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## **Bio Note**

Dr. Ged M Murtagh is currently a Senior Lecturer in the Department of Surgery and Cancer, Imperial College London. He is one of the leads for the Clinical Communication Programme for Medical Undergraduates at Imperial and his main research interest is Conversation Analysis of communication practices in health care settings.

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## **Data**

The data that support the findings of this study are available on request from Dr Jeff Bezemer. The data are not publicly available due to privacy and ethical and legal restrictions

## **Abstract**

Effective teamwork is a critical feature of surgical practice and is based on shared expectations and understandings between team members. These shared understandings are intimately tied to a hierarchy of expertise pertaining to role, responsibility and participation status. It has been suggested that this can sometimes negatively impact on trainees' experience of intraoperative surgical training. This paper examines this issue exploring how surgeons and their trainees collaboratively manage decision making amidst the hierarchy of expertise. The paper analyses some of the interactional practices used by surgeons and trainees which preserve, and on rare occasions, challenge that hierarchy. The paper concludes by considering the implications of the findings within the broader context of patient safety.

(Word Count 128)

**Keywords:** Surgical Teamwork, Intra-operative Decision Making, Conversation Analysis

## **1. Introduction**

The concept of effective teamwork among health care professionals is rapidly becoming one of the core elements of the future delivery of health care. The primacy of teamwork is evidenced at both the level of training policy and professional practice (GMC 2015, RCS 2014) as part of a recognition of the need to meet future challenges facing the NHS.

However, effective teamwork in clinical environments is not without its difficulties. This may be partly because medicine is a rigidly hierarchical profession with relatively clear expectations concerning role and responsibility. Differentials in training, technical skill and knowledge typically reflect a relatively rigid hierarchy of expertise. This in turn can in turn shape the ways different teams or team members interact with one another. If this interaction is sub-optimal, the technical expertise of the teams or team members is at best sub-optimal, at worst negligible

Taking surgery as a case in point, a core requirement of teamwork in surgery is a high level of shared understanding and shared expectations (Undre and Sevdalis et al. 2006) among team members. Such understandings are implemented and sustained through training but also in and through the interactions between team members. However, communication among surgical teams is often less than optimal (Anderson and Davis et al. 2013) sometimes resulting in higher levels of adverse events for patients (Mazzocco and Petitti et al 2009) which are often driven by sub-optimal team communication rather than poor surgical technique (Weller and Boyd 2014; Hu and Arriaga et al. 2012; Lingard and Espin, et al. 2004.) Such deficiencies in communication can arise from factors internal to the team (Agha

and Fowler et al. 2015) disrupting the effectiveness of information transfer between team members (Nagpal and Vats et al. 2010; Nagpal and Aora et al 2012).

This issue is crystallised in the context of surgical trainee participation. Edmondson (1999) has suggested that surgical teams are particularly prone to compromised trainee involvement because of the interdisciplinary nature of their structure as well as marked differences in status and training. Differences can arise in the perception of the quality of feedback and teaching between consultants and surgical trainees (Levinson and Barlin et al. 2010). For example, Williams and Silverman et al. (2007) report that the fear of being compromised can prevent junior members of staff from presenting their evaluation and assessments of situations if they feel it is at odds with the evaluation of a senior member. More recent research suggests that little has changed. Consultant surgeons ('Attendings' in the US) have been reported to underestimate the amount of guidance they give to trainees (Chen and Williams et al. 2011). Rose and Waibel et al. (2011) found perceptual disparities between consultants and surgical trainees on the issue of intraoperative feedback, a finding supported by Butvidas and Anderson et al. (2011).

In addition to highlighting these disparities amid the technical hierarchy of expertise, these studies also indicate the significance of the structure and process of team interaction. Closer investigation of the character and structure of team interaction should provide us with further insight into how perceptions of roles, responsibilities, conduct and action shape and are shaped by team communication (Lingard et al 2002; Lingard and Espin, et al. 2004).

This paper attempts such further exploration by examining episodes of interaction between consultants and surgical trainees during intra-operative decision making. Except for a handful

of studies (e.g. Lingard 2004; Sanchez Svensson and Heath et al. 2007; Koschmann, and Baron et al; Goodwin and Feltovitch 2010; Mondada 2014; Nieboer et al 2019), there is comparatively little research capturing empirical data on how consultant surgeons manage their interactions with surgical trainees in the context of surgical team work. We examine the kinds of opportunities afforded to trainees to contribute to evaluating and assessing<sup>1</sup> when decisions need to be made during a procedure. We also examine how trainees and lead surgeons respond to those opportunities.

## **The Procedures**

Our data are taken from laparoscopic cholecystectomies (gall bladder removal operations). This procedure is performed routinely and usually straightforward. However, it does involve a stage which is typically surrounded by heightened uncertainty to greater or lesser degrees. Before the gallbladder can be removed, two structures need to be identified, clipped, and cut: the cystic duct and the cystic artery. In most patients, these structures are not directly visible as they are surrounded by fibrous and fatty tissue. Only when this tissue is carefully removed do they become visible. The completion of this dissection is a matter of clinical judgement. Misidentification of structures can lead to injury of the common bile duct, which is considered a serious complication; therefore, consultant and trainee need to tread carefully.

