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Safe mobile phone use in the operating room as defined by research: A scoping review

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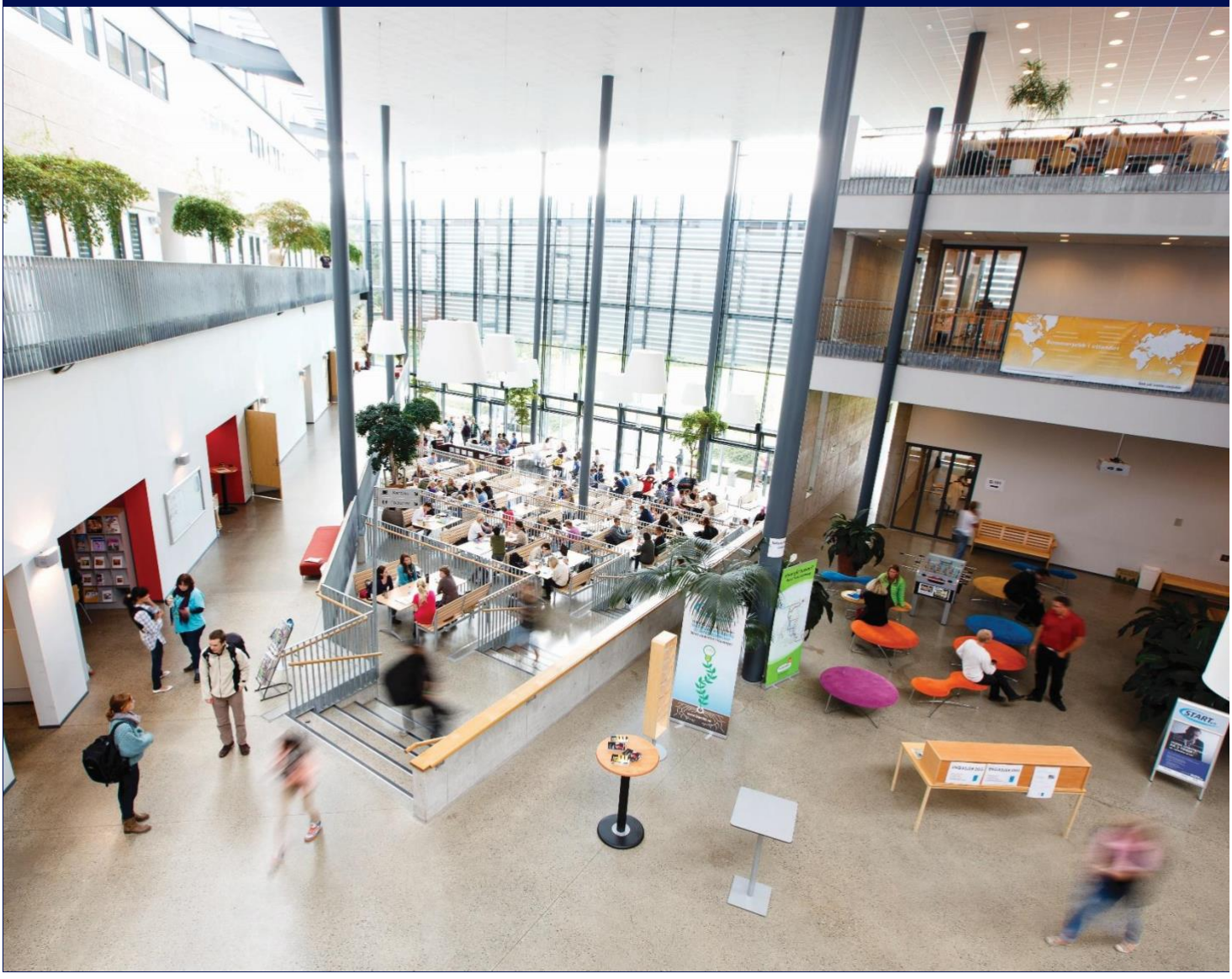

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Mobile- cell- smartphone, safe use, operating room, operating room nurse, surgery

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Abstract

Background: The development of mobile phone technology has been fast, from the basic mobile phone 30 years ago to the smart mobile phones we use today. The healthcare sector is keeping pace with its growth by integrating mobile phones into their daily clinical work. However, there are benefits and drawbacks to its use.

Aim: This study aimed to determine how research describes the safe use of mobile phones in the operating room.

Methods: The scoping review method was utilized in this study since the subject is quite broad and there is little research done on this matter. The search for relevant articles was conducted using two databases: CINAHL and Medline. In total, fifteen studies were included.

Results: Using mobile phones in the operating room can divert the surgical team´s attention, raise the risk of post-operative infection, and pose a risk of violating the patient´s privacy. Some measures are available to minimize these negative effects.

