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Distractions in the Operating Room: the Prevalence of Mobile Device Uses Among Anesthesia Staff, A Cross- Sectional Study

Abdulrhman Alamri[1], Mohammed Alshehri[2], Abdulsalam Alahmari[3], Waleed Alharbi[4], Fahad Alanazi[5], Ahmad Adnan[6]

[1]Anesthesia Technology Specialist,Prince Sultan, military college health science
[2]Anesthesia Technology Specialist,Al kharj Military Industries Corporation Hospital
[3]Anesthesia Technology Specialist ,Sharurah Armed Forces Hospital
[4] Anesthesia Technology Specialist ,Armed Forces hospital, king Abdulaziz neval base in Jubail
[5]Anesthesia Technology Specialist ,King Salman armed forces hospital
[6]Anesthesia consultant,Department of Anesthesia Technology, Prince Sultan Military College of Health Sciences

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ABSTRACT

Background: Distractions are frequently present in healthcare settings and can significantly impede the performance of complex tasks that demand high levels of cognitive processing.

Aim: This goal of this investigation to assess the prevalence of distractions in the operating rooms due to the use of mobile devices.

Patients and methods: This was a cross- sectional investigation design included 175 participants using a self-administered validated questionnaire between April 2023 and May 2023 conducted in the three referral hospitals: King Fahad Military Medical City (KFMMC), Airbase Hospital, and Armed Forces Hospital, in Jubail, Saudi Arabia.

Results: Out of the total respondents, 93.7% (n=175) reported using smartphones while providing care to anesthetized patients. The most frequent purposes for smartphone usage were making phone calls (70.3%, n=123), social media (33.7%, n=59), anesthesia App (31.4%, n=55), and surfing the internet (28.0%, n=49). However, 54.3% (n=95) of the respondents claimed that they rarely or never used their smartphones through critical stages of anesthesia. While 50.9(n=89) of the respondents reported that they were never distracted by smartphone use,53% (n=93) reported witnessing their colleagues being distracted by smartphone utilization at least once.

Conclusion: Mobile devices are frequently used in for non- medical purposes in the operating room in the eastern region of Saudi Arabia. While distraction due to mobile devices use is still a concern, there is currently no evidence-based data available to determine if restrictions on mobile devices use are necessary.

Keywords: Mobile device, Anesthesia, Anesthesia providers, Distraction

INTRODUCTION

Distractions are frequently present in healthcare settings and can significantly impede the performance of complex tasks that demand high levels of cognitive processing **(1)**. Operating rooms (OR), in particular, involve numerous work system factors, such as the teamwork, physical environment, and communication, technology and tools, tasks and workload, and organizational processes, which can make them especially susceptible to such complex tasks. Even minor distractions in the OR have the potential to lead to errors or lapses that may cause serious harm to patients, as reported by reference **(2)**.

In the OR, distractions are frequently present and can originate from both intrinsic sources (such as alarms from surgical equipment and relevant communication among the surgical team) and extrinsic sources (such as beepers, phone calls, and communication from staff outside the OR, as reported by Healey **(3)**.

Pulitzer and his colleagues pointed out that the potential for distraction increases as doctors use more devices **(4)**. These distractions can have an impact on all members of the surgical team, including anesthesiologists and nurse anesthetists, nurses, perfusionists, surgeons, surgical technicians, and other team members. The high level of cognitive processing required by each of these professionals and the demanding cognitive workloads involved can result in several high-risk points during an operative procedure, as cited by reference **(2)**.

According to Baumgart and Epocrates, there has been an increase in the utilization of mobile technology in healthcare over the last decade, which has supported health professionals in administrative functions, research, clinical activity, and health education, and has been used for clinical information, communication, e-learning,

and multimedia capture **(5, 6)**. Lee reported that about ninety-percent of adults use mobile devices, making it the most commonly utilized information-sharing device globally (Lee P, 2019).
This investigation aimed to assess the prevalence of distractions in the operating rooms due to the use of mobile devices.

MATERIALS AND METHODS

This was a cross- sectional investigation design included 175 participants using a self-administered validated questionnaire between April 2023 and May 2023 conducted in the three referral hospitals: King Fahad Military Medical City (KFMMC), Airbase Hospital, and Armed Forces Hospital, in Jubail, Saudi Arabia.

