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Anaesthetists' attitudes to teamwork and safety

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Summary
A questionnaire survey was conducted with 222 anaesthetists from 11 Scottish hospitals to measure their attitudes towards human and organisational factors that can have an impact on effective team performance and consequently on patient safety. A customised version of the Operating Room Management Attitude Questionnaire (ORMAQ) was used. This measures attitudes to leadership, communication, teamwork, stress and fatigue, work values, human error and organisational climate. The respondents generally demonstrated positive attitudes towards the interpersonal aspects of their work, such as team behaviours and they recognised the importance of communication skills, such as assertiveness. However, the results suggest that some anaesthetists do not fully appreciate the debilitating effects of stress and fatigue on performance. Their responses were comparable with (and slightly more favourable than) those reported in previous ORMAQ surveys of anaesthetists and surgeons in other countries.

Keywords *Anaesthestists*: attitudes, safety, human error, teamwork.

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Reported incidence rates of adverse events in UK [1] and US hospitals [2] have resulted in professional and governmental exhortation and guidance [3–5] designed to improve standards of patient safety. In industrial settings requiring high levels of safety, such as energy production or passenger transportation, significant efforts have been made to understand the factors contributing to such adverse events. Detailed investigative analyses have shown that the problems are primarily attributed to human failure rather than technical malfunction [6–8]. These relate to managerial as well as operator behaviours [9, 10]; although it is acknowledged that the former have a powerful influence in hospitals [11, 12], only the latter are the focus of this study. Anaesthetists have long regarded human error as the leading cause of anaesthesia-related complications [13, 14]. It is apparent that non-technical skills, such as leadership, decision making, assertiveness and team coordination play a major role in error management in the operating theatre [16–19].

In the aviation industry, psychologists have spent many years studying pilots' attitudes in order to ascertain their level of awareness regarding the non-technical factors influencing crew performance [20]. Although attitudes are not a perfect predictor of future behaviour, they do give a strong indication of expected behaviour patterns and can signify the prevailing culture in a given professional group. However, there are only a few published reports of anaesthetists' attitudes to teamwork and safety in the operating theatre (none based on UK samples). Gaba *et al.* [21] measured 279 Californian anaesthesiologists' attitudes towards work pressure and found that half of the sample admitted having made an error attributable to fatigue or workload, and had witnessed a surgeon or colleague do something unsafe. Some also reported pressures from surgeons to proceed with cases rather than cancel them and to hasten anaesthetic procedures.

Helmreich *et al.* extended their work with the aviation industry to examine the attitudes of hospital operating theatre personnel to teamwork and safety. They adapted the Cockpit and Flight Management Attitudes Questionnaires (CMAQ) [20, 22] (FMAQ) [23] to produce the Operating Room Management Attitudes Questionnaire (ORMAQ) [24, 25]. This measures operating theatre staff attitudes to stress, hierarchy, teamwork and error, using items that are 'relevant to understanding error, predictive

of performance, and sensitive to training interventions.' [26]. In a survey of anaesthetists, surgeons and nurses at a European teaching hospital [27], respondents were aware of the importance of team coordination and communication, but group differences were found. For instance, anaesthetists were more accepting than surgeons of the idea that a pre-operative briefing is important for team effectiveness. Helmreich had already found that pilots underestimated the effects of fatigue and stress on their performance: 'To our surprise the attitudes of medical professionals were equally unrealistic'. Subsequent surveys [26, 28] reported similar attitudes in operating theatre staff from 12 hospitals in Italy, Germany, Switzerland, Israel and the USA.

Such findings are extremely valuable for identifying areas that need to be addressed in training, as well as providing baseline data against which to measure any changes in attitude resulting from safety interventions. Existing studies have recorded the attitudes of anaesthetists working outside the UK. As attitudes and values relating to workplace behaviours can be culturally determined [19, 29], and healthcare systems vary across cultures, the generality of the above results to medical practices across countries remains to be determined. This study reports the findings of the first survey of anaesthetists in the UK, using the ORMAQ to collect attitudinal data relating to teamwork and safety.

Method

Questionnaire

The version of the ORMAQ [25] used in this study consisted of four sections.

