OREGON HEALTH AND SCIENCE UNIVERSITY
OFFICE OF CLINICAL INTEGRATION AND EVIDENCE-BASED PRACTICE

Evidence-Based Practice Summary
Distractions in the Operating Room

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BACKGROUND AND RATIONALE

The operating room (OR) is a setting in which health care team members perform high-risk, complex tasks that require situational awareness, concentration, transfer of information, and communication among team members for the safety of the patient. Given the amount and nature of the medical equipment used and number of team members present, operating rooms also are prone to high levels of noise. The noise in the OR can serve as a distraction, increasing risk for error and presenting an unsafe condition for patient safety. There are many sources of noise and distraction within an OR with the most commonly cited being non-case relevant conversations, telephone calls, pagers, and music. (Joint Commission 2017)

This evidence brief seeks to determine the relationship between the distractions from pagers/cellphone, music, and interruptions from team members during surgery and adverse patient outcomes such as surgical site infections and retained surgical items.

ASK THE QUESTION

1) *In patients having surgery, does eliminating cell phones and/or pagers from the OR suite compared to OR suites where there are cell phones and pagers present reduce the incidence of surgical site infection (SSI)/Surgical error (SE)?*

2) *In patients having surgery does eliminating music in the OR suites compared to OR suites where music is playing reduce the incidence of SE/SSI?*

3) *In patients having surgery does eliminating interruptions at the surgical field during surgical counts compared to surgical counts with no intervention to limit distractions and interruptions reduce the incidence of retained surgical items or incorrect counts?*

SEARCH FOR EVIDENCE

Databases included : Ovid Medline

Search strategy included:

1 exp Arousal/ (110803)
2 exp Operating Rooms/ (12503)
3 1 and 2 (65)
4 exp Noise, Occupational/ (3134)
5 2 and 4 (40)
6 3 or 5 (98)
7 exp Postoperative Complications/ (493327)
8 exp Intraoperative Complications/ (48142)
9 exp Surgical Procedures, Operative/ (2858900)
10 7 or 8 or 9 (3014995)
11 exp Hospital Communication Systems/ (1611)
12 exp Cell Phone/ (8686)
13 exp Computers, Handheld/ (4984)
14 exp Music/ (12663)
15 exp noise/ or exp noise, occupational/ (22219)
16 11 or 12 or 13 or 14 or 15 (48960)
17 10 and 16 (1683)
18 (distract* or interfer* or interrupt* or intrud* or intrus* or ((lose* or losing or lost or break* or broke*) adj3 (attent* or concentrat* or focus* or arous* or vigil*))).mp. (552642)
19 ((surg* or (operat* adj2 (room* or theat*))) adj7 ((instrument* or swab* or spong*) adj5 (count* or tally* or collect* or find* or found or locat* or (keep* adj2 track*)))).mp. (286)
20 18 or 19 (552924)
21 17 and 20 (84)

22 6 or 21 (171)
23 2 and 16 (199)
24 exp "Task Performance and Analysis"/ (32900)
25 exp safety/ (71051)
26 exp medical errors/ (103335)
27 exp malpractice/ (30770)
28 24 or 25 or 26 or 27 (226574)
29 2 or 10 (3022892)
30 16 and 28 and 29 (85)
31 22 or 23 or 30 (357)
32 limit 31 to english language (337)
33 limit 31 to abstracts (220)
34 32 or 33 (343)

Filters/limits included: studies published in English

CRITICALLY ANALYZE THE EVIDENCE

The literature search resulted in over 300 studies that evaluated noise or interruptions in the operating room and the effects on adverse outcomes. The literature appraisal is divided by the three PICO questions pertaining to cellphones/pagers, music, and interruptions and subdivided by study type.

Pico: In patients having surgery, does eliminating cell phones and/or pagers from the OR suite compared to OR suites where there are cell phones and pagers present reduce the incidence of surgical site infection (SSI)/Surgical error (SE)?

Cellphones/pagers: Ten non-randomized studies were included in the appraisal for cellphones and pager use in the OR, five observational studies and five survey studies.

Observational studies: The first observational study (Healey 2007) sought to quantify distraction and interruption to the sterile surgical team in urology. This study included 30 urology day-case surgeries in which an observer recorded a brief description of each distraction or interruption and rated each using the ordinal scale, also noting the time of onset and end of observed work interruption. Concurrently, the observer collected a tally of personnel entering or leaving the operating theatre. The observer reported 130 phone events with a distraction ratio of 2.17 (out of 8) and 26 bleeper events with a total distraction ratio of 1.53 (out of 8). The second study (Healey 2006) observed and recorded the frequency of distraction and interruption in the operating theatre during the intra-operative phase of surgery, that is, from incision to closure. The study observed 50 general surgery operations in which an observer recorded and rated the

distracting events on a scale of 1-9 with 9 being the most distracting. The study reported a total of 62 phone and bleeper events with a mean rating of 2.3-3.9 with all members of the surgical team distracted to a statistically significant level. The third study (Ortega 2009) aimed to measure critical-to-quality, non-time variables such as communication errors, response rates (answer to page/cellular call or no answer), orthopedic floor nurse satisfaction rating, communication difficulties, and whether the communication caused an intraoperative case or patient care interruption. This study compared orthopedic floor nurse and intraoperative orthopedic surgeon communication via two methods using either indirect pager communication (current standard) or direct cellular communication. In addition, the reverse situation was observed where the surgeon called to speak with the floor nurse. Then compared indirect communication via a common method consisting of calling the hospital floor associate's desk and asking to speak with the nurse versus direct communication with the nurse. The authors found a significant percentage of intraoperative case interruptions 33% (10/30) with indirect page communication compared to no case interruptions with direct wireless communication. The fourth study (Rose 2012) aimed to evaluate the impact of paging on perceptions of intraoperative learning. Over a 30-day period, the investigators logged intraoperative interruptions for all operations in which a surgical resident participated. During each operation, the circulating nurse documented the post-graduate year (PGY) of the resident, frequency of pager interruptions per operation, category of caller, reason for call, and the urgency of the page. The authors found that 92% of pages were non-urgent. Residents did not perceive that pager interruptions negatively impacted their education and were neutral with respect if messages taken by a third party decreased interruptions. The final observational study (Sevdalis 2014) aimed to test the hypothesis that intraoperative distractions are associated with deterioration in patient safety checks in the OR. This study included 24 elective urologic procedures in which distractions were assessed via in vivo observation in the OR using an instrument previously developed and validated. A distraction was defined as "any event that occurs intraoperatively and that is not directly related to the care of the patient who is on the operating table at the time." Each observed distraction was rated for its visible severity on an anchored scale of 1 to 9, where 1 is a potentially distracting event and 9 is interrupted flow of the operation. Patient safety was assessed via in vivo observation using a validated checklist. The authors reported 6 events where phone/bleepers were the cause of the distraction with a mean severity of 3.67.

Survey Studies: The first survey study (Lee 2013) sought to evaluate and characterize distractions during urologic surgery. This study included 523 respondents who were given an Internet-based survey. The survey consisted of 6 questions each on demographic data and clinical practice details, followed by 36 questions focused on various factors that have been theorized or demonstrated to have a negative impact on surgical performance of either cognitive and/or psychomotor skills. Urologists were able to anonymously provide responses through the Internet-based Web site. The authors found that 68% of respondents routinely answered pages while operating. 15% thought that at least one surgical complication had occurred mainly because of an external distraction (music, pager, discussing consults, loud talking in OR, etc.). The second study (Patterson 2012) surveyed the subscribers of *OR Manager* regarding the risks and benefits of smartphones and tablets in the OR. Of the 124 respondents, 13% said their OR has a policy on personal use of mobile

devices, and 48% said their hospital has a policy. For 18%, both the OR and hospital have policies. For most (79%) the policy applies only to employees rather than to both employees and physicians. More than 8 in 10 say they believe personal use of mobile devices in the OR sometimes distracts providers from patient care. The majority see it as a problem for all disciplines, most commonly anesthesia personnel (80%) and nurses (69%).Over half (55%) have received reports of an OR clinician being distracted by a mobile device during patient care, and 41% have personally witnessed distracted behavior. Six respondents of the 112 who answered this question indicated personal use of a mobile device was possibly linked to an adverse event during surgery. The third study (Pinar 2016) included the responses of 955 anesthesia providers in Turkey to learn about their smartphone use, habits, and views. The authors reported that 93.7% of respondents used smartphones during the anesthetized patient care. Phone calls (65.4 %), messaging (46.4 %), social media (35.3 %), and surfing the internet (33.7 %) were the most common purposes. However, 96.7 % of respondents indicated that smartphones were either never or seldom used during critical stages of anesthesia. Most respondents (87.3 %) stated that they were never distracted because of smartphone use; however, 41 % had witnessed their colleagues in such a situation at least once. The fourth study (Sergeeva 2016) is an observational study followed by interviews of the OR assistants. The aim of the observations was to capture in rich detail the OR assistants' work practices and to observe the extent, location, frequency and type of iPod use during the everyday work practices and any effects of such use on work processes. In the survey responses, distraction was the most often mentioned disadvantage of iPod use: 9 out 17 respondents mentioned concerns regarding their partners paying less attention during surgery. The final study (Smith 2011) surveyed 439 members of the American Society of Extracorporeal Technology (AMSECT). The study aimed to determine the frequency of cell phone use in the perfusion community, and to identify concerns and opinions among perfusionists regarding cell phone use. The authors reported that 92.7% respondents have never been distracted or negatively affected on CPB and 98% report that they have never made an error on CPB that could be attributed to cell phone use. When asked about witnessing another perfusionist being distracted while on CPB due to cell phone use, 34.5% report that they have seen another perfusionist distracted. Additionally, 95.4% of respondents report no known serious perfusion accidents that were the direct result of cell phone use.

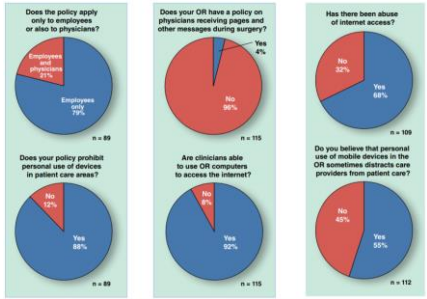
Overall, there is *Very Low Quality* evidence to indicate that cell phones and pages cause distractions that may cause patient adverse outcomes. The literature was downgraded due to inconsistency and indirectness with the PICO question along with individual study design limitations.

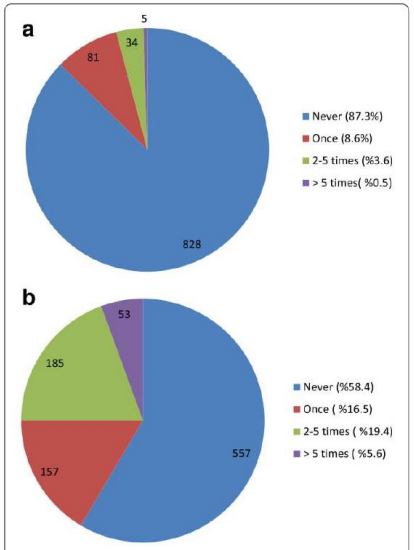
PICO Question: 1) In patients having surgery, does eliminating cell phones and/or pagers from the OR suite compared to OR suites where there are cell phones and pagers present reduce the incidence of surgical site infection (SSI)/Surgical error (SE)?						**Low Quality Rating if:** ☒ Studies inconsistent (*wide variation of treatment effect across studies, population, interventions, or outcomes varied*)
Study Acronym; Author; Year Published; Location	**Aim of Study; Study Type; Study Size (N)**	**Population**	**Study Intervention (# patients) / Study Comparator**	**Endpoint Results / Outcome (Absolute Event Rates, P values; OR or RR; & 95% CI)**	**Design Limitations**	

