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Distractions and the anaesthetist: a qualitative study of context and direction of distraction

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Editor's key points

- Distractions contribute to medical error.
- It is likely that the anaesthetist is particularly prone to significant distraction because of the close relationship between vigilance, actions, and outcome.
- This study found that the most common distractions come from the circulating nurse and other anaesthetists.
- Such causes of distractions, and how best to minimize them, need to be further investigated.

Background. Distractions are cited as contributory to healthcare-associated errors in a large proportion of incidents including those involving anaesthetists. The anaesthetist is relatively understudied, despite the closer coupling between action and outcome than in surgery.

Methods. After formal regulatory approval, we undertook an observational study using a validated rating scale for the observed effect of distractions. We also recorded the parties involved, the relative urgency of the distraction and the likely benefit or harm to the initiator and recipient.

Results. Thirty-two separate surgical operations were observed. Median case duration was 103 min (range 22–227 min). 3557 potentially distracting events were observed, of which 1173 (33%) were deemed to score $\geq$2 on the distraction scale (i.e. caused distraction). Of these 3557 events, 1227 involved the anaesthetist either as an initiator of a potential/actual distraction, or the recipient of an actual distraction. The commonest initiators of distraction were the circulating nurse (832/3557) and the anaesthetist (816/3557). Sixty distracting events were observed while the anaesthetist was preparing or administering drugs (~2 per case). Of the 60 drug-related distracting events, 26 were initiated by the anaesthetist, and 3 of 7 airway events.

Conclusions. Distracting events involving the anaesthetist are common, but approximately two-thirds of these events have no externally visible effect. Another anaesthetist was the most common recipient of a distracting event initiated by the anaesthetist. Anaesthetists need to address themselves as causes of distractions and the potential impact on patient safety.

Keywords: attention; interdisciplinary communication; medical errors, prevention and control; observation; operating theatres; quality of health care; safety

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Distractions are cited as contributory to healthcare-associated errors in a large proportion of incidents.[1] Previous reports have estimated that ~10% of patients experience some form of healthcare-related error during their hospital stay, of which 50% were deemed avoidable.[2]

Several groups have attempted to describe and quantify distraction in the operating theatre, for the scrubbed team and during various phases of anaesthesia.[3–6] These studies have provided valuable information about the number of distractions, but have largely not addressed the issue of the context or quality of the distraction. The Imperial and Toronto groups have published some investigations of case-irrelevant communication, and limited aspects of timing.[7 8] More recently, Rivera-Rodriguez and Karsh have proposed that distractions in the operating theatre context should be studied in a more contextual framework—a sociotechnical systems perspective. They argue that not all distractions are negative, and both the distractor and distractee may have positive, neutral, or negative effects from the distraction. These effects may be relevant to the patients at hand, or other patients with whom staff may be involved.

Anaesthetists are relatively under-studied compared with the surgical team, despite their ability to make mistakes, and the close coupling between action and outcome (particularly with drug errors). In a similar manner to airline pilots and naval captains, their professional role involves periods of high risk and workload interspersed with relative inactivity where the focus is on monitoring rather than intervention. During these periods, distraction for the anaesthetist may, in fact, be beneficial in maintaining alertness. These periods may not coincide with low-risk periods for the other members of the operative team. Human factors

research suggests that teams function best (and by implication are safest) when team members fully understand each other's role. However, research from the Imperial Patient Safety group suggests that, at best, the different members of the operating theatre team over-estimate their understanding of each other's roles.[9]

We, therefore, undertook a pilot study to investigate the quality, context, and direction of distraction involving the anaesthetist in particular.

Methods

Ethical review, consent, and confidentiality

The study was sponsored by the University Of Nottingham and approved by North West Great Manchester Research Ethics Committee (11/NW/0581; 24/8/2011). Written informed consent was obtained from all staff taking part in the observational aspect of the study. Written consent was obtained only once, but continued participation was confirmed with staff before each observation period. Patients also gave written informed consent for this part of the study.

Anonymity and non-traceability for staff involved in the observational study were assured:

- There were no names recorded on any observation schedules.
- There were no dates recorded on the observation schedules.

Observational study

Two medical student observers (H.J., J.H.-H.) were trained by an experienced observational researcher (R.E.). Once the trainer was satisfied with their accuracy and timeliness of observation, the students observed independently. For each observation period, a single observer positioned himself where he could observe the anaesthetist unimpeded without disrupting the process of care. The observer did not initiate interaction with team members but would respond to staff if they initiated conversation. The observers discussed their observations and their interpretation with the senior investigators as the study progressed to ensure consistency of interpretation.