To avoid complications, surgeons are instructed to make explicit and teach how to identify the cystic structures. A common method for doing this is called the ‘Critical View of Safety’ (CVS). This method involves demonstrating, in a ‘time-out’ just before the cystic structures are divided, (1) that the lower part of the gall bladder is detached from the liver; (2) that only two structures are attached to the gall bladder; and (3) that these structures are freed from

fatty and fibrous tissue (Strasberg et al. 2017). Anatomical and pathological variation means that the dissection stage leading up to dividing these structures can take anywhere between several minutes or sometimes several hours. Some patients may have an unusually thick duct which is covered by layers of fat, whereas others may have a long, thin duct which presents itself without much dissection. Yet other patients have arteries which run in unusual places. Therefore, correct identification of these structures is critical and is probably one of the most important aspects of the procedure. It is highly consequential and is, in many instances, an irreversible step.

## **2. Method**

### *Design of main study*

This study was conducted as part of a much larger study into education and training in general surgery at a major London teaching hospital. Within this larger study audio and video data were captured with wireless microphones worn by at least one of the consultant surgeons in each operation and the laparoscopic camera which was used to capture the intra-corporeal instrument movements. All staff in the operating room and all patients involved gave informed consent. Participants were informed that the study was examining pedagogical practices in the operating theatre to provide insights that may be helpful to improve surgical training. Ethical approval was granted by the UK National Health Service Research Ethics Committee (ref no 10/H0712/1).

### *Design of present study*

The data presented derive from video recordings of eleven laparoscopic cholecystectomies (gall bladder operations). Each operation lasted between 20min and 1hr30min (counting from the point that the laparoscope is inserted into the body cavity until the point it is taken out again). Total operating time was 9hr38min and the average operating time was 52min. The surgical teams involved four different consultant surgeons, five surgical registrars (ranging from ‘ST3’ to ‘ST6’, i.e. trainees who are in their third and sixth year of specialist training, respectively). In practice associate specialists are frequently older and may have more years of experience) and one ‘staff grade’ (i.e. a non-training grade doctor), and a number of core trainees (i.e. junior surgeons on surgical rotations).

### *Data Analysis*

All recordings were transcribed utilising Conversation Analytic transcription conventions (see Table 1) to detail specific features of the design of the talk and its production (Sidnell and Stivers 2012, Heritage and Maynard 2006). We examine the interactional choices participants make when positioning their turns at talk in relation to the cystic duct and cystic artery. Intra-operative decisions of this kind require careful evaluation and assessment before any decision can be made. Consequently, such instances provide a direct line of sight into the character of team interaction when it comes to decision making.

Extensive analysis was made of how and by whom decision making was initiated, how it was delivered and how others responded, if at all. All transcriptions were carefully examined by both authors (GM, JB) incorporating findings from ethnographic data on the practical aspects



of surgical work (JB). This has also been incorporated into the transcripts so, for example specific actions taken with the surgical instruments when no verbal exchange takes place, have also been described. These physical actions have been italicised to distinguish them from verbal actions in the transcript. Any disagreement regarding the interpretation of the data was resolved through discussion.

### **3. Findings**

The findings reported in this paper indicate that surgical team members are highly sensitive to expectations concerning differential expertise and professional authority. These expectations are reflected in the different communication practices (which typically constitute the consultant surgeon as authoritative expert) produced by surgeons and trainees. These different communication practices can be characterised in five different ways and the paper examines examples of these practices in action.

- Surgeon initiates a first assessment and proceeds with direct action and does not interact with trainee/s.
- Surgeon initiates a cautious first assessment and tentatively requests the opinion of trainees.
- Surgeon initiates a first assessment through instructional commentary (the general case).
- Trainee initiates a first assessment, surgeon produces an instructional commentary (the particular case)
- Surgeon initiates a first assessment, trainee confirms assessment, surgeon produces an instructional commentary (the particular case)

In what follows, we present six extracts from the data which highlight some of the aforementioned communication practices within the context of surgical teamwork. The extracts are taken from two types of teamworking situation, one where the consultant surgeon is performing the procedure whilst the trainee observes, and the other where the trainee is performing the procedure under the direct supervision of the surgeon. The communication practices we examine reflect the careful orchestration of intra-operative decision making which almost invariably sustain the position of the consultant surgeon as the authoritative expert.

*Extract 1 (Consulting surgeon operating, ST4 assisting – ‘This is going to be over in a minute’)*

*Surgeon initiates a first assessment and proceeds with direct action*

- |    |      |  |
|----|------|--|
| 1  | Cons | <i>Pushes a closed grasper through a very thin layer of tissue</i>   |
| 2  | Cons | <i>Makes series of small expansive movements when grasper has penetrated the tissue, creating a window</i> |
| 3  | Cons | <i>Open the clips</i>  |
| 4  | Cons | <i>Re-inserts grasper into window, then opens and closes grasper</i>                                       |
| 5  | Cons | <i>Is the hook diathermy ready</i>   |
| 6  | SN   | <i>(0.5) Yes</i>   |
| 7  | Cons | <i>Re-inserts grasper into window, then opens and closes grasper twice</i>                                 |
| 8  | Cons | <i>(6.0) Clips</i>   |
| 10 | Cons | <i>(5.0) This is going to be over in a minute<br/>↑Clips</i>   |
| 11 | SN   | <i>Passes clip applicator</i>  |
| 12 | Cons | <i>Thanks</i>  |