Journal: *Quality & Safety in Health Care* Author: Healey, A. N., et al. Year Published: 2007 Location: UK	**Aim**: To quantify distraction and interruption to the sterile surgical team in urology. **Study Type**: observational study **Size**: 30 urology day-case procedures	**Inclusion Criteria**: An observer recorded events that distracted or interrupted the sterile surgical team. We defined distraction as observed behavior such as orienting away from a primary task or verbally responding to a secondary task. We defined interruption as a distraction resulting in a break in primary task activity.	**Intervention**: The observer recorded a brief description of each distraction or interruption and rated each using the ordinal scale, also noting the time of onset and end of observed work interruption. Concurrently, the observer collected a tally of personnel entering or leaving the operating theatre.	**Results:** The total of distraction or interruption events observed per case ranged from 1 to 89, with a mean of 20.47. The rate of events observed per minute ranged from 0.11 to 0.82, with a mean of 0.45 events/min. The ordinal rating tally for each case ranged from 8 to 266. Cumulative work interruption as a percentage of the operation duration ranged from 0.41% to 50.17%, with a mean of 13.05%, an average of 5.66 min interruption per operation. Movement through the operating theatre was very frequent, with 1543 door openings, a mean rate of 1.08/min for the whole sample. **Phone events: 130 events for a rating of 283 and a ratio of 2.17. Interruption duration of 4.05** **Bleeper events: 26 events for a total of 40 event ratings and a ratio of 1.53. Interruption duration of 1.3** **Table 3** Totalled events observed and their ratings, and interruption duration associated with each source category Source / Tally of events (a) / Tally of event ratings (b) / Ratio of a to b / Interruption duration Conversation 198 902 4.55 100.62 Phone 130 283 2.17 4.05 Bleeper 26 40 1.53 1.30 Equipment 58 376 6.48 35.48 Procedure 36 195 5.41 26.73 Environment 163 351 2.15 1.53 Monitor 3 10 3.33 0.13	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	☒ Studies are indirect (*PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)* ☐ Studies are imprecise (*when studies include few patients and few events, and thus have wide confidence intervals, and the results are uncertain)* ☐ Publication Bias (*e.g. pharmaceutical company sponsors study on effectiveness of drug only small, positive studies found)* **Increase Quality Rating if:** ☐ Large effect ☐ Dose-response gradient ☐ Plausible confounders or other biases increase certainty of effect **Quality (certainty) of evidence for studies as a whole:** ☐ High ☐ Moderate ☐ Low ☒ Very Low
Journal: *Ergonomics* Author: Healey, A. N., et al. Year Published: 2006 Location: UK	**Aim**: To observe and record the frequency of distraction and interruption in the operating theatre during the intra-operative phase of surgery, that is, from incision to closure (pre- and post-operative phases warrant separate study)	**Inclusion Criteria**: General operations at a teaching hospital. **Exclusion Criteria**: Short examinations and cases likely to last more than 4 h, from incision to closure, were excluded, as the observational method was particularly demanding of attention.	**Intervention**: Scale points 1–3 refer to salient events that potentially or actually distract or interrupt the work of a circulating nurse. Scale points 4–6 refer to observed distraction or interruption to a single member of the team. Scale points 7–8 refer to similar distraction or interruption to points 5 and 6, but where two or more team members	**Results:** The total counts of events per case ranged from one to 39, with a mean of 13.56 (SE+1.12). The total count of events per case as a proportion of operative time ranged from 0.04 to 0.86 per min, with an average of 0.29 (SE+0.02**).** **There were a total of 62 phone and bleeper events with a mean rating of 2.3-3.9 with all members of the team affected to a statistically significant level**	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding	

	Study Type: observational study **Size**: 50 general operations (29 laparoscopic and 21 open) were sampled from a single operating theatre in a National Health Service Teaching Hospital		are involved. The highest scale point 9 refers to observed interruption to the whole team, where they are observed to attend to another event.	Table 2. Summary data on recorded events from the 50-case sample, in the frequency and levels of interference for each source category. Source / n cases* / Mean count† / Max count‡ / Mean rate§ / I−mean/case¶ / I−sample‖ Phone 26 1.62 4 3.90 6.31 164 Bleeper 36 3.31 21 2.30 8.56 274 Radio 6 1.00 1 3.67 3.67 22 A cic 27 1.63 4 4.30 7.00 189 S cic 33 1.88 5 4.35 8.18 270 N cic 24 1.46 3 4.83 7.04 169 Communication 10 1.10 2 5.77 5.22 5 External staff 25 1.44 3 4.75 11.18 271 Equipment 35 1.83 7 5.84 10.69 374 Procedural 36 1.86 6 5.13 9.56 344 Environment 27 1.78 6 5.58 9.93 268 Monitor B 26 5.00 13 1.06 5.52 138 Monitor F 9 1.56 4 1.71 3.00 24 *Shows the number of cases where a particular source was recorded. †Refers to the mean number of events from cases where they were recorded. ‡Shows the maximum count of recorded events for each source in a single case. §Shows the mean rating assigned to events across the 50-case sample. ¶Shows the mean interference (I) from each category to cases where those events were recorded. ‖Shows the sum I of each category from the entire 50-case sample. A = anaesthetists; N = nurses; S = surgeons; cic = case-irrelevant conversation; Monitor-B = movement behind video display monitor; Monitor-F in front of video display monitor. Table 4. A sum count of groups observed effected by separate sources of interference. Source / A / N / S / χ^{2*} / $p <$ Phone 5 20 18 9.25 0.01 Bleeper 7 45 13 38.52 0.0001 Radio 2 4 3 – NS A cic 21 3 24 16.12 0.0001 S cic 4 10 58 58.62 0.0001 N cic 2 29 13 25.13 0.0001 Communication 1 5 7 – NS External staff 8 26 31 13.5 0.001 Equipment 12 40 47 20.78 0.0001 Procedural 42 10 18 23.77 0.0001 Work environments 12 21 44 21.22 0.0001 Group total 116 213 276 *Test results show significant differences between groups, affected by different sources. A = anaesthetists; N = nurses; S = surgeons; cic = case-irrelevant conversation.	☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Journal of Endourology* Author: Lee, J. Y., et al. Year Published: 2013 Location: Canada	**Aim**: To evaluate and characterize distractions during urologic surgery. **Study Type**: Survey Study **Size**: 523 respondents	**Inclusion Criteria**: Urologists in Endourological Society and the Canadian Urological Association membership lists.	**Intervention**: An Internet-based survey was distributed to 2057 international urologists in June 2011. The survey consisted of 6 questions each on demographic data and clinical practice details, followed by 36 questions focused on various factors that have been theorized or demonstrated to have a negative impact on surgical performance of either cognitive and/or psychomotor skills. Urologists were able to anonymously provide responses through the Internet-based Web site.	**Results**: **68% routinely answered pages while operating. 15% thought that at least one surgical complication had occurred mainly because of an external distraction (music, pager, discussing consults, loud talking in OR, etc).**	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Technology & Health Care*	**Aim**: To measure critical-to-quality, non-time variable	**Inclusion Criteria**: Residents and attending	**Intervention**: This study compared orthopedic floor nurse and	**Results**: Direct wireless, cellular communication showed a better response rate than indirect page (Cell 100%,	Study Limitations: ☒ None ***Non-Randomized***	

Author: Ortega, G. R., et al. Year Published: 2009 Location: USA	such as communication errors, response rates (answer to page/cellular call or no answer), orthopedic floor nurse satisfaction rating, communication difficulties, and whether the communication caused an intraoperative case or patient care interruption **Study Type**: Observational Study **Size**: 60 trials		intraoperative orthopedic surgeon communication via two methods using either indirect pager communication (current standard) or direct cellular communication. In addition, the reverse situation was observed where the surgeon called to speak with the floor nurse. Then compared indirect communication via a common method consisting of calling the hospital floor associate's desk and asking to speak with the nurse versus direct communication with the nurse.	Page 73%). Cellular communication allowed the floor nurses to have a 100% direct communication with the surgeon compared to 3% direct surgeon communication with paging. Cellular communication also allowed a 0% error rate in relation to communicating the patient problem to the surgeon versus a 27% error rate with indirect page communication among the floor and OR circulating nurse and surgeon. When the surgeon presented the solution to the patient problem, the nurses received a 0% error rate with cellular communication and a 33% error rate with page communication. **A significant percentage of intraoperative case interruptions 33% (10/30) with indirect page communication compared to no case interruptions with direct wireless communication.**	☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *OR Manager* Author: Patterson Year Published: 2012 Location: Online	**Aim**: To survey the risks and benefits of smartphones and tablets in the OR **Study Type**: Survey Study **Size**: 124 survey responses	**Inclusion Criteria**: OR Manager Subscribers	**Intervention**: Survey invitations were e-mailed in February 2012 to 350 OR Manager subscribers. A survey link was also included in the weekly OR Manager email bulletin. In all, 124 responses were received. Two-thirds of respondents (66%) were from community hospitals, with 26% from teaching facilities, and 8% from ambulatory surgery centers.	**Results**: 13% said their OR has a policy on personal use of mobile devices, and 48% said their hospital has a policy. For 18%, both the OR and hospital have policies. For most—79%—the policy applies only to employees rather than to both employees and physicians. More than 8 in 10 say they believe personal use of mobile devices in the OR sometimes distracts providers from patient care. The majority see it as a problem for all disciplines, most commonly anesthesia personnel (80%) and nurses (69%).Over half (55%) have received reports of an OR clinician being distracted by a mobile device during patient care, and 41% have personally witnessed distracted behavior. **Six respondents of the 112 who answered this question indicated personal use of a mobile device was possibly linked to an adverse event during surgery.**	Study Limitations: ☐ None ***Non-Randomized*** ☒ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

						
Journal: *BMC Anesthesiology* Author: Pinar, H. U., et al Year Published: 2016 Location: Turkey	**Aim**: To learn about the smartphone use habits and views of Turkish anesthesia providers **Study Type**: questionnaire study **Size**: 955 participants	**Inclusion Criteria**: anesthesia providers in Turkey	**Intervention**: A questionnaire consisting of 14 questions about smartphone use habits during anesthesia care was sent anesthesia providers.	**Results**: 93.7 % of respondents responding that they used smartphones during the anesthetized patient care. Phone calls (65.4 %), messaging (46.4 %), social media (35.3 %), and surfing the internet (33.7 %) were the most common purposes. However, 96.7 % of respondents indicated that smartphones were either never or seldom used during critical stages of anesthesia. **Most respondents (87.3 %) stated that they were never distracted because of smartphone use; however, 41 % had witnessed their colleagues in such a situation at least once**.	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☒ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

				 **Fig. 2** The responses of the participants to the question whether (**a**) themselves or (**b**) another anaesthesia provider has ever been distracted with smartphone use. (shown as percentages in parantheses and respondent number on graphic)		
Journal: *American Surgeon* Author: Rose, J. S., et al Year Published: 2012 Location: USA	**Aim**: To evaluate the impact of paging on perceptions of intraoperative learning. **Study Type**: Observational Study **Size**: 124 operations	**Inclusion Criteria**: voluntary study of surgical residents	**Intervention**: Over a 30-day period, a log of intraoperative interruptions was created for all operations in which a surgical resident participated. During each operation, the circulating nurse documented the post-graduate year (PGY) of the resident, frequency of pager interruptions per operation, category of caller, reason for call, and the urgency of the page	**Results**: 55% (68) of operations were interrupted. For those interrupted operations, 45 % were interrupted once, 49% were interrupted two to five times, and 6% had six or more interruptions. Junior residents (PGY 1 to 3) were interrupted more frequently than senior-level residents (PGY 4 to 6) with 69% of their cases interrupted compared with 39% of senior residents (PGY 4 to 6) (P=0.001) **92% of pages were non-urgent. Residents did not perceive pager interruptions negatively impacted their educational but were neutral with respect if messages taken by a third party decreased interruptions.**	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☒ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Health Informatics Journal* Author: Sergeeva, A., et al.	**Aim**: To identify different patterns of mobile technology use by OR nurses,	**Inclusion Criteria**: All OR assistants	**Intervention**: the data was obtained through observations of OR teams' work practices and semi-	**Results**: In terms of ranking the benefits, the answers of 17 respondents to the open survey questions about advantages of iPod are illustrative: the use of protocols, also as	Study Limitations: ☐ None ***Non-Randomized***	

