



## Patients' perspectives on the extent of resident participation in the operating room for total hip or knee arthroplasty

### Le point de vue des patients sur le degré de participation des résidents en salle d'opération dans le cas d'une arthroplastie totale de la hanche ou du genou

Jessica Bryce, Silvio Ndoja, Prateek Goyal, Brent Lanting et James Howard

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Résumé de l'article

**Contexte :** Des travaux antérieurs suggèrent que les patients ne comprennent pas le degré de participation des stagiaires dans leurs soins et que cette participation les rend mal à l'aise.

**Méthodes :** Nous avons recruté 202 patients anglophones qui ont eu ou qui vont avoir une arthroplastie totale du membre inférieur pour un essai prospectif par sondage. Nous avons évalué les connaissances des participants sur le niveau de formation des résidents et leur confiance dans la participation des stagiaires dans l'intervention en fonction de la supervision dont ils font l'objet.

**Résultats :** Le niveau moyen de confiance des participants dans le chirurgien consultant était de 4,30 (SD±1,13) sur une échelle de Likert à 5 points. Le degré de confiance dans les résidents était bien inférieur, quelle que soit l'expérience du résident ( $p < 0,05$ ). Parmi les participants, 11,1 % ne voulaient pas que les résidents interviennent dans leur traitement et 60,6 % souhaitaient en savoir plus sur leur niveau de formation. Moins de la moitié des participants ont correctement identifié le niveau de formation des résidents et des fellows.

**Conclusion :** La confiance des patients par rapport au fait que les stagiaires effectuent une partie ou la totalité de l'intervention chirurgicale augmente avec l'expérience et la supervision des résidents. La plupart des patients ne comprennent pas les niveaux de formation des stagiaires en médecine et voudraient en savoir plus sur celui du médecin en formation qui intervient dans leurs soins. Des études plus poussées s'imposent sur la manière d'aider les patients à mieux comprendre la participation des stagiaires dans les soins chirurgicaux.

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## Patients' perspectives on the extent of resident participation in the operating room for total hip or knee arthroplasty

### Le point de vue des patients sur le degré de participation des résidents en salle d'opération dans le cas d'une arthroplastie totale de la hanche ou du genou

Jessica Bryce,<sup>1</sup> Silvio Ndoja,<sup>1</sup> Prateek Goyal,<sup>2</sup> Brent Lanting,<sup>1,3</sup> James Howard<sup>1,3</sup>

<sup>1</sup>Schulich School of Medicine & Dentistry, Ontario, Canada; <sup>2</sup>Queen Elizabeth II Health Sciences Centre, Ontario, Canada; <sup>3</sup>London Health Sciences Centre, Ontario, Canada

Correspondence to: Jessica Bryce, University Hospital, 339 Windermere Rd, London ON, N6A5A5; email: jbryce2018@meds.uwo.ca

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#### Abstract

**Introduction:** Previous work suggests that patients do not understand the extent of resident involvement in their care and are also uncomfortable with resident involvement.

**Methods:** We recruited 202 English speaking patients with previous or planned total joint arthroplasty of the lower limb for a prospective survey trial. We assessed participant's knowledge of resident level of education and confidence of resident involvement in their surgery as a function of supervision.

**Results:** Participants' mean level of confidence in the consultant surgeon was 4.30 (SD±1.13) on a 5-point Likert scale. Confidence in residents was significantly less, regardless of experience ( $p < 0.05$ ). 11.1% of participants did not want residents involved in their treatment. 60.6% would like to know more about the education level of the trainee. Less than half of participants correctly identified the education level of residents and fellows.

**Conclusion:** Patient confidence in residents performing part or all of their surgery increases with resident experience and supervision. Compared with attending surgeons, patients have significantly less confidence in residents performing their surgery, including while supervised. Most patients do not understand the educational progression of medical trainees and would like to know more about the education level of the resident involved in their care. Further work should explore how we can help patients better understand resident involvement in their surgical care.

#### Résumé

**Contexte:** Des travaux antérieurs suggèrent que les patients ne comprennent pas le degré de participation des stagiaires dans leurs soins et que cette participation les rend mal à l'aise.

**Méthodes :** Nous avons recruté 202 patients anglophones qui ont eu ou qui vont avoir une arthroplastie totale du membre inférieur pour un essai prospectif par sondage. Nous avons évalué les connaissances des participants sur le niveau de formation des résidents et leur confiance dans la participation des stagiaires dans l'intervention en fonction de la supervision dont ils font l'objet.