Fig. 1. Line 1



Fig. 2. Line 2



Fig. 3. Line 4



This extract is taken from a procedure being led by a consultant surgeon with an ST4 (surgical trainee in their fourth year of specialist training) in assistance. The action begins as the consultant surgeon is pushing his closed grasping instrument through a thin layer of tissue (Figs. 1-2). As soon as the tip of the instrument has come through the tissue layer, he makes a request to open the clips. He then lifts the instrument out and re-inserts it in the opening (Fig. 3). By opening the grasper and pushing it towards one side he makes the extent of the opening, visible. This manoeuvre is critical to the procedure at both a technical and interactional level. At the technical level, surgeons perform this action to counter uncertainty produced by limitations to visibility (Koschmann et al 2011).

At the level of team interaction, the manoeuvre is an indication of what potentially is about to happen next. Executed just after the consultant surgeon has requested the clip applicator to be prepared, it performs ‘double duty’ (Heritage and Watson 1980), as a way of managing visibility but also as a signal to others of the upcoming next relevant action. In extract 1 the request (‘open the clips’) is the first verbal indication that the surgeon is planning to clip a structure imminently. This signals that this surgeon is certain, or soon to be certain, that the structure he is planning to clip is indeed the structure he takes it to be (at this point he has not yet indicated exactly what he is planning to clip –the cystic duct, the cystic artery, or another vessel).

When the consultant surgeon has completed this manoeuvre, he pulls the grasper up and asks, 'is the diathermy ready'. The diathermy is an instrument needed for the next stage of the procedure i.e. after the cystic structures have been clipped and cut to render the gall bladder separate from the liver bed. He then pushes the grasper back in the opening he has just created, repeating the same manoeuvre. He then pulls the grasper out, and requests clips. What follows is inactivity: he has already removed the grasper, and so is ready to receive the clip applicator and insert it through the port he just used for the grasper. After suggesting 'This is going to be over in a minute' he repeats the request for the clip applicator.

Looked at in a certain way, this example represents minimal sensitivity to team working in relation to trainee involvement. All interaction is initiated by the consultant surgeon who is performing the procedure. The sequence involves only five utterances produced by the consultant. He does not interact directly with the surgical trainee, which, in our data, was unusual. Another feature of this extract is that there is no hesitation or uncertainty expressed regarding the decision. Notably, once the decision is taken to clip and cut, there is a very clear directional character to action, which, in this instance, seemingly shapes conduct, action and interaction toward endorsing the consultant surgeon's role as authoritative expert. At this level of training an ST4 would certainly have the requisite knowledge to read the anatomy as well as the actions of the surgeon and pronounce accordingly. The ST4's silence, in this instance, further cements the consultant surgeon's authority regarding the upcoming decision.

Examples like this underscore the importance of analysis of the relationships between categories/identities and action not as a deterministic, but rather as influencing or shaping action and interaction among team members. In this extract, as in all other extracts in our

data, the consultant surgeon, and the surgical trainee both have immediate visual access to the situation at hand, yet how that situation is pronounced upon, assessed, evaluated and acted upon is very carefully orchestrated. That is to say, the interactional rights to pronounce, assess, evaluate and act are not equally distributed (Raymond and Heritage 2006). One consequence of this is that in nearly all cases, surgical trainees agree with the consultant surgeon. The next extract explicitly highlights this point.

*Extract 2 (Consultant surgeon operating, F2 assisting – ‘No-one says anything’)*

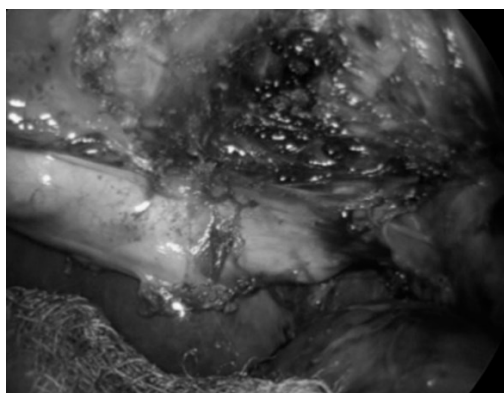
*Surgeon initiates a cautious first assesement*

1	Cons	So her bile duct is going to be down there
2		Somewhere
3		(4.0)
4	Cons	Under there
5		(2.0)
6	Cons	It's not going to be up here is it
7		(3.0)
8	Cons	Hm no-one says anything did you notice
9	F2	(laughter) They all agree [     ]

Fig. 4. Line 1. ('there')



Fig. 5. Line 5 ('here')



In this extract, in the endeavour to locate specific anatomical sites, the consultant draws attention to two areas for assessment, first in Lines 1 -2 and line 4, when he points to where

he thinks the (common) bile duct is, and then in Line 6, when he stretches the surrounding tissue out to the right, to expose an area where he believes the common bile duct is not.