Year Published:2016 Location: Netherlands	including both work-related and non-work-related use. **Study Type** Qualitative study **Size**: 17 interviewees		structured interviews. OR staff was shadowed over 16 full-working days in February-April 2012, 10 full days in July-August 2012 and 5 full days during March 2013. The aim of the observations was to capture in rich detail the OR assistants' work practices and to observe the extent, location, frequency and type of iPod use during the everyday work practices and any effects of such use on work processes.	intended by initiators, was the one most often mentioned as being the primary reason for using the device (14 out of 17 respondents reported this benefit), followed by email (13 respondents) and the ability to look up information on the Internet needed for doing surgery (10 respondents). **In the survey responses, distraction was the most often mentioned disadvantage of iPod use: 9 out 17 respondents mentioned concerns regarding their partners paying less attention during surgery.** **Table 2.** Concerns over distractions caused by mobile devices. Distraction from core clinical tasks: To be honest, I am not that positive about it [iPods]. [...] Because I think that people use it too much for individual purposes, or private purposes, and the goal for which it was introduced here in the OR ... well, it's not used for only that goal. (Interviewee 6) Distraction from collaboration: When you see people playing games during the operation when you are supposed to be aware of what's happening, and one of the surgeons asks for something, for the scrub nurse who is on the table it's really handy if the circulating hears what the surgeon says, but when people start playing games they don't hear it anymore, so the scrub nurse has to ask also for new gauzes, for example. (OR assistant, Interviewee 10) Distraction from hands-on learning: I think there is a difference if you are experienced, you have an extra ear or an extra eye, and the student does not have that yet. And when they are on their iPod or their Facebook and they are really not paying attention to anything at all, that's disturbing when you have to ask for everything you need. Because they are students and they are here to learn, and they have to learn. (Interviewee 23)	☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☒ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *World Journal of Surgery* Author: Sevdalis, N., et al. Year Published: 2014 Location: UK	**Aim**: To test the hypothesis that intraoperative distractions are associated with deterioration in patient safety checks in the OR. **Study Type**: Prospective observational study **Size**: 24 elective urologic procedures	**Inclusion Criteria**: The same Attending surgeon performed all operations with assistance by a resident and the presence of an Attending anesthesiologist and senior OR nursing personnel. The anesthesia and nursing personnel came from the same "pool" across all procedures. Also, the OR personnel had ample experience of working together.	**Intervention**: Distractions were assessed via in vivo observation in the OR using an instrument previously developed and validated. A distraction was defined as "any event that occurs intraoperatively and that is not directly related to the care of the patient who is on the operating table at the time." Each observed distraction was rated for its visible severity on an anchored scale of 1 to 9, where 1 is a potentially distracting event and 9 is interrupted flow of the operation. Patient safety was assessed via in vivo observation using a checklist that was developed and validated for	**Results**: Patient tasks were completed more often than other tasks (minimum completion rate of 85 %), communication tasks were least likely to be completed, and tasks relating to OR equipment were in between. Significant variation was observed across procedures in terms of the proportion of tasks carried out by the OR team: task completion ranged from 100 % (all done) to 0 % (none done). **There were 6 events where phone/bleepers were the cause of the distraction with a mean severity of 3.67**	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

			use in general and urologic surgery			
Journal: *Perfusion* Author: Smith, T., et al. Year Published: 2011 Location: USA	**Aim**: To (1) determine the frequency of cell phone use in the perfusion community, and (2) to identify concerns and opinions among perfusionists regarding cell phone use. **Study Type**: survey study **Size**: 439 respondents	**Inclusion Criteria**: Members of the American Society of Extracorporeal Technology (AMSECT), particularly those on AMSECT's e-mail list, Perflist, as well as members of Perfusion.com's forum	**Intervention**: The 19-question survey was divided into 4 parts: Demographics, Communication Devices, Cell Phone Use on CPB, and Opinions on Cell Phones and Safety. The questions were developed to understand the role of cell phone use as a primary communication device among perfusionists, as well as to understand any distractions that might arise from their use.	**Results**: 54.1% of respondents reported the pager, a combined 44.4% used a cell phone (25.5% oral, 18.9% texting) and 1.4% use overhead paging. Every respondent owned a cell phone, with 58.9% owning a smart phone (internet, e-mail), 30.8% owning a phone with text facility and 10.3% owning a basic cell phone only capable of making calls. Among the respondents, 36.1 % had a hospital policy regarding cell phone use, while 16.4% had a perfusion department policy. **92.7% report that they have never been distracted or negatively affected on CPB and 98% report that they have never made an error on CPB that could be attributed to cell phone use. When asked about witnessing another perfusionist being distracted while on CPB due to cell phone use, 34.5% report that they have seen another perfusionist distracted. Additionally, 95.4% of respondents report no known serious perfusion accidents that were the direct result of cell phone use.**	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☒ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

References:
Healey, A. N., et al. (2007). "Quantifying distraction and interruption in urological surgery." Quality & Safety in Health Care 16(2): 135-139.
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Pico: In patients having surgery does eliminating music in the OR suites compared to OR suites where music is playing reduce the incidence of SE/SSI?

Music: Seven studies were included in the appraisal for the distracting effects of music in the OR and the relationship with adverse patient outcomes; three observational studies, two survey studies, one systematic review, and one randomized study.

Observational Studies: The first observational study (Dholakia 2015) assessed whether noise levels in the operating room are associated with the development of SSI and to elucidate the extent to which these levels affect the financial burden of surgery. The study included 64 elective, day-case males who were fit and at low risk for SSI undergoing elective hernia repairs. Patients were examined postoperatively weekly for the first 30 days and any SSI identified was recorded and classified. Noise levels during surgery were recorded in decibels at 10-minute intervals from the start of surgery. Five (7.81 %) of the 64 patients developed an SSI. All infections were superficial and treated with oral co-amoxiclav for 7 days. Overall, the noise levels were greater the group of patients that developed an SSI. The mean level for background noise was 47.6 dB before the procedure started. An independent samples t-test was performed and showed that the noise levels were greater in patients with SSI from time point of 50 minutes and greater. Music and nonrelated patient conversation as the 2 factors present when overall greater noise levels were observed. The second observational study (Jenkins 2015) included measured noise, and quantify potential distractions, in obstetric theatre before and during caesarean sections under regional anesthesia. 869 measurements in 30 c-sections were collected during three phases of anesthesia, defined as follows: Phase l, 'establishment of blockade', Phase 2, 'testing', Phase 3 began following delivery of the fetal head. The nature and frequency of any potential auditory and physical distractions were noted. Phase 3 (following delivery of the fetal head) had the greatest incidence of all types of auditory distraction, except the presence of music playing. There was no significant difference in the presence of music, which was playing on approximately 50% of occasions during each phase. The last observational study (Way 2013) simulated OR listening conditions and evaluated the effect of operating noise on auditory function.15 surgeons were presented with sentences from the Speech In Noise Test-Revised and asked to repeat the last word in the sentence under 4 different conditions. For condition 1, sentences were presented in quiet, equivalent to normal conversational levels recorded in the OR. In condition 2, the sentences were also presented in a quiet condition, however, a simulated filter effect of the surgical mask was applied to the sentences. In condition 3, surgeons were presented with different list of sentences, this time with 65 dB SPL of OR noise. Condition 4 music was (classic rock) in addition to the OR noise. This was presented at 74.2 dB SPL, which was the average level of music recorded across a sampling of ORs. In the untasked state, surgeons were seated in a comfort-able chair within a double-wall sound-treated room. In the tasked state, the surgeon was positioned at the same point as in the untasked condi-tion, however, they had to complete a manual dexterity task when responding. Poorer performance was demonstrated in the tasked vs the untasked condition ($P< 0.003$). A statistically significant difference with respect to 4 listening situations, with the best performance demonstrated in quiet ($P<0.001$). In the untasked condition, performance in quiet was superior to performance in noise ($P < 0.005$) and performance in noise plus music ($P< 0.008$). Noise and noise plus music were not found to be significantly different when untasked. Results in the tasked condition revealed the same trends

as the untasked condition (P< 0.002 for noise and P< 0.001 for music); however, there was a statistically significant difference between the noise and noise plus music condition (P< 0.009) as well.

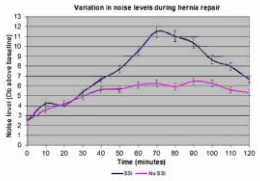
Survey Studies: One survey study (Hawksworth 1997) determined the prevalence of music playing in the operating theatre and anesthetists' attitudes to it. 144 randomly selected consultant anesthetists were included in the study. Respondents were sent a 13 question survey, an introductory letter and a stamped addressed envelope for return. Around 26% of the sample felt that music reduced their vigilance and impaired their communication with other staff while 11.5% felt that music might distract their attention from alarms. 51% felt that music was distracting when a problem was encountered during the anesthetic. The second survey study (Padmakumar 2017) obtained further information about the perspective of healthcare professionals on how noise can affect their practice and whether it affects their work in theatre. A 6 question survey was distributed via Survey Monkey across 50 National Health Service (NHS) hospitals in the United Kingdom. Most respondents (n = 385, 78%) thought that music did not have an adverse influence on them.

Randomized Study: One Prospective randomized study (Lies and Zhang 2015) evaluated the effect of music on simple wound closure. The study included 15 plastic surgery residents who were asked to perform layered closures on pigs' feet with and without their preferred music playing. Simple randomization was used to assign residents to the music playing first or music playing second group. The time to complete the repair was measured and repairs were graded by blinded faculty. Results were analyzed to determine significant differences in time to complete the task and quality of repair. Participants were retested in a second session with music played in the opposite order to evaluate consistency. The average time to complete the repair for all residents was 11.5 minutes without music and 10.6 minutes with music, a 7% difference (P = 0.04). The average rating without music was 3.09 and with music 3.3, a 6% increase. This was statistically significant (P = 0.047).

Systematic Review: One systematic review (Mentis 2016) aimed to identify the most common and most significant forms of distraction in order to devise guidelines for mitigating the effects of distractions in the OR. 17 studies were included and the appraisal determined there was high heterogeneity among the studies. However, the included experimental studies showed auditory distractions to have a significant impact corroborating the observational studies' findings that auditory distractions were quite distracting and associated with errors. Four studies showed the negative impact on error rates or accuracy. Four studies showed the negative impact on speed or time to task completion. Finally, two studies showed the negative impact on economy of motion. However, two studies also showed no impact at all from auditory distractions. In addition, three studies showed that the type of auditory distraction does make a difference in performance. Thus, not all auditory distractions are alike, and some, such as certain types of music, are associated with enhanced surgical performance outcomes.

Overall, there is *Very Low Quality* evidence to indicate that music may cause distractions and is associated with patient adverse outcomes. The literature was downgraded due to inconsistency and indirectness with the PICO question along with individual study design limitations.

PICO Question: In patients having surgery (P) does eliminating music in the OR suites (I) compared to OR suites where music is playing (C) reduce the incidence of surgical error/SSI (O)?

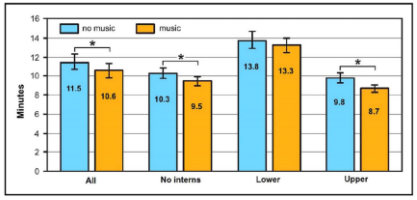
Study Acronym; Author; Year Published; Location	Aim of Study; Study Type; Study Size (N)	Patient Population	Study Intervention (# patients) / Study Comparator	Endpoint Results / Outcome (Absolute Event Rates, P values; OR or RR; & 95% CI)	Design Limitations
Journal: *Surgery* Author: Dholakia, S., et al. Year Published: 2015 Location: UK	**Aim**: To assess whether noise levels in the operating room are associated with the development of SSI and to elucidate the extent to which these levels affect the financial burden of surgery. **Study Type**: Prospective cohort study **Size**: 64 patients	**Inclusion Criteria**: elective, day-case males who were fit and at low risk for SSI undergoing elective hernia repairs. **Exclusion Criteria:** female sex, previous or existing SSI, known comorbidity associated with SSI, and any recent emergency procedure/ operation.	**Intervention**: Precautionary measures used to minimize SSI were used. Postoperatively, patients were examined weekly for the first 30 days and any SSI identified was recorded and classified. Noise levels during surgery were recorded in decibels at 10- minute intervals during a 1,201 minute period from the start of surgery. Background noise level was defined as the mean level from all the procedures, recorded before the start of the operation. Noise during the procedure was recorded as readings greater than this level once the operation started. Each operation was being timed so that key points of the operation could be recorded and causes for any large changes in noise could be measured; the timings of the procedure	**Results**: Five (7.81 %) of the 64 patients developed an SSL All infections were superficial and treated with oral co-amoxiclav for 7 days. Overall, the noise levels were greater the group of patients that developed an SSI. The mean level for background noise was 47.6 dB before the procedure started. An independent samples t-test was performed and showed that the noise levels were greater in patients with SSI from time point of 50 minutes and greater. **Music and nonrelated patient conversation as the 2 factors present when overall greater noise levels were observed**  **Fig.** The variation in noise levels during hernia repair; standard deviation error bars have been included. *SSI*, Surgical-site infection.	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up

