

# Participation of Surgical Residents in Operations: Challenging a Common Classification

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## Abstract

**Background** One important form of surgical training for residents is their participation in actual operations, for instance as an assistant or supervised surgeon. The aim of this study was to explore what participation in operations entails and how it might be described and analyzed.

**Methods** A qualitative study was undertaken in a major teaching hospital in London. A total of 122 general surgical operations were observed. A subsample of 14 laparoscopic cholecystectomies involving one or more residents was analyzed in detail. Audio and video recordings of eight operations were transcribed and analyzed linguistically.

**Results** The degree of participation of trainees frequently shifted as the operation progressed to the next stage. Participation also varied within each stage. When trainees operated under supervision, the supervisors constantly adjusted their degree of control over the resident's operative maneuvers.

**Conclusions** Classifications such as “assistant” and “supervised surgeon” describing a trainee's overall participation in an operation potentially misrepresent the varying involvement of resident and supervisor. Video recordings provide a useful alternative for documenting and analyzing actual participation in operations.

## Introduction

Participation in operations is key to surgical learning. Yet the process of learning surgical skills in the operating room

has received little attention. Research to date has focused largely on measuring output variables, such as the complication rates for cases performed by trainees under supervision. Process variables—exploring the qualitative features of the supervision that was provided—has received little attention. The aim of our study was to provide insight into participation in surgical operations and explore the potentialities and constraints of classifying them for research and assessment purposes.

We argue that current classifications of the involvement—such as assistant, surgeon, supervised surgeon—are simplifications of a complex picture. Rather than adopting the quantitative or qualitative methods familiar to most surgeons, we draw on linguistic and anthropologic methods of analysis. We acknowledge that this approach may be unfamiliar, and we do not wish to overstate the conclusions that can be drawn from our sample. However, we believe that important lessons can be learned from an in-depth analysis about what gets lost when classifications of participation do not differentiate between different moments in the operation.

## Materials and methods

This study was carried out in a major London teaching hospital. The data were collected jointly by a linguist/educationalist and a clinical researcher/surgical resident. The study was exploratory, set up to generate, rather than test, hypotheses. No attempt was made to be comprehensive or to capture a representative sample in a statistical sense. In total, 122 operations in general surgery were observed. These ranged from simple skin lesion excisions under local anesthesia to major cancer operations taking an entire day. Within this sample, the most frequently captured operation

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**Table 1** Number of residents per role and stage for 14 laparoscopic cholecystectomies

Personnel	Placing ports	Dissecting Calot's triangle	Clipping/cutting cystic duct/cystic artery	Dissection/removal of gallbladder	Closure
Assistant	5	7	7	7	6
Supervised surgeon	8	7	7	7	4
Unsupervised surgeon	1	1	1	1	4
Training a more-junior trainee	1	0	0	0	1

was laparoscopic cholecystectomy. In all, 14 laparoscopic cholecystectomies involving one or more residents were observed during the course of the study. Ten residents were involved in these operations, ranging in seniority from ST3 to ST7 (third to seventh postgraduate year of surgical training, respectively). A total of 13 operations involved one resident and one attending surgeon; 1 operation involved two residents and no attending physician.

Both researchers kept independent field notes for all of the operations. The field notes described the degree of the participation for each stage during the operation. Following the classification of the Royal College of England's Intercollegiate College of the Surgical Curriculum, the researchers distinguished between four degrees of participation: assisting, operating under supervision, operating without supervision, and training a more junior trainee. Consistent with scoring systems for laparoscopic cholecystectomy [1], the operations were classified by five distinct stages: placing the ports; dissecting Calot's triangle; clipping and cutting the cystic duct and the cystic artery; dissecting and removing the gallbladder; closure. The field notes were compared, and agreement was reached on the classification of participation of each resident during each of the major stages of the laparoscopic cholecystectomy.

Eight operations were audio- and video-recorded. A wireless microphone was worn by at least one of the surgeons. The laparoscope was used to capture the instrument movements. The two researchers analyzed the audio and video data iteratively. The aim was to produce an in-depth, "microscopic" account of surgical learning and teaching in the operating theater, rather than a broad numerical account of a large data set. Linguistic tools were used to transcribe and analyze the recordings in detail [2, 3]. The transcripts were analyzed and reviewed by a linguist and two surgeons (one a senior surgical trainee and the other an established attending physician) with a view to exploring how participation and supervision during operations varied from moment to moment.

