

Attitudes to teamwork and safety in the operating theatre

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Background: A survey was undertaken to assess surgical team members' attitudes to safety and teamwork in the operating theatre. **Method:** The Operating Room Management Attitudes Questionnaire (ORMAQ) measures attitudes to leadership, teamwork, stress and fatigue and error. A version of the ORMAQ was distributed to surgical teams in 17 hospitals in Scotland. A total of 352 responses were analysed, 138 from consultant surgeons, 93 from trainee surgeons and 121 from theatre nurses. **Results:** Respondents generally demonstrated positive attitudes to behaviours associated with effective teamwork and safety. Attitudes indicating a belief in personal invulnerability to stress and fatigue were evident in both nurses and surgeons. Consultant surgeons had more positive views on the quality of surgical leadership and communication in theatre than trainees and theatre nurses. While the ubiquity of human error was well recognised, attitudes to error management strategies (incident reporting, procedural compliance) suggest that they may not be fully functioning across hospitals. While theatre staff placed a clear priority on patient safety against other business objectives (e.g. waiting lists, cost cutting), not all of them felt that this was endorsed by their hospital management. **Conclusions:** Attitude surveys can provide useful diagnostic information relating to behaviour and safety in surgical units. Discrepancies were found between the views of consultants compared with trainees and nurses, in relation to leadership and teamwork. While attitudes to safety were generally positive, there were several areas where theatre staff did not seem to appreciate the impact of psychological factors on technical performance

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INTRODUCTION

While patient safety problems can occur in non-acute domains of healthcare, there are particular risks in surgery and surgical patients are involved in as many as 45% of medical adverse events.¹⁻⁴ Estimates of the percentage of surgical events that occur while the patient is in the operating room range from 35% to 66%.^{3,5} Studies of safety in other high-risk industries show that adverse events are primarily attributed to human failures, rather than technical malfunction and for experienced practitioners, it is not usually a lack of technical expertise that is responsible. Non-technical skills (e.g. leadership, decision making, assertiveness, team coordination) are responsible for maintaining safety.⁶⁻⁸ Surgeons' non-technical skills play an equally significant role in patient safety in the intra-operative environment.⁹ Giddings (2001) discussing surgical training said, 'there is strong evidence to show that behaviour can be modified to make us better able to work with others and thereby increase safety and efficiency.'¹⁰

Observations of performance in the operating theatre show that breakdowns in team working, leadership, communication, lack of situation awareness and poor decision making are not uncommon and can lead to poor outcomes for patients.¹¹⁻¹⁶ Conversely, high performance practitioners demonstrate non-technical skills as an integral part of their surgical expertise.¹⁷ Such findings are reinforced by error analyses as well as autobiographical and anthropological accounts of surgeons' behaviour.^{2,4,18,19} While surgeons believe that inexperience is a prime factor in their errors, breakdowns in communication, fatigue and weaknesses in cognitive skills also contribute.³ Observational and interview studies play a valuable role in our understanding of surgical teams but a complementary approach is to examine the underlying attitudes that are influencing these behaviours. One of the most efficient methods for collecting such data is the questionnaire survey.

THE OPERATING ROOM MANAGEMENT ATTITUDES QUESTIONNAIRE (ORMAQ)

The most extensively used attitudes questionnaire with surgical teams is the Operating Room Management Attitudes Questionnaire (ORMAQ).²⁰ This was adapted from an instrument measuring safety attitudes in aviation and is used to determine the attitudes of operating theatre personnel towards behaviours related to teamwork and safety.

Surgical staff have been surveyed using the ORMAQ in Israel, USA, Germany, Switzerland, and Italy.^{16,21,22} It is not clear to what extent these earlier findings would generalise to a British sample. As training in non-technical skills is being introduced in the UK for acute medicine, it is important to identify prevailing attitudes to the relevant behaviours.^{9,23} Helmreich and Sexton (2004) point out, 'Based on experience in aviation, it is safe to predict that those programs that succeed will be based on empirical data about the attitudes and culture of the particular organisation.' Workplace attitudes may be influenced by national culture, as well as the particular healthcare system.²⁵ As part of a project designed to examine surgeons' non-technical skills, this study was undertaken to assess surgical team members' attitudes to safety and teamwork in the operating theatre.

