

Intraoperative Surgical Decision Making – A Video Study

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ABSTRACT

Aim: This study investigated the differences between trainee and consultant general surgeons in their intraoperative risk assessment, risk tolerance and decision making. **Method:** A sample of 13 consultant general surgeons and 14 trainee general surgeons from 3 Scottish hospitals were interviewed while observing three videotapes of gall bladder surgery (laparoscopic cholecystectomy). Decision making and risk assessment were examined by requesting them to verbalise their cognitive processes at two decision points when the videotape was paused. They also completed a short risk tolerance and skills judgement questionnaire.

Results and Discussion: There were no significant differences between consultant surgeon and trainee risk ratings (1-7) at the first or second decision points in any of the 3 videos. Consultants' and trainees' risk-taking preference scores were not significantly different. The interview results are currently being analysed and will be presented in the poster at the meeting.

KEYWORDS

Decision making; surgeons; expertise; risk judgements; intra-operative

INTRODUCTION

Surgeons' cognitive processes, especially situation awareness and judgmental ability are key non-technical skills (Yule et al, 2008) contributing to effective performance. Most decision making occurs when the surgeon diagnoses the patient's condition and works out a plan for the operation, and so the surgical literature mainly focuses on pre-operative decisions. However, intraoperative decision making can be important during routine operations where the operative site is not as anticipated (e.g. anatomic variations) or the procedure does not go to plan. Moreover, during emergency surgery, there can be less time for preoperative planning and proportionately more decision-making may be required in the intraoperative phase.

The few studies on surgeons' intraoperative decision making have examined differences related to expertise, cognitive style or personality. A comparison of conversion preferences during observations of videorecorded laparoscopic cholecystectomy, found that 50% of residents and 40% of staff surgeons would convert the operation at some point, while other surgeons preferred to continue with the laparoscopic approach (Dominguez, 2004). This raised several questions around cue recognition and differences in risk tolerance. Intraoperative risk management requiring consideration of risk levels and personal competence, as well as the surgeon's risk tolerance may also be important factors during conversion decision making (Pauley et al, 2011). Injury to the extrahepatic bile duct occurs at a rate of 0.1-0.5% seemingly regardless of seniority or experience (Way et al, 2003). Bile duct misidentification is reported as being the causal factor in 86% bile duct injury and since no surgeon would divide a structure without prior identification of the anatomy nor knowingly transect the common bile duct, this suggests that inaccurate visual perception is the major cause of such injuries (Dekker & Hugh, 2008). Visual misperception (i.e. seeing what you believe), cue ambiguity and underestimation of risk were important factors in misidentification in previously reviewed cases (Massarweh et al, 2009). More recent research has suggested that surgeons develop an intuitive sense of when they need to 'slow down' in order to make the right decisions intraoperatively (Moulton et al, 2010), and that experienced surgeons will identify critical information at an earlier stage of diagnosis than junior colleagues (Abernathy & Hamm, 1995). Experts develop the ability to make decisions rapidly and intuitively, often without effortful processing (Klein, 1993) and on that basis, it was anticipated that trainee surgeons' comments on their decisions might indicate a more analytical style, explicitly comparing optional courses of action, while consultants' comments might indicate a more intuitive style, stating identification of a single preferred course of action. Although Pauley et al's (2011; under review) interview studies with general and ophthalmic surgeons show the use of both methods and surgeons' reliance on intuitive or analytical decision styles probably depends on both personal preferences and situational constraints.

To test intra-operative surgical decision making, video vignettes of common operative procedures were shown to students, novice and proficient urologists, and differences were found in their knowledge and surgical judgement, through analysis of their 'think aloud' cognitive processes (Chatterjee et al, 2009). The current study



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investigated the differences between trainee and consultant general surgeons in their intraoperative risk assessment, risk tolerance and decision making styles using a similar method using video tapes of a common procedure. Decision making and risk assessment were examined by requesting surgeons to verbalise their cognitive processes at decision points whilst watching videos of laparoscopic cholecystectomy operations.

METHOD

Ethical approval was granted for the study from the [University of Aberdeen, School of Psychology and the North of Scotland NHS Research Ethics Committees (refs: 2/032/10; REC 10/S0802/83)]. Surgeons were allocated a participant number which enabled their ratings and questionnaire data to remain anonymous.