I Sixty Likert scale attitude statements relating to eight themes: leadership–structure; confidence–assertion; information sharing; stress and fatigue; teamwork; work values; error; organisational climate (see Ref. 28 for a more detailed discussion). Respondents indicated the extent to which they agreed with each statement on a 5-point scale consisting of *disagree strongly* (1), *disagree slightly* (2), *neutral* (3), *agree slightly* (4) and *agree strongly* (5).

II The second section asked respondents to rate their perception of the quality of teamwork and cooperation/communication that they have experienced with other professional groups who work in operating theatre (eight groups listed).

III The third section contained five statements relating to error management. Respondents indicated degree of agreement as above. Two open questions asked about common errors and strategies for reducing error.

IV The fourth section invited suggestions on increasing the effectiveness of operating theatre teams and improving their job satisfaction.

The ORMAQ was adapted for use in the UK with the help of a consultant anaesthetist, who was trained in the UK and had worked in the USA. She translated the American terms to their British equivalents. A first sample of 44 responses was collected in 1999 in one large teaching hospital. The following year, the questionnaire was adapted slightly more (into the version described above), with the assistance of the University of Texas team who had been responsible for the previous surveys [26]. Three extra questions were added to section I, and section III on error was introduced, therefore the respondent numbers are not identical on each question. The questionnaire was designed to be completed anonymously, and the only biographical data requested related to hospital, nationality, grade and experience.

Sample

The survey was conducted at 11 hospitals in Scotland selected to provide a range from large teaching hospitals to smaller district general hospitals. A total of 222 anaesthetists (range 4–47 per hospital) completed the questionnaire from an estimated 374 distributed (response rate 59%). (This rate is comparable with earlier surveys.) The sample consisted of 136 consultants (62% of the total sample, average 18 years' anaesthesia experience, range 6–35 years), 13 non-consultant career grades (6%, average 13 years' experience, range 5–21 years), 42 specialist registrars (19%, average 6 years' experience, range 3–10 years), 29 senior house officers (13%, average 2 years' experience, range 0.2–5 years), and two respondents who did not provide information on their grade. There were 147 males (67%); 91% of the sample were of British nationality.

Procedure

Copies of the questionnaire were given to each anaesthetic department for distribution and when completed, they were returned to the Department of Psychology in sealed envelopes. The STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS) programme was used for analysis.

Results

The results are presented for each of the four sections in turn.

Section I: Attitudes to leadership, teamwork, work values, stress, error and the organisation

Some preliminary psychometric analyses were conducted in order to determine the underlying construct properties of this version of the ORMAQ scale using reliability analysis of the proposed conceptual/thematic structure,

shown in bold (e.g. Teamwork) in Table 1. This was to ascertain whether the response patterns on combinations of the items are sufficiently related to allow the scores on these items to be combined in order to produce underlying factors (such as teamwork or stress). This would permit the calculation of factor scores to be used in subsequent analysis (although the sample is rather small for this technique). A reliability analysis of proposed structure based on Cronbach's alpha scores for each of the proposed themes, showed low values ($r = 0.18$–0.54) for internal reliability. It was possible that another construct structure could be extracted but the overall interitem correlation matrix indicated that the values were too low for an exploratory factor analysis. No factor structure or alpha scores for the ORMAQ are reported in the previous study [26], although Helmreich & Davis [28] state that all the scales they derived from the ORMAQ had alpha values of 0.55–0.85 (no specific details are given). Factorial data for the aviation version (CMAQ) are available [22]. This means that the groupings shown in Table 1 should be regarded as indicative rather than definitive and they have been presented this way for ease of interpretation.

Table 1 shows the percentage frequency of responses to each item, responses on *disagree strongly* and *disagree slightly* have been combined, as have those on *agree strongly* and *agree slightly*. Items have been grouped into thematic categories, original item numbers are shown to indicate the order in which they appeared in the questionnaire.

These results indicate that, overall, the anaesthetists demonstrated a reasonably good awareness of teamwork issues relating to safety; however, there are more mixed responses to error management and the organisation. To investigate the effects of seniority, the mean scores on each item for consultants ($n = 136$) vs. all other grades ($n = 84$) were compared. Although there was no effect of grade on the majority of the items, significant differences were found in some areas (Table 2). The full text of each item is provided in Table 1.

The results show that most of the differences relate to leadership and teamwork issues. Compared with other grades, consultants see briefing as less important, are more likely to speak up, are less uncomfortable instructing other disciplines, consider it more insulting to have to wait for others and are more irritated working with inexperienced staff. Although they do not feel strongly that one should be obliged to mention personal stress, they do agree with this more than non-consultants. Consultants believe that human error is inevitable to an even greater degree than do other grades.