Conclusion: To reduce the above mentioned risks, use of personal mobile phones should be prohibited inside the operating room and the surgical team is encouraged to disinfect their hands and mobile phones routinely. Nevertheless, the study we conducted revealed that there are only a few guidelines or regulations established regarding the safe use of mobile phones in the operating room. Therefore, more research on this topic is required. It is evident, however, that operating room nurses have an essential function in resolving this predicament by identifying factors that can affect the patient´s safety and the quality of care in the operating room.

Table of Contents

Definition of terms

ACS	- American College of Surgeons
AST	- Association of Surgical Technologists
AORN	- The Association of Perioperative Registered Nurses
CDC	- Centers for Disease Control and Prevention
EBP	- Evidence Based Practice
EPA	- The Environmental Protection Agency
ESU	- Equipment, powered instruments, electrosurgical unit
FCC	- The Federal Communications Commission
HUH	- Haukeland University Hospital
HAI	- Healthcare Associated infection
ICT	- Information and Communications technology
JBI	- Joanna Briggs Institute
MMAT	- Mixed Methods Appraisal Tool
Mobile phone	- Cell phone(s), smartphone(s), mobile device, ipad
MRSA	- Methicillin Resistant Staphylococcus Aureus
NSF	- Norsk Sykepleierforbund
NSFLOS	- Norsk Sykepleierforbund Landsgruppe av Operasjonssykepleiere
OUH	- Oslo University Hospital
PCC	- Population, Concept and Context
SSI	- Surgical Site Infections
SPLINTS	- Scrub Practitioners' List of Intraoperative Non-Technical Skills
UK	- United Kingdom
VRE	- Vancomycin-Resistant Enterococci
WHO	- World Health Organization

1. Introduction

Digital technology has made a huge impact on how medicine is practiced in the present time (IBM, 2023). For instance, the Norwegian government has begun to digitalize the healthcare industry, seeing it as a vital instrument for enhancing productivity, expanding the scope of healthcare services, and obtaining a more economical use of public funds (Regjeringen, 2016). Furthermore, digitalization is a goal that needs to be integrated in the healthcare services and should be a natural part of the problem-solving process in the healthcare sector (Direktorat for e-helse, 2023). The World Health Organization (WHO) defines eHealth as a cost-effective and secure use of information and communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research (WHO, 2023).

Motorola, Inc. launched the very first commercially available handheld mobile phone in 1983 (Hardy, 2022). In 2022, 39 years later, it is estimated that 73% of the global population aged 10 and over owns a mobile phone, and 66% of the world's population use the Internet (ITU, 2023). In 1992, the very first text message was sent from the United Kingdom (UK), but today, social media and other messaging applications have taken over such functions (NRK, 2022).

It is now common for healthcare professionals to interact with patients and develop treatment plans using electronic journal systems or other technology. Mobile phones, tablets, and laptops are becoming equally common as stethoscopes (IBM, 2023). Over the past few years, there has been an increase in the usage of mobile phones by healthcare professionals (Mosa et al., 2012), including the use of applications tailored to their needs (Charani et al., 2014). More than 200,000 health-related applications are either free or available for purchase, according to a survey by Fölster (2017). Healthcare workers' growing use of mobile phones and specific applications is a reflection of the industry's growing adoption of information technology (de Jong et al., 2020). Mobile phone use in the healthcare industry does, however, come with benefits and drawbacks. The main benefit of mobile phone use, according to a study by Reis et al., (2023), is the improvement of healthcare personnel´s competences; the disadvantages include the potential for infection and staff distraction.

1.1 Previous research

We conducted a brief search for literature on mobile phone use in the healthcare setting early in our study using two databases, CINAHL and PubMed. Articles detailing the implications of technology on the healthcare sector and the common concerns associated with utilizing mobile phones in the field have been identified.

1.1.1. Technology in the healthcare sector

Nowadays, a wide variety of technologies are employed in the healthcare industry. Information and Communications Technology (ICT) is the second most popular right after Medical technology (IBM, 2023). The Norwegian healthcare system is in the process of digitalization, and as part of this effort, the government implemented electronic patient records in 2012 which allows patients to have a single electronic record regardless of their level of care (Ehelse, 2023). One of the objectives of the first national eHealth strategy in 2017 is to provide access to user-friendly digital solutions that improve administrative processes and provide reliable decision support (Mackey & Bassendowski, 2017). The rapid advancement of ICT, combined with the digitalization of the healthcare industry, has increased the degree of mobile phone use among healthcare practitioners. According to de Jong et al. (2020), who published a scoping review on nurses' use of personal mobile phones in the workplace, there are a number of reasons why nurses use mobile phones while at work. When using their mobile phones for work-related purposes, nurses most frequently use them to look up information regarding illnesses and medications, such as drug references and guides. Nurses also browsed for material on their mobile phones to satisfy both their and their patients' educational demands. Secondly, nurses prefer to communicate with other members of the healthcare team via mobile phones rather than the traditional fixed-line phones. They note that this allows for immediate interaction with colleagues and improves communication efficiency among team members, including doctors and other allied healthcare providers, as mobile phones allow for text messaging with images or videos in addition to phone calls. Finally, nurses believe that using mobile phone features like the calculator, flashlight, and photo and video capabilities can be beneficial (de Jong et al., 2020).