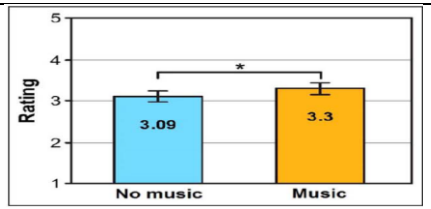
Low Quality Rating if:
☒ Studies inconsistent (*wide variation of treatment effect across studies, population, interventions, or outcomes varied*)
☒ Studies are indirect (*PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome*)
☐ Studies are imprecise (*when studies include few patients and few events, and thus have wide confidence intervals, and the results are uncertain*)
☐ Publication Bias (*e.g. pharmaceutical company sponsors study on effectiveness of drug only small, positive studies found*)

Increase Quality Rating if:
☐ Large effect
☐ Dose-response gradient
☐ Plausible confounders or other biases increase certainty of effect

Quality (certainty) of evidence for studies as a whole:
☐ High
☐ Moderate

			could then be compared with the noise data. Factors that may have contributed to the additional noise also were collected through surreptitious observation during the procedure by a member of staff.			☒ Very Low ☐ Low
Journal: *Anesthesia* Author: Hawksworth, C., et al. Year Published: 1997 Location: UK	**Aim**: To determine the prevalence of music playing in the operating theatre and anaesthetists' attitudes to it. **Study Type**: survey study **Size**: 144 respondents	**Inclusion Criteria**: randomly selected consultant anaesthetists in the United Kingdom	**Intervention**: 13 question survey, an introductory letter and a stamped addressed envelope for its return. Questionnaires were numbered to allow for remailing if the return rate was low but otherwise the answers were anonymous.	**Results**: **Around 26% of the sample felt that music reduced their vigilance and impaired their communication with other staff while 11.5% felt that music might distract their attention from alarms. 51% felt that music was distracting when a problem was encountered during the anaesthetic.** **Table 1** Opinions of respondents on the effect of music played during the anaesthetic. Values given are number (per cent). **Table 2** Opinions of respondents on the capacity of music to distract surgeons and anaesthetic assistants. Values given are number (per cent).	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☒ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Anesthesia* Author: Jenkins, A., et al. Year Published: 2015 Location: UK	**Aim**: To measure noise, and quantify potential distractionS, in obstetric theatre before and during caesarean sections under regional anaesthesia. **Study Type**: observational study **Size**: 869 measurements over 30 c-sections	**Inclusion Criteria**: both elective and emergency procedures, performed under subarachnoid anaesthesia, combined spinal-epidural anaesthesia or epidural blockade extended from that used during labour.	**Intervention**: The data were collected during three phases of anaesthesia, defined as follows. Phase l, 'establishment of blockade', Phase 2, 'testing', Phase 3 began following delivery of the fetal head. The nature and frequency of any potential auditory and physical distractions were noted.	**Results**: Phase 3 (following delivery of the fetal head) had the greatest incidence of all types of auditory distraction, except the presence of music playing. There was no significant difference in the pres-ence of music, which was playing on approximately 50% of occasions during each phase. Table 1 Auditory distractions during three phases of anaesthesia. Values are mean (SD), median (IQR) [range] or number (proportion). See text for comparative everyday sound levels. p values indicate that each phase differed significantly from the other phases.	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up	

					☐ Differences in important prognostic factors at baseline	
Journal: *Aesthetic Surgery Journal* Author: Lies, S. R. and A. Y. Zhang Year Published:2015 Location: USA	**Aim**: The goal of this study is to evaluate the effect of music on simple wound closure **Study Type**: Prospective Randomized Study **Size**: 15	**Inclusion Criteria**: plastic surgery residents	**Intervention**: Plastic surgery residents were asked to perform layered closures on pigs' feet with and without their preferred music playing. Simple randomization was used to assign residents to the music playing first or music playing second group. The time to complete the repair was measured and repairs were graded by blinded faculty. Results were analyzed to determine significant differences in time to complete the task and quality of repair. Participants were retested in a second session with music played in the opposite order to evaluate consistency.	**Results**: **The average time to complete the repair for all residents was 11.5 minutes without music and 10.6 minutes with music, a 7% difference (P = 0.04).** Subgroup analysis showed that when excluding interns, the average time to complete repair was 10.3 minutes without music and 9.5 minutes with music (P= 0.009), an 8% difference. PGY 1-3 completed the task with an average time of 13.8 minutes without music versus 13.3 minutes with music (P= 0.57). PGY 4-6, in comparison, completed the task with an average time of 9.8 minutes without music and 8.7 minutes with music (P= 0.006), a 10% decrease in time. **The average rating without music was 3.09 and with music 3.3, a 6% increase. This was statistically significant (P = 0.047).** Subgroup analysis according to level of training revealed a similar, though not significant, trend. Senior residents had an average rating of 3.3 without music and 3.36 with music, whereas lower levels had a rating of 2.9 without music com-pared to 3.27 with music. 	**Study Limitations:** ☐ None ***RCTs*** ☒ Lack of blinding ☒ Lack of allocation concealment ☐ Stopped early for benefit ☐ Incorrect analysis of ITT ☐ Selective reporting of measures (e.g., no effect outcome) ☐ Large losses to F/U ☐ Difference in important prognostic factors at baseline	

						
Journal: *Surgical Endoscopy* Author: Mentis, H. M., et al. Year Published: 2016 Location: USA	**Aim**: To identify the most common and most significant forms of distraction in order to devise guidelines for mitigating the effects of distractions in the OR. **Study Type**: Systematic Review **Size**: 17 studies	**Inclusion Criteria**: the study (1) presented novel empirical results, (2) specified distraction or a dis-tracting event such as noise as at least one of the constructs of interest, and (3) specified their interest in surgeon per-formance and/or surgery outcomes. **Exclusion Criteria**: (1) not pertaining to surgical environment or performance (2)not discussing distractions (3) did not present new data (4) presented survey data	**Intervention**: Outcomes of interest were effect of distraction on performance, distraction types, outcomes of distractions, effect of distractions on experience level	**Results**: There was high heterogeneity among the studies. **However, the included experimental studies showed auditory distractions to have a significant impact corroborating the observational studies' findings that auditory distractions were quite distracting and associated with errors.** Four studies showed the negative impact on error rates or accuracy. Four studies showed the negative impact on speed or time to task completion. Finally, two studies showed the negative impact on economy of motion. However, two studies also showed no impact at all from auditory distractions. In addition, three studies showed that the type of auditory distraction does make a difference in performance. **Thus, not all auditory distractions are alike, and some, such as certain types of music, are associated with enhanced surgical performance outcomes.**	**Study Limitations:** ☐ None ***Systematic Review*** ☐ Review did not address focused clinical question ☐ Search was not detailed or exhaustive ☒ Quality of the studies was not appraised or studies were of low quality ☒ Methods and/or results were inconsistent across studies	

<table>
<tr>
<td>Journal: British Journal of Oral & Maxillofacial Surgery
Author: Padmakumar, A. D., et al.
Year Published: 2017
Location:UK</td>
<td><u>Aim</u>: To obtain further information about the perspective of healthcare professionals on how noise can affect their practice and whether it affects their work in theatre.

<u>Study Type</u>: survey study

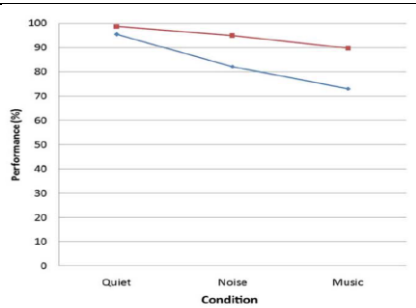
<u>Size</u>: 519 responses</td>
<td><u>Inclusion Criteria</u>: Healthcare professionals who worked in operating theaters across the UK.</td>
<td><u>Intervention</u>: 6 question survey distributed via Survey Monkey across 50 NHS hospitals</td>
<td><u>Results</u>: Most respondents (n = 385, 78%) thought that music did not have an adverse influence on them.

Table 2
Factors thought to be adversely affected by noise (n = 519). Participants were given an opportunity to select more than one option for this question.
<table><tr><th>Factors</th><th>Number (%)</th></tr><tr><td>Communications between staff</td><td>400 (80)</td></tr><tr><td>Concentration</td><td>384 (77)</td></tr><tr><td>Stress level</td><td>305 (61)</td></tr><tr><td>Effective team work</td><td>288 (58)</td></tr><tr><td>Performance in general</td><td>251 (50)</td></tr><tr><td>Performance of some tasks</td><td>234 (47)</td></tr><tr><td>None</td><td>8 (2)</td></tr></table></td>
<td>Study Limitations:
☐ None
Non-Randomized
☐ Failure to develop and apply appropriate eligibility criteria
☒ Flawed measurement of both exposure and outcome
☒ Failure to adequately control confounding
☐ Incomplete or inadequately short follow-up
☐ Differences in important prognostic factors at baseline</td>
<td></td>
</tr>
<tr>
<td>Journal: Journal of the American College of Surgeons
Author: Way, T. J., et al.
Year Published: 2013
Location: USA</td>
<td><u>Aim</u>: To simulate OR listening conditions and evaluate the effect of operating noise on auditory function.

<u>Study Type</u>: Prospective observational study

<u>Size</u>: 15 surgeons</td>
<td><u>Inclusion Criteria</u>: Surgeons with normal hearing and free of neurologic and otologic impairment.</td>
<td><u>Intervention</u>: Surgeons were presented with sentences from the Speech In Noise Test-Revised and asked to repeat the last word in the sentence under 4 different conditions. For condition 1, sentences were presented in quiet, equivalent to normal conversational levels recorded in the OR. In condition 2, the sentences were also presented in a quiet condition, however, a simulated filter effect of the surgical mask was applied to the sentences. In condition 3, surgeons were presented with different list of sentences, this time with 65 dB SPL of OR noise. Condition 4 music was (classic rock)</td>
<td><u>Results</u>: Poorer performance was demonstrated in the tasked vs the untasked condition (P< 0.003). A statistically significant difference with respect to 4 listening situations, with the best performance demonstrated in quiet (P<0.001).

In the untasked condition, performance in quiet was superior to performance in noise (P < 0.005) and performance in noise plus music (P< 0.008). Noise and noise plus music were not found to be significantly different when untasked. Results in the tasked condition revealed the same trends as the untasked condition (P< 0.002 for noise and P< 0.001 for music); however, there was a statistically significant difference between the noise and noise plus music condition (P< 0.009) as well.</td>
<td>Study Limitations:
☒ None
Non-Randomized
☐ Failure to develop and apply appropriate eligibility criteria
☐ Flawed measurement of both exposure and outcome
☐ Failure to adequately control confounding
☐ Incomplete or inadequately short follow-up
☐ Differences in important prognostic factors at baseline</td>
<td></td>
</tr>
</table>

			in addition to the OR noise. This was presented at 74.2 dB SPL, which was the average level of music recorded across a sampling of ORs. In the untasked state, surgeons were seated in a comfort-able chair within a double-wall sound-treated room. In the tasked state, the surgeon was positioned at the same point as in the untasked condi-tion, however, they had to complete a manual dexterity task when responding.	 **Figure 2.** Audiological performance in 3 listening conditions (quiet, noise, and music) in both tasked (blue line) and untasked (red line) conditions.		

References:
Dholakia, S., et al. (2015). "The association of noise and surgical-site infection in day-case hernia repairs." Surgery 157(6): 1153-1156.
Hawksworth, C., et al. (1997). "Music in theatre: not so harmonious. A survey of attitudes to music played in the operating theatre." Anesthesia 52(1): 79-83.
Jenkins, A., et al. (2015). "Distractions during critical phases of anaesthesia for caesarean section: an observational study." Anaesthesia 70(5): 543-548.
Lies, S. R. and A. Y. Zhang (2015). "Prospective Randomized Study of the Effect of Music on the Efficiency of Surgical Closures." Aesthetic Surgery Journal 35(7): 858-863.
Mentis, H. M., et al. (2016). "A systematic review of the effect of distraction on surgeon performance: directions for operating room policy and surgical training." Surgical Endoscopy 30(5): 1713-1724.
Padmakumar, A. D., et al. (2017). "Effect of noise on tasks in operating theatres: a survey of the perceptions of healthcare staff." British Journal of Oral & Maxillofacial Surgery 55(2): 164-167.
Way, T. J., et al. (2013). "Effect of noise on auditory processing in the operating room." Journal of the American College of Surgeons 216(5): 933-938.