Study Sample

The target population of the study included the anesthesiologists, and anesthetists' medical workers within the hospitals or healthcare center at KFMMC, Airbase Hospital, and Armed Forces Hospital, in Jubail, Saudi Arabia. using the Daniel for sample size calculation **(7)**.

$$n = \frac{z^2\,pq}{d^2} = x = \frac{(1.96)^2\ 0.85(1-0.85)}{0.05} = 196 \pm 25$$

Where q = 1 – p; p = proportion for the investigation; d = ninety-five percent confidence interval is desired with d = 0.05; By applying this formula, assuming proportion of 0.85. the sample size would be 196.2 Therefore, the sample from the population can be 196 ± 25. Then the range is between 171 to
221. This research recruited 175 participants.
Inclusion criteria: Anesthesiologists, anesthetists, and Anesthesia Resident who are working in the above-mentioned three hospitals.
Exclusion criteria: Other health care professionals and those who were not willing to participate.

Methods

Study Instruments

A validated structured questionnaire was used. This questionnaire was designed via reviewing the previous studies **(8, 9)** then questionnaire was subjected to different types of validations, including content evaluation, face validation, and reliability study to assess internal consistency before data collection. The final form consists of two sections. The first section (eight items) included sociodemographic data of the participants, such as age, gender, marital status, profession, etc. The second part (fifteen items (includes questions to assess the mobile device usage and its pattern of distractions in the operating room. For this section, the mobile use was graded based on the frequency of using the mobile device, where very often received score of 5 and never received score of zero. A 5-point Likert scale ranging from very often, often, sometimes, seldom and never was utilized in most questions that intended to evaluate the frequency of mobile use among participants with scores ranging from 1 to 5.

Data collection Procedures

The study link was sent privately to the participants according to the above-mentioned criteria using social media applications (eg: WhatsApp, Facebook) Along with a thorough explanation of the goals of the investigation, participants were asked to complete the questionnaire and return it immediately. Each participant was asked to share the link with her colleague in order to complete the online version. The number of participants appeared in the online version was monitored periodically to ensure the participations were enough and represented all candidates. The required time to answer the online version is ranged from 5 to 8 minutes.

Ethical approval

The study protocol including IRB application form, informed consent form, research proposal, and the questionnaire were provided to the ethical committee at the Prince Sultan Military College of Health Sciences. The ethical approval was obtained before data collection.

Statistical analysis

The data that has been collected and presented have been analyzed utilizing the following method: The distribution of qualitative parameters (i.e., close ended) values of samples will be studied with frequency tables even for other demographic variables between samples. The questions that represented mobile device usage (quantitative variable Mobile Device usage questions) were coded as the following: very often = 4, often =3,

sometimes = 2, seldom = 1, never = 0). The overall mobile use frequency was tested for normality using Kolmogorov- Smirnov and found to have non normal distribution data then the overall mobile use frequency was classified into "more frequent use" when the total number of mobile uses was greater than or equal to the median (10) and into "less frequent use" when the total number of mobile uses was less than the median (10). The chi-square test has been utilized to calculate the comparison tables and identify the correlation between the qualitative variables as needed. quantitative variable Mobile Device usage questions were analyzed with demographic variables by using univariate and multivariate logistic regression to find the significant difference. To determine the effect of each predictor on the Mobile Device utilization, odd ratios have been determined. SPSS (Release 21.0; IBM Corp., Armonk, NY, USA) has been utilized to conduct all statistical analyses. Statistical significance has been considered as a P value of less than 0.05.

RESULTS

Table 1: Participants' sociodemographic data

Variable		**Count**	**(%)**
Age	25-35 years	114	(65.1)
	36-45 years	50	(28.6)
	> 46 years	11	(6.3)
Gender	Male	128	(73.1)
	Female	47	(26.9)
Institutions	KFMMC	64	(36.6)
	Airbase Hospital	47	(26.9)
	Armed Forces Hospital	64	(36.6)
Profession	Anesthesiologists	77	(44.0)
	Anesthetist	67	(38.3)
	Anesthesia Resident	31	(17.7)
Marital status	Single	72	(41.1)
	Married	94	(53.7)
	Others	9	(5.1)
Do you have a mobile device?	Yes	164	(93.7)
	No	11	(6.3)
Is there any anesthesia related application on your mobile device?	Yes	100	(57.1)
	No	75	(42.9)
Is there any restriction of using mobile device during working hours in your institution	Yes	66	(37.7)
	No	58	(33.1)
	Partly	51	(29.1)

KFMMC: King Fahad Military Medical City;