1.1.2. Disadvantages of mobile phone use

In nearly half of the 22 research studies that made up the review by de Jong et al. (2020), nurses used their mobile phones while at work for non-work-related activities. Texting friends and family was the most common use, followed by checking or posting content to personal social media accounts. Making phone calls, checking for missed calls, and partaking in activities like gaming or shopping were among the other common uses. The majority of healthcare professionals who took part in the studies reported seeing negative consequences brought on by mobile phone use-related interruptions at work (Reis et al., 2023). Several nurses have admitted to being occasionally distracted by their mobile phones when providing patient care, and they have also observed other nurses being distracted (de Jong et al., 2020). Nearly half of the respondents in a study on nurses' opinions of their professional performance regarding mobile phone use said that mobile phones could be a major source of distraction at work, and more than half thought that, despite some advantages, using personal mobile phones at work is generally not a good idea (Reis et al., 2023). Another drawback of using mobile phones in healthcare is the potential for patient privacy to be violated. When using their own mobile phones for work, nurses voiced concerns regarding the privacy and confidentiality of patient health information (de Jong et al., 2020).

1.1.3. Infection risks

Concerning the use of mobile phones in healthcare setting, Reis et al. (2023) discovered that significant levels of bacterial contamination were found on the personal mobile phones of healthcare personnel in six trials, five of which showed contamination rates as high as 80%. Furthermore, they found that almost all of the operating room personnel had the same bacteria on their hands, noses, and mobile phones. Interestingly, operating room staff workers were not routinely cleaning their mobile phones as there were no explicit guidelines regarding the methods, frequency, and usage of disinfectants for cleaning mobile phones, despite the findings that doing so can significantly lower bacterial contamination (Reis et al., 2023). The field of infection prevention and control is constantly evolving due to various factors such as the continuous modifications in the healthcare setting and the progress made in minimally invasive and other surgical procedures (Rothrock, 2019, p.54).

1.1.4. Noise in the operating room

Noise is defined as any unwelcome sound or sound that interferes with one's ability to hear (Rothrock, 2019, p.47). In the operating room, there is constant noise coming from various sources, which can be distracting and raise the risk of errors and miscommunication (Wood et al., 2020). Noises produced by personnel include talking, doors opening and closing, overhead pages, and music. Equipment noises include clinical and alert alarms, heating, ventilation, and air conditioning systems, telephones, other communication devices, and tools related to the provision of surgical procedures (equipment, powered instruments, electrosurgical unit (ESUs), smoke evacuators, suction devices, and ventilators) (Kyle & Anderson, 2022, p.149-150). The Environmental Protection Agency (EPA) states that hospitals should not have background noise levels during the daytime that are more than 45 decibels. On the other hand, peak noise levels in the operating room were measured in a study and found to be as high as 106 dB, or as loud as an ambulance siren (AORN, 2019). According to a study by Keller et al. (2018) on noise in the operating room and distraction, noise pollution during periods of high mental workload caused the surgical team to become especially distracted. Furthermore, AORN (2019) states that noise is a distraction that interferes with patient care and may raise the chance of error. Noise is a distraction because it diverts attention from one task and directs it toward the source of the noise (The Joint Commission, 2017). It has also been connected to ineffective task performance and the incapacity to carry out difficult, problem-solving tasks (AORN, 2019). Among the main causes of noise in the operating room are mobile phones and other communication devices (Kyle & Anderson, 2022, p.149).

The information presented above only highlights the existing knowledge gap regarding the appropriate usage of mobile phones, given the hazards associated with infection, distraction, and potential invasion of patient privacy, to name a few. Therefore, most studies recommended the development of guidelines and policies on mobile phone use in the healthcare settings. It is important to note, however, that none of the studies mentioned where specifically conducted only for operating room nurses, but certain elements in those studies can be applicable in the operating room setting.

In summary, sufficient data exists to demonstrate the advantages and disadvantages of mobile phone use in the hospital environment. Nevertheless, there is currently no established protocol for the responsible and safe use of mobile phones in the healthcare industry, especially during

surgery. We believe, its development will lessen adverse consequences, if not totally eliminate them.

1.2 Aim of the Study

We therefore wanted to collect knowledge and / or recommendations on the proper and safe use of mobile phones in the operating room, which can then be used as a basis for the development of new guidelines or procedures. Our study aims to determine how research describes the safe use of mobile phones in the operating room.

1.3 Research Questions

1. How can the surgical team use mobile phones in the operating room without increasing the risk of infection?

2. How can the surgical team minimize the chance of distraction while using mobile phones in the operating room?

3. How can the surgical team use mobile phones in the operating room without invading the patients privacy?

2. Theory

This chapter discusses a number of concepts that could affect a surgical patient in the operating room, particularly the concept of healthcare personnel using mobile phones. Given that both authors are from Norway, the background provided conforms with Norwegian practice, laws, and regulations, even though the studies that are presented subsequently come from various parts of the world.