At lines 1-2 in this sequence the consultant surgeon who is performing the procedure does something which occurs a lot throughout our data i.e. he assumes first position and makes an assessment of the situation (So her bile duct is going to be down there somewhere). Initiating the first assessment of the situation is part of the teaching but it is also one of the resources consultant surgeons use to sustain their position as authoritative expert. We note that this interactional move occurs whether the consultant surgeon is performing the procedure or not. A first assessment ‘carries an implied claim that the [consultant surgeon] has primary rights to evaluate the matter assessed’ (Raymond and Heritage 2006). Apart from one instance (see the ‘deviant case’ below, which, however, follows an invitation from the consultant surgeon), trainees rarely initiate a first assessment of the situation particularly when it comes to decision making.

The importance of getting this decision right is reflected in the consultant surgeon’s reference to the bile duct and its location which is mitigated by an aired? uncertainty (lines 1-4, 6) (‘down there somewhere (4.0) under there it’s not going to be up here is it’). These mitigated pronouncements indicate some “epistemological cautiousness” (Heritage, 1997 p. 238) as the consultant surgeon appears uncertain and is not willing, at this stage, to commit to a precise location.

At this point it is unclear if the consultant surgeon is simply thinking aloud or eliciting the opinion of the accompanying trainees. This is clarified in the utterance that follows three seconds later (‘hm no-one says anything did you notice’). The consultant

surgeon was indeed eliciting the opinion of others, however his comment ‘no-one says anything’ explicates the implied expectations associated with category and action i.e. that typically surgical trainees do not assess or evaluate a situation, but that if they do they will, as the F2 (a junior doctor who has not yet started specialist surgical training) points out, typically agree.

The absence of comment from the others co-present (as well as the assisting F2, an ST6 trainee was present (officially in her role as researcher)) may have to do with the fact of their ‘playing it safe’, for fear of being compromised (Williams and Silverman et al 2007).

Alternatively, the trainees may genuinely not know, lacking the necessary knowledge to offer an assessment at this stage. Nevertheless, the utterances at lines 8 and 9 appear to hold implied claims concerning conventions surrounding participation where the consultant surgeon is cast as the authoritative expert. In this instance both senior and junior members of this surgical team orient to these conventions as to what is the appropriate or permissible response, notably in this case, no response. Secondly, whether the trainees are ‘playing it safe’ or genuinely do not have the knowledge to make an informed comment is unknown from the data. The latter is unlikely and so this suggests a potential site of tension particularly when trainees do have the knowledge to comment, but acquiesce to convention.

*Extract 3 (Consultant surgeon operating – ST3 assisting – ‘You can see it pulsating as well can’t you’)*

*Surgeon initiates a first assessment through instructional commentary (policy statements)*

- |   |       |   |
|---|-------|---|
| 1 | Cons  | And then I open up that window on<br>no petelin again |
| 2 | (2.0) |   |
| 3 | Cons  | An I I need to obtain what’s called the critical      |
| 4 |       | view  |

5      Cons      *The consultant surgeon pushes the grasper*  
                          *through window that was just created,*  
                          *then flips gall bladder over, showing*  
                          *the tip of the grasper*

6      Cons      When I know there's only one structure

7      (2.0)

8      Cons      And nothing else

9      (1.5)

10     Cons      Okay clip applicator (6.0) you can see it

11                   pulsating as well can't you=

12     ST6       =Yeah absolutely yeah it's  
                          definitely the artery

This third extract is taken from a consultant led procedure again with an ST3 assisting (and an ST6 co-present in her role as researcher). It is similar to extract one and two in that the consultant is conducting the procedure. However, what is distinctive about this extract is the short instructional commentary (lines 1-8) produced by the consultant surgeon.

This instructional commentary is quite distinctive as it is framed as a series of policy statements or professional guidelines, for example, 'and then I open up that up window' as opposed to a plain description/ running commentary of what he has just done 'I am opening ... or is about to do 'I will open that up'. The consultant surgeon explicitly provides the background schema for how to competently perform the procedure. This type of policy statement delivery invokes a shift in orientation from the particular anatomical structures of this particular case to the general case. Moreover, the commentary (in and of itself), indicates an orientation to some objective beyond the safe completion of *this* surgery, i.e. the instruction of surgical trainees. In this instance the instructional talk demonstrates to others present what counts as competence/professionalism in performing this particular procedure.



Although the consultant surgeon delivers the instructional commentary with the orientation to the general case, as a way of involving the trainees in the procedure, the technical hierarchy of expertise is once again maintained. Again, it is the consultant surgeon who initiates the assessment at lines 10-11 ('You can see it pulsating as well'). The selection of the evidential verb 'see' makes direct reference to the sensory evidence (Heritage and Stivers 1999) and is immediately followed by the question (can't you=') the positioning of which, 'cast [s] [the trainee] as likely or possibly or capable of interpreting the reading' (Pomerantz and Rintel 2004) following the consultant surgeon's assessment. Moreover, the overall design of this assessment with the tag question presupposes 'a version of yes as the answer' (Goodwin, 2000). Again, the consultant surgeon's role as technical expert and the trainee's role as passive observer is endorsed. At line 12 the surgical trainee/researcher responds with ('Yeah absolutely yeah it's definitely the artery'). The consultant surgeon then proceeds to clip.