The two observers had two overlapping pre-specified foci of observation. Observer 1 focused on the anaesthetist as the initiator or recipient of distraction. Observer 2 focused on the context of when these distractions occurred. Preliminary work suggested that it was not possible for a single observer to capture all this information in real-time.

The distractions score described by Healey[5] was used to rate the 'severity' of distraction (Table 1). This tool has been developed and validated by the Patient Safety group from Imperial College, London as a reproducible metric for the distraction quantity and quality. Several terms are used for distracting events in the literature. Interruptions, where an individual attends to the distraction, are rated according to increasing severity by the Healey scale. Potentially distracting events (i.e. where no interruption was observed) score 1. In addition, the direction and context of the distraction was recorded, and the perceived benefit/harm to the initiator and recipient of the distracting event both at the time of the event and in the near future. Benefits to the distractor were events such as the anaesthetist lifting the drapes to give a drug, asking the surgeon how the case was progressing. Current harm would be interrupting someone else in their task (e.g. the surgeon) whereas there may be future benefit ('shall we send for the next patient?'). Case-irrelevant conversations were given a separate category of 'social' as they are in general not directly beneficial to the current patient's care. The urgency of the distracting event was scored on three-point scale: (i) event is truly urgent; (ii) event has urgency, but does not need to happen at the present moment; and (iii) no urgency to event (Table 2). In all the observations, the primary focus was on the anaesthetist, rather than on the operating personnel.

Statistical considerations

All data were summarized using simple descriptive statistics (frequencies, proportions, median, and range) as appropriate. Data from the Healey distraction scale were *a priori* split into level 1 events (which are potential distractors with no observed effect on staff) and events scored >1 (which have an observed effect on one or members of the team).

Table 1 Scoring system for impact of potentially distracting events or interruptions[5]

Level	Observed effects on team
1	Potentially distracting source
2	Interference noticed by non-sterile, non-anaesthetic staff
3	Non-sterile/non-anaesthetic staff attends to non-case interference
4	Team member momentarily distracted from task
5	Team member pauses current task
6	Team member attends to distraction
7	Team (anaesthetic or surgical) distracted momentarily
8	Team (anaesthetic or surgical) attend to distraction
9	Operation flow interrupted

Table 2 Scoring system for urgency of events

Score	Category	Example
1	Immediate	Equipment failures; immediate patient safety issues
2	Urgent	Questions about list; arranging or preparing equipment for next case
3	Non-urgent	Social conversations

Table 3 Details of observed cases and rates of distracting events overall and by phase of anaesthesia

	Median (interquartile range) and [range]			
	All observations	Induction	Maintenance	Emergence
Case duration	101 (88–142) [22–237]	26 (15–37) [3–67]	59 (44–100) [15–145]	15 (12–23) [4–70]
Total events observed	3557	466	2464	627
Total events causing distraction	1174 (33%)	134 (29%)	833 (34%)	207 (33%)
Events per case	100 (64–155) [30–260]	9 (7–24) [2–50]	63 (43–121) [23–186]	21 (13–25) [3–87]
Events per minute	1.0 (0.8–1.2) [0.4–1.6]	0.6 (0.3–0.9) [0.2–1.5]	1.2 (1.0–1.4) [0.6–1.7]	1.1 (0.8–1.4) [0.5–1.8]
Events causing observed distraction per case	32 (19–46) [6–90]	3.5 (1–7) [0–7]	23 (13–35) [5–72]	6.5 (2–9) [1–26]
Proportion of events causing observed distraction per case	0.3 (0.27–0.40) [0.18–0.58]	0.3 (0.2–0.4) [0–0.9]	0.3 (0.3–0.4) [0.2–0.6]	0.3 (0.2–0.4) [0.1–0.5]
Events causing observed distraction per minute	0.32 (0.24–0.43) [0.09–0.63]	0.1 (0.1–0.3) [0–0.5]	0.4 (0.3–0.5) [0.1–0.7]	0.3 (0.2–0.5) [0.1–0.8]

Results

Thirty-two separate surgical operations were observed over a total of nearly 60 h. Median case duration was 103 (range 22–227) min (Table 3).