The majority of individuals who took part in the study were men, making up 73.1% (n=128) of the sample. Most of the participants were aged between 25-35 years (65.1%, n=114) and worked at either KFMMC or Armed Forces Hospital (both 36.6%, n=64). The largest proportion of participants were anesthesiologists (44.0%, n=77) and married (53.7%, n=94). Almost all of the participants owned a mobile device (93.7%, n=167) and more than half had an anesthesia-related app installed on their phone (57.1%, n=100). Additionally, just over one- third of the participants reported having restrictions on mobile device use during working hours (37.7%, n=66). (Table 1)

Table 2: Mobile device usage during practice

Variable		Count	(%)
How often do you use a mobile device throughout anesthetized patient care?	Very often	29	(16.6)
	Often	36	(20.6)
	Sometimes	63	(36.0)
	Seldom	21	(12.0)
	Never	26	(14.9)
How often do you use mobile device throughout critical stages of Anesthesia	Very often	21	(12.0)
	Often	18	(10.3)
	Sometimes	41	(23.4)
	Seldom	17	(9.7)

	Never	78	(44.6)
Have you ever experienced any distraction or negative medical consequence because of mobile device usage throughout anesthetized patient care?	Never	89	(50.9)
	Once	36	(20.6)
	2-5 times	45	(25.7)
	more than 5 times	5	(2.9)
Have you ever witnessed one of your colleagues experienced any distraction or negative medical consequence because of mobile device usage throughout anesthetized patient care?	Never	82	(46.9)
	Once	44	(25.1)
	2-5 times	37	(21.1)
	more than 5 times	12	(6.9)
How much time do you spend on the mobile device during duty hours	<25%	79	(45.1)
	25%–50%	52	(29.7)
	>50%	25	(14.3)
	cannot say	19	(10.9)
Do you feel irritable if juniors/staff use mobile device during work hours	Yes	61	(34.9)
	No	44	(25.1)
	Sometimes	70	(40.0)
How do you feel mobile device use has impacted on patient care	Improved	45	(25.7)
	Worsen	58	(33.1)
	Cannot say	72	(41.1)
The main purpose of using mobile device is			
Phone call	Yes	123	(70.3)
	No	52	(29.7)
Surfing the Internet	Yes	49	(28.0)
	No	126	(72.0)
Anesthesia App	Yes	55	(31.4)
	No	120	(68.6)
Social media	Yes	59	(33.7)
	No	116	(66.3)
writing /reading emails	Yes	39	(22.3)
	No	136	(77.7)
Playing game	Yes	20	(11.4)
	No	155	(88.6)
≥ two purposes	Yes	88	(50.3)
	No	87	(49.7)
Which of the following mobile device usage methods might result a distraction or negative medical consequence during anesthetized patient care? (You can choose more than one option)			
Phone call	Yes	84	(48.0)
	No	91	(52.0)
Surfing the Internet	Yes	38	(21.7)
	No	137	(78.3)
Social media	Yes	79	(45.1)
	No	96	(54.9)
writing /reading emails	Yes	42	(24.0)
	No	133	(76.0)
Playing game	Yes	71	(40.6)
	No	104	(59.4)
≥ two purposes	Yes	81	(46.3)
	No	94	(53.7)
Do you think the mobile device usage should be restricted in operating theaters?	Yes, it should be restricted	63	(36.0)
	No need for restriction	54	(30.9)
	It should be partly restricted	58	(33.1)
Have you ever been warned by your colleagues or surgical team because of mobile device usage during the patient care?	No	98	(56.0)

	Yes, once	45	(25.7)
	Yes, 2–5 times	27	(15.4)
	Yes, more than 5 times	5	(2.9)

A total of 65 (36%) of the participants used mobile device very often/often and 39 (22%) of the participants used mobile device very often/often during critical stages of anesthesia. The majority of the participants have ever witnessed one of their colleagues experienced distractions because of mobile device usage during anesthetized patient care (53.1%, n=93), and have ever experienced distraction because of mobile device usage during anesthetized patient care (49.1%, n=86). A proportion of the participants (33.1%, n=58) feel mobile device use has worsen patient care. A total of 77 (44%) of the participants have ever been warned by colleagues or surgical team because of mobile device utilization throughout the case care and the majority (36.0%, n= 63) of the participants thought that the mobile device utilization must be restricted in operating theaters. (Table 2)