**Résultats :** Le niveau moyen de confiance des participants dans le chirurgien consultant était de 4,30 (SD±1,13) sur une échelle de Likert à 5 points. Le degré de confiance dans les résidents était bien inférieur, quelle que soit l'expérience du résident ( $p < 0,05$ ). Parmi les participants, 11,1 % ne voulaient pas que les résidents interviennent dans leur traitement et 60,6 % souhaitaient en savoir plus sur leur niveau de formation. Moins de la moitié des participants ont correctement identifié le niveau de formation des résidents et des fellows.

**Conclusion :** La confiance des patients par rapport au fait que les stagiaires effectuent une partie ou la totalité de l'intervention chirurgicale augmente avec l'expérience et la supervision des résidents. La plupart des patients ne comprennent pas les niveaux de formation des stagiaires en médecine et voudraient en savoir plus sur celui du médecin en formation qui intervient dans leurs soins. Des études plus poussées s'imposent sur la manière d'aider les patients à mieux comprendre la participation des stagiaires dans les soins chirurgicaux.

## Introduction

Resident participation in patient care is paramount in academic centers across Canada. Surgical residents have the additional responsibility of acquiring surgical skills through a hands-on training process of gradual entrustment. Residents start by being involved in simpler aspects of the procedure and by the end of their training are expected to have the skills to perform the procedure completely independently. Yet, if patients do not inquire about the educational level of the resident, often this information is not explicitly discussed.<sup>1-4</sup>

Traditionally, level of supervision required was dictated in part by year of training; the first three “junior” years emphasized skill acquisition and the final two “senior” years emphasized independence. The Royal College of Physicians and Surgeons of Canada (“Royal College”), which is the regulatory body of specialist education in Canada, is implementing a competency based medical education (CBME) framework for residency training. In a CBME framework, residents progress, in part, by demonstrating competency in predefined entrustable professional activities. CBME brings increased scrutiny to residents’ skill development; residents must achieve competency prior to the completion of their training. Ultimately, these skills are acquired to provide excellent patient care. Yet, there is a paucity of research on the perspective of the very patients who ultimately benefit from the skill development of the resident. This study seeks to better characterize the patient perspective of resident involvement in their surgical care.

Patients may not want resident involvement in their surgical care for fear of an increased rate of surgical error. Most literature, however, suggests that resident involvement has minimal negative impact on orthopaedic patient care and operative experience. Two large analyses utilized the American College of Surgeons National Surgical Quality Improvement Program to study orthopaedic patient outcomes with resident participation in the operating room.<sup>5-6</sup> Resident participation was not a risk factor for complications in most domains studied, although was associated with an increase in operating time. A retrospective analysis of primary total knee arthroplasties performed at a university medical centre in Germany revealed no difference in complication rate, operative time, and postoperative outcome when the surgery was performed by a resident compared to a senior surgeon.<sup>7</sup> While resident involvement does not appear to increase

complications, there remains a reluctance toward resident involvement in surgical care which must be better characterized.

This reluctance toward resident involvement may also arise from lack of understanding of the medical education system, which is undoubtedly complex to patients. Residents are often the first point of contact for patients in academic institutions; yet, patients are often unaware of a resident’s level of training.<sup>8-12</sup> In a recent Canadian study of patients scheduled for gynecological surgery, 40% of patients were unsure whether residents were doctors.<sup>16</sup> In an American orthopedics clinic, over half of the patients did not know that residents were doctors who had completed medical school.<sup>8</sup> Canadian orthopedic surgery residents face similar dilemmas with respect to their involvement in surgical care. A study of general orthopedic clinic patients in the United States suggested that only 65% of patients knew whether their doctor was a resident.<sup>8</sup> Yet, over 90% of the same patients believe it is very important to know the level of training of the physician treating them.<sup>8</sup> This finding is replicated amongst patients in seemingly all medical fields.<sup>8-12</sup>