2.1. Operating room nurses´ responsibilities

When performing their duties, operating room nurses abide by the regulations that are currently in effect as well as the Norsk Sykepleierforbund Landsgruppe av Operasjonssykepleiere (NSFLOS) ethical guidelines (Eikemo, 2023). The daily tasks performed by operating room nurses are directed toward the patient in both direct and indirect ways. Direct patient-oriented work involves observing, evaluating, and interpreting the patient's need for nursing care prior to, during, and following the surgical procedure, as well as putting the necessary measures into action and documenting them (Dåvøy et al., 2018, p.29). Meanwhile, the operating room nurse´s indirect patient-oriented duties include facilitating surgery by helping decide on the operating room, instruments, and equipment required for the procedure, making sure the appropriate instruments are available in the correct dimensions and quantity, and making sure the operating room has an adequate amount of additional equipment (Dåvøy et al., 2018, p.31).

In order to take care of the perioperative patient, the operating room nurse is expected to perform measures which promote health, prevents illness and injury, ease suffering, and provide treatment and rehabilitation (Eikemo, 2023). It is the operating room nurse's responsibility to identify the risk of infection and break the chain of infection (Dåvøy et al., 2018, p.30). The perioperative patient and its requirement for surgical care and assessment form the foundation of operating room nursing practice (Eikemo, 2023). In order to deliver person-centered nursing care, the patient's needs and abilities are taken into consideration. According to the law, operating room nurses must provide person-centered nursing care from an individual, group, and social perspective to persons of all ages (Forskrift om nasjonal retningslinje for operasjonssykepleierutdanning, 2021).

Moreover, the operating room nurse´s planning and execution takes into account the complexity of the procedure, surgical approach, surgical method, asepsis preservation throughout surgery, expected operating time, and potential risk (Eikemo, 2023). As the coordinator of activities in the operating room, the operating room nurse is responsible for both implementing aseptic practice and monitoring the aseptic technique of the entire surgical team, providing each patient with an aseptic environment where the risk for Surgical Site Infection (SSI) is reduced to its lowest potential (Goodman & Spry, 2017, p.95). Additionally, NSFLOS (2023) requires operating room nurses to perform evidenced-base nursing and to critically analyze situations and theories based on their knowledge and experience in order to give the best possible care to the surgical patient. Evidence-based Practice (EBP) is a clinical problem-solving strategy that involves making professional decisions based on systematically obtained research-based knowledge, experience-based knowledge and the patient's wishes and needs in a given situation (Helsebiblioteket, 2021). Moreover, EBP is a way for the nursing discipline to minimize the theory-to-practice gap and is an important avenue for nursing educators to disseminate foundational knowledge to undergraduate and graduate nursing students (Mackey & Bassendowski, 2017, p.51).

Operating room nursing is carried out through two distinct roles, the circulating and sterile roles, which, according to NSFLOS (2023), are interdependent and complementary to one another. It is the circulating nurse's responsibility to ensure that the patient avoids surgical complications such as infections, unnecessary heat loss, and inadvertent physical harm. Meanwhile, he or she keeps an eye on the surgical field, manages the operating room, and makes sure the surgical staff has all the equipment they need to do their jobs efficiently. On the other hand, watching over the patient in the sterile area is the duty of the sterile nurse. He or she takes infection control measures in addition to assisting the surgeons with the handling of instruments. The surgical table, the necessary equipment, and the medical-technical equipment are under the combined supervision of the two operating room nurses in the operating room (NSFLOS, 2023).

2.1.1 Non-technical skills for scrub practitioners

A multidisciplinary team from the University of Aberdeen, consisting of operating room nurses, surgeons, anesthetists, and psychologists, created a behavioral rating system known as the Scrub Practitioners' List of Intra-operative Non-Technical Skills (Flin et al., 2014). They

claim that the approach provides the perioperative community with a framework for explicitly integrating non-technical abilities into training and is designed for use by perioperative practitioners who have clinical knowledge and expertise. There are three categories in the SPLINTS skills taxonomy, and each category contains three elements (Flin et al., 2014). Situation Awareness: gathering information, recognizing and understanding information, and anticipating; Communication and Teamwork: acting assertively, exchanging information, and coordinating with others; and Task Management: planning and preparing, providing and maintaining standards, and coping with pressure. Sirevåg et al. (2021) have identified two non-technical skills essential for Norwegian operating room nurses. Each category has two associated sub-themes. These are Ethical Competence: engaging in respectful care and practice, and being the patient´s guardian and advocate in the OR; and Professional Accountability: displaying tailored professional competence and displaying autonomy, confidence, and courage.