Section II: Teamwork

Mean ratings of anaesthetists' perception of the quality of teamwork and cooperation/communication they have experienced with other professional groups they work with in the operating theatre were calculated. (The rating scale points are scored as: 1 = very low, 2 = low, 3 = adequate, 4 = high, 5 = very high). There were minimal differences in rating between grades, so only total group results are shown (Table 3).

As can be seen from Table 3, the quality of teamwork is rated fairly high, although at a lower level with surgeons than with other groups.

Section III: Error management

Again, the responses have been collapsed into three categories (as above). As shown in Table 4, anaesthetists were prepared to admit that they can make errors in the operating theatre, and that these are regarded as important, irrespective of subsequent outcome.

Responses to the question 'What are the three most frequently occurring errors in the operating theatre (that you have observed)?' have been categorised under general headings; only topics mentioned by at least five respondents are listed in Table 5.

Responses to the question 'What strategies have you seen to be effective for managing error?' were allocated to common thematic categories, shown in Table 6, with only those strategies mentioned by at least five respondents included.

Section IV: Improving effectiveness/job satisfaction

Responses to these open questions on improving the effectiveness and job satisfaction of operating theatre teams were grouped into common thematic categories, shown in Tables 7 and 8, with only those strategies mentioned by at least five respondents included.

Discussion

This is a first attempt to systematically survey the attitudes of anaesthetists in the UK in relation to operating theatre teamwork and safety. The results show that although, in the main, the respondents were concerned about safety and were aware of factors influencing human performance, there remain a number of attitudinal patterns which may merit further investigation. These are discussed below in relation to six thematic areas: leadership, teamwork, awareness of personal limitations, work values, safety and error management, and organisational climate.

Leadership and assertiveness

On the items relating to leadership structure, anaesthetists' attitudes are, in general, positive and non-hierarchical. Only 54% agreed that leadership should rest with the medical staff and this may be because anaesthetists tend to

Table 1 Attitudes to leadership, stress, teamwork, work values, error and organisational climate (% response).

Items	Disagree	Neutral	Agree
Leadership Structure			
3. Senior staff should encourage questions from junior medical and nursing staff during operations if appropriate	2	2	96
10. Doctors who encourage suggestions from operating theatre team members are weak leaders	95	2	3
27. Successful operating theatre management is primarily a function of the doctor's medical and technical proficiency	67	19	14
42. Leadership of the operating theatre team should rest with the medical staff	17	29	54
50. There are no circumstances where a junior team member should assume control of patient management	91	5	4
Confidence–Assertion			
1. The senior person, if available, should take over and make all decisions in life-threatening emergencies	18	6	75
14. Junior operating theatre team members should not question the decisions made by senior personnel	89	5	6
32. If I perceive a problem with the management of a patient, I will speak up, regardless of who might be affected	7	10	83
34. In critical situations, I rely on my superiors to tell me what to do	74	13	13
36. I sometimes feel uncomfortable telling operating theatre members from other disciplines that they need to take some action	37	10	53
38. Team members should not question the decisions or actions of senior staff except when they threaten the safety of the operation	66	12	22
60. I always ask questions when I feel there is something I don't understand	12	11	77
Information Sharing			
12. A regular debriefing of procedures and decisions after an operating theatre session or shift is an important part of developing and maintaining effective team co-ordination	29	31	40
13. Team members in charge should verbalise plans for procedures or actions and should be sure that the information is understood and acknowledged by others	3	5	92
16. I am encouraged by my leaders and co-workers to report any incidents I may observe	9	31	60
19. The pre-session team briefing is important for safety and for effective team management	20	41	39
Stress and Fatigue			
4. Even when tired, I perform effectively during critical phases of operations	51	12	37
5. We should be aware of, and sensitive to, the personal problems of other team members	8	16	76
8. I let other team members know when my workload is becoming (or is about to become) excessive	29	18	51
11. My decision-making is as good in emergencies as it is in routine situations	25	14	61
21. I am more likely to make errors in tense or hostile situations	18	12	70
39. I am less effective when stressed or tired	7	10	83
43. My performance is not adversely affected by working with an inexperienced or less capable team member	51	10	39
45. Team members should monitor each other for signs of stress or tiredness	11	23	66
46. I become irritated when I have to work with inexperienced medical staff	37	22	41
49. A truly professional team member can leave personal problems behind when working in the operating theatre	24	10	66
51. Team members should feel obligated to mention their own psychological stress or physical problems to other operating theatre personnel before or during a shift or assignment	63	19	18
55. Personal problems can adversely affect my performance	20	14	66
Teamwork			
17. The only people qualified to give me feedback are members of my own profession	68	10	22
18. It is better to agree with other operating theatre team members than to voice a different opinion	88	7	5
22. The doctor's responsibilities include co-ordination between his or her work team and other support teams	1	6	93
25. Operating theatre team members share responsibilities for prioritising activities in high workload situations	10	11	79
31. I enjoy working as part of a team	3	7	90
44. To resolve conflicts, team members should openly discuss their differences with each other	8	14	78
48. All members of the operating theatre team are qualified to give me feedback	26	11	63
54. The concept of all operating theatre personnel working as a team does not work at this hospital	65	14	21
56. Effective operating theatre team co-ordination requires members to take into account the personalities of other team members	5	9	86