Frequency of distracting events

A total of 3557 potentially distracting events were observed, of which 1173 (33%) were deemed to score 2 or higher on the Healey scale (i.e. caused distraction) (Table 2). Of these 3557 events, 1227 (34%) involved the anaesthetist either as an initiator of a potential/actual distraction, or the recipient of an actual distraction. Of the level 1 events, 582 of 2384 (24%) originated from the anaesthetist. The commonest initiators of distraction were the circulating nurse (832/3557; 23%) and the anaesthetist (816/3557; 23%). Of the 1173 events causing a discernible effect, 234 (20%) originated from the anaesthetist, 186 (16%) from the circulating nurse, 172 (15%) from visitors to theatre, and 138 (12%) from the surgeon. For highest level distractions (7–9), the anaesthetists initiated 25/101 (25%), surgeons 15 (15%), visitors 15 (15%), and process events (e.g. lack of equipment) 14 (14%) (Table 4).

Distractions involving the anaesthetist were numerically most common during maintenance, though the rates of events were similar in each of the phases [median (range): 1 (0.4–1.44) events min^{-1}]. There was a close association between duration of anaesthesia and number of distractions (Pearson's coefficient of determination, r^2=0.81) but not between number of staff in theatre and number of distractions.

The commonest recipient of distractions originating from the anaesthetist with an observable effect was the anaesthetist (84/234; 34%) followed by the surgeon (50/234; 21%), and ODP (40/234; 17%) (Table 5). Of the anaesthetist–anaesthetist distractions, 9/84 (10%) were a single anaesthetist (i.e. distracting him or herself); the remainder involved two anaesthetists distracting each other.

Conversely, the commonest initiator of distractions having an observable effect on the anaesthetist was the anaesthetist (84/286; 29%), followed by the ODP (46/286; 16%), visitors to theatre (38/286; 13.3%), and the surgeon (38/286; 13%). In comparison, the data for the surgeon were: anaesthetists (50/224; 22%), visitors to theatre (39/224; 17%), circulating nurse (32/224; 14%), and surgeon (30/224; 13%).

For high-level distractions (7–9), 21/25 (84%) of the anaesthetist initiated events affected the anaesthetist or the whole team, 11/15 (73%) of surgeon initiated events affected

Table 4 Anaesthetist as initiator of distractions

Recipient of distracting event	Level 1	>Level 1	Level 7–9
All	582	234	25
Anaesthetist	–	84 (34%)	21 (84%)
Surgeon	–	50 (21%)	
ODP	–	40 (17%)	
Categories			
Movement	417	76	4
Case/list relevant Communication	53	49	9
Non-clinical communication	109	97	11

Table 5 Anaesthetist as recipient of distractions

Initiator of distracting event	Level 1	>Level 1	Level 7–9
All	140	287	24
Anaesthetist	–	85 (30%)	16 (67%)
ODP	–	46 (16%)	3 (13%)
Visitors		38 (13%)	2 (8%)
Surgeon	–	35 (12%)	2 (8%)
Categories			
Movement	6	63	–
Case/list relevant Communication	38	51	3
Non-clinical communication	90	112	11

the anaesthetist or the whole team, and 10/15 (67%) from visitors.

Types of distraction

Movement by the anaesthetist caused predominantly level 1 events (417/493; 85%). Communication initiated by the anaesthetist were more evenly spread between level 1 (162/308; 53%) and >1. Of the communication events initiated by the anaesthetist, 206/308 (67%) were not apparently clinically related.

A similar proportion of anaesthetist initiated events affecting the surgeon were not apparently clinically related (26/38; 68%). Of the 20 high-level (7–9) communication events initiated by the anaesthetist, 11 (55%) were non-case relevant. Conversely, of the 14 high-level (7–9) communication events with the anaesthetist as recipient, 11 (79%) were not apparently clinically related.

Context of distraction

Specific anaesthetic actions occurring at the time of distraction were recorded relatively infrequently, reflecting the proportion of time the anaesthetist is in monitoring mode. Airway and drug-related actions were specifically recorded as were the components of the WHO checklist. Of these 97 events recorded, 60 distracting events were observed while the anaesthetist was preparing or administering drugs (~2 per case). Of the 60 drug-related distracting events, 26 were initiated by the anaesthetist, and 3 of 7 airway events. The anaesthetist initiated a distracting event during the WHO checklist on 11 occasions, of which 9 were scored >1.