2.2. Patient safety

Patient safety is the foundation of perioperative nursing practice (Rothrock, 2019, p.16). In previous years, patient safety was ensured through the professions' ethical guidelines of the "do no harm principle" and prudent professional practice, but today, patient safety is written into law specifically in Section Four of the Health Personnel Act (Dåvøy et al., 2018, p. 178; Helsepersonelloven, 1999). This law underlines that every medical professional has an obligation to ensure patient safety. The Association of Perioperative Registered Nurses (AORN) has recommended the establishment of a patient safety culture in the operating room, in which every surgical team member places value on safety and commits to personal responsibility for patient safety (Wood et al., 2020, p. 1043). In addition to individual accountability, everyone in the operating room has a shared responsibility for guaranteeing patient safety and delivering high-quality care (Anestesisykepleierne NSF, 2020). The WHO has developed a Surgical Safety Checklist aiming to decrease errors and adverse events and increase teamwork and communication in surgery (WHO, 2009).

The requirements for professional conduct for healthcare workers are outlined in Chapter Two of the Norwegian Health Personnel Act (Helsepersonelloven, 1999). According to Section Four, "Responsible conduct," healthcare workers must carry out their duties with the

professional responsibility and careful attention that one would expect given their educational background, the nature of their work, and the overall circumstances. The duty to provide adequate and compassionate healthcare in the Health Personnel Act is related to patients' rights to necessary and adequate health care, Sections 2-1 to 2-1c of the Patients' and Users' Rights Act , and Section 2-2 of the Specialist Health Service Act (Helsepersonelloven, 1999).

2.3. Surgical team

A surgical team usually consists of surgeons, assistants (interns or residents), anesthetists, nurse anesthetists, and operating room nurses (Rothrock, 2019, p. 7). The surgeon is the principal decision-maker when it comes to performing surgeries and providing patient care (Eikemo, 2023). They are responsible for planning and executing the procedure according to best practices and standards. Additionally, they collaborate and interact closely with the other members of the team throughout the procedure. There are two distinct tasks for operating room nurses, as mentioned above. The circulating nurse remains non-scrubbed and applies the nursing process to assess the patient, determine the intended results, create a nursing diagnosis, develop a plan of care, carry out or delegate interventions, and evaluate the outcome of the care provided (Rothrock, 2019, p. 13). The sterile nurse, on the other hand, assembles the needed instruments and supplies in a manner that maximizes safety and efficiency. This position requires a deep comprehension of every step involved in the surgical process as well as the capacity to foresee the requirement for each instrument and provide it (Rothrock, 2019, p. 13). The anesthetists and nurse anesthetists are in charge of giving the patient anesthetics and medications and preserving the patient's vital signs. They keep a close eye on the patient's status and modify the anesthetic dosage as necessary. Successful operation execution requires teamwork, open communication, and a positive work atmosphere (Anestesisykepleierne NSF, 2016).

2.4. Digitalization in the healthcare sector

The National eHealth strategy is the government’s policy for digitalization in the Norwegian healthcare sector (Hornnes & Simensens, 2023, p. 4). Access to easy-to-use digital technologies that facilitate administrative procedures and offer sound decision support is one of the goals of the first national eHealth plan, which was introduced in 2017 (Mackey &

Bassendowski, 2017). By 2030, the Norwegian government will have set out to meet the following goals:

1) Healthcare professionals have access to holistic digital work tools that contribute to an efficient working day.

2) Healthcare professionals have easy access to relevant and necessary information about the patient, regardless of where in the country and what level of treatment they have received.

3) Healthcare professionals can digitally collect information and have a dialogue with the patient.

4) Reduced double registration and provide more automatic reporting to health registries, other registries and public authorities.

5) Health-related assessments are supported to a greater extent by digital knowledge and decision-support tools.

6) Clinical and administrative processes are more efficient and take advantage of opportunities in new technologies, including artificial intelligence and personalized medicine.

7) Healthcare professionals have good digital competence both through education and training in the use of new digital work tools (Hornnes & Simensens, 2023, p. 13).

On top of that, the WHO claims that clear evidence exists on the growing impact that eHealth has on the delivery of healthcare around the world today and how it is making health systems more efficient and more responsive to people's needs and expectations (WHO, 2023).

2.5. Privacy

Privacy is a broad term that can be defined in a lot of ways, but its central focus is the sanctity of the individual, the right to respect from other people, and respect for one's own integrity and private life (Ehelse, 2022). In Norway, there are several regulations in place to safeguard individuals' privacy against any misuse of their right to privacy, including the inappropriate use of personal data. The Personal Data Act is the first, and its main objective is to protect individuals' privacy from being violated by the processing of their personal data

(Personopplysningsloven, 2018). The second is found in chapters three and four of the Patient and User Rights Act (Pasient- og brukerrettighetsloven, 1999). Among other things, chapter three states that the processing of personal data, including health and medical information, must abide by current laws safeguarding confidentiality, that information must be handled with the utmost care, and that the integrity of the individual must be preserved. Conversely, chapter four highlights the individual's entitlement to provide consent for medical treatment. Unless there is a statutory authority or any legitimate legal foundation for delivering healthcare without consent, healthcare can only be supplied with the patient's consent (Pasient- og brukerrettighetsloven, 1999). Third, Section 21 of the Health Personnel Act imposes an obligation of confidentiality on healthcare workers. According to the law, anybody employed in the healthcare sector is obligated to keep private any information they receive about patients' health, problems, or other personal details from other people (Helsepersonelloven, 1999). Lastly, specialist healthcare facilities are required by Section 3-2 of the Specialist Healthcare Act to guarantee the security of their medical records and information systems (Spesialisthelsetjenesteloven, 1999).