Table 1 (*Continued*).

Items	Disagree	Neutral	Agree
Work Values			
6. Senior staff deserve extra benefits and privileges	17	25	58
7. I do my best work when people leave me alone	25	22	53
9. It bothers me when others do not respect my professional capabilities	7	13	80
15. I try to be a person that others will enjoy working with	3	9	88
20. It is important that my competence be acknowledged by others	8	28	64
23. I value compliments about my work	1	8	91
26. As long as the work gets done, I don't care what others think of me	79	12	9
28. A good reputation in the operating theatre is important to me	4	14	82
35. I value the goodwill of my fellow workers – I care that others see me as friendly and co-operative	2	7	91
40. It is an insult to be forced to wait unnecessarily for other members of the operating theatre team	26	21	53
52. In the operating theatre, I get the respect that a person of my profession deserves	9	25	66
Error/Procedural Compliance			
29. Errors are a sign of incompetence	77	9	14
33. I am ashamed when I make a mistake in front of other team members	21	21	58
37. Procedures and policies are strictly followed in our operating theatre	29	34	37
41. Mistakes are handled appropriately in this hospital	22	39	39
53. Human error is inevitable	4	5	91
59. Team members frequently disregard rules or guidelines (e.g. hand washing, treatment protocols/clinical pathways, sterile field) developed for our operating theatre	57	14	29
Organisational Climate			
2. The department provides adequate, timely information about events in the hospital which might affect my work	23	28	59
24. Working in this hospital is like being part of a large family	39	20	41
30. Departmental leadership listens to staff and cares about our concerns	8	14	78
47. I am proud to work for this hospital	12	30	58
57. I like my job	4	6	90
58. I am provided with adequate training to successfully accomplish my job	4	7	89

Table 2 Significant differences relating to seniority.

12. Regular debriefing is important	Co = 3.1, **NCo = 3.5**	(t = 1.8, d.f. 218, p = 0.12)
15. Person enjoy working with	Co = 4.2, **NCo = 4.6**	(t = 2.8, d.f. 218, p = 0.005)
30. Department leadership listens	**Co = 3.7**, NCo = 3.4	(t = −1.9, d.f. 217, p = 0.053)
32. Will speak up	**Co = 4.3**, NCo = 3.9	(t = −2.7, d.f. 217, p = 0.007)
34. Critical sits, rely on superiors	Co = 1.5, **NCo = 2.5**	(t = 6.4, d.f. 214, p = 0.000)
36. Uncomfortable telling others	Co = 2.8, **NCo = 3.4**	(t = 3.3, d.f. 217, p = 0.001)
40. Insult to wait	**Co = 3.6**, NCo = 3.0	(t = −3.4, d.f. 216, p = 0.001)
42. Leadership is medical staff	**Co = 3.7**, NCo = 3.4	(t = −2.1, d.f. 216, p = 0.046
46. Irritate working inexperienced	**Co = 3.1**, NCo = 2.6	(t = −3.1, d.f. 215, p = 0.002)
47. Proud this hospital	**Co = 3.8**, NCo = 3.4	(t = −2.5, d.f. 216, p = 0.013)
51. Obliged to mention stress	**Co = 2.4**, NCo = 2.1	(t = −2.1, d.f. 216, p = 0.037)
53. Human error is inevitable	**Co = 4.6**, NCo = 4.3	(t = −2.2, d.f. 215, p = 030)

Co, consultant; NCo, – all other grades. Bold text indicates groups who agree more strongly.