Pico: In patients having surgery does eliminating interruptions at the surgical field during surgical counts compared to surgical counts with no intervention to limit distractions and interruptions reduce the incidence of retained surgical items or incorrect counts?

Eliminating Interruptions: Twelve studies were included in the appraisal for eliminating interruptions in the OR and the relationship with patient outcomes: seven observational studies, one survey study, one observational and survey study, one before and after study, one randomized study, and one systematic review.

Observational Studies: One observational study (Broom 2011) was conducted to qualify and quantify commonly occurring distractions and non-essential activities during the different phases of anesthesia including 30 anesthetic inductions, maintenances and

emergencies. Study found the mean (SD) noise during emergence (58.3 (6.2) dB) was higher than during induction (46.4 (4.3) dB) and maintenance (52 (4.5) dB; P<0.001). Sudden loud noises, greater than 70 dB, occurred more frequently at emergence (occurring 34 times) than at induction (occurring nine times) or maintenance (occurring 13 times). The median (IQR [range]) of staff entrances or exits were 0 (0-2 [0-7]), 6 (3-10 [1-18]) and 10 (5-12 [1-20]) for induction, maintenance and emergence, respectively (P<0.001). Conversations unrelated to the procedure occurred in 28/30 (93%) emergences. These data demonstrate increased distraction during emergence compared with other phases of anesthesia. The second observational study (Campbell 2012) included determined the frequency and nature of distracting events to the anesthetist through-out the entire anesthetic process and to analyze the possible consequences these might have on the patient. Observations focused solely on distractions encountered by the anesthetist and were quantified and classified during the case. 15 post-case interviews were performed. Each respondent was interviewed after he/she had been observed, at an interval varying from days to weeks. The average frequency of distracting events, per minute, was 0.23 overall, with 0.29 during induction, 0.33 during transfer into theatre, 0.15 during maintenance, and 0.5 during emergence. Ninety-two (22%) events were judged to have a negative effect, and 14 (3.3%) positive. The third observational study (Healey 2007) aimed to quantify distraction and interruption to the sterile surgical team in urology. An observer recorded events that distracted or interrupted the sterile surgical team in 30 urology day-case procedures. The total of distraction or interruption events observed per case ranged from 1 to 89, with a mean of 20.47. The rate of events observed per minute ranged from 0.11 to 0.82, with a mean of 0.45 events/min. The ordinal rating tally for each case ranged from 8 to 266. Cumulative work interruption as a percentage of the operation duration ranged from 0.41% to 50.17%, with a mean of 13.05%, an average of 5.66 min interruption per operation. Movement through the operating theatre was very frequent, with 1543 door openings, a mean rate of 1.08/min for the whole sample. Conversation was the most frequent source of interruption with 198 total events and an average distraction rating of 4.55 for a total interruption duration of over 100 minutes. The fourth observational study (Healey 2006) observed and recorded the frequency of distraction and interruption in the operating theatre during the intra-operative phase of surgery, that is, from incision to closure (pre- and post-operative phases warrant separate study). The total counts of events per case ranged from one to 39, with a mean of 13.56 (SE+1.12). The total count of events per case as a proportion of operative time ranged from 0.04 to 0.86 per min, with an average of 0.29 (SE+0.02). There were a total of 84 case irrelevant conversations which had a statistically significant effect on the staff. The fifth observational study (Jothirai 2013) investigated the quality, context, and direction of distraction involving the anesthesiologist. 3557 potentially distracting events were observed, of which 1173 (33%) were deemed to score >= 2 on the distraction scale (i.e. caused distraction). Of these 3557 events, 1227 involved the anesthetist 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 anesthetist (816/3557). Sixty distracting events were observed while the anesthetist was preparing or administering drugs (~2 per case). Of the 60 drug-related distracting events, 26 were initiated by the anesthetist, and 3 of 7 airway events. The sixth observational study (Sevdalis 2007) described the content, initiators and recipients of

communications that intruded or interfered with individual surgical cases and to consider the level at which the surgical team and its team members are distracted by these case-irrelevant communications (CICs). Surgeons were the most likely initiators of a CIC event (35.80%), followed by anesthetists (25.93%), nurses (23.46%) and external staff visiting the OT [14.82%; P < 0.01]. In addition to being the most likely initiators of CICs, surgeons were also the most likely recipients of them (61.73%), followed by the nursing staff (24.07%) and the anesthetists [14.20%; P,0.001]. The CIC events that were related to equipment and provisions were more distracting than irrelevant comments/queries (P < 0.01), more distracting than patient-related CICs (P < 0.05), and, finally, more distracting than teaching (P < 0.01 'Small-talk' was significantly less distracting than CICs that related to patient, equipment or provisions [P<0.05]. External initiators initiated CI Cs that were significantly more distracting to the team than those initiated by surgeons (P < 0.01) or by anesthetists (P = 0.05). Surgeons received less distracting CICs than either anesthetist (P < 0.05) or nurses (P < 0.05). The final observational study (Sevdalis 2014) included in the appraisal assessed distractions in the OR using an instrument previously developed and validated. Each observed distraction was rated for its visible severity on an anchored scale of l to 9, where l is a potentially distracting event and 9 is interrupted flow of the operation. Patient tasks were completed more often than other tasks (minimum completion rate of 85%), communication tasks were least likely to be completed, and tasks relating to OR equipment were in between. Significant variation was observed across procedures in terms of the proportion of tasks carried out by the OR team: task completion ranged from 100% (all done) to O% (none done).Distracting communications instigated by external visitors to the OR were most distracting to the team, matched only by communications stemming from the surgeons. The correlation between distractions and the patient safety task completion was statistically significant (P<0.05).

Survey Study: One survey study (Lee 2013) evaluated and characterized distractions during urologic surgery using an internet-based survey distributed to urologists. The survey consisted of 6 questions each on demographic data and clinical practice details, followed by 36 questions focused on various factors that have been theorized or demonstrated to have a negative impact on surgical performance of either cognitive and/or psychomotor skills. 72% commonly discussed consults with trainees while in the OR, and 54% reported being distracted routinely by loud talking between the scrub team and circulating nurses. When asked specifically about preventable intraoperative complications, 13% of respondents believed that at least one surgical adverse event had been caused mainly by an internal distraction (fatigue, illness, injury, stress) while 15% thought that at least one surgical complication had occurred mainly because of an external distraction (music, pager, discussing consults, loud talking in OR, etc). Routine performance of a preoperative ‘‘time-out’’ was reported by 89% of respondents with patient identification (91%), proposed surgical procedure (94%), and side/location of surgery (87%) being the most commonly discussed items. Among urologists who routinely performed preoperative time-outs, only 4% reported any discussion of internal distractions that may affect OR performance (surgeon fatigue, illness, MSK injury, social stress), while only 5% mentioned any discussion of other external or interactive factors that could potentially affect OR performance.

Observational and Survey Study: One study (Persoon 2011) aimed to quantify the frequency, nature, and effect on performance of (potentially) distracting events occurring during endourological procedures and additionally explored urologists' and residents' perspectives on experienced ill effects due to distracting factors. Methods include a seven-point ordinal scale to measure the level of observed interference with the main task of the surgical team and semistructured interviews with eight urologists and seven urology residents in two hospitals to obtain their perspectives on the impact of distracting factors. A median of 20 distracting events occurred per procedure, which corresponds to an overall rate of one distracting event every 1.8 min. Equipment problems and procedure-related and medically irrelevant communication were the most frequently observed causes of interruptions and identified as the most distracting factors in the interviews. Occurrence of distracting factors in difficult situations requiring high levels of concentration was perceived by all interviewees as disturbing and negatively impacting performance. The majority of interviewees (13/15) thought distracting factors impacted more strongly on residents' compared to urologists' performance due to their different levels of experience.

Before and After Study: One study (Wright 2016) educated perioperative team members about no-interruption-zones (NIZs), implemented NIZs in the perioperative setting, and measured dB levels during the critical phases of surgery to determine if NIZs reduce nonessential noise in the OR. Study found that there was a statistically significant decrease in noise in all of the 5 phases before and after the intervention.

Randomized Study: One randomized study (Murji 2016) study evaluated the impact of distractions on patient care by (1) assessing the accuracy and safety of responses to clinical questions posed to a surgeon while operating and (2) determining whether pager distractions affect simulation-based surgical performance. Upon arrival, informed consent was obtained and subjects completed a brief demographics survey. Residents were then provided 10 min to review a patient sign-out list from which they would later be asked a series of questions during the simulation. After reviewing the sign-out list, all residents were encouraged to familiarize themselves with the simulator by completing a training module prior to randomization. Residents were randomized into 1 of 2 groups: distraction followed by quiet phase or quiet followed by distraction phase. Residents were given 10 min to complete a laparoscopic task, and the same task was performed twice (once during the distraction phase and once during the quiet phase) with a 10-min washout period in between. The laparoscopic task consisted of a salpingectomy module for treatment of an ectopic pregnancy. The mean score for correct responses to clinical questions during the distracted phase was 80 % (SD ±14 %). 19 residents (63 %) made at least 1 unsafe clinical decision while operating on the simulator (range 0-3). Regardless of which order the distraction was presented, there was no difference in mean clinical accuracy scores (81 vs. 79 % when distraction phase first vs. second, P= 0.65)or the number of unsafe decisions (13 vs. 12) between the randomization arm. Five residents (20 %) made 1 unsafe clinical decision (range 0-1). The mean score for correct responses to clinical questions was significantly higher when questions were asked in a quiet setting compared to the distracted phase during the simulated laparoscopic task (93 vs. 80 %, P < 0.01). The number of residents who made at least 1 unsafe

decision was significantly lower in the quiet setting compared to the distracted phase (20 vs. 63 %, P < 0.01).Subjects were more likely to successfully complete the surgical task in the allotted time under the quiet compared to distracted phase (OR 11.3, 95 % CI 1.14-110.4, P=0.03).

Systematic Review: One systematic review (Mentis 2016) identified the most common and most significant forms of distraction in order to devise guidelines for mitigating the effects of distraction in the OR. There was high heterogeneity among the 17 studies. However the trends of the included studies indicated that movement and case-irrelevant conversation were the most frequently occurring distractions, but equipment and procedural distractions were the most severe. Auditory and mental distractions can significantly impact surgical performance, but visual distractions do not incur the same level of effects; (2) task difficulty has an interaction effect with distractions; and (3) inexperienced subjects reduce their speed when faced with distractions, while experienced subjects did not.

Overall, there is *Low Quality* evidence to indicate that eliminating interruptions may reduce patient adverse outcomes. The literature was downgraded due to inconsistency and indirectness with the PICO question along with individual study design limitations.