Urgency of distracting events

Of the 816 events initiated by the anaesthetist, the urgency could not be coded by the observer in 457, of which 435 were level 1 events. These events were almost exclusively movements in and out of the anaesthetic room by the anaesthetist. Only 8 of the 816 anaesthetist initiated events were classified as level 1 (immediate). These involved requests for help, checking the patient condition, and reminding the team of the need for a WHO time-out. Of the 426 events where the anaesthetist was the recipient, 21 were classed as level 1. Of these, nine originated from equipment (alarms, noises), four from another anaesthetist, and three from the patient talking to the anaesthetist.

Benefit of distracting events

Of the 816 events initiated by the anaesthetist, 581 could not be rated for current benefit or harm, of which 577 were level 1 events. Only 7 of these events were judged to be of immediate benefit to the recipient, whereas 75 were judged likely to be of future benefit. Two hundred and twenty-three were judged to be of detriment to patient care at the time.

Of the 426 events where the anaesthetist was a recipient, 281 were judged to be of detriment to current patient care. Case-irrelevant communication was the largest fraction of these events (86; 20%). Only one was classified as level 1. Although there was no observable effect, this event involved the surgeon talking to the anaesthetist while he/she was drawing up drugs. Ninety-five of these events were judged to be of future benefit—case or list relevant communication; 131 and 143 were judged to be of neutral effect (conversations or activities concerning other members of the team) or social in nature.

Discussion

In this study, distracting events involving the anaesthetist are common, but approximately two-thirds of these events have no externally visible effect. Another anaesthetist was the most common recipient of a distracting event initiated by the anaesthetist, whether this was considered for all events, all events causing a discernible effect or high-level distractions. Movement by the anaesthetist (predominantly in and out of the anaesthetic room) was the commonest low level distracting event recorded; case-irrelevant communication was a common cause of distraction both initiated by and affecting the anaesthetist.

Distracting events during key anaesthetic interventions were observed relatively frequently, with around two events per case during drug preparation, of which just under half were initiated by the anaesthetist. Events initiated by or affecting the anaesthetists which were judged to be immediately necessary were uncommon, and were either environmental (equipment noise) or clinically relevant communications.

Limitations

With any experimental observations, it is important to question whether they are valid. The investigators were trained by an experienced qualitative researcher before starting. We considered having two observers in theatre at the same time, but felt that this would add unnecessary obtrusion to the investigation. The rates and distributions of degree of distraction were similar between the two observers and discussion between the research team failed to demonstrate any major inconsistencies in coding interpretation between the observers. The distractions rating scale used has been validated previously by the Imperial Patient Safety group and shown to have good inter-rater reliability and face validity.[5–7] We adapted the scale slightly, as the original scale focused exclusively on the sterile team, and solely during surgery.

Our observations did raise the question of how to score distractions when the anaesthetist is not clearly undertaking a task. Much of this time will be monitoring the patient and the wider situation. This is a continuous process and we observed no identifiable task from which the anaesthetist could be distracted. We chose to score these events as level 1. However, there is ample evidence from experimental psychology[3] and simulated medical practice[10 11] that distracting events may result in failure to complete tasks even though there is no observable effect. Even for identifiable tasks such as drug preparation external observation is

limited in its ability to detect distraction. Conversation within earshot of the anaesthetist may have no observable effect (scored 1) but result in mis-selection or mislabelling. There were a large number of events where the observer could not code either the urgency or the benefit of the event. Most of these were movements by the anaesthetist or other staff in and out of theatre and were scored at level one (potentially distracting events). Self-reporting by the anaesthetist may have provided more information, but at the expense of introducing distractions directly. A future avenue for research in this field may be to explore what makes anaesthetists come and go from theatre and whether similar patterns occur in hospitals that do not use anaesthetic rooms.

Validity

Our data are consistent with the findings of others. Healey reported a mean rate of distracting events for the surgical team of 0.29 min^{-1}.[6] Studies particularly targeting anaesthetists found rates of 0.29 min^{-1} [12] and 0.7 min^{-1}.[4] The higher rates found in our study may reflect the design of the observations. Previous studies have predominantly investigated the surgical team[5–8] or have investigated distractions affecting the anaesthetist. Our investigation was bi-directional—observing events originating or (potentially) affecting the anaesthetist, which may explain the higher rate. The low rate of events rated as level 1 urgency (immediate) is consistent with routine elective and urgent operating practice and supports the validity of the observation and coding.