Each of the above extracts display elements of the 'manner of certitude' described by Fox (1957) evidencing the force of epistemic status in shaping the participation levels of surgical trainees. In each case the consultant surgeon makes the first assessment of the situation. However, in each case it is the consultant surgeon who is performing the procedure and so, almost intuitively, may feel the need to lead the decision making and similarly, trainees may feel reticent to comment on what is going on unless and until the consultant has spoken. In all three cases the consultant surgeon goes first in initiating an assessment of the situation and trainee response is minimal or non-existent.

Nevertheless, there are indications that the status of the consultant surgeon as authoritative expert is co-produced. For example, in extract 1 the pushing of the grasper as the action prior to clipping and cutting, something that is likely to be recognisable to an ST4 as an indication of the next action, provides an opportunity for trainee participation in the assessment of what's going on. In extract 2, the consultant surgeon's joke about nobody saying anything whilst a remark on a, perhaps typical, expected response, also serves as an invitation for trainee participation in assessment at that stage of the procedure. Finally, in extract 3 there is the pushing of the grasper alongside the consultant surgeon's online commentary and the observation of pulsation, providing some "access into the [consultant surgeon's] reasoning" (Heritage and Stivers, 1999). In each case, the trainees are equipped to make a comment or assessment, however in each case they decline these opportunities and the status of the consultant surgeon as authoritative expert, is preserved.

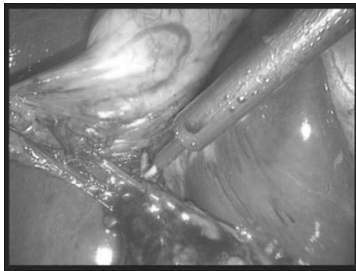
*Extract 4 (ST4 operating, consultant surgeon supervising 'I think you're fine')*

*Trainee initiates a first assessment, surgeon produces an instructional commentary (the particular case)*

- |    |      |   |
|----|------|---|
| 1  | ST4  | Do you think I'm going to have to take it from this |
| 2  |      | side? =   |
| 3  | Cons | =Ya we::ll I think you're fine I er (5.0)           |
| 4  |      | there's something in there isn't there so you       |
| 5  |      | need to stay high on the gall bladder so I'd        |
| 6  |      | take these structures                               |
| 7  | ST4  | (1.5) Ok [clips please                              |
| 8  | Cons | [take them around the gall bladder and              |
| 9  |      | you'll be fine =                                    |
| 10 | ST4  | =Clips please                                       |
| 11 | Cons | (7.0 so you got the cystic duct cystic artery       |

12           the whole thing is I mean this is a fairly  
13           straightforward one but if you get a (2.0)  
14           difficult one you just need to make all this (.)  
15           You just need to make all this (.) window so  
16           that's Calot's triangle so this is a classic  
17           Anatomy the artery going through (.) the middle  
18           of Calot's triangle (2.0) er I don't think  
19           you've got a clip loaded up there just erm  
20           rotate it round that's all

Fig. 6. Line 1



In extract four the consultant surgeon is 'leading' the procedure, however the major difference between this and the other extracts is that the trainee is conducting the procedure (metaphorically speaking, holding the scalpel) under the consultant surgeon's supervision. This change in dynamic is useful to examine more closely the claim made so far, that consultant surgeons typically assume first position when it comes to decision making and that trainees, through their silence or minimal contribution, actively preserve the authoritative expertise of the consultant surgeon.

From the outset, it is clear that although the trainee is conducting the procedure, very little changes in regard to the positioning of the consultant surgeon as the authoritative expert. At line 1, the trainee poses a question regarding what to do next ('Do you think I'm

going to have to take it from this side'). This question holds implied knowledge pertaining to the current situation. In other words, it is not a simple 'what do I do next' but rather holds a specific referent point, 'take it from this side' and so embodies a first (albeit tentative) assessment of the situation, a privilege typically preserved for the consultant surgeon. However, despite assuming first position, the trainee uses the interrogative form ('Do you think'), thus downgrading his assessment (Raymond and Heritage, 2006, 2013) vis-à-vis the consultant surgeon's perspective deferring any authoritative announcement to the expert.

In replying (lines 3-6) the consultant surgeon expresses some initial cautiousness (the elongated 'we::ll' which is mitigated by 'I think' followed by two other hesitation markers ('I er') and a five-second pause). This hesitation is not unusual given the critical nature of the decision and the fact that the trainee is performing the procedure.

'Epistemological superiority' (Heritage, 1997 p. 239), however, is soon resumed at line 4 where the consultant surgeon provides the trainee with instruction for the next action ('there's something in there so you need to stay high on the gall bladder so I'd take these structures').