PICO Question: In patients having surgery does eliminating interruptions at the surgical field during surgical counts (I) compared to surgical counts with no intervention to limit distractions and interruptions (C) reduce the incidence of RSI and incorrect counts?						**Low Quality Rating if:** ☒ Studies inconsistent (*wide variation of treatment effect across studies, population, interventions, or outcomes varied*) ☒ Studies are indirect (*PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome*) ☐ Studies are imprecise (*when studies include few patients and few events, and thus have wide confidence intervals, and the results are uncertain*) ☐ Publication Bias (*e.g. pharmaceutical company sponsors study on effectiveness of drug only*
Study Acronym; Author; Year Published; Location	**Aim of Study; Study Type; Study Size (N)**	**Patient Population**	**Study Intervention (# patients) / Study Comparator**	**Endpoint Results / Outcome (Absolute Event Rates, P values; OR or RR; & 95% CI)**	**Design Limitations**	
Journal: *Anaesthesia* Author: Broom, M. A., et al. Year Published: 2011 Location: UK	**Aim**: To qualify and quantify commonly occurring distractions and non-essential activities dur-ing the different phases of anesthesia. **Study Type**: Observational Study **Size**: 30 anesthetic inductions, maintenances and emergences	**Inclusion Criteria**: 30 inductions (from first administration of oxygen or medication until leaving the anaesthetic room), 30 maintenance phases (from conunencement of surgical preparation until final wound closure) and 30 emergences, selected at random, though not by randomization, and representing all specialties.	**Intervention**: the nature and frequency of potential distractions: noise levels; sudden loud noises; number of alarms sounding; whether music was playing; staff numbers present; their move-ments during each phase of anaesthesia; and the number of conversations unrelated to the task in hand were recorded by a single observer.	**Results**: Mean (SD) noise during emergence (58.3 (6.2) dB) was higher than during induction (46.4 (4.3) dB) and maintenance (52 (4.5) dB; P<0.001). Sudden loud noises, greater than 70 dB, occurred more frequently at emergence (occurring 34 times) than at induction (occurring nine times) or maintenance (occurring 13 times). The median (IQR [range]) of staff entrances or exits were 0 (0-2 [0-7]), 6 (3-10 [1-18]) and 10 (5-12 [1-20]) for induction, maintenance and emergence, respectively (P<0.001). Conversations unrelated to the procedure occurred in 28/30 (93%) emergences. These data demonstrate increased distraction during emergence compared with other phases of anaesthesia.	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☒ Incomplete or inadequately short follow-up	

<table>
<tr>
<td>Journal: British Journal of Anaesthesia
Author: Campbell, G., et al.
Year Published: 2012
Location:UK</td>
<td><u>Aim</u>: To determine the frequency and nature of distracting events to the anaesthetist through-out the entire anaesthetic process and to analyse the possible consequences these might have on the patient.

<u>Study Type</u>: observational study

<u>Size</u>: 30 anesthetics</td>
<td><u>Inclusion Criteria</u>: elective and emergency cases, a range of specialities, different theatres, and as many anaesthetists as possible during a 6 month time period</td>
<td><u>Intervention</u>: Observations focused solely on distractions encountered by the anesthetist and were quantified and classified during the case. 15 post-case interviews were performed Each respondent was interviewed after he/she had been observed, at an interval varying from days to weeks.</td>
<td><u>Results</u>: The average frequency of distracting events, per minute, was 0.23 overall, with 0.29 during induction, 0.33 during transfer into theatre, 0.15 during maintenance, and 0.5 during emergence. Ninety-two (22%) events were judged to have a negative effect, and 14 (3.3%) positive.

Table 5 Negative patient impact associated with distracting events
<table><tr><th>Negative consequence</th><th>Distraction</th><th>Interruption</th></tr><tr><td>Deterioration in physiological variables</td><td>8</td><td>9</td></tr><tr><td>Prevention of smooth induction of anaesthesia</td><td>7</td><td>3</td></tr><tr><td>Repeated attempts at procedures</td><td>6</td><td>1</td></tr><tr><td>Brief periods when the patient was unattended by anaesthetist</td><td>0</td><td>25</td></tr><tr><td>Delays in procedure (including transfer, reconnecting monitoring, and responding to other tasks)</td><td>10</td><td>10</td></tr><tr><td>Malfunctioning equipment</td><td>11</td><td>1</td></tr></table></td>
<td>Study Limitations:
☐ None
Non-Randomized
☐ Failure to develop and apply appropriate eligibility criteria
☐ Flawed measurement of both exposure and outcome
☐ Failure to adequately control confounding
☒ Incomplete or inadequately short follow-up</td>
<td rowspan="2">small, positive studies found)

<u>Increase Quality Rating if:</u>
☐ Large effect
☐ Dose-response gradient
☐ Plausible confounders or other biases increase certainty of effect

<u>Quality (certainty) of evidence for studies as a whole:</u>
☐ High
☐ Moderate
☐ Very Low
☒ Low</td>
</tr>
<tr>
<td>Journal: Quality & Safety in Health Care
Author: Healey, A. N., et al.
Year Published: 2007
Location: UK</td>
<td><u>Aim</u>: To quantify distraction and interruption to the sterile surgical team in urology.

<u>Study Type</u>: observational study

<u>Size</u>: 30 urology day-case procedures</td>
<td><u>Inclusion Criteria</u>: An observer recorded events that distracted or interrupted the sterile surgical team. We defined distraction as observed behavior such as orienting away from a primary task or verbally responding to a secondary task. We defined interruption as a distraction resulting in a break in primary task activity.</td>
<td><u>Intervention</u>: The observer recorded a brief description of each distraction or interruption and rated each using the ordinal scale, also noting the time of onset and end of observed work interruption. Concurrently, the observer collected a tally of personnel entering or leaving the operating theatre.</td>
<td><u>Results</u>: The total of distraction or interruption events observed per case ranged from 1 to 89, with a mean of 20.47. The rate of events observed per minute ranged from 0.11 to 0.82, with a mean of 0.45 events/min. The ordinal rating tally for each case ranged from 8 to 266. Cumulative work interruption as a percentage of the operation duration ranged from 0.41% to 50.17%, with a mean of 13.05%, an average of 5.66 min interruption per operation. Movement through the operating theatre was very frequent, with 1543 door openings, a mean rate of 1.08/min for the whole sample.

Conversation was the most frequent source of interruption with 198 total events and an average distraction rating of 4.55 for a total interruption duration of over 100 minutes.

Table 3 Totalled events observed and their ratings, and interruption duration associated with each source category
<table><tr><th>Source</th><th>Tally of events (a)</th><th>Tally of event ratings (b)</th><th>Ratio of a to b</th><th>Interruption duration</th></tr><tr><td>Conversation</td><td>198</td><td>902</td><td>4.55</td><td>100.62</td></tr><tr><td>Phone</td><td>130</td><td>283</td><td>2.17</td><td>4.05</td></tr><tr><td>Bleeper</td><td>26</td><td>40</td><td>1.53</td><td>1.30</td></tr><tr><td>Equipment</td><td>58</td><td>376</td><td>6.48</td><td>35.48</td></tr><tr><td>Procedure</td><td>36</td><td>195</td><td>5.41</td><td>26.73</td></tr><tr><td>Environment</td><td>163</td><td>351</td><td>2.15</td><td>1.53</td></tr><tr><td>Monitor</td><td>3</td><td>10</td><td>3.33</td><td>0.13</td></tr></table></td>
<td>Study Limitations:
☒ None
Non-Randomized
☐ Failure to develop and apply appropriate eligibility criteria
☐ Flawed measurement of both exposure and outcome
☐ Failure to adequately control confounding
☐ Incomplete or inadequately short follow-up
☐ Differences in important prognostic factors at baseline</td>
</tr>
</table>

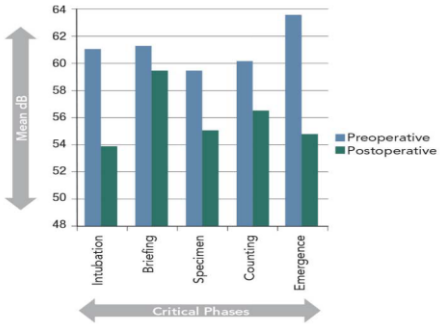
Journal: *Ergonomics* Author: Healey, A. N., et al. Year Published: 2006 Location: UK	**Aim**: To observe and record the frequency of distraction and interruption in the operating theatre during the intra-operative phase of surgery, that is, from incision to closure (pre- and post-operative phases warrant separate study) **Study Type**: observational study **Size**: 50 general operations (29 laparoscopic and 21 open) were sampled from a single operating theatre in a National Health Service Teaching Hospital	**Inclusion Criteria**: General operations at a teaching hospital. **Exclusion Criteria**: Short examinations and cases likely to last more than 4 h, from incision to closure, were excluded, as the observational method was particularly demanding of attention.	**Intervention**: Scale points 1–3 refer to salient events that potentially or actually distract or interrupt the work of a circulating nurse. Scale points 4–6 refer to observed distraction or interruption to a single member of the team. Scale points 7–8 refer to similar distraction or interruption to points 5 and 6, but where two or more team members are involved. The highest scale point 9 refers to observed interruption to the whole team, where they are observed to attend to another event.	**Results:** The total counts of events per case ranged from one to 39, with a mean of 13.56 (SE+1.12). The total count of events per case as a proportion of operative time ranged from 0.04 to 0.86 per min, with an average of 0.29 (SE+0.02). **There were a total of 84 case irrelevant conversations which had a statistically significant effect on the staff.** Table 2. Summary data on recorded events from the 50-case sample, in the frequency and levels of interference for each source category. Source / n cases* / Mean count† / Max count‡ / Mean rate§ / I–mean/case¶ / I–sample‖ Phone / 26 / 1.62 / 4 / 3.90 / 6.31 / 164 Bleeper / 36 / 3.31 / 21 / 2.30 / 8.56 / 274 Radio / 6 / 1.00 / 1 / 3.67 / 3.67 / 22 A cic / 27 / 1.63 / 4 / 4.30 / 7.00 / 189 S cic / 33 / 1.88 / 5 / 4.35 / 8.18 / 270 N cic / 24 / 1.46 / 3 / 4.83 / 7.04 / 169 Communication / 10 / 1.10 / 2 / 5.77 / 5.22 / 5 External staff / 25 / 1.44 / 3 / 4.75 / 11.18 / 271 Equipment / 35 / 1.83 / 7 / 5.84 / 10.69 / 374 Procedural / 36 / 1.86 / 6 / 5.13 / 9.56 / 344 Environment / 27 / 1.78 / 6 / 5.58 / 9.93 / 268 Monitor B / 26 / 5.00 / 13 / 1.06 / 5.52 / 138 Monitor F / 9 / 1.56 / 4 / 1.71 / 3.00 / 24 *Shows the number of cases where a particular source was recorded. †Refers to the mean number of events from cases where they were recorded. ‡Shows the maximum count of recorded events for each source in a single case. §Shows the mean rating assigned to events across the 50-case sample. ¶Shows the mean interference (I) from each category to cases where those events were recorded. ‖Shows the sum I of each category from the entire 50-case sample. A = anaesthetists; N = nurses; S = surgeons; cic = case-irrelevant conversation; Monitor-B = movement behind video display monitor; Monitor-F in front of video display monitor. Table 4. A sum count of groups observed effected by separate sources of interference. Source / A / N / S / χ^2* / $p <$ Phone / 5 / 20 / 18 / 9.25 / 0.01 Bleeper / 7 / 45 / 13 / 38.52 / 0.0001 Radio / 2 / 4 / 3 / – / NS A cic / 21 / 3 / 24 / 16.12 / 0.0001 S cic / 4 / 10 / 58 / 58.62 / 0.0001 N cic / 2 / 29 / 13 / 25.13 / 0.0001 Communication / 1 / 5 / 7 / – / NS External staff / 8 / 26 / 31 / 13.5 / 0.001 Equipment / 12 / 40 / 47 / 20.78 / 0.0001 Procedural / 42 / 10 / 18 / 23.77 / 0.0001 Work environments / 12 / 21 / 44 / 21.22 / 0.0001 Group total / 116 / 213 / 276 *Test results show significant differences between groups, affected by different sources. A = anaesthetists; N = nurses; S = surgeons; cic = case-irrelevant conversation.	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *British Journal of Anaesthesia* Author: Jothiraj, H., et al Year Published: 2013 Location:	**Aim**: to investigate the quality, context, and direction of distraction involving the anesthesiologist **Study Type**: Observational study **Size**: 32 operations	**Inclusion Criteria**: Surgical Operations	**Intervention**: A validated rating scale was developed to measure the effect of distractions. The parties involved, the relative urgency of the distraction and the likely benefit or harm to the initiator and recipient were also observed and recorded.	**Results:** 3557 potentially distracting events were observed, of which 1173 (33%) were deemed to score >= 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.**	Study Limitations: ☐ None ***Non-Randomized*** ☒ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up	