Clinical relevance

The question remains whether these distracting events matter. Most of the literature explicitly or implicitly describes distractions as potentially harmful events. However, the social and process context of when distractions occur is important. General background theatre noise has been associated with deterioration in mental efficiency and short-term memory in a laboratory study of anaesthesia residents.[13] The reported effects of background music are inconsistent and are assumed to be dependent upon the context of when it is played, volume, and type of music. Conversely, distracting events may be beneficial. First, the Yerkes–Dodson law describes the inverse U-shaped relationship between external stimulation (arousal) and learning (performance).[14] Low-demand tasks may be performed better with increasing levels of external stimulation (conversations, noise, and music) up to a point, whereas higher demand tasks may suffer with the same degree of external stimulation. The anaesthetist may, therefore, benefit during monitoring by having more noise around him or her. We found that the majority of distracting events were social interactions—background chatter. As well as the arousal benefit these may have, they may have a less measurable effect on team cohesiveness. Most models of effective team working have some descriptor of social relationships[15] and given that many theatre teams do not interact greatly outside of the theatre environment, social conversations within theatre are presumably beneficial to the team in the long term. To our knowledge, there is no direct evidence from operating theatre environments that this social interaction is beneficial, or that a lack of it is harmful in the short- or longterm. However, research from other fields—sport, aviation, space flight—suggests that cohesive teams achieve better performance and are more resilient in stressful situations.[16]

However, there are certain moments when distractions are viewed as potentially harmful. For the anaesthetist, this is particularly during the 'critical moments': drug preparation and administration; airway management; safe transfer to theatre; and emergence. The *perception* of staff is that distractions come from *other* people.[17] Campbell and colleagues[12] provide some insight into this: 'the anaesthetic room, … is perceived as [the anaesthetists'] territory … it is the *perception* of distraction that is important, and its acceptability seems to depend upon this.' 'their view that [distractions] were common in the anaesthetic room may reflect their view that *other staff* may not fully appreciate the nature of anaesthetic induction (our italics).' Yet, our results suggest that anaesthetists themselves are common initiators of distraction. Just under half of observed distracting events during drug preparation and airway management were from the anaesthetist. Broom and colleagues[18] suggest that the sterile cockpit concept from aviation could usefully be applied to anaesthesia, though their description of interventions was again directed at 'others'—'staff not involved in emergence could leave theatre'. The aviation regulations do not differentiate by staff type: 'No flight crew member may engage in, nor may any pilot in command permit, any activity during a critical phase of flight which could distract any flight crew member from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties. Activities such as eating meals, engaging in non-essential conversations within the cockpit and non-essential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft.'[19] One review of non-compliance with the sterile cockpit rule found that extraneous conversation by the pilots was the commonest reason for violation, followed by interruptions by flight attendants, and 'non-pertinent radio calls'. Our results would suggest that, qualitatively, anaesthetists violate the (unwritten) sterile cockpit rule in a similar fashion.

Future research

Distracting events are inevitable, but most are not of immediate urgency. One avenue to explore is how to better manage these non-time-critical events. In order to do this, team members need to understand when distraction is inappropriate and when it is likely to be unhelpful. A first stage in this process would be to define when these critical phases are for all members of the team. Although some of these will be context dependent (e.g. an anticipated difficult

airway) some are probably universal (e.g. tracheal extubation). As yet, we do not know whether anaesthetists' *perceptions* of critical moments reflect when problems really occur. For example, we have cited airway management as a critical moment, yet the critical moment may actually be sometime before this when the strategy is discussed and preparations made.

Conversely, however well a team manages distractions by moving them to non-critical times, anaesthetists cannot avoid distracting events completely. Other safety conscious industries teach strategies to minimize the risk from distractions—both internal and external. Little is currently known about techniques that anaesthetists use or those that are useful. Research is needed into which strategies may be of benefit to anaesthetists to reduce their risk of error.

The content and context of social conversations in theatres, particularly those involving anaesthetists, are not well studied. Although the assumption is that this is 'glue' which holds the team together, there is little direct evidence to support this within the operating theatre environment.

In conclusion, we have demonstrated that distraction of the anaesthetist is commonly from another anaesthetist. Most distractions are low level, and these may be beneficial for vigilance and social cohesion, but anaesthetists are responsible for distractions during critical moments. Training and education to reduce the impact of distractions will need to focus on anaesthetic behaviours and other members of the team.

Declaration of interest

I.K.M. has received honoraria from Schering-Plough in the past 5 years. He is a member of the editorial board of the British Journal of Anaesthesia. He is a member of the NICE Quality Standards Topic Expert Group on Hip Fracture.

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