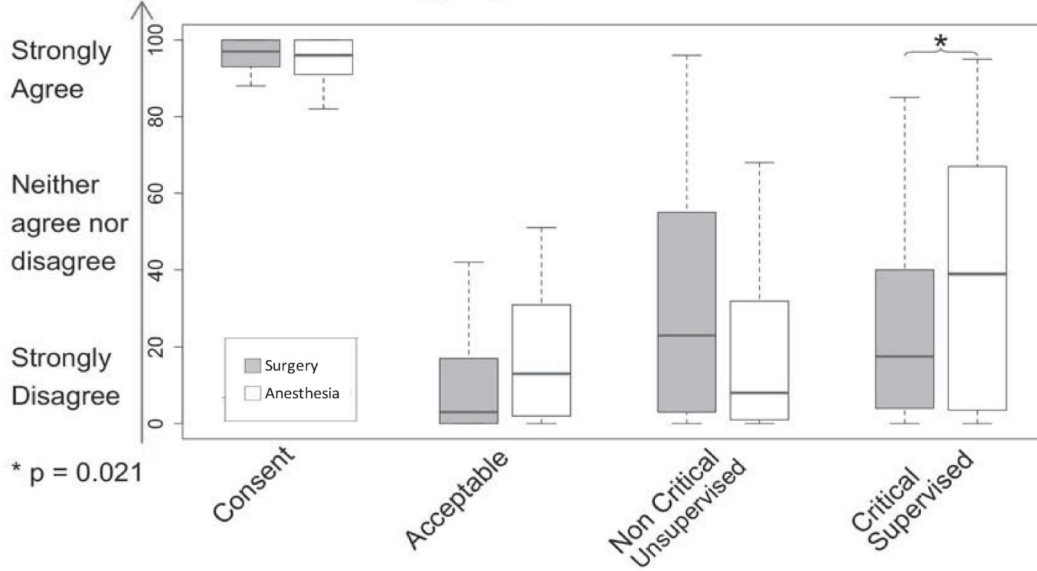
**Cancel:** “If I was informed on the day of surgery that my child was scheduled (concurrent vs overlapping), I would reschedule surgery, knowing that the next available surgery time may be several months away.”

**Premium:** “I would pay a premium to ensure that no other patient is scheduled (concurrent vs overlapping) with my child's attending surgeon during the time of my child's operation.”

**Figure 1.**

Box and whisker plot comparing subject agreement responses (Y-axis) to six statements (X-axis) on concurrent versus overlapping scheduling.

### Perspectives on Surgery and Anesthesia Practices



**Consent**

Surgery: "I should be told, as part of obtaining informed consent for surgery, if my child's operation is scheduled concurrently with another operation."

Anesthesia: "I should be told as part of obtaining informed consent for surgery that my child's attending anesthesiologist may be caring for another patient at the same time s/he is assigned to my child's operation"

**Acceptable**

Surgery: "I would proceed with surgery if I was informed of concurrently scheduling, and my child's attending surgeon had designated another attending surgeon to be immediately available to present to the operating room if needed."

Anesthesia: "It would be acceptable to me to have my child's attending anesthesiologist take care of another patient during the time s/he is assigned to my child's operation. During this time, the resident anesthesiologist would be in the operating room supervising my child"

**Non-Critical (Unsupervised)**

Surgery: "It would be acceptable to me to have the orthopaedic resident perform the noncritical part of my child's operation without my child's attending surgeon supervising."

Anesthesia: "It would be acceptable to me to have the resident anesthesiologist manage the noncritical part of my child's operation without supervision by the attending anesthesiologist."

**Critical (Supervised)**

Surgery: "It would be acceptable to me to have the orthopaedic resident perform the critical part of my child's operation with my child's attending surgeon supervising."

Anesthesia: "It would be acceptable to me to have the resident anesthesiologist manage the critical part of my child's operation with attending anesthesiologist supervision."

**Figure 2.**

Box and whisker plot comparing subject agreement responses (Y-axis) to four statements (X-axis) on simultaneous surgery versus anesthesia practices.

**Table 1.**

## Demographic Information and Assessment of Medical Knowledge

<b>Demographic Information</b>	<b>n (%)</b>
Participants	31
Sex	
Female	19 (61%)
Male	12 (39%)
Ethnicity	
White	20 (65%)
Asian	5 (16%)
Hispanic	2 (6%)
Other	1 (3%)
Unspecified	3 (10%)
Highest level of education	
College graduate	16 (52%)
Postgraduate degree	8 (26%)
Some college	4 (13%)
High-school graduate	1 (3%)
Unspecified	2 (6%)
Annual household income	
>\$100,000	25 (82%)
\$50,000–\$99,999	2 (6%)
\$25,000–\$49,999	1 (3%)
\$<24,999	1(3%)
Unspecified	2 (6%)
Relationship	
Mother	19 (61%)
Father	12 (39%)
<b>Medical Knowledge</b>	
<b>n (%)</b>	
What is your understanding of who an attending physician is?	
Correct	19 (61%)
What is your understanding of who a resident is?	
Correct	21 (68%)
What is your understanding of who a fellow is?	
Correct	19 (61%)
What is your understanding of who a medical student is?	
Correct	31 (100%)