				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	☐ Differences in important prognostic factors at baseline	
Journal: *Journal of Endourology* Author: Lee, J. Y., et al. Year Published: 2013 Location: Canada	**Aim**: To evaluate and characterize distractions during urologic surgery. **Study Type**: Survey Study **Size**: 523 respondents	**Inclusion Criteria**: Urologists in Endourological Society and the Canadian Urological Association membership lists.	**Intervention**: An Internet-based survey was distributed to 2057 international urologists in June 2011. The survey consisted of 6 questions each on demographic data and clinical practice details, followed by 36 questions focused on various factors that have been theorized or demonstrated to have a negative impact on surgical performance of either cognitive and/or psychomotor skills. Urologists were able to anonymously provide responses through the Internet-based Web site.	**Results**: 72% commonly discussed consults with trainees while in the OR, and 54% reported being distracted routinely by loud talking between the scrub team and circulating nurses. When asked specifically about preventable intraoperative complications, 13% of respondents believed that at least one surgical adverse event had been caused mainly by an internal distraction (fatigue, illness, injury, stress) while **15% thought that at least one surgical complication had occurred mainly because of an external distraction (music, pager, discussing consults, loud talking in OR, etc).** Routine performance of a preoperative "time-out" was reported by 89% of respondents with patient identification (91%), proposed surgical procedure (94%), and side/location of surgery (87%) being the most commonly discussed items. **Among urologists who routinely performed preoperative time-outs, only 4% reported any discussion of internal distractions that may affect OR performance (surgeon fatigue, illness, MSK injury, social stress), while only 5% mentioned any discussion of other external or interactive factors that could potentially affect OR performance.**	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Surgical Endoscopy* Author: Murji, A., et al.	**Aim**: To evaluate the impact of distractions on patient care by (1) assessing the	**Inclusion Criteria**: OB/GYN residents	**Intervention**: Upon arrival, informed consent was obtained and sub-jects completed a brief	**Results**: The mean score for correct responses to clinical questions during the distracted phase was 80 % (SD ±14 %). **19 residents (63 %) made at least 1 unsafe clinical decision while operating on the simulator**	**Study Limitations:** ☐ None ***RCTs*** ☒ Lack of blinding	

Year Published: 2016 Location: Canada	accuracy and safety of responses to clinical questions posed to a surgeon while operating and (2) determining whether pager distractions affect simulation-based surgical performance. **Study Type**: randomized crossover study **Size**: 30 residents		demographics survey. Residents were then provided 10 min to review a patient sign-out list from which they would later be asked a series of questions during the simulation. After reviewing the sign-out list, all residents were encouraged to familiarize themselves with the simulator by completing a training module prior to randomization. Residents were randomized into 1 of 2 groups: distraction followed by quiet phase or quiet followed by distraction phase. Residents were given 10 min to complete a laparoscopic task, and the same task was performed twice (once during the distraction phase and once during the quiet phase) with a 10-min washout period in between. The laparoscopic task consisted of a salpingectomy module for treatment of an ectopic pregnancy.	**(range 0-3). Regardless of which order the distraction was presented, there was no difference in mean clinical accuracy scores (81 vs. 79 % when distraction phase first vs. second, P= 0.65) or the number of unsafe decisions (13 vs. 12) between the randomization arm.** **Five residents (20 %) made 1 unsafe clinical decision (range 0-1).** The mean score for correct responses to clinical questions was significantly higher when questions were asked in a quiet setting compared to the distracted phase during the simulated laparoscopic task (93 vs. 80 %, P < 0.01). **The number of residents who made at least 1 unsafe decision was significantly lower in the quiet setting compared to the distracted phase (20 vs. 63 %, P < 0.01).Subjects were more likely to successfully complete the surgical task in the allotted time under the quiet compared to distracted phase (OR 11.3, 95 % CI 1.14-110.4, P=0.03)**	☐ Lack of allocation concealment ☐ Stopped early for benefit ☐ Incorrect analysis of ITT ☐ Selective reporting of measures (e.g., no effect outcome) ☐ Large losses to F/U ☐ Difference in important prognostic factors at baseline	
Journal: *Journal of Evaluation in Clinical Practice* Author: Sevdalis, N., et al. Year Published: 2007 Location: UK	**Aim**: To describe the content, initiators and recipients of communications that intrude or interfere with individual surgical cases and to consider the level at which the surgical team and its team members are distracted by these case-irrelevant	**Inclusion Criteria**: CICs (as well as other observable distractions, such as ringing telephones, malfunctioning equipment and others)	**Intervention**: Case-irrelevant communication events were recorded in 48 general surgery procedures in a large teaching hospital. Nineteen of the procedures were open and 29 closed. All procedures lasted between 30 minutes and 4 hours. Two psychologist observers sampled 48 general surgery procedures and they recorded the initiator and the recipient of	**Results**: **Surgeons were the most likely initiators of a CIC event (35.80%), followed by anaesthetists (25.93%), nurses (23.46%) and external staff visiting the OT [14.82%; P < 0.01]**. In addition to being the most likely initiators of CICs, surgeons were also the most likely recipients of them (61.73%), followed by the nursing staff (24.07%) and the anaesthetists [14.20%; P,0.001]. **The CIC events that were related to equipment and provisions were more distracting than irrelevant comments/queries (P < 0.01), more distracting than patient-related CICs (P < 0.05), and, finally, more distracting than teaching (P < 0.01 'Small-talk' was**	Study Limitations: ☐ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☒ Failure to adequately control confounding	

	communications (CICs). **Study Type**: observational study **Size**: 48 general surgery procedures		CIC events, their content and the level of observable distraction that they caused.	**significantly less distracting than CICs that related to patient, equipment or provisions [P<0.05].** **External initiators initiated CI Cs that were significantly more distracting to the team than those initiated by surgeons (P < 0.01) or by anesthetists (P = 0.05). Surgeons received less distracting CICs than either anesthetist (P < 0.05) or nurses (P < 0.05).**	☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *Surgical Endoscopy* Author: Mentis, H. M., et al. Year Published: 2016 Location: USA	**Aim**: To identify the most common and most significant forms of distraction in order to devise guidelines for mitigating the effects of distractions in the OR. **Study Type**: Systematic Review **Size**: 17 studies	**Inclusion Criteria**: the study (1) presented novel empirical results, (2) specified distraction or a dis-tracting event such as noise as at least one of the constructs of interest, and (3) specified their interest in surgeon per-formance and/or surgery outcomes. **Exclusion Criteria**: (1) not pertaining to surgical environment or performance (2)not discussing distractions (3) did not present new data (4) presented survey data	**Intervention**: Outcomes of interest were effect of distraction on performance, distraction types, outcomes of distractions, effect of distractions on experience level	**Results**: There was high heterogeneity among the studies. However the trends of the included studies indicated that **movement and case-irrelevant conversation were the most frequently occurring distractions, but equipment and procedural distractions were the most severe. Auditory and mental distractions can significantly impact surgical performance, but visual distractions do not incur the same level of effects; (2) task difficulty has an interaction effect with distractions; and (3) inexperienced subjects reduce their speed when faced with distractions, while experienced subjects did not.**	**Study Limitations:** ☐ None ***Systematic Review*** ☐ Review did not address focused clinical question ☐ Search was not detailed or exhaustive ☒ Quality of the studies was not appraised or studies were of low quality ☒ Methods and/or results were inconsistent across studies	
Journal: *Surgical Endoscopy* Author: Persoon, M. C., et al. Year Published: 2011 Location: The Netherlands	**Aim**: To quantify the frequency, nature, and effect on performance of (potentially) distracting events occurring during endourological procedures and additionally explored urologists' and residents'	**Inclusion Criteria**: ommon endourological procedures [transu-rethral resection of the prostate (TURP), transurethral resection of a bladder tumor (TURBT), and	**Intervention**: seven-point ordinal scale was used to measure the level of observed interference with the main task of the surgical team. Second, semistructured interviews were conducted with eight urologists and seven urology residents in two hospitals to obtain their	**Results:** A median of 20 distracting events occurred per procedure, which corresponds to an overall rate of one distracting event every 1.8 min. Equipment problems and procedure-related and medically irrelevant communication were the most frequently observed causes of interruptions and identified as the most distracting factors in the interviews. Occurrence of distracting factors in difficult situations requiring high levels of concentration was perceived by all interviewees as disturbing and negatively impacting performance. The majority of interviewees (13/15) thought distracting factors impacted more strongly on	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome	

	perspectives on experienced ill effects due to distracting factors. **Study Type**: Observational Study and survey study **Size**: 78 procedures and 15 interviews	ureteroscopic stone treatments (URS) **Exclusion Criteria**: Conventional and laparoscopic procedures were excluded because they are different kinds of proce-dures requiring different instruments and techniques.	perspectives on the impact of distracting factors	residents' compared to urologists' performance due to their different levels of experience. **Table 4** Mean rating of each source of distraction induced by each team member, calculated from all 78 procedures *SU* sterile urologist, *SR* sterile resident, *SN* sterile nurse, *NST* nonsterile team member SU / SR / SN / NST / Rating per event Pager: 3.67 / 4.1 / 0 / 1.50 / 2.31 Telephone: 2.50 / 0 / 1.00 / 2.07 / 1.39 Radio: 1.38 / 1.06 / 1.11 / 1.02 / 1.14 Door movement: 0 / 1.00 / 0 / 1.56 / 1.28 Procedure-related communication: 5.68 / 5.54 / 4.69 / 3.27 / 4.80 Patient-irrelevant communication: 4.95 / 4.17 / 4.02 / 3.67 / 4.20 Medically irrelevant communication: 5.55 / 6.00 / 4.34 / 3.28 / 4.79 Equipment: – / – / – / – / 4.97	☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	
Journal: *World Journal of Surgery* Author: Sevdalis, N., et al. Year Published: 2014 Location: UK	**Aim**: To the hypothesis that intraoperative distractions are associated with deterioration in patient safety checks in the OR. **Study Type**: Prospective observational study **Size**: 24 elective urologic procedures	**Inclusion Criteria**: The same Attending surgeon performed all operations with assistance by a resident and the presence of an Attending anesthesiologist and senior OR nursing personnel. The anesthesia and nursing personnel came from the same "pool" across all procedures. Also, the OR personnel had ample experience of working together.	**Intervention**: Distractions were assessed via in vivo observation in the OR using an instrument previously developed and validated. A distraction was defined as "any event that occurs intraoperatively and that is not directly related to the care of the patient who is on the operating table at the time." Each observed distraction was rated for its visible severity on an anchored scale of l to 9, where l is a potentially distracting event and 9 is interrupted flow of the operation. Patient safety was assessed via in vivo observation using a checklist that was developed and validated for use in general and urologic surgery	**Results**: Patient tasks were completed more often than other tasks (minimum completion rate of 85 %), communication tasks were least likely to be completed, and tasks relating to OR equipment were in between. Significant variation was observed across procedures in terms of the proportion of tasks carried out by the OR team: task completion ranged from 100 % (all done) to O % (none done).Distracting communications instigated by external visitors to the OR were most distracting to the team, matched only by communications stemming from the surgeons. **The correlation between distractions and the patient safety task completion was statistically significant (P<0.05)** **Table 2** Frequency and severity of distracting communications, by sources and recipients Distracting communication sources Surgeons (N = 8): Mean 5.63, SD 1.30 Anesthesiologists/assistants (N = 14): Mean 4.21, SD 1.85 OR nurses (N = 35): Mean 4.57, SD 1.50 External visitors (N = 13): Mean 5.77, SD 2.20 Entire OR team (N = 6): Mean 3.67, SD 2.42 Distracting communication recipients Surgeons (N = 26): Mean 4.85, SD 1.49 Anesthesiologists/assistants (N = 22): Mean 4.09, SD 1.74 OR nurses (N = 16): Mean 4.25, SD 1.18 External visitors (N = n/a): Mean N/A, SD Entire OR team (N = 21): Mean 5.52, SD 2.27 Entries are frequencies of distracting communications and their observer-rated severity on a 1–9 scale (1 = potentially distracting event, 9 = operation flow interrupted). On nine occasions the source was unclear, and these instances were excluded from the table *SD* standard deviation **Table 4** Correlations between distractions and task completion (safety checks) intraoperatively Communication distractions during case: Number of distractions / Average severity of distractions / Total summed severity of distractions Other distractions (excluding communications) during case: Number of distractions / Average severity of distractions / Total summed severity of distractions Patient safety task checklist (% completed per case) Patient tasks: −0.56* / −0.55* / −0.66** / −0.23 / −0.35 / −0.39 Equipment tasks: −0.12 / −0.22 / −0.20 / −0.26 / −0.12 / 0.15 Communication tasks: −0.13 / −0.41 / −0.22 / 0.25 / −0.10 / 0.30 Entries are Spearman's rho correlation coefficients. *$p < 0.05$; **$p < 0.01$	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