The trainee then asks for the clips to clip the cystic structures so that they can then be divided. Following on from this, as in extract three, the consultant surgeon produces an instructional commentary (lines 11-20) providing the background schema for how to competently perform the procedure and reinforcing his position of 'Epistemological superiority'. In contrast to extract three where the consultant surgeon makes a move from the particular to the general, in this extract the consultant surgeon particularises this case as 'straightforward' not 'a difficult one' showing characteristics of 'classic

anatomy'. The provision of these evidential formulations (Heritage and Stivers 1999) provides further support for the consultant surgeon's position as lead decision maker/authoritative expert. Performing the procedure may presumably give the trainee a higher level of autonomy than simply observing the consultant surgeon. However, this example suggests the trainee performing the procedure is not a mitigating factor when it comes to the social order of the operating theatre.

*Extract 5 (ST4 operating, consultant surgeon supervising – 'I think you're probably fine') Surgeon initiates a first assessment, trainee confirms assessment, surgeon produces an instructional commentary (the particular case)*

1	Cons	I think you're probably fine there now John I'd
2		just take it all
3	ST4	↑Clip em=
4	Cons	=Yeah (4.0) because you can see if you just
5		push up on the gall bladder (1.0) with your
6		hook just push up on the gall bladder go
7		through there and you can see you've got a
8		nice big window there (0.5) an the ideal is
9		you take all that stuff and you make a big
10		window

In this extract, again, a trainee is operating with the consultant surgeon supervising. Again, the conventional mode is maintained where decision making is initiated again by the consultant surgeon going first at line 1. The trainee's response ('Clip em') at line 3 is given with rising intonation indicating some uncertainty as to the instruction. The consultant surgeon answers by affirming the trainee's question. Following on from this again, as in extracts 3 and 4, we see the consultant surgeon engage in the provision of evidential grounds to further support his assessment. Similarly, to extract 3 the selection of the evidential verb

‘see’ makes direct reference to the available sensory evidence (Heritage and Stivers 1999) to support the consultant surgeon’s assessment.

#### 4. The deviant case

The final extract is of interest for several reasons. Firstly, it offers some signs of a deviation from the standard order of role and responsibility during intra-operative decisions. Secondly, as part of the ethnographic investigation, experienced surgeons who were shown this clip, were of the view that the trainee was ‘out of order’. Finally, in the other examples discussed, the consultant surgeons involved had at least 5 years of experience. However, the consultant in this extract was newly appointed. This fact alone appears to alter the perception each has of their role and responsibility, a perception that appears to be reflected in the interaction between the consultant and the ST4.

*Extract 6 (Consultant surgeon operating, ST4 assisting – ‘I think we have to clip that’)*

- |    |      |  |
|----|------|--|
| 1  | Cons | Camera in  |
| 2  | ST4  | °er that (1.5) the vessel there  |
| 3  | Cons | <u>What</u>  |
| 4  | ST4  | Is that (0.5) the vessel   |
| 5  | Cons | .hhh °Think so° (2.0) there’s a thick layer                            |
| 6  |      | Here   |
| 7  |      | (23.0) <i>creates window with grasper</i>                              |
| 8  | ST4  | Have you got endo  |
| 9  |      | [interruption, someone walks in and asks who is the on call registrar] |
| 10 | ST4  | Can we have the endoclips ready please                                 |
| 11 | Cons | °camera back° (3.0 opens out jaws behind structure repeatedly)         |

12 ST4 I think we have to clip that don't we  
 13 Cons Sorry  
 14 ST4 Do we (.) we'll have to clip that  
 15 Cons I think it's quite safe to clip that [isn't it  
 16 ST4 [Yeah, yeah  
 17 It's [going into the gall bladder  
 18 Cons [It's going into the gall bladder it's er I  
 19 can't see  
 20 ST4 It's going a bit high (0.5)  
 21 Cons I I can't see what else this could be apart from  
 22 the cystic artery so we've made some progress  
 23 (0.5) give me the clip applicator ten  
 24 millimetres please (1.0) like now

25 (46.0 *as consultant surgeon applies the clips*)  
 °camera° (45.0) What do you think=  
 26 ST4 =I think you have to cut it and then free it  
 27 up and (5.0) you've got no other choice really  
 28 *consultant surgeon divides structure*

Fig 7. Line 2

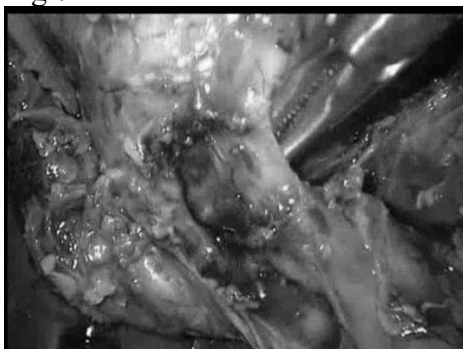
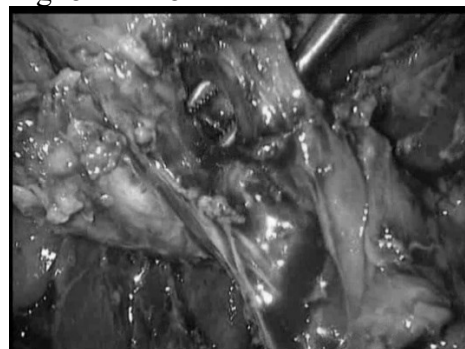


Fig. 8. Line 8



At line 1 the consultant surgeon requests the camera to go in and as that happens at line 2 the trainee (who is holding the camera) contravenes the general pattern and makes a first position assessment but, as in other extracts, he does so cautiously ('is that the vessel

there?') using the interrogative form. The consultant surgeon's reply ('what') identifies a 'trouble' but at the same time leaves the precise cause of the trouble, open to interpretation, something described by Drew (1997) as an open repair initiator. In other words, at this instance it is not clear if the 'what' is prompted by a mishearing or that the trainee's assessment was unexpected by the consultant surgeon at this stage of the procedure.