METHODS

Questionnaire

The ORMAQ was adapted for use in the UK with the help of three consultant surgeons. (The version of questionnaire used in this study can be found on www.abdn.ac.uk/iprc/notss). It consisted of five sections:

1. Operating Theatre Management Attitudes. Section 1 had 60 Likert scale attitude statements related to eight themes: Leadership-Structure, Confidence-Assertion, Information Sharing, Stress and Fatigue, Team Work, Work Values, Error, and Organisational Climate. This thematic categorisation was proposed by Flin *et al* (2003) in a survey of anaesthetists, as no statistically-derived factor structure had been reported in the literature for the ORMAQ.²⁰ Helmreich and Davies (1996) stated that all the sub-scales had Cronbach alpha (internal reliability) values of 0.55-0.85 (no specific details were given).²¹ The alpha values in the present study for these themes were in the range 0.1-0.75. As some of these were very low, the discussion that follows is based principally at an item level. Respondents were asked to indicate the extent to which they agreed with each statement on a scale ranging from Disagree strongly (1), Disagree slightly (2), Neutral (3), Agree slightly (4) and Agree strongly (5).

2. Teamwork. Respondents were asked to rate the quality of teamwork which they have experienced with other professionals (e.g. theatre nurses) in the operating theatre.

3. Error. Five statements relating to error (e.g. I make errors in theatre), respondents indicated degree of agreement as above. They were also asked to give suggestions for improving a) the efficiency and b) the job satisfaction of the operating theatre team.

4.a) Prioritisation. Respondents were asked to rank four healthcare targets (reducing waiting lists, patient safety, saving costs, the Trust's reputation) in terms of which would most concern a) them, and b) their Trust management, in the case of failure.

4.b) Leadership. Four styles of leadership decision making were listed (A: autocratic, B: consultation, C: joint or D: delegation).²⁷ Consultant surgeons were asked which style they normally used. Trainee surgeons and nurses were asked which style a) they normally encountered, and b) which style they preferred:

Style A: Leader makes decisions and communicates them firmly, expects loyalty and obedience.

Style B: Leader makes decisions promptly, but explains them fully, provides reasons, and answers questions.

Style C: Leader normally consults with subordinates when important decisions are to be made, listens to advice, considers it, and then makes decision.

Style D: Leader puts problem before the group and invites discussion before accepting majority viewpoint as decision.

5. Errors. Participants were asked what the three most frequently occurring errors were in theatre, and what strategies they had seen to be effective for error management in the operating theatre.

The questionnaire was completed anonymously. The only biographical data requested related to hospital, gender, grade and experience.

PROCEDURE

For each hospital, copies of the questionnaire were delivered to one consultant surgeon (identified as a College Tutor by the Royal College of Surgeons of Edinburgh) in general, orthopaedic or cardiac surgery. These were to be distributed to consultants, trainee surgeons and theatre nurses. The completed questionnaires were placed in sealed envelopes and returned to the University for analysis. Ethical approval for the study was granted by the School of Psychology Ethics Committee which adheres to the British Psychological Society ethical standards. The Statistical Package for the Social Sciences was used for analysis.

SAMPLE

The survey was conducted at 17 hospitals in Scotland. A total of 1268 questionnaires were provided to the contact surgeons in these hospitals. The response rates have been conservatively estimated, as the actual numbers of questionnaires distributed by surgeons at each hospital are unknown. A total of 352 usable responses were analysed, 138 from consultant surgeons (general 70; orthopaedic 40; other 28), (response rate: 48%) and 93 from trainee surgeons (response rate: 27%). In addition, 121 responses were returned by theatre nurses (response rate: 19%). The low response rates for trainees and nurses mean that their data have to be regarded with some degree of caution. Demographic data are given in Table 1.

TABLE 1. SAMPLE DEMOGRAPHICS			
Demographics	Level		
	Consultant surgeon	Trainee surgeon	Nurse
N=x	138	93	121
% response	48%	27%	19%
Response range (n) per hospital	1-26	1-42	1-47
Years experience (std deviation)	18.1 years (7.4)	3.9 years (2.9)	12.1 years (8.3)
Gender	92% male 8% female	74% male 26% female	13% male 87% female
Specialism: General (n)	70	41	30
Specialism: Orthopaedic (n)	40	28	13
Specialism: Cardiac (n)	2	3	2
Specialism: Other (n)	13	9	62
Specialism: Not stated (n)	13	12	14

RESULTS

All the tables of results are provided on www.abdn.ac.uk/iprc/notss. Selected findings from the principal themes are presented and discussed below. Comparisons between mean scores for each of the three groups were tested using analysis of variance (statistical details on website), only significant differences between nurses and surgeons are mentioned below.