Table 3 Ratings of teamwork in the operating theatre.

Teamwork with (grade)	Mean	% Low	% Medium	% High
Consultant anaesthetists	4.2	1	13	86
Trainee anaesthetists	4.2	1	10	89
Non-consultant grades	3.8	3	29	68
Consultant surgeons	3.2	22	42	36
Trainee surgeons	3.4	11	47	42
Theatre nurses	3.8	4	29	67
Anaesthesia assistants	4.2	1	14	85
Orderlies	3.7	6	36	58

favour flatter team structures with shared responsibilities for leadership. In fact, leadership roles and styles in operating theatre teams have not been studied in detail. Helmreich & Schaefer reported that anaesthetists preferred consultative leadership styles, whereas many surgeons 'endorsed the mild autocratic style' [27]. There is little doubt that leadership at all levels in the healthcare system influences patient safety [11] and determining those leadership behaviours which generate high performance in operating theatre teams would be a worthwhile exercise.

Table 4 Error management (% response).

Items	Disagree	Neutral	Agree
1. I rarely witness an error where one or more team members lack the knowledge to perform the needed action	26	12	62
2. Errors committed during patient management are not important, as long as the patient improves	87	4	9
3. I make errors in the theatre	6	10	84
4. Medical errors are discussed to prevent recurrence	6	3	91
5. A confidential reporting system that documents medical errors is important for safety	3	4	93

Table 5 Most common errors.

Error cited	Number of citations
Wrong drug administration	51
Operating list errors	25
Consent form problems	15
Disconnected breathing circuit	15
Equipment problem/failure	15
Not checking anaesthetic machine	12
Forgetting to do something/not completing routine tasks	11
Poor communication	10
Poor sterile procedures/sterile contamination	9
Limbs not marked/operation site errors	8
Operations by inexperienced staff	8
Pre-med. problems/forgotten on ward	8
Poor preparation	5
Patient positioning	5
Shortage of equipment	5
Surgical errors	5
Underestimation of patient's condition	5
Wrong patient sent for	5

Table 6 Strategies for reducing error.

Error reduction strategies cited	Number of citations
Critical incident reporting	29
Disseminate information about errors/M & M meetings	26
Education/training	20
Protocols/checklists	17
Discussing of errors after event	16
Good communication/closed loop communication	12
Adequate cross-checking	10
Creating culture where errors can be discussed	6
Continuous monitoring	5
Supervision of juniors	5

M & M, Morbidity and mortality.

Table 7 Increasing the effectiveness of operating theatre teams.

Suggestions	Number of citations
Adequate remuneration/reward	23
Teamwork	17
Better list management (scheduling, start/finish times, changes)	14
Improve work/physical environment	12
Being valued	9
Better feedback on performance/positive feedback	8
Better/adequate staffing levels	8
Better recognition	6
Improved communication/good communication	6
Respect for everyone in team	6
Adequate/improve training	5
Better time management	5
Good interpersonal relationships/skill	5
Managers to be more understanding, make contact	5
Regular review meetings (no-blame)	5

Table 8 How can the job satisfaction of operating theatre teams be increased?

Suggestions	Number of citations
Increased and improved communication	19
Adequate/appropriate training (& retraining)	12
Increase staff numbers/levels	12
Teamwork (encourage, acknowledge importance, shared goals)	10
Keep people in same theatre/team	5
Good/clear leadership	5
Appreciate/understand roles/problems of others	5
Improved list management (protocols, control over)	5
Better theatre management	4

In relation to confidence–assertion, the majority of respondents said they would speak up when they perceived a problem, although some were less comfortable when this involved a team member from another discipline. There was an awareness of the importance of juniors speaking up, with only 6% believing that juniors should not question decisions of senior personnel. This compares to 16% of anaesthetists and 24% of surgeons in Sexton *et al.*'s study [26]. However, 22% agreed that team members should not question decisions of senior members except when these threaten patient safety. The

importance of assertiveness skills in high-reliability work environments such as flight decks has been well documented [30] and it is apparent that this can be a critical behaviour in the operating theatre, especially for anaesthetists [31, 32].