Sample Surgeons (n=27, 6 female)) were individually interviewed in response to an invitational email. There were 13 consultant general surgeons (n=13; age $M=49$ years; experience $M=13$ years, SD 8.46, range 2-28 years) and 14 trainee surgeons; (age $M=35$ years, experience $M=6$ years, $SD=1.86$, range 3-9 years) from three Scottish teaching hospitals.

Procedure Recordings of three different laparoscopic cholecystectomy operations were shown in a randomised order, each displaying differing degrees of risk and complication. The video sequences were sourced through commercial contacts and pre-existed this study.

Each video was paused at two judgement points (selected by authors IA and MM) and the same set of questions posed to each participant. The questions were as follows:

- i) What do you think is happening here?
- ii) What would you do at this point and why?
- iii) What cues or information are you attending to at this point?
- iv) Do you have any concerns here? If so, what are they?
- v) What do you think could happen next?
- vi) Are you reminded of any previous experiences?

This was to investigate the information/ cues being utilised, the assessment of the situation and possible actions, e.g. what options were available to proceed. Each surgeon also rated the degree of risk at the two decision points (1=low risk to 7=high risk).

Following the interview, a six item questionnaire on risk taking preference was completed, adapted from the Jackson Personality Index (Jackson, 1994 ; Pearson et al,1995). Risk-taking preference was scored on a 5-point ordinal scale with the highest point value in questions one, three and five, being assigned to the most affirmative responses (“Not at all like me” = 1 point, “very much like me” = 5 points). In the other three questions, scoring was reversed. Surgeons were also asked to report how many times in the previous 24 months they had made a decision which could have resulted in an adverse event. Finally, two questions adapted from an aviation study (O’Hare, 1990) required surgeons to rate (1-7) their own skills and judgement compared with their peers.

Analysis The risk ratings were analysed using PASW Statistics Version 18. (2011). Responses to questions at the pause points were transcribed, de-identified and are being analysed using NVivo 8 software (2008). These are being coded by categorising responses with emerging themes and cues being mentioned in response to each of the questions

RESULTS

There were no significant differences between consultant surgeon and trainee risk ratings (1-7) at the first or second decision points in any of the videos. A series of t-tests comparing surgeons’ (n=27) risk ratings at each decision point showed that in video **A**, surgeons rated the risk in the first decision point significantly higher than at the second decision point; $t(26) = 4.22$; $p < .0$. There was no significant difference between the decision points in video **B**; $t(26) = -.75$, ns and in video **C**, surgeons rated the risk higher in the second decision point than in the first; $t(25) = -5.13$, $p < .01$.

Consultants’ and trainees’ mean risk-taking preference scores on the questionnaire were not significantly different ($M=14.1$; $SD=3.7$; $M=16.9$; $SD=5.6$, respectively).

Preliminary results from the analysis of the surgeons’ responses at the decision points will be given in the poster. A sample of analysis from video B is given below (C = consultant surgeon, T = trainee surgeon):

Video B

At the first decision point, more consultants expressed criticism of the techniques being used than trainees (C=7; T=2). More trainees’ statements suggested they were unclear of the anatomy at this point than consultants’ (T=8; C=0). More consultants specified the structures they were identifying than trainees (C=8; T=4) and converting to an open procedure was considered as an option by a minority (C=3; T=3) at this decision point. At the second decision point, converting to an open procedure was an option expressed by four consultants; no

trainees mentioned conversion at this point but three stated that they might ask for assistance, and one consultant mentioned asking for a second opinion.

DISCUSSION

Consultants' and trainees' risk-taking scores were not significantly different and preliminary analysis of the interview responses does not indicate major differences. The trainee surgeons in the study were almost all at an advanced stage of their training and in many cases are showing similar responses to the consultants and so may have been too experienced to reveal significant expert novice differences for this type of procedure which is frequently carried out by general surgeons. As the sample sizes of the two groups are not large, then one option for analysis will be to combine the groups and to conduct the remaining analyses without the expertise variable, focussing instead on individual differences in approach. As in our previous study (Pauley et al, 2011), there appear to be a wide range of responses across the 26 surgeons to a given situation on the video taped procedure, as individual surgeons tend to prefer different techniques and technical solutions for the same procedure. The intention is to explore these differences in relation to the risk and skill judgement ratings.

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