A significant amount of data is handled in the healthcare industry to support research, innovation, health registries, and high-quality healthcare services. All of this information must be managed to protect people's confidence in the healthcare industry while simultaneously facilitating the appropriate delivery of services (Ehelse, 2022). Consequently, good digital security is necessary when the healthcare industry goes digital since security lapses can seriously disrupt the provision of healthcare services. As a result, the government gives top priority to initiatives on digital security through partnerships with the corporate sector and the Norwegian National Cyber Security Strategy (Hornnes & Simensens, 2023).

The Directorate of e-Health has defined information security as managing risks related to information and the processing of personal data (Ehelse, 2022). The integrity, availability and confidentiality of the information shall be ensured since good information security is important to providing justifiable health services. Integrity means that health and personal data must be secured against accidental or unauthorized alteration or deletion; availability means that health and personal data to be processed are available at the time and place where the information is needed; and confidentiality means that health and personal data must be secured against

unauthorized persons gaining knowledge of the information. Good information security and good privacy protection are prerequisites for digitalization in healthcare (Ehelse, 2022).

2.6. Distraction in the operating room

In several hospitals, more recent technologies, such as mobile phones and other portable electronic devices, have been included into standard hospital communications and act as access points for patient information and images (ACS, 2016). However, as beneficial and significant as these gadgets might be when utilized appropriately, healthcare professionals may get more distracted by social media, email, and other electronic communication when using these devices improperly (ACS, 2016). Distraction is defined as something that turns your attention away from something you want to concentrate on (Collins English Dictionary, 2024). The operating room should be ideally as quiet as possible, except for the essential sounds of communication among team members directly concerned with the patient´s care; the reality, however, is that there is a lot of noise in the operating room, which can be a source of distraction (Phillips, 2007, p. 215). Distraction compromises patient safety by impairing alertness, situational awareness, and the ability to respond promptly to changes in the patient's condition (Pelt & Weinger, 2017, p. 140). Intrinsic sources of distraction include elements like alarms, the sound of surgical equipment, shift changes, and important communication. Extrinsic sources, on the other hand, include visitors, calls from outside the operating room, irrelevant communication, beepers, computers, and personal electronic devices, as well as traffic into and out of the room (ACS, 2016).

2.7. Healthcare-associated infections

The WHO has described Healthcare-associated infections (HAIs) as the most frequent adverse event affecting patient safety worldwide leading to significant mortality and financial losses for the health system (WHO, 2010). HAIs are infections acquired by patients when receiving care at a healthcare facility. This includes urine-, chest-, blood- and wound infections such as SSI (Allegranzi, 2016). As per the definition provided by the Centers for Disease Control and Prevention (CDC), SSI is an infection that develops in the area of the body where the surgery was performed following the procedure (CDC, 2010). Infections confined to the skin can occasionally occur at the site after surgery while more serious SSIs might affect organs, implanted materials, or subcutaneous tissues (CDC, 2010). Additionally, SSIs are infections

that occur within 30 days after an operation or up to one year after operations where a foreign body is implanted (UNN, 2023). Healthcare personnel adhere to the CDC´s Infection Prevention Guidelines to prevent SSI (CDC, 2010). On a daily basis, HAIs results in prolonged hospital stays, long-term disability, increased resistance of microorganisms to antibiotics, massive additional costs for health systems, high costs for patients and their families, and even unnecessary deaths (WHO, 2010).

2.8. Infection control

Healthcare institutions must have an infection control program in place in order to comply with the mandate on infection control in the health sector (Forskrift om smittevern i helse- og omsorgstjenesten, 2005). This holds true for ambulatory surgery centers, nursing homes, hospitals, and rehabilitation centers. An infection control program is a set of guidelines that include all required precautions to keep patients safe while also managing and investigating infection outbreaks in healthcare facilities (FHI, 2015). Additionally, it is mandatory for all healthcare establishments to identify potential infection-causing conditions in its daily operations and take appropriate action. Strategies to safeguard employees from contamination must also be included in the infection control program (FHI, 2015).

Regardless of a patient's presumed infection status, suspected or confirmed diagnosis, basal infection control practices should be applied in all patient contact in order to prevent transmission of infectious pathogens (Duvaland, 2023). These practices are intended to both protect healthcare professionals against infections, and prevent infection to and amongst patients. The foundation of these procedures is the understanding that all bodily fluids, such as blood, mucosal membranes, non-intact skin, and secretions and excreta (apart from perspiration), might harbor infectious pathogens. However, when basal infection control routines do not provide adequate protection against the spread of infection, other infection prevention regimes such as isolation should be implemented (Duvaland, 2023).