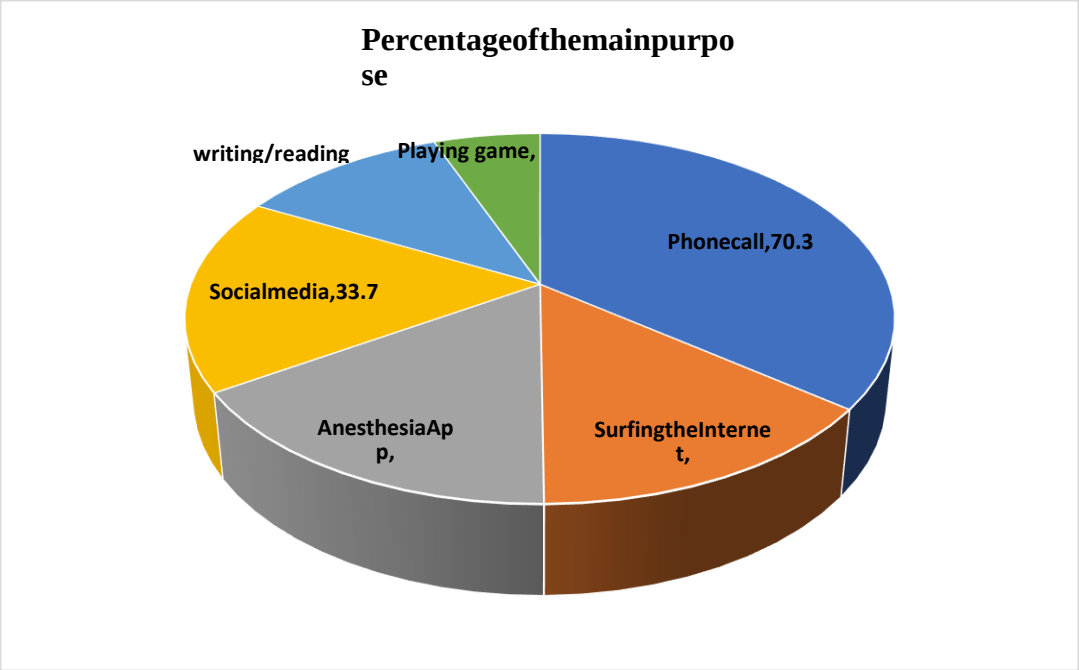

Figure 1: Main purpose of using mobile device

Figure 2: Activities might lead to negative medical consequences

The majority of the participants reported that the main purpose of using mobile device was for phone call (70.3%, n=123), followed by social media (33.7%, n=59) and the majority of the participants reported that phone call (48.0%, n=84), (45.1%, n=79) and playing games (40.6%, n=71) were the most likely methods that might lead to a distraction or negative medical consequence throughout anesthetized patient care**. (Figures 1, 2)**

Table 3: Association between participants' data and more frequent use of mobile device

Variable		Univariate logistic regression		Multivariable logistic regression	
		OR (95% C.I.)	P value	OR (95% C.I.)	P value
Age	>36 years	Reference		Reference	
	£35 years	2.36 (1.24-4.46)	0.009*	1.71 (0.819-3.556)	0.154
Gender	Male	Reference			
	Female	1.24 (0.63-2.42)	0.533		
Institutions	KFMMC	Reference			
	Airbase Hospital	1.94 (0.89-4.22)	0.095		
	Armed Forces Hospital	0.73 (0.36-1.47)	0.376		
Profession	Anesthesiologists	Reference			
	Anesthetist	1.11(0.58-2.15)	0.747		
	Anesthesia Resident	1.71(0.73-4.01)	0.215		
Marital status	Married	Reference		Reference	
	Unmarried	2.40(1.30-4.41)	0.005*	1.86 (0.92-3.75)	0.082

OR: odd ratio; CI: confidence interval

In univariate logistic regression, participants who were age less than or equal 35 years were 2.36 times (*P* value=**0.009*)** more frequent use of mobile device compared with those who were more than 36 years. Additionally, unmarried participants were 2.40 times (*P* value=**0.005*)** more frequent use of mobile device compared with married participants. In multivariable logistic regression, no predictor was found to have significant effect on the use of mobile device among participants. (Table 3)

DISCUSSION

After excluding the response "I don't have smartphone," it was found that 93.7% (n=164) of the study participants in the operating room reported using a smartphone. The most common purposes of using mobile device were phone calls and social media, with usage rates of 70.3% and 33.7%, correspondingly. The high rates of smartphone usage may be due to the need for in- house communication. As a majority of the participants were young anesthesia providers, the utilization of smartphones for computing purposes, including anesthesia App (31.4%) and internet browsing (28.0%), was also common among the population studied. Additionally, the majority of the participants reported that the activities might result in negative medial consequences were phone call (48%) and social media (45.1%).