In response the trainee asks again at line 4 'is that the vessel?' At line 5 the consultant surgeon aligns with this assessment and evaluates the evidence, 'there's a thick layer here' which is followed by the effort to create a safety window by opening and closing the jaws of his instrument behind the structure. As mentioned earlier, the non-invasive, sweeping movement is something typically done by surgeons to demonstrate that a critical view has been achieved and that the cystic duct has been correctly identified. However, the consultant surgeon in this case performs this action more slowly and more often than in other cases we observed. This action makes "a reference to an inferential process" (Peräkylä, 2006, p.218), but that process appears to be a longer one than normal, a total of 23 seconds.

At line 8 the trainee indicates his judgement that clipping should now take place by making a request to the scrub nurse ('have you got the endo?'). Following an interruption, where someone is asking for the on-call registrar, at line 10 the trainee asks the scrub nurse for the endoclip. At line 11 the consultant surgeon requests that the camera go back in and opens the jaws of the grasper. It is possible that the trainee senses hesitation or uncertainty given the length of time taken with the grasper. Further supporting evidence for this comes at line 12 when the ST4 says 'I think we have to clip that don't we'.



This utterance is a direct contravention of the general pattern. Firstly, it is a first position assessment (albeit mitigated ‘I think’, ‘don’t we’, something typically reserved for the consultant surgeon. Secondly, it provides the consultant surgeon with instruction as to what to do next. That this was unexpected by the consultant surgeon is given at line 13 (‘sorry’) which is another open repair initiator (Drew 1997) now strongly suggesting that the interactional trouble is sequential in nature. In other words, the consultant surgeon has heard and understood what the trainee has just said but is having difficulty connecting that with the sequential organisation of action. In this sense there is a ‘perceived lack of fit between that turn and its prior sequence’ (Drew, 1997, p. 30).

At line 14 the trainee repeats his assessment, with slight hesitation to begin with (‘Do we (.) we’ll have to clip that’). At line 15 the consultant surgeon aligns with that assessment and then both consultant surgeon and trainee concur on the sensory evidence (‘It’s going into the gall bladder’). The trainee then suggests further evidence (‘It’s going a bit high’). This is usurped by the consultant surgeon, at line 21, with an evidential formulation (Heritage and Stivers 1999) (‘I I can’t see what else this could be apart from the cystic artery’). ‘I can’t see’ still leaves open the possibility that the artery may still not have been identified. The consultant surgeon then requests the clip applicator to start to apply the clips which takes some time and after forty-five seconds asks the trainee ‘what do you think’, the only time such an open question was used by a senior member of staff to a junior member of staff, in our data set, and the trainee offers his opinion.

## **5. Discussion**

Whilst both consultant surgeon and surgical trainee have equal perceptual access to what they are doing, the epistemic rights to evaluate what is going on are not equally distributed (Raymond and Heritage 2006). In our data, there are instances where the consultant surgeon can be found providing (subtle) guidance to trainees as to what to see. Nevertheless, in almost all cases it is the consultant surgeon who is presumed to be the authoritative expert and whom others are found to be in agreement with.

In this regard, phases of intraoperative decision making are almost akin, borrowing from Sudnow (1967), to ‘announceable events’ following the death of a patient. In Sudnow’s study, these events are carefully orchestrated around ‘announcers’ and ‘non- announcers’. Typically, doctors (rather than nurses) announce the death of the patient to relatives. Similarly, in our data, offering an assessment or evaluation intraoperatively is, broadly speaking, structured around ‘announcers’ and ‘non-announcers’. Consultant surgeons (rather than surgical trainees) announce what to do next when a decision needs to be made during a procedure. In other words, interaction rights and responsibilities are relatively tied to the professional identities of the interlocutors. Even in situations where trainees have an opportunity to contribute (with the exception of the last case where the difference in training experience between consultant and trainee was very little) this distribution of interactional rights is carefully maintained, and the status of the consultant surgeon as authoritative expert is preserved.

The hierarchical relations may not determine social action/interaction but they do shape how those actions/interactions are produced and organised reflecting a ‘ceremonial order’ (Strong 1979)<sup>2</sup> to the way in which surgeons and surgical trainees organise their interactions with one another. In Strong’s study of paediatric consultations the ceremonial order of the clinic was

partly informed by the doctor's presumption that mothers were the competent, primary carers of their child. This expected status of the mother was presumed to be true and oriented to in the actions of the doctor, independently of whether it actually was the case. If the mother's competence was found wanting, doctors had to find ways to address this which didn't disrupt the ceremonial order of the clinic.