According to FHI (2022), the hands of healthcare personnel are often instrumental in the transmission of infection between people in the healthcare services, and hand hygiene is an important measure to prevent the spread of infection. For hand hygiene to have the desired effect, it must be carried out in the right way, at the right time, and with effective products. They added that hand washing with soap and water and alcohol-based hand sanitizer are both

good and effective methods of hand hygiene, when done correctly. However, hand sanitizer is recommended as the first choice in the healthcare service in most situations because:

1. It is more effective than soap and water against most microorganisms.
2. It takes less time than hand washing with soap and water.
3. It is easier to implement in the patient situation.
4. It is gentler on the skin of the hands than hand washing (FHI, 2022).

In situations where the hands are contaminated with chemicals or body fluids or other organic material, or there is infection with spore-forming bacteria, alcohol-based hand sanitizer may have reduced efficacy, hand washing with soap and water is recommended (FHI, 2022). Additionally, they advised to use alcohol-based hand sanitizers containing 70–90% alcohol while mild liquid soaps without fragrance or preservative are advised for hand washing.

Hand hygiene should be carried out during patient contact and during any of the following:

1. Before touching a patient or objects in the patient's immediate surroundings (patient zone).
2. Immediately before a clean/aseptic task.
3. Immediately after contact with body fluids (including when gloves are worn).
4. When leaving a patient after touching him or her or objects in the patient's immediate surroundings (the patient zone) (FHI, 2022).

Likewise, in order to prevent cross-transmission in the healthcare industry, it is also necessary that healthcare personnel perform hand hygiene outside the patient situation. Among other things, they should perform hand hygiene before touching items in clean warehouses such as textiles, medicines and medical equipment, before handling or serving food, after staying in disinfection rooms or handling waste or unclean equipment, after coughing or sneezing their hands or brushing their nose, and after using the toilet (FHI, 2022).

2.9. Disinfection of mobile devices

Disinfection describes a process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects (CDC, 2018). Chemicals used for this process are referred to as disinfectants, and in healthcare settings, a variety of disinfectants are used.

Disinfectants vary in their ability to kill microorganisms and are categorized as high-level, intermediate-level, or low-level. High-level disinfectants kill all microorganisms except for small numbers of bacterial spores; intermediate-level disinfectants kill mycobacteria, vegetative bacteria, and most viruses and fungi but not bacterial spores; and low-level disinfectant kill most vegetative bacteria and some viruses and fungi (Rothrock, 2022, p. 74). Low-level and intermediate-level disinfectants are generally used on environmental surfaces such as floors and countertops and may also be used for disinfection of noncritical items, items that only come in contact with intact skin.

In light of the COVID-19 pandemic, the Federal Communications Commission (FCC) and the two of the biggest mobile phone manufacturers in the world, Samsung and Apple, have released mobile phone cleaning guidelines for the general public. None of them, nevertheless, have published guidelines for medical professionals. The public is advised by the FCC to clean and disinfect their mobile devices at least once a day (FCC, 2020), and Apple (Apple.com, 2023) and Samsung (Samsung.com, n.d.) both suggest cleaning mobile devices in the following ways:

- Unplug the device before cleaning.

- Use a lint-free cloth slightly dampened with soap and water.
- Gently wipe the exterior surfaces with 70% alcohol-based wipes.
- Don’t spray cleaners directly onto the device.
- Avoid aerosol sprays and cleaning solutions that contain bleach or abrasives.
- Keep liquids and moisture away from any openings on the device (Apple.com, 2023; Samsung.com, n.d.).

3. Methods

This chapter describes the systematic methods used in this master's thesis to address the research problem in light of the topic's wide scope and scarcity of available literature through the use of scoping reviews.

3.1. Scoping Review

A research literature review is a written synthesis and appraisal of evidence on a research problem and has many different types (Polit & Beck, 2021a, p. 82). Scoping reviews as defined by Arksey and O´Malley, are a method of knowledge synthesis that identifies trends and gaps within an existent knowledge base, or scope of knowledge, to inform research, policy, and practice (Westphaln et al., 2021, p. 30). In contrast to a systematic review, a scoping review addresses broad questions, uses flexible procedures, and does not evaluate evidence quality (Polit & Beck, 2021b, p. 657). It is also used when a body of literature has not yet been comprehensively reviewed or exhibits a large, complex, or heterogeneous nature not amenable to a more precise systematic review (Peters et al., 2015, p. 141). Accordingly, Munn et al. (2018) stated that scoping reviews provide an accurate representation of the quantity of literature and studies that are available, as well as a broad or deep overview of their focus. They also mentioned that scoping reviews are an ideal instrument for figuring out the depth or coverage of a body of research on a particular issue. Like integrative reviews and narrative literature reviews, scoping reviews can include both research (i.e., empirical) and non-research evidence (gray literature) such as policy documents and online media (Peters et al., 2015, p. 2).