All staff in the operating room and all patients involved gave informed consent. The UK National Health Service

Research Ethics Committee approved the study (reference no. 10/H0712/1).

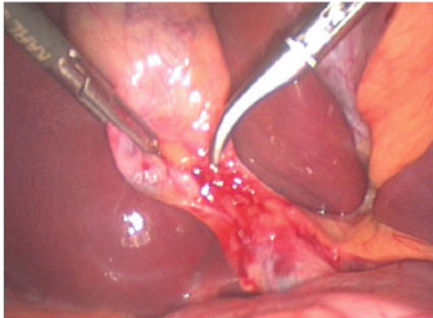
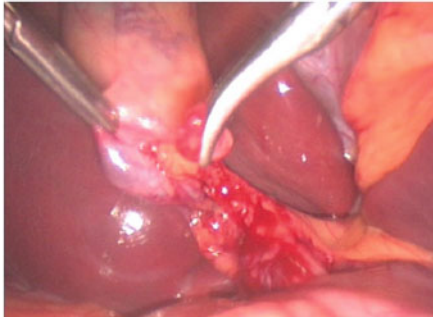
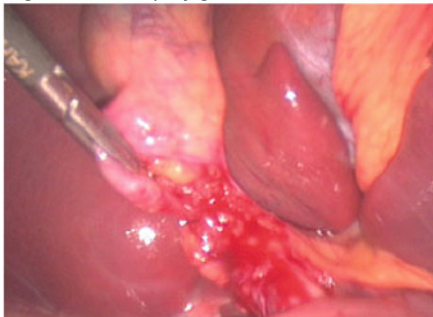
## Results

Residents were involved in some capacity in 78 of the 122 observed cases. The total number of residents involved in these cases was 82. Among them, 34 were recorded as assistants, 26 as supervised surgeons, 16 as unsupervised surgeons, and 6 as trainers of more-junior trainees. However, analysis of a subset of laparoscopic cholecystectomies suggests that their degree of participation varied within cases. In half of the 14 cases that were included in the subsample, the resident was operating throughout the operation as supervised surgeon, unsupervised surgeon, or trainer of a more-junior trainee. In the other half of the cases, the resident was assistant during at least one (and in three cases in all) of the major five stages of the operation. Table 1 details the degree of participation across the stages of the operation.

The table indicates that when a resident was operating a supervisor was present during the dissection of Calot's triangle and clipping and cutting in all but one case. When a resident was placing the ports, dissecting the gallbladder off the liver, and/or closing, the supervisor was sometimes absent from the operating room.

Shifts in the degree of participation of the resident occurred in three of the four pairs of consecutive stages. Between the placing of ports and dissection of Calot's triangle, between clipping and cutting and dissection of the gallbladder, and between dissection of the gallbladder and closure, shifts occurred four to five times. No shifts occurred between dissection of Calot's triangle and clipping and cutting. In total, 13 shifts were observed. Six of these shifts were upgrades; that is, residents shifting to a higher degree of participation (e.g., from assistant to supervised surgeon). Seven were downgrades; that is, residents shifting to a lower degree of participation (e.g., from supervised surgeon to assistant). Most upgrades occurred

**Fig. 1** A resident is dissecting under supervision. *R* resident, *A* attending physician

Time	Operative manoeuvres	Spoken interaction
6m20sec	<i>R is dissecting Calot's triangle.</i> 	R: Can I have a hook please. A: I'd do a bit more, teasing. R: Okay. A: Until we've got the anatomy a bit sorted coz it looks like that could be a tenting. That certainly looks like common bile duct there.
6m33sec	<i>R does more 'teasing'.</i>	
7m02sec	<i>Gall bladder slips off grasper. R grabs it again.</i> 	
7m11sec		A: Grab onto the tip, just really, so you can really pull it out to the\.
7m13sec	<i>R grabs onto tip of gall bladder.</i> 	
7m14sec		A: That's it.

after clipping and cutting and after dissection of the gall bladder (six shifts). Most downgrades occurred after the placing of ports (four shifts). This pattern of participation coincides with the varying degrees of risk involved during the respective stages of the operation. During the stages that involved the highest risk—dissection of Calot's and clipping and cutting—the residents were least likely to be afforded high degrees of participation. During the stages that involved the lowest risk—placing ports and closing—they were most likely to be afforded high degrees of participation.