In a study of orthopedic patients in Singapore, 64% of respondents would prefer not to have residents operate despite close supervision.<sup>17</sup> Patients seeking care from non-surgical specialists generally have a more positive view of resident involvement in their care.<sup>12,18</sup> In fact, in a Canadian study, respondents reported very positive experiences with family medicine residents and 71% of patients would choose to have residents involved in their care.<sup>12</sup> Early discussion of resident education and responsibility is essential for patient satisfaction. Most negative responses regarding resident participation in non-surgical care are a result of patients not being aware that a resident was involved in their care.<sup>10</sup> The vast majority of a group of Canadian patients undergoing cataract surgery consented to resident participation in their surgery when a discussion regarding the resident’s experiences, which includes details regarding patient outcomes, was used to obtain consent.<sup>20</sup> Other Canadian ophthalmology surgical education groups have explored different techniques of obtaining informed patient consent. High rates of consent for resident involvement are achieved with direct and personalized conversation between the surgeon and the patient.<sup>21</sup>

With a change in population demographics, the number of total knee and hip replacements performed in North America is expected to increase in the next ten years.<sup>13</sup>

There has been great attention paid to wait times in total joint replacements in Canada,<sup>14</sup> making this a fundamental competency of a graduating orthopaedic surgeon. Total hip replacements also allow for early resident involvement. Variations present within patients' anatomy can be accounted for and corrected with few steps without significantly affecting the other parts of the procedure. This provides learners the opportunity to improve their ability to use operative tools and improve their dexterity through sheer repetition.

To date, there have been no studies outlining the perspectives of the Canadian population with respect to residents performing their total hip or knee arthroplasty. Arthroplasty is a fundamental skill in orthopaedic surgery and an operation which will continue to increase in demand. Additionally, joint arthroplasty is unique in that it is most often an elective procedure. Therefore, if patients are uncomfortable with resident involvement in their care, they can refuse surgery and seek care elsewhere. However, patients typically wait 6 months or longer for total hip or knee arthroplasty.<sup>14</sup> Refusal to have resident involvement in their care, even as a surgical assist rather than the primary performing surgeon, may lead to maldistribution of demand and exacerbate wait times. Given these variables, we felt it was important to better understand how orthopedic patients felt about resident involvement in their care.

This study sought to better understand patient confidence in residents with various levels of experience performing their surgery. Using a satisfaction scoring survey, we assessed patients' understanding of the medical education system and evaluated patient attitudes regarding the extent of resident participation in the operating room for total joint arthroplasty.

## Methods

### Patients

We studied a convenience sample of patients attending an outpatient total joint replacement clinic at a university-affiliated hospital between September 2012 and July 2013. We obtained ethics approval from the University of Western Ontario Research Ethics Board. We recruited English-speaking patients over the age of 18 with planned or completed total joint arthroplasty. We studied only a population undergoing procedures related to lower limb arthroplasty to allow standardization of the results. We excluded patients who had major neurologic impairment or poor ability to communicate in English.

Patients were assured that responses were anonymized and thus their preoperative, operative, and post-operative care would not be impacted by their responses. In addition to obtaining written consent from the patient, supplementary information was made available to the patients explaining the purpose of the study and highlighting voluntary participation. A research nurse administered the survey to consenting patients prior to consultation by an orthopaedic surgeon.

### The survey

A previously published questionnaire investigating patient perceptions of obstetrics and gynecology residents was adapted to an orthopaedic scenario.<sup>15</sup> The survey was initially tested on twenty patients and modifications to sentence structure were made to improve survey clarity. The survey was solely administered in English. It was comprised of four separate sections including demographics, pre-survey knowledge of medical residents, patient confidence levels in residents, and miscellany. See Appendix A for the complete survey. Factor analysis was performed in SPSS on the survey items.

The first part of the survey collected age, gender, level of education, occupation, and healthcare involvement of the patient or their immediate family members. The second part of the survey tested patient knowledge of the current medical education hierarchy by identifying the correct level of education of a fellow, resident, and medical student. It also tested comparative knowledge of level of medical education between trainees.

The third part of the questionnaire asked patients to rate their confidence in residents performing their procedure based on the resident level of experience, both with and without supervision. Levels of experiences included were none (performing the procedure for the first time), little (previously performed less than 10 similar surgeries), some (10-50 similar surgeries) and a lot of experience (had performed >50 similar procedures). As it is unlikely for a resident to be performing a surgery without supervision with little or no experience, this permutation was not included.

The final part of the survey inquired about patient preferences with regards to knowing residents' level of education and patient prejudices towards residents gaining experience through involvement in the patient's care.