Teamwork, Work Values, Organisational Climate

Almost all surgeons (consultants and trainees) and theatre nurses said that they enjoyed working as a part of a team, although 38% of consultants and 43% of trainees and 49% of nurses agreed, 'I do my best work when people leave me alone'. (This may be related to the need to concentrate without being distracted). Positive attitudes to teamwork behaviours that are known to enhance safety were found, such as verbalising plans and actions, as well as encouraging junior medical and nursing staff to speak up. A significant difference was found in attitudes towards briefings (a technique regarded as key for safety management in other industries). Nurses and trainees favoured regular debriefings post-operatively more than consultant surgeons (78%/72% vs 44%). Likewise 79% of nurses and 51% of trainees thought that a pre-session briefing was important for safety, compared with only 37% of consultants. Anecdotal evidence suggests that formal briefing and de-briefing of events

in the operating theatre is not commonplace although it is now being introduced to surgical teams.²⁸ Surgeons rated working with other consultants and with nurses equally highly, however the nurses rated working with surgeons significantly lower than they rated working with other nurses (see Table 2).

TABLE 2. QUALITY OF TEAMWORK EXPERIENCED WITH OTHER PROFESSIONS

Other team member	Consultant surgeons (n=133)	Trainee surgeons (n=92)	Nurses (n=120)
Consultant surgeon	3.34 (.78)	3.07 (.86)	2.66 (1.01)
Higher surgical trainee	3.25 (.78)	3.15 (.63)	2.61 (.90)
Basic surgical trainee	2.72 (.95)	2.76 (.87)	2.12 (.85)
Associate specialist/staff grade surgeon	2.78 (.89)	2.71 (.93)	2.67 (1.50)
Nurse	3.36 (1.85)	2.71 (.84)	3.15 (.69)
ODP/ Anaesthetic nurse	2.84 (.92)	2.84 (.74)	3.11 (.87)

(Mean score on 1-5 scale, higher score = higher quality; standard deviation in brackets)

Nurses report lower job satisfaction (78% 'liked their job' compared with 92% of surgeons), and were less likely than surgeons to feel that they received 'the respect that a person of my profession deserves' (48% vs 68% of consultants). There were a range of suggestions for improving the efficiency of the operating theatre team mainly related to team and organisational issues. Surgeons wanted more constancy in team composition, nurses suggested better communication and trainees' most frequent response was 'better time management'. To enhance job satisfaction, consultant surgeons desired feedback about patient outcomes, realistic staffing, recognition and pay increases. Trainees and nurses wanted time for training and recognition for good work; the nurses also asked for supportive leadership.

About 40% of respondents did not feel that there was adequate information provided by their department. Many nurses (51%) did not feel that their departmental leadership listened to their concerns, as compared with 25% of surgeons. The nurses were less likely to agree that they were provided with adequate training than surgeons (51% vs 76%). Only half of respondents agreed that 'procedures and policies are strictly followed in our operating theatre' and only 40% thought that 'mistakes are handled appropriately in this hospital'. Fewer surgeons (17%) thought that team members frequently disregard rules or guidelines for the operating theatre, compared with 41% of nurses.

When asked about relative concern regarding failure on

TABLE 3. PRIORITIES FOR SELF AND FOR TRUST MANAGEMENT (% RATING OPTION FIRST)

If I were to fail in the following areas, which would concern me the most?	Reduce waiting lists	Patient safety	Saving costs	Trust's reputation
Consultant surgeons	0%	100%	0%	0%
Trainee surgeons	2%	97%	1%	0%
Nurses	4%	93%	3%	0%
If I were to fail in the following areas, which would concern the Trust's management the most?	Reduce waiting lists	Patient safety	Saving costs	Trust's reputation
Consultant surgeons	27%	42%	15%	16%
Trainee surgeons	11%	49%	16%	24%
Nurses	9%	30%	36%	25%

healthcare targets (see Table 3), all consultant surgeons and almost all trainees and nurses ranked patient safety first (i.e. of most concern). When asked which targets would concern their NHS Trust's management most in the event of failure, the results were significantly different. Less than half of the surgeons and only a third of nurses thought that patient safety failures would concern their management more than failures in waiting list reduction, cost savings or reputation.