Not only did the degree of participation vary across the stages, it also varied within each stage. This was particularly obvious when residents were operating under

supervision. Detailed linguistic analysis of these operations showed that the actual control of residents under supervision frequently shifted from moment to moment. As the participation of the resident decreased, the participation of the supervisor increased and vice versa. In other words, the relative control of resident and supervisor over the operation fluctuated, demonstrating the subtle, dynamic nature of supervision of surgical trainees. The teaching episode in Fig. 1 illustrates this.

Figure 1 shows how an operation “done by” a resident under supervision typically unfolds. Through spoken directives the supervisor can take control of an operative maneuver undertaken by the resident without taking direct control over the instruments involved in those maneuvers.

Similarly, residents can cede control over the maneuvers without having to relinquish control over the instruments. Attending surgeons can be more or less specific in their prompts by using different types of directive. For instance, in Fig. 1, the attending's "grab onto the tip" refers to a specific action that is demanded at a specific moment in the operation. In contrast, the attending's "I'd do a bit more teasing" refers to a range of actions performed over a period of time. Seen from this perspective, the participation of residents amounts to a continuing negotiation of control. Only when the attending surgeon was unable to control the operative maneuvers sufficiently through talk (the short pause between "more" and "teasing" already indicates that the attending is looking for apt descriptors of the actions he wants the resident to perform) did he take over from the resident. That enabled the (scrubbed) supervisor to demonstrate surgical techniques instead of merely describing them and to ensure satisfactory progress.

Alternation was seen between episodes of resident-controlled operating (with no overt directions from the supervisor), co-controlled operating (with the attending giving occasional directions), and attending-controlled operating (with the attending orchestrating every maneuver of the trainee or taking over control of the instruments). These alternations were marked by changes in the challenges posed by the operation and/or the attending's responses to these challenges. In other words, the locus of control was not fixed but shifted in response to the operation's stages. Participation of surgical residents and other members of the team, including the attending, can therefore be seen not as an "all or nothing" static state but, rather, as dynamic and fluctuating throughout the operation.

## Discussion

The dynamic and fluctuating character of participation challenges a commonly used classification of operations. For instance, in some randomized control trials [4–6] the clinical outcomes of operations performed by attending surgeons have been compared to the outcomes of operations performed by residents under direct supervision. However, these studies did not take the relative control of residents and attending surgeons over the operations into account. In England, residents keep online portfolios set up by the Intercollegiate College of the Surgical Curriculum, detailing for each case whether they performed, assisted in, or supervised the operation. These records are taken into account at the periodical assessment of residents (Record of In Training Assessment, or RITA). Our study suggests that such classifications are an oversimplification of a complex picture. Surgical residents operating under supervision are not necessarily primary "agents"

throughout an operation: they do not always "do" or "lead" the operation; nor are they ever merely passive "recipients" of instruction. Instead, the attending surgeon and resident frequently redistribute their control over the operation—not only in between the major stages of the operation but also within them.

We propose that to measure participation in operations adequately—whether for research or for assessment purposes—more discriminatory classification is required, detailing significant changes in participation during an operation. For instance, operations can be broken down into phases, and the degree of supervision can be specified for each stage. Moments at which supervisors take over from the resident can be investigated in more detail and their frequency of occurrence and duration measured. Video-recording equipment is increasingly available in operating rooms and can play a key role in these measurements. Such recordings allow researchers, assessors, supervisors, and residents to capture, replay, and analyze participation and supervision in much greater detail than when recordings are made on observation sheets. Portfolios kept by surgical trainees could include video clips, giving a much more nuanced and objective picture of the trainee's performance than the existing portfolios currently allow.

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**Conflicts of interest** None.

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