Survey responses were graded using of a variety of modalities. Some were presented as multiple-choice questions asking patients to pick a response from a list of

possible answers. Confidence in residents and the orthopaedic surgeon was rated on a five-point Likert Scale, grading their confidence from “no confidence at all” to “very confident”. Opinion based questions were rated on a Likert scale of 1 (strongly disagree) to 5 (strongly agree).

Statistical analysis was performed using SPSS (IBM Statistics, NY, v25). Chi-square tests and Wilcoxon Ranked tests were used to compare confidence in an orthopaedic surgeon compared to a resident

## Results

We enrolled a total of 202 patients. The mean age was 67.2 ± 10.5 years. Population characteristics are summarized in Table 1. All patients completed the survey at the time of enrollment. Participants more correctly identified the education level of a medical student compared to a resident and fellow (Figure 1). When participants were asked to compare the level of education of various trainees, 68.8 % correctly identified that orthopaedic resident had more education than a medical student. Only 48.0% were able to identify that fellows had more education than residents. Sixty-one percent of participants correctly identified a fellow as having more training than a medical student.

Mean level of confidence in the consultant orthopaedic surgeon performing the surgery was 4.30 (SD±1.13) on the Likert scale. The increase in confidence in residents performing their operation by resident surgical experience was statistically significant. (Figure 2) There was a significant difference in the confidence level between the Orthopaedic surgeon and the resident performing the procedure in any setting regardless of the extent of resident experience ( $p < 0.001$ ). Patients have significantly more confidence in residents performing the operation under supervision regardless of their level of experience ( $p < 0.001$ ; Figure 3).

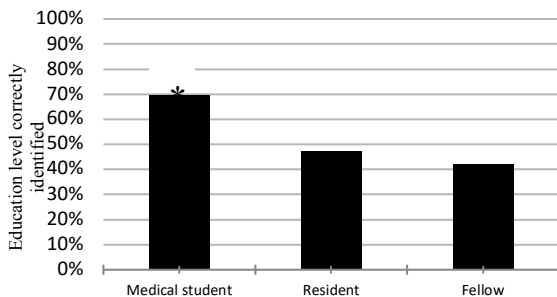


Figure 1. Participant ability to identify education level of medical trainees. Asterix indicates a statistically different result ( $p < 0.05$ )

Table 1. Demographics of survey respondents

	Number of respondents # (%)
<b>Age</b>	
<50	10 (5.0)
50-59	33 (16.3)
60-69	80 (39.6)
70-79	56 (27.7)
80+	23 (11.4)
<b>Gender</b>	
Female	114 (56.4)
Male	88 (43.6)
<b>Education</b>	
Highschool	80 (39.6)
College	63 (31.2)
University	52 (25.7)
Other / unspecified	7 (3.5)
<b>Profession (self or immediate family)</b>	
Medical	57 (28.2)
Non-medical	145 (71.8)
<b>Work status</b>	
Retired	123 (60.9)
Employed	57 (28.2)
Unemployed/Unspecified	22 (10.9)
<b>Previous THA/TKA</b>	
Yes	144 (71.3)
No	58 (28.7)

The majority (60.6%) of patients agreed that they would like to know more about the education level of the resident involved in their care (Table 2). 35.2% of patients agreed that orthopaedic surgeons perform better in the presence of residents. 11.1% agreed or strongly agreed with the statement “I do not like having trainees involved in my treatment” (see Table 2).

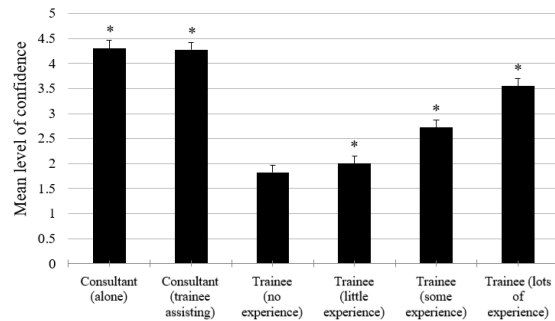


Figure 2. Participant mean level of confidence in consultants and residents performing surgery under supervision. (Error bars indicate 95% confidence interval for mean. Asterix indicates a statistically different result in comparison a resident with no experience operating under supervision.)