Teamwork

In general, positive attitudes were reported in relation to behaviours regarded as supportive of effective teamwork, such as the doctor's responsibilities to enable coordination between teams, as well as conflict resolution and workload management. Whereas 90% agreed that they enjoyed working in teams, 53% of anaesthetists believed that they did 'their best work when people leave me alone'. This might appear at face value to be something of a contradiction, but it may refer to the desire to work without interruption and distraction or could be related to having to teach and continue to provide anaesthesia when working with trainees. On the interdiscipline items, again there was a lower consensus regarding the merits of receiving feedback from other team members who were not anaesthetists, with only 60–70% agreeing that this was acceptable. Only 65% of respondents believed that all operating theatre personnel worked as a team in their hospital. When asked to rate the quality of teamwork with other professions, the anaesthetists rated this most highly for working with other anaesthetists and lowest for working with surgeons. A similar pattern was reported by Sexton and colleagues who found that surgeons generally report good teamwork with anaesthetists, 'but anaesthesia staff do not necessarily hold a reciprocal perception' [26].

In terms of information sharing, the importance of verbalising plans and procedures was endorsed (92% agree). The questions about the importance of briefing and debriefing, which are regarded as very important activities in other safety-critical workplaces, produced a more inconsistent response. Only 40% of anaesthetists felt that team briefing and debriefing were important for safety and teamwork (consultants less so than other grades). Helmreich & Schaeffer found that surgeons were even less likely than anaesthetists to use team briefing techniques [27].

Awareness of personal limitations

When attitudes to the effects of stress and fatigue on performance are examined, a rather less encouraging picture emerges. There is ample evidence that stress and fatigue are detrimental to skilled performance [33, 34]. Yet, significant numbers of anaesthetists (30–40%) reported that they were unaffected by stress and fatigue. Although 83% agreed that they were less effective when stressed or tired, only 51% acknowledged that tiredness impacted their performance during critical phases of operations. Only half of the sample agreed that they should disclose to others that their workload was becoming excessive. More significantly, only 18% agreed that other team members should be told of someone's suffering from psychological stress or physical problems before or during the shift. This was despite 66% agreeing that personal problems could affect their performance. Compared with consultants, the more junior anaesthetists were less likely to agree that one should reveal personal stress. The need for medical trainees to appear invincible [35] may be producing this result. The effects of fatigue on anaesthetists are well known [36, 37] and they are certainly not immune to the effects of occupational stress [38], whether or not they choose to acknowledge these limitations. In the previous surveys using the ORMAQ [26–28], similar invulnerability attitudes were shown by anaesthetists and even more so by surgeons. In aviation, pilots' inability to recognise their personal level of vulnerability, especially in relation to the physiological and cognitive impact of fatigue and stress, was revealed in the early attitude studies and treated as a cause for concern to be remedied in training [23].

Work values

Work values, such as being status conscious and the perceived importance of receiving professional recognition, were also measured. Responses showed that anaesthetists had a general concern for professional standing but this was tempered by positive attitudes on the importance of team harmony. As written, these items do not differentiate between the sources of respect and recognition and it may be that anaesthetists would answer these questions differently in relation to surgeons, as compared with nurses or other operating theatre staff.

Safety and error management

Attitudes to human error and procedural compliance were examined in two scales. These results echo previous findings using the ORMAQ and indicate several areas of weakness in hospital safety management systems. The anaesthetists appreciated (91%) that human errors were inevitable and were not necessarily a sign of incompetence; a message psychologists have been promoting for over a decade [39]. In fact, 84% admitted that they had made errors in the operating theatre. There was less consensus regarding whether such errors are due to lack of knowledge, as a quarter of respondents believed that this could be a contributing factor. The main types of errors identified by anaesthetists were wrong drug administration and operating list errors. Their suggestions for methods of reducing error included critical incident reporting, disseminating information, training, and better use of protocols and checklists.

The medical profession has recognised that errors and mistakes need to be formally reported in order to learn from them and reduce the chance of their recurrence [3, 4, 40]. Respondents strongly agreed that errors were discussed to prevent recurrence, but only 39% of them said that mistakes were handled appropriately in their hospital. They also agreed that a confidential reporting system was an important safety management tool. Although the use of reporting systems in anaesthesia is developing, none of the hospitals involved had a full confidential system of the type used in the aviation industry [41, 42], which solicits named reports, interviews respondents to collect additional details, then de-identifies them, prior to dissemination. Examination of current anaesthetic systems shows that they collect primarily clinical data and are rather limited in their incorporation of human factors [31]. Moreover, a scenario-based study of medical staff (including anaesthetists) from three English NHS trusts found that healthcare professionals, particularly doctors, are still reluctant to report adverse events to a superior, and are more likely to tell a colleague [43].