While this survey is the 1st of its kind among anesthesia providers, previous investigations have investigated smartphone use in other healthcare professionals. For example, in 2010, a study found that 55.6percent of perfusionists utilized cell phones throughout cardiopulmonary bypass procedures, although usage for other purposes was lower **(10)**. A study by Cho et al. found that 46.2percent of nursing students used smartphones throughout clinical practice, and 24.7% of them reported being distracted by their phones. Additionally, 83.7percent of nurses found someone else being distracted by smartphone use during clinical practice **(11)**.

In 2015, Mcbride and his colleague stated that 78.1 percent of participating nurses utilized smartphones at work, and the main purposes of using smartphone were for writing/reading e- mail (38.6 percent), read news (25.7 percent), social media (20.8 percent), and playing (6.5 percent) **(12)**. Experienced anesthesiologists have an improved capacity of carrying out multiple simultaneous tasks, which is challenging for trainees or less experienced anesthesiologists **(12).** Therefore, inexperienced anesthesiologists must avoid additional distractors in the operating room, like smartphone utilizes. Nevertheless, our findings indicate that anesthesia providers who are younger are more likely to utilize smartphones than those who are elderly.

In the current investigation, it was found that 50.9% of participants claimed that they had not experienced any negative medical consequences from their smartphone utilization during their practice. Nevertheless, 46.9% reported witnessing colleagues experience such medical consequences. This discrepancy may be due to participants being unaware of the negative effects caused by their own smartphone utilization and the tendency

for people to provide self- protecting answers in self-report questionnaires **(8)**.

In this study, the most commonly reported distracting smartphone applications were phone call (65.1%), social media (45.1%), and playing games (40.6%). Similar findings were obtained from a Turkish study **(8)**. 36% of the participants advocated for complete restriction of smartphone use in the practice setting, while 33.1% preferred that it be to in- house calls.

Regarding the restriction in technology use different studies have discussed this issue. The utilization of newer technologies like personal electronic devices (PEDs) and smartphones in healthcare settings is raising concerns regarding the potential for distractions, as referenced in **(10, 13)**. In addition to phone calls and text messages, these devices can also distract users with social media, email, and other forms of electronic communication. Furthermore, the constant urge to check personal electronic devices is increasingly being recognized as a form of addiction that can affect healthcare providers and other users of these devices, as reported in reference **(14)**.

Regarding mobile devices, AORN has provided specific recommendations to address the issue of cell phone use in the OR. AORN suggests that OR staff should avoid bringing cell phones and pagers into the procedural environment whenever possible, clearly identify essential communication devices that require attention, put nonessential devices on mute or standby mode throughout operation, and restrict external communication to only urgent or emergent conversations **(15)**.

The American College of Surgeons (ACS) recognized the potential for distractions caused by cell phone use in the OR as early as 2008, as stated in reference **(16)**. In an updated statement released in 2016, ACS acknowledged that distractions from technology, including smartphones, can compromise patient care. Instead of banning the use of cell phones, ACS listed 10 considerations to guide appropriate utilization, such as avoiding personal calls, silencing ring tones, forwarding calls, and setting distinct alerts for urgent calls, as reported in references **(17)**.

Although cell phones, pagers, and smartphones have been identified as sources of distraction in healthcare settings, they can also be used to prevent distractions, depending on their appropriate usage. Historically, clinicians preferred synchronous communication, such as face- to-face or telephone conversations, which can be very disruptive, over asynchronous communication like text messages or voicemail. However, asynchronous communication using newer technologies allows senders to communicate information without interrupting the receiver's workflow, giving them the opportunity to review and respond to the information at a later time. This decreases interruptions and helps prevent distractions **(18, 19)**.

According to a study by Leung and his colleague, using a smartphone can lead to longer reaction times, decreased focus, and reduced performance throughout cognitive tasks such as driving **(20)**. Other studies found that smartphone use by anesthesiologists could detract from patient safety if they become distracted from the patient, they are currently attending to the operating room can be a distracting environment for anesthesia practice **(8, 21)**, as observed by Campbell et al. in a study where many distracting factors were found to originate from staff, working area, ambient noise, external team members, equipment, and anesthesiologists themselves **(22)**.

Limitations

There were numerous limitations to this investigation. The first limitation was that the study had a limited representation of older anesthesiologists, as most of the participants were young. Additionally, the study did not investigate whether smartphone use rates differed based on the type of surgery or anesthesia administered. The study also did not collect detailed information about the medical issues faced by the participants due to smartphone use.

CONCLUSION

Mobile devices are frequently used in for non- medical purposes in the operating room in the eastern region of Saudi Arabia. While distraction due to mobile devices use is still a concern, there is currently no evidence-based data available to determine if restrictions on mobile devices use are necessary.

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