Leadership

Most consultant surgeons (54%) said that they mainly used a consultative style where the leader makes decisions but explains them. Very few said they used autocratic (8%) or delegative styles (1%). However, although 58% of trainees said they typically encountered the consultative style, 30% said they encountered autocratic leadership (in a recent article, a senior surgeon identified his favourite leadership book as *The Leadership Secrets of Attila the Hun*).³⁴ Trainee surgeons would prefer to work with an explanatory style or a consultative style. The autocratic style in surgeons was most commonly seen by nurses (59%) and like the trainees, they preferred to work with explanatory or consultative styles. Similarly, Edmondson (2003) found that cardiac surgeons leading more effective teams (learning new techniques), engaged in coaching and motivating behaviours and minimised concerns about power and status.¹² This created an atmosphere where team members felt more inclined to speak up during operations. While leadership in other workplaces has been extensively studied, there is very little research on the leadership role in the operating theatre.^{6,27}

Stress and Fatigue

The levels of awareness of the limiting effects of stress and fatigue on performance were higher than reported in earlier ORMAQ studies from other countries. However, although 79% of surgeons and 73% of nurses agreed that they were less effective when stressed or tired, 52% of surgeons and 63% of nurses still believed that 'even when tired, I perform effectively during critical phases of operations'. Only 40% of surgeons said that they would let other team members know when their workload was becoming excessive, compared with 69% of nurses. They were also less likely than nurses to agree that 'team members should monitor each other for signs of stress or tiredness' (55% of consultants vs 78% of nurses). Many respondents recognised that they were 'more likely to make errors in tense or hostile

situations' (68% of nurses and consultants and 86% of trainees agreed). Attitudes regarding personal invulnerability to psychological stress were evident with only half the respondents in each group agreeing that 'personal problems can adversely affect my performance'.

Error and Procedures

Almost all staff agreed that errors were not a sign of incompetence and were important irrespective of outcome: 74% of consultants, 68% of trainees and 44% of nurses admitted to making errors in theatre. Two thirds of all staff said that they rarely saw errors where lack of knowledge was the causal factor. Trainees were more ashamed about making a mistake in front of other team members than consultants or nurses (63% vs 39%/48%). Consultant surgeons were more likely (85%) than trainees (78%) or nurses (58%), to agree that medical errors were discussed to prevent recurrence. Most staff felt that a confidential error reporting system was important for safety but significantly more nurses agreed with this (92%) than consultant surgeons (76%). More nurses (70%) said that they were encouraged by their leaders and co-workers to report observed incidents, than trainee (44%) or consultant surgeons (41%). For surgeons who gave examples of observed errors (see Table 4) the most frequent were technical, contamination of sterile field, equipment problems and list changes/accuracy. Nurses also mentioned communication breakdowns, lack of consent and incomplete records.

When asked what strategies they had seen that were effective in managing error (Table 5), the most common responses for all respondents related to debriefing, team involvement and consultation during the operation, as well as improved communication and training.

DISCUSSION

Surgeons and nurses generally demonstrated positive attitudes to behaviours likely to enhance teamwork and safety in the operating theatre. There were some differences in the opinions of consultant surgeons versus nurses and trainees. The consultants have more positive views on the quality of surgical leadership and communication in theatre, for example, and they are less likely to recognise the importance of team briefing. A recent observational study of complex general surgery cases has shown that problems in communication and information flow