Journal: *AORN Journal* Author: Wright, M. I. Year Published: 2016 Location: Kentucky	**Aim**: To educate perioperative team members about no-interruption-zones (NIZs), implement NIZs in the perioperative setting, and measure dB levels during the critical phases of surgery to determine if NIZs reduce nonessential noise in the OR. **Study Type**: Before and after study **Size**: 30 pre intervention surgeries and 27 post intervention surgeries	**Inclusion Criteria**: Outpatient general and gynecologic surgeries	**Intervention**: *Educational Intervention* The project intervention involved educating perioperative team members about how noise in the OR can affect communication, decrease attention, impair thought processes, and increase risk of adverse occurrences. The primary focus of the education was to ensure that team members acknowledge and respect the critical phases of every surgery by keeping noise to a minimum. staff members were provided with ways to reduce noise during critical phases, including • eliminating nonessential conversation, • turning the volume down or off on electronics, • silencing mobile devices, and • avoiding the use of instruments or devices that increase noise levels if they are unnecessary at that time. **Comparator**: *Pre-intervention Testing* preintervention noise levels during the critical phases of surgery using a digital sound level meter.	**Results: There was a statistically significant decrease in noise in all of the 5 phases before and after the intervention.** Table 2. Mean Decibel Levels Recorded in Each of the Critical Phases Phase / No. of Procedures / Mean / t Value Intubation Preintervention 30 61.05 Postintervention 27 53.82 10.49 ($P < .001$) Briefing Preintervention 30 61.35 Postintervention 27 59.36 2.10 ($P < .05$) Specimen collection Preintervention 30 59.33 Postintervention 27 55.00 4.91 ($P < .001$) Final count/debriefing Preintervention 30 60.48 Postintervention 27 56.71 3.80 ($P < .001$) Emergence Preintervention 30 63.52 Postintervention 27 54.84 12.19 ($P < .001$)  **Figure 1.** Graph depicting the preintervention and postintervention differences in mean decibel (dB) levels for each of the five critical phases during which noise levels were recorded.	Study Limitations: ☒ None ***Non-Randomized*** ☐ Failure to develop and apply appropriate eligibility criteria ☐ Flawed measurement of both exposure and outcome ☐ Failure to adequately control confounding ☐ Incomplete or inadequately short follow-up ☐ Differences in important prognostic factors at baseline	

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Sevdalis, N., et al. (2014). "Impact of intraoperative distractions on patient safety: a prospective descriptive study using validated instruments." World Journal of Surgery 38(4): 751-758.
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The GRADE criteria were used to evaluate the quality of evidence presented in research articles reviewed during the development of this guideline. For more detailed information, see Appendix A.

Accrediting Guidance:

The **Joint Commission** released the following information in the August 2017 Quick Safety Issue**:**

Safety Actions to Consider:

While eliminating all sources of noise and distraction within an OR is not feasible, as many sources are necessary and unavoidable, organizations should consider a systems approach and facilitate conditions that minimize distractions and noise that can impede concentration and communication and negatively impact patient and staff safety.

The following actions can be taken to specifically address noise levels in the OR:

- Create a “no-interruption zone” (also known as “sterile cockpit”) during critical phases of a procedure, prohibiting nonessential conversation and activities.
- Consider measuring noise levels within the OR to provide evidence for noise-reduction strategies, empirical data reflecting efficacy of such strategies, as well as real-time information to the OR team as to when noise levels are exceeding recommended levels.
- Educate staff on sources of noise, its impact to patient and staff safety, and noise reduction strategies.
- Consider equipment alternatives that produce less noise, whenever possible.
- Consider the physical environment and means for attenuating noise. For example, minimize dropping metal instruments into instrument trays.
- Consider simulation and training to enhance focused attention skills in the presence of continuous and intermittent noise and distractions.
- Consider simulation training to model strategies for reducing noise (e.g., equipment use, communication techniques, speaking up to reduce noise, etc.).

The remaining actions can be taken to support decreasing noise in the work environment:

- Foster a safety culture in which staff feel empowered and comfortable speaking up and asking for silence.
- Establish policy and a code of conduct to minimize noise and distraction (code of conduct regarding entering/leaving room, unnecessary conversation, use of phones and pagers, use of music, etc.).
- Consult staff to understand resource needs for cellphones, pagers and tablets, and establish policies around them. Minimize tones that are similar to monitors and alarms within the OR.
- Practice effective team communication strategies to ensure information has been effectively received.

Guideline Recommendations:

The **AORN 2016 guideline for the Prevention of Retained Surgical Items** recommends:

- A consistent multidisciplinary approach should be used for preventing RSIs during all surgical and invasive procedures
- Policies and procedures for the prevention of RSIs should be developed, reviewed periodically, revised as necessary, and readily available in the practice setting.
- Perioperative personnel should participate in a variety of quality assurance and performance improvement activities that are consistent with the facility or health care organization plan to improve understanding and compliance with the principles and processes of RSI prevention.

Guideline Ratings

Guideline Issuer	AORN 2016
1. Transparency	A
2. Conflict of interest	NR
3. Development group	B
4. Systematic Review	A
5. Supporting evidence	A
6. Recommendations	C
7. External Review	NR
8. Currency and updates	A

See appendix B for full description of the Trustworthy Guideline grading system

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1. The Joint Commission. Minimizing noise and distractions in the OR and procedural units. Quick Safety Issue 35. August 14th, 2017. https://www.jointcommission.org/issues/article.aspx?Article=vMm4mDZyUKRMBfOcERmhZu1cew4buR9VbsfEpTPfTvU%3D. Accessed June 20th, 2018.
2. Wood A, Conner RL. Guideline for prevention of retained surgical items. In: 2016 Guidelines for Perioperative Practice. Denver (CO): Association of periOperative Registered Nurses (AORN); 2016 Jan. p. 369-414

Appendix A. GRADE criteria for rating a body of evidence on an intervention

Developed by the GRADE Working Group

Grades and interpretations:

High: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low: Any estimate of effect is very uncertain.

Type of evidence and starting level

Randomized trial–high
Observational study–low
Any other evidence–very low

Criteria for increasing or decreasing level

Reductions
Study quality has serious (–1) or very serious (–2) problems
Important inconsistency in evidence (–1)
Directness is somewhat (–1) or seriously (–2) uncertain
Sparse or imprecise data (–1)
Reporting bias highly probable (–1)
Increases
Evidence of association† strong (+1) or very strong (+2)
†Strong association defined as significant relative risk (factor of 2) based on consistent evidence from two or more studies with no plausible confounders Very strong association defined as significant relative risk (factor of 5) based on direct evidence with no threats to validity.

Appendix B. Trustworthy Guideline rating scale

The University of Pennsylvania's Center for Evidence-Based Practice Trustworthy Guideline rating scale is based on the Institute of Medicine's "Standards for Developing Trustworthy Clinical Practice Guidelines" (IOM), as well as a review of the AGREE Enterprise and Guidelines International Network domains.

The purpose of this scale is to focus on the weaknesses of a guideline that may reduce the trust a clinical user can have in the guideline, and distinguish weaknesses in documentation (e.g. guide-line does not have a documented updating process) from weaknesses in the guidance itself (e.g. recommendations are outdated). Current quality scales like AGREE emphasize documentation. They are important checklists for developers of new guidelines, but are less useful for grading existing guidelines. These scales also are harder for clinicians and other persons who are not methodology experts to apply, and their length discourages their use outside formal technology assessment reports. This new scale is brief, balanced, and easy and consistent to apply.

We do not attempt to convert the results of this assessment into a numeric score. Instead we present a table listing the guidelines and how they are rated on each standard. This facilitates qualitative understanding by the reader, who can see for what areas the guideline base as a whole is weak or strong as well as which guidelines are weaker or stronger.

1. Transparency

A	Guideline development methods are fully disclosed.
B	Guideline development methods are partially disclosed.
C	Guideline development methods are not disclosed.

The grader must refer to any cited methods supplements or other supporting material when evaluating the guideline. Methods should include:

Who wrote the initial draft
How the committee voted on or otherwise approved recommendations

Evidence review, external review and methods used for updating are not addressed in this standard.

2. Conflict of interest

A	Funding of the guideline project is disclosed, disclosures are made for each individual panelist, and financial or other conflicts do not apply to key authors of the guideline or to more than 1 in 10 panel members).
B	Guideline states that there were no conflicts (or fewer than 1 in 10 panel members), but does not disclose funding source.
C	Lead author, senior author, or guideline panel members (at least 1 in 10) have conflict of interest, or guideline project was funded by industry sponsor with no assurance of independence.

NR	Guideline does not report on potential conflict of interests.

For purposes of this checklist, conflicts of interest include employment by, consulting for, or holding stock in companies doing business in fields affected by the guideline, as well as related financial conflicts. This definition should not be considered exclusive. As much as anything, this is a surrogate marker for thorough reporting, since it may be assumed that guideline projects are funded by the sponsoring organization and many authors think it unnecessary to report a non-conflict.

3. Guideline development group

A	Guideline development group includes 1) methodological experts and clinicians and 2) representatives of multiple specialties.
B	Guideline development group includes one of the above, but not both.
C	Guideline developers all from one specialty or organization, and no methodologists.
NR	Affiliations of guideline developers not reported

The purpose of this standard is to ensure that supporters of competing procedures, or clinicians with no vested interest in utilization of one procedure or another, are involved in development of the guideline. Both AGREE II and IOM call for patient or public involvement: very few guideline panels have done so to date, so this is not necessary for guidelines to be rated A. Involvement of methodologists or HTA specialists in the systematic review is sufficient involvement in the guideline development group for our purposes. In the absence of any description of the guideline group, assume the named authors are the guideline group.

4. Systematic review

A	Guideline includes a systematic review of the evidence or links to a current review.
B	Guideline is based on a review which may or may not meet systematic review criteria.
C	Guideline is not based on a review of the evidence.

In order to qualify as a systematic review, the review must do all of the following:

Describe itself as systematic or report search strategies using multiple databases
Define the scope of the review (including key questions and the applicable population)
Either include quantitative or qualitative synthesis of the data or explain why it is not indicated

Note: this element does not address the quality of the systematic review: simply whether or not it exists. Concerns about quality or bias of the review will be discussed in text, where the analyst will explain whether the weaknesses of the review weaken the validity or reliability of the guideline.

Note: a guideline may be rated B on this domain even if the review on which it is based is not available to us. This potential weakness of the guideline should be discussed in text of the report.

5. Grading the supporting evidence

A	Specific supporting evidence (or lack thereof) for each recommendation is cited and graded
B	Specific supporting evidence (or lack thereof) for each recommendation is cited but the recommendation is not graded.
C	Recommendations are not supported by specific evidence.

To score a B on this domain there should be specific citations to evidence tables or individual references for each relevant recommendation in the guideline, or an indication that no evidence was available. Any standardized grading system is acceptable for purposes of this rating. If a guideline reports that there is no evidence available despite a thorough literature search, it may be scored B on this domain, or even A if evidence for other recommendations is cited and graded.

6. Recommendations

A	Considerations for each recommendation are documented (i.e. benefits and harms of a particular action, and/or strength of the evidence); and recommendations are presented in an actionable form.
B	Either one or the other of the above criteria is met.
C	Neither of the above criteria are met

In order to be actionable, the guideline should specify the specific population to which the guideline applies, the specific intervention in question, and the circumstances under which it should be carried out (or not carried out). The language used in the recommendations should also be consistent with the strength of the recommendation (e.g. directive and active language like “should” or “should not” for strong recommendations, and passive language like “consider” for weak recommendations). A figure or algorithm is considered actionable as long as it is complete enough to incorporate all the applicable patients and interventions. Please see the forthcoming NICE manual (24) for a good discussion of actionability in guidelines.

7. External review

A	Guideline was made available to external groups for review.
B	Guideline was reviewed by members of the sponsoring body only.
C	Guideline was not externally reviewed.
NR	No external review process is described.

8. Updating and currency of guideline

A	Guideline is current and an expiration date or update process is specified.
B	Guideline is current but no expiration date or update process is specified.
C	Guideline is outdated.

A guideline is considered current if it is within the developers' stated validity period, or if no period or expiration data is stated, the guideline was published in the past three years (NOTE: the specific period may be changed at the analyst's discretion, based on whether the technology is mature and whether there is a significant amount of recent evidence). A guideline must address new evidence when it is updated. A guideline which is simply re-endorsed by the panel without searching for new evidence must be considered outdated