Table 2. Participant responses to questions, listed as percentages on 5-point Likert scale

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I would like to know more about the education level of the trainees involved in my treatment.	5.1%	8.6%	25.8%	27.3%	33.3%
It is important that people involved in my treatment explain how far their training has progressed	4%	7%	27.5%	25%	36.5%
I do not like having trainees involved in my treatment.	34.7%	28.6%	26%	7.1%	3.6%
I think that consultants perform better in the presence of trainees.	11.2%	12.2%	41.3%	22.4%	12.8%
I think it is fine when trainees gain experience by being involved in my care.	1%	5.5%	23.1%	30.7%	39.7%

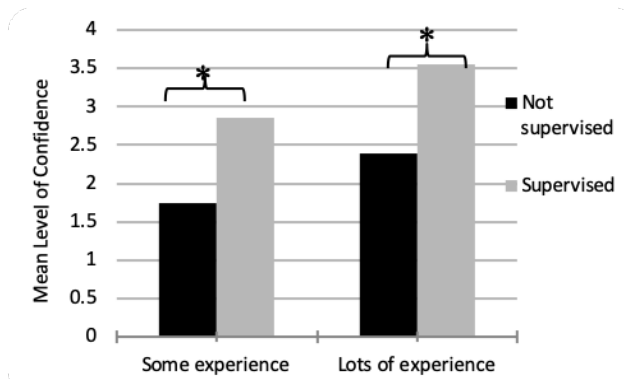


Figure 3. Mean level of confidence in residents performing TKA or THA

## Discussion

Our study suggests that most patients do not understand the educational progression in medical education. Orthopedic patients would like to know more about the education level of the resident involved in their care. Patient confidence in residents performing part or all of their total knee or hip arthroplasty increases with resident experience and supervision. Our study suggests that patients have significantly less confidence in residents performing their surgery, even those residents with substantial experience and while being supervised. Predictably, confidence increases with resident experience. Yet, in seeming contradiction, greater than 90% of patients indicated it was appropriate for residents to gain experience through involvement in their care.

Patient hesitation toward resident involvement in their care is not a new finding.<sup>17</sup> For example, Cantor et al found that only 50% of participants scheduled for gynecological surgery at a Canadian academic hospital would be comfortable with residents operating on them even with supervision.<sup>16</sup> However, they did not study whether confidence changes with resident experience. Our study sought to better understand this by including level of

experience of the resident as one of the variables. One day after they finish residency, an orthopedic surgeon has no more skill than they did on the final day of residency; yet, they may be perceived entirely differently by the patient. Perhaps this perception stems from the broad-encompassing use of the word “resident” to describe both first and final year residents despite their markedly different level of expertise. Previous work outlines three aspects of trainee progression (experience, competency, and level of supervision) that could be considered to frame discussions on resident involvement in a patient’s surgery.<sup>15</sup> Assessment of competence is fundamental to resident progression, particularly in the era of competency based post-graduate medical education.

Our survey also did not specify what aspect of the surgery the resident would perform; to the study participant, this might imply that the resident would be doing the entire procedure. Patients may be more comfortable with residents doing smaller parts of the procedure. This can be elucidated in future research.

We assessed patient confidence in the resident performing the surgery based on level of experience. We chose the ‘number of procedures performed’ as a surrogate marker for level of experience. While this is discordant with the Royal College competency by design measure of competency, we believe that this is adequate surrogate marker. First, we required a simple, objective, and easily understood measure that allows patients to “ballpark” the skillset of a resident. Second, we wanted to be consistent with the validated scale to ensure accuracy of the data. However, we acknowledge that in reality, determination of the level of competence is nuanced as it will vary among procedures and among residents with the same amount of experience.

Our study lacks the statistical power to adequately assess the effect of prior total joint arthroplasty and satisfaction

with prior joint arthroplasty on the perception of resident involvement in future surgical care. Prior positive or negative experiences with resident, a personal/family connection to the healthcare field, and patient level of education may also affect patient perception of resident involvement in their operative care.<sup>12</sup> In addition, the timing of survey administration may limit generalizability of the results. Surveys were administered before consultation with an orthopedic surgeon and before the patient was booked for surgery. Patient attitudes may change after interaction with the orthopedic surgeon and residents or other staff working in the clinic. More specifically, their perspectives may change after they undergo the surgical procedure itself, especially if they know the specific extent of resident involvement. We recommend further research in this area to better improve a patient's experience in the healthcare system.