Our data indicate a parallel finding concerning the preservation of the ceremonial order of the operating theatre. That is to say, that in all cases the consultant surgeon is presumed to be the authoritative expert and this presumption is oriented to in the actions and interactions between surgeon and surgical trainee. Even the 'deviant case' shows evidence of the preservation of the lead surgeon as the authoritative expert where the trainee's initiation of action is mitigated by the interrogative form of his utterances ('I think', 'don't we', 'is that the vessel?').

A clear feature of the data is the significance of the context of action, namely clipping and cutting and the decision making around those actions. Clipping and cutting has a very definite directional character. In other words, once the decision is taken to clip and cut it cannot be undone. Surgeons know that, and trainees know that and this may partly explain the latter's reticence to initiate action, preferring to relinquish the 'danger mandate' (Goffman, 1961) to the consultant surgeon, a move which involves less psychological risk (Edmondson 2004) for the trainee.

In the extracts where the surgeon is performing the procedure the 'manner of certitude' (Fox 1957) is most evident. In these extracts the consultant surgeon makes the first assessment of the situation. Given that the consultant surgeon is performing the procedure, trainees may feel

reticent to comment on what is going on unless and until the consultant has spoken. Where the trainee is performing the procedure, guided by the surgeon, more expansive exchanges occur between trainee and surgeon before the action of clipping and cutting take place. It is in these cases where even the lead surgeon may display ‘epistemological caution’ but notably this is relatively short-lived and the provision of evidential grounds for the assessment/decision re-instates the ‘manner of certitude’ (Fox 1957) preserving the consultant surgeon’s authoritative status.

Whilst none of our data involve serious incidents or adverse events, they do beg the question, would trainees continue to acquiesce to the status quo if they thought the patient’s safety was in jeopardy? As mentioned previously, poor communication, not poor surgical technique, between surgical teams has been related to higher levels of adverse events for patients (Mazzocco and Petitti et al 2009, Lingard and Espin, et al. 2004). This of course is contingent on how one defines ‘poor communication’ However, if the character of team communication is such that trainees generally acquiesce to the authoritative expertise of the lead surgeon, this does present some cause for concern with regard to patient safety.

### *Study Limitations*

We acknowledge that there are several limitations to these findings. Firstly, the sample is not sufficient in size to confidently make any generalizable claims. Secondly, all the cases involved trainees (which is the norm in a teaching hospital) and so from the point of view of understanding intra-operative decision making, it could be suggested that with surgical trainees present one would expect the lead surgeon to wield more authority in directing events and in communicating with more junior team members particularly in a situation (like

the ones discussed above) where a mistake could be consequential. One further limitation is the sole reliance on audio material. The inclusion of video material may add some further insights into the orchestration of initiating action within surgical teams.

## **6. Conclusion**

Surgery remains a rigidly hierarchical profession where authoritative status goes hand in hand with technical expertise typically reflecting occupational rank. Communication in the operating theatre is influenced by many factors, hierarchy, status and power relations among some of them. However, our data go some way toward specifying the impact of hierarchy and power on communication particularly between senior and junior members of staff. The hierarchy of expertise does not determine action, so to speak, but can systematically shape how communication between surgeons and trainees is conducted. Trainees' reticence to speak up may not just be a simple matter of the imposition of senior power and status, but may have more to do with the careful distribution of interactions rights and responsibilities that both trainees and consultant surgeons meticulously orient to.

It appears that implicit in the interactions between consultant surgeons and trainees is the expectation that the lead surgeon is the authoritative expert, the one with the requisite knowledge and expertise to assess a situation and lead decision making. Trainees actively acquiesce to that order. Working with surgeons and trainees to examine data like this may be one way of cultivating awareness of the character of action and interaction in the operating theatre which may in turn provide a more open platform to explore communication training for teaching and learning in the operating theatre.

**Table 1**

**Transcription symbols**

° °	Talk marked by the degree sound indicates words that are softly spoken
(.)	A full stop in brackets indicates a micro pause
(1.0), (0.5)	Indicates silence in seconds and tenths of seconds
[Okay	
[Yes	Talk which is preceded by a square bracket indicates overlap in speech between two different speakers
=	Talk marked with the equals sign at the end of one line and the beginning of another indicates no pause between the end of one utterance and the start of another
::	Indicates prolonged sound
→	Indicates notable utterance
.	Indicates a falling, or final intonation contour, not necessarily the end of a sentence.
?	Indicates rising intonation not a question although in some instances the two occur together
,	Indicates continuing intonation.

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## **Data**

The data that support the findings of this study are available on request from Dr Jeff Bezemer. The data are not publicly available due to privacy and ethical and legal restrictions

**Declaration of conflict of interests**

The Authors declare that there is no conflict of interest



## Endnotes

1. Our understanding of assessments (and hence our characterization of these actions and utterances) has been informed by the work of Goodwin and Goodwin 1987. They refer to what they call ‘assessment actions’, their definition of which is worth quoting at length. *‘Within this activity individuals not only produce assessment actions of their own but also monitor the assessment relevant actions of others and indeed dynamically modify their own behavior in terms of both what they see others are doing, and the recognizable structure of the emerging assessment activity itself’* (Goodwin and Goodwin 1987).
2. We are grateful to Geoffrey Raymond for drawing our attention to this parallel in an earlier discussion and presentation of these data.

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