In other safety-critical work environments, standard procedures are used in order to reduce the risk of error, although workers do not always comply with them [44]. There are also procedures developed for hospital operating theatres. But only 37% of the anaesthetists reported that 'procedures and policies are strictly followed in this hospital' and 29% agreed that 'team members frequently disregard rules or guidelines (e.g. handwashing, treatment protocols, sterile field) developed for our operating theatre'.

Organisational climate

With regard to organisational climate, although 90% of anaesthetists liked their job and thought that their training was adequate, only 41% agreed that 'working in this hospital is like being part of a large family' and only 58% were proud to work for their hospital. To some extent, such scores may be reflecting general levels of professional motivation and satisfaction with the NHS, rather than specific feelings towards a given hospital. The majority felt that their departmental leaders listened to their concerns, but only 59% thought that they were given sufficient information by their department. These results suggest that it might be worthwhile to examine organisational climate in more detail, especially in regard to factors known to influence safety, such as perceived management commitment to safety. There are a number of instruments available for this purpose [45], some of which have been used in the health sector [46]. The most popular suggestions from the anaesthetists for increasing team effectiveness were improved rewards (with some indication that they feel that their work is not always valued by others), as well as better teamwork and operating theatre list management. In terms of enhancing the job satisfaction of operating theatre teams, they listed improvements to communication, training, staffing resources and, again, better teamwork.

Conclusions

This study represents an initial attempt to measure the attitudes of anaesthetists in the UK towards human and organisational factors that can have an impact on effective team performance and consequently on patient safety. Such attitudinal data can be used to identify the prevailing safety culture in anaesthesia and surgery, to monitor and shape training initiatives and to draw comparisons with medical research from other countries. Helmreich & Davies suggest that they can also be used as part of the periodic data collection for a hospital's quality assurance programme [28].

Overall, the anaesthetists demonstrated positive attitudes towards the interpersonal aspects of their work, such as team behaviours, leadership and critical aspects of communication, such as assertiveness. Their responses tended to be slightly more favourable than those reported in earlier studies using the ORMAQ with anaesthetists and surgeons [26–28], although these were conducted in other countries and prior to recent public concern about adverse events in medicine.

With regard to attitudes suggesting invulnerability to the effects of stress and fatigue, a significant number of anaesthetists were found to show these beliefs, although to a slightly lesser degree than found in the earlier studies. Helmreich & Davies commented that it was surprising to see medical staff holding these views of personal immunity to stress and fatigue, given their level of physiological knowledge [28]. The replication of their finding with this UK sample suggests that anaesthetists (like pilots) may benefit from additional training in human performance limitations, both in postgraduate education or for consultants through continuing professional development programmes.

One factor which emerged was an awareness of the need to encourage and acknowledge the importance of teamwork in the operating theatre. In anaesthetic and surgical training these group working skills have not usually been taught on a formal basis. One method, now used to address this in medicine, is team skills training in the form of crew resource management (CRM) [16, 47, 48]. This is a form of human factors training for team members, designed to address key behaviours and attitudes (non-technical skills) which impact on safe performance. Initially developed in the aviation industry

[8], CRM training is widely used in other safety critical industries such as nuclear power production and air traffic control [49].

In the UK, CRM training for anaesthetists has been developed to improve team skills, such as the Crisis Avoidance Resource Management course at the Scottish Clinical Simulator Centre [50]. Evidence that CRM training has an impact on an organisation's safety performance is limited, although it does appear to enhance safety-related attitudes and behaviours [51]. It would also be possible to chart any changes in the attitudes of anaesthetists resulting from human factors training such as CRM, although the measuring instrument would need to be tailored to the particular set of non-technical skills being trained. In an attempt to gain a better understanding of what these are, researchers are developing taxonomies of anaesthetists' non-technical skills to aid in training and assessment [27, 31, 32, 52]. Data from attitude surveys, such as those reported here, can help to pinpoint areas of training need, as well revealing existing strengths in patient safety management.

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