A reluctance toward resident involvement in surgical care likely also arises from the lack of understanding of the medical education system.<sup>9</sup> In our study, participants were unfamiliar with the Canadian medical education labels for level of training. Predictably, patients were more easily able to identify the level of training of a medical student compared to a resident and fellow. Most patients agreed that they would like to know more about the education level and the progression of training of the resident involved in their care. Preliminary research at other institutions suggests that patient education may positively affect the perception of resident participation in care,<sup>10,19</sup> and that early discussion of resident education and responsibility is essential for patient satisfaction.<sup>20,21</sup> Given this, future work should further qualify, rather than just quantify, orthopedic patients' perceptions on resident operative involvement. We could explore how educating patients on trainee qualifications can affect confidence in residents performing part or all of their total knee or hip arthroplasty.

As evidenced elsewhere, residents are closely involved in patient surgical care without having a statistically significant negative impact on patient care<sup>5-6,8,22</sup> and work needs to be done to ensure patients are comfortable with this involvement. We demonstrated that patients overall are accepting of resident involvement in their training provided this is communicated with them and that the resident has sufficient experience and supervision. Our study paves the way for future studies involving patient education on a resident's capacity, their level of

involvement, and the evidence regarding resident effect on patient safety.

**Conflicts of Interest:** None

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**Previous presentations:** Data previously presented at Canadian Orthopedic Association Annual Meeting 2014 and American Academy of Orthopedic Surgeons Annual Meeting 2015

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## Appendix A

Survey distributed to study participants

### Part 1: Demographics:

Age: \_\_\_\_\_

Please circle your gender: Male                      Female

Please circle the highest level of education you obtained:

High School                      College                      University

Please state your current occupation: \_\_\_\_\_

Do you or one of your family members work/worked in health care?

Yes                      No

Have you had a previous Total Knee Replacement or Total Hip Replacement?

Yes                      No

If yes, were you satisfied with your previous surgery/surgeries?

- a) Very dissatisfied
- b) Dissatisfied
- c) Neither satisfied nor dissatisfied (Neutral)
- d) Satisfied
- e) Very satisfied
- f) Not sure / not applicable

**Part 2: Pre-Survey Knowledge**

**Fellows have (circle one):**

- a) Not finished medical school and do not have their M.D. degree.
- b) Finished medical school but they have not earned their M.D. degree.
- c) Finished medical school, have their MD degree and are getting more training in a specialty.
- d) Have a M.D. degree and are capable of acting as attending physicians/consultants.

**Medical Students have (circle one):**

- e) Not finished medical school and do not have their M.D. degree.
- f) Finished medical school but they have not earned their M.D. degree.
- g) Finished medical school, have their MD degree and are getting more training in a specialty.
- h) Have a M.D. degree and are capable of acting as attending physicians/consultants.

**Residents have (circle one):**

- a) Not finished medical school and do not have their MD degree.
- b) Finished medical school but they have not earned their MD degree.
- c) Finished medical school, have their MD degree and are getting more training in a specialty.
- d) Have a M.D. degree and are capable of acting as attending physicians/consultants.

**Who has received more training?**

**Please mark the first answer that comes to mind. There is no “wrong” answer.**

	Less than	Just as much	More than	
Medical student	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Orthopaedic Surgeon
Resident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Medical student
Fellow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Resident
Resident	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Orthopaedic Surgeon
Fellow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Orthopaedic Surgeon
Fellow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Medical Student

## Part 3: Survey Questions

Please circle how confident you would be with the following scenarios describing varying levels of trainee involvement and consultant supervision in the operating room.

- 1) How confident would you be with the consultant performing all of your surgery alone without any trainees?



Not Confident at all

Neutral

Very confident

- 2) How confident would you be with the consultant performing your surgery with a trainee assisting in the operating room?



Not Confident at all

Neutral

Very confident

- 3) How confident would you be with trainee, with no experience, performing your surgery under supervision?



Not Confident at all

Neutral

Very confident

- 4) How confident would you be with a trainee performing your surgery under supervision, knowing that the trainee has little experience (i.e. has previously performed less than 10 similar surgeries)?