TABLE 4. MOST FREQUENTLY OCCURRING ERRORS CITED BY CONSULTANT SURGEONS, TRAINEE SURGEONS AND THEATRE NURSES

Error	Consultants (n=79)		Trainees (n=28)		Nurses (n=53)	
	freq	%	freq	%	freq	%
Technical errors (all)	23	12.6	7	15.6	3	2.5
Contamination of sterile field	22	12	7	15.6	12	9.9
Equipment problems/ failure	20	10.9	6	13.3	1	0.8
List changes/inaccuracy/ coordination	17	9.3	1	2.2	15	12.4
Equipment not available	17	9.3	9	20	4	3.3
Delays	13	7.1	1	2.2	4	3.3
Lack of training/ experience	12	6.6	3	6.7	1	0.8
Communication breakdown	7	3.8	2	4.4	12	9.9
Drug error	6	3.3	1	2.2	6	5.0
Staffing roster	6	3.3	0	-	1	0.8
Positioning	5	2.7	1	2.2	1	0.8
Lack of consent	5	2.7	1	2.2	12	9.9
Theatre protocol (e.g. wearing masks, using cor- rect doors)	4	2.2	3	6.7	3	2.5
Handed wrong instrument	4	2.2	0	-	0	-
Patient side not marked properly	4	2.2	0	-	5	4.1
Lost needle/swab	3	1.6	1	2.2	8	6.6
Poor handwriting	3	1.6	0	-	0	-
Decision making	3	1.6	1	2.2	0	-
Notes missing	3	1.6	0	-	0	-
Incomplete records	0	-	0	-	14	11.6
Count errors	0	-	0	-	7	5.8
Pre-operative planning	2	1.1	0	-	6	5.0
Manual handling	2	1.1	0	-	3	2.5
Needlestick injuries	2	1.1	1	2.2	3	2.5
TOTAL ERRORS	183		45		121	

TABLE 5. STRATEGIES TO REDUCE ERROR

Strategy	Consultants (n=94)		Trainees (n=20)		Nurses (n=66)	
	freq	%	freq	%	freq	%
Regular debrief meetings to discuss error openly	16	17.0	2	10.0	6	9.1
Team involvement and consultation during operation	10	10.6	3	15.0	3	4.5
More training	9	9.6	2	10.0	8	12.1
Improve communication and feedback	8	8.5	4	20.0	9	13.6
Establish protocol to manage errors	8	8.5	1	5.0	3	4.5
Strong leadership (from surgeon/sister)	6	6.4	0	-	2	3.0
Experienced staff to make decisions	5	5.3	1	15.0	0	-
Blame-free culture	4	4.3	3	15.0	2	3.0
Maintain consistent teams	4	4.3	0	-	0	-
Closer supervision of trainees	4	4.3	0	-	0	-
Anticipate problems	4	4.3	1	5.0	1	1.5
Team briefing (pre-op)	3	3.2	0	-	3	4.5
Regular audit	3	3.2	0	-	2	3.0
Check equipment regularly	3	3.2	0	-	4	6.1
Reporting negative events	3	3.2	2	10.0	12	18.2
Check patient against list	2	2.1	1	5.0	4	6.1
Adhere to policies	2	2.1	0	-	7	10.6

during the operation have detrimental effects on team performance and patient safety.²⁹ Lingard *et al* (2002) found that trainee surgeons are particularly affected by tension in team communication and respond with behaviours that intensify rather than resolve conflict.³⁰

While the ubiquity of human error was well recognised, attitudes to error management strategies (incident reporting, procedural compliance) suggest that these may not be fully functioning across hospitals. While theatre staff placed a clear priority on patient safety against other business objectives (e.g. waiting lists, cost cutting), not all of them felt that this was endorsed by the management of their NHS Trust.

The results are generally aligned with previous ORMAQ studies of surgical teams in other countries and they are similar to the results from an earlier survey of anaesthetists in Scotland.² As in previous reports, a number of theatre staff believe that they would not be vulnerable to the effects of stress or fatigue, an unrealistic attitude regarded as undesirable in safety-critical industries.²³ The results have been presented and discussed at an item level due to the absence of an established factor structure for the ORMAQ. While these have provided valuable descriptive data, future research (e.g. modelling the relationships between attitudinal factors and surgical outcome measures) will need to develop a questionnaire with a clearer factor structure.

The importance of leadership, communication, team co-ordination skills, and awareness of psychological and physiological factors likely to impair cognitive performance are taught in other industries through Crew Resource Management courses.⁹ Kneebone (2003) discussing surgical training argued that, ‘communication is a vital component of safe practice but is not always considered an important part of skills training’.³¹ These non-technical skills are now being introduced into surgical training.^{9,32,33} For example, the Royal College of Surgeons of England offers a course called ‘Safety and Leadership for Interventional Procedures and Surgery’ (SLIPS) and the Royal College of Surgeons of Edinburgh runs courses on ‘Non-Technical Skills for Surgeons’. In order to maximise their relevance, these courses need to be designed to address prevailing attitudes to the behaviours being trained. Attitude surveys offer an efficient method of assessing current opinion and provide baseline data for the design and evaluation of the effectiveness of training in altering unfounded or risky attitudes to teamwork and safety.

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