Not Confident at all

Neutral

Very confident

- 5) How confident would you be with a trainee performing your surgery under supervision, knowing that the trainee has some experience (i.e. has previously performed 10-50 similar surgeries)?



Not Confident at all

Neutral

Very confident

- 6) How confident would you be with a trainee performing your surgery under supervision, knowing that the trainee has a lot of experience (i.e. has previously performed more than 50 similar surgeries)?



Not Confident at all

Neutral

Very confident

- 7) How confident would you be with a trainee performing your surgery alone, without supervision, knowing that the trainee has some experience (i.e. has previously performed 10-50 similar surgeries)?

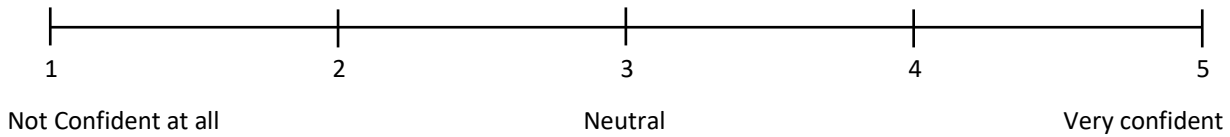


Not Confident at all

Neutral

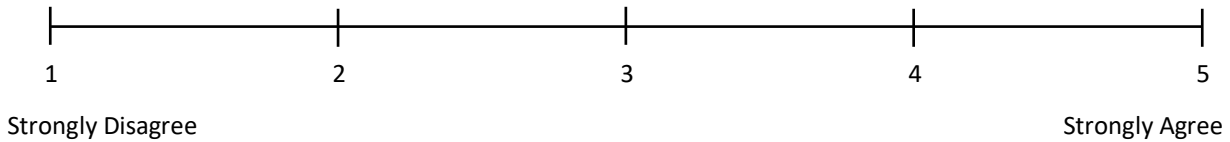
Very confident

8) How confident would you be with a trainee performing your surgery alone, without supervision, knowing that the trainee has a lot of experience (i.e. has previously performed more than 50 similar surgeries)?

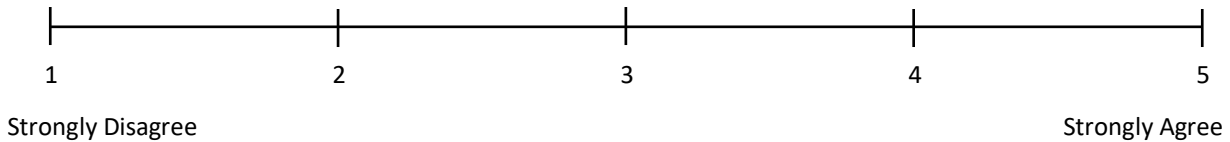


To what extent do you agree with the following statements?

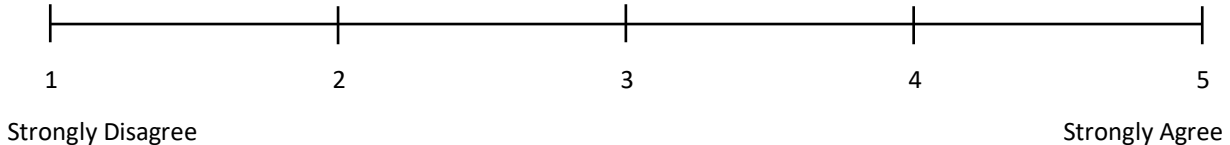
9) I would like to know more about the education level of the trainees involved in my treatment.



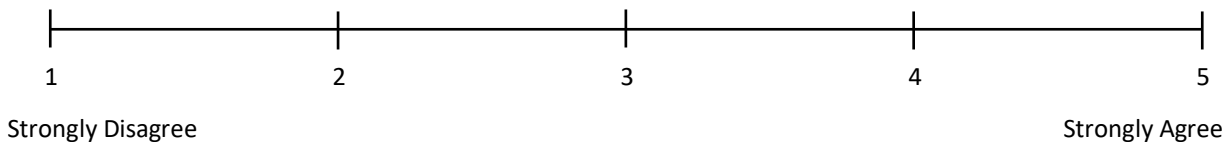
10) It is important that people involved in my treatment explain how far their training has progressed.



11) I do not like having trainees involved in my treatment.



12) I think that consultants perform better in the presence of trainees.



13) I think it is fine when trainees gain experience by being involved in my care.