In this master thesis, the Joanna Briggs Institute (JBI) methodology for a scoping review was applied. However, the framework by Arksey & O'Malley, (2005) was also included since they have explained the stages thoroughly and it made the process less complex. They have developed a framework to help authors through the scoping review process, which is composed of six stages: 1) specify the research question; 2) identify relevant literature; 3) select studies; 4) map out the data; 5) summarize, synthesize, and report the results; and 6) include expert consultation. The process is not linear but iterative, requiring researchers to engage with each stage in a reflexive way and, where necessary, repeat steps to ensure that the literature is covered comprehensively (Arksey & O'Malley, 2005, pp. 22–28). However, since this master's thesis was written by two authors and includes both quantitative and qualitative studies, the

framework's modifications suggested by Westphaln et al. (2021, p. 1) were also applied. The modifications emphasize the use of mixed-method research and incorporate a team-based approach into the scoping review process at every level. This study aimed to minimize the possibility of bias and incorporate pertinent research, irrespective of the type of study. JBI´s methodology for scoping review includes the following: 1) Title, 2) Background, 3) Review question/ objective, 4) Inclusion Criteria, 5) Types of participants, 6) Concept, 7) Context, 8) Searching, 9) Extracting and charting the results with the use of PRISMA diagram, 10) Discussion and 11) Conclusion (Peters et al., 2015, pp. 18–22). We used the ´PCC´ mnemonic (Population, Concept and Context) in formulating the research question (Peters et al., 2015, p. 7). Operating room nurses, nurse anesthetics, anesthesiologists, and surgeons all make up the interdisciplinary population of our study in the use of mobile phones safely in the context of the operating room.

3.2. Search strategy

An expert university librarian was consulted for assistance in the database search process before any pertinent articles were found. Search phrases, search combinations, and strategies were developed, along with the types of articles that were sought. The aim was to include studies from the various surgical team professions, the operating room, and the hospital context as a whole. Two distinct database searches were carried out in total. The first occurred in early August of the previous year, and the most recent one took place in early January of this year. For both searches, the inclusion and exclusion criteria were the same.

In all the searches, the EBSCO host platform was used to look for papers pertaining to the topic mainly in two databases: Medline, CINAHL and CINAHLwith Full text. In all articles, the inclusion criteria were: 1) it should be written in either English/Norwegian/Danish/Swedish; 2) it can be either a quantitative, qualitative, or mixed-method study; 3) it should involve healthcare workers use of mobile phone / devices; 4) it should be in the hospital setting; 5) it should be full text and 6) it should be accessible through the university's library. The exclusion criteria, on the other hand, were: 1) published not later than the last 10 years; and 2) patients´ use of mobile phone/ devices. The literature search was performed with the use of a PCC mnemonic, see attachment 1. The study's population consisted of multidisciplinary teams, including nurses, anesthesiologists, and surgeons. Its concept was the use of mobile phones,

and its context was the operating room or hospital. The same keyword combinations were employed in both searches. Following the steps mentioned above, a total of 661 articles were identified, see attachment 2. Twelve articles were included after mutual consensus on the inclusion and exclusion criteria. Lastly, three additional articles were identified by employing the snowballing method in conjunction with a Google Scholar search for gray literature. This master thesis includes a total of 15 publications, all coming from different countries, none of which represent Norway.

3.3. Quality Assessment of Included Studies

This master thesis includes twelve research studies that used different methods. It is comprised of one case study, one prospective study, five cross-sectional studies, two observational studies, two descriptive studies, and a scoping review. Only one of these research studies employed a mixed strategy while the other ten used a quantitative approach. Eight of the studies that are included were conducted between 2019 and 2022, while the remaining four were conducted between 2014 and 2017. The majority of the research was published in the last five years. One study was from the United States, two were from the United Kingdom, and the others were from Canada, France, Israel, Japan, Kuwait, the Netherlands, Pakistan, Sweden, and Taiwan. To evaluate and verify the quality of the research studies included in this master thesis, the Mixed Methods Appraisal Tool (MMAT) was used (HONGa et al., 2018). The checklist is an assessment tool for mixed method research which enables the evaluation of the methodological quality of studies in five categories: mixed methods studies, non-randomized studies, randomized controlled trials, qualitative research, and quantitative descriptive studies (HONGa et al., 2018). Both authors of this master thesis took part in the assessment procedure separately in order to get unbiased conclusions. The MMAT assessment yielded a score of 7/7 for almost half of the studies we analyzed, however, five of the studies did not provide a clear answer when asked if the interventions were implemented as intended. Even so, since they helped us find answers to our research questions, we decided to include them in our review. The full MMAT form can be found in table 1. A scoping review is also included in this thesis, and the quality of which was assessed using the PRISMA-ScR checklist, see attachment 3 (Page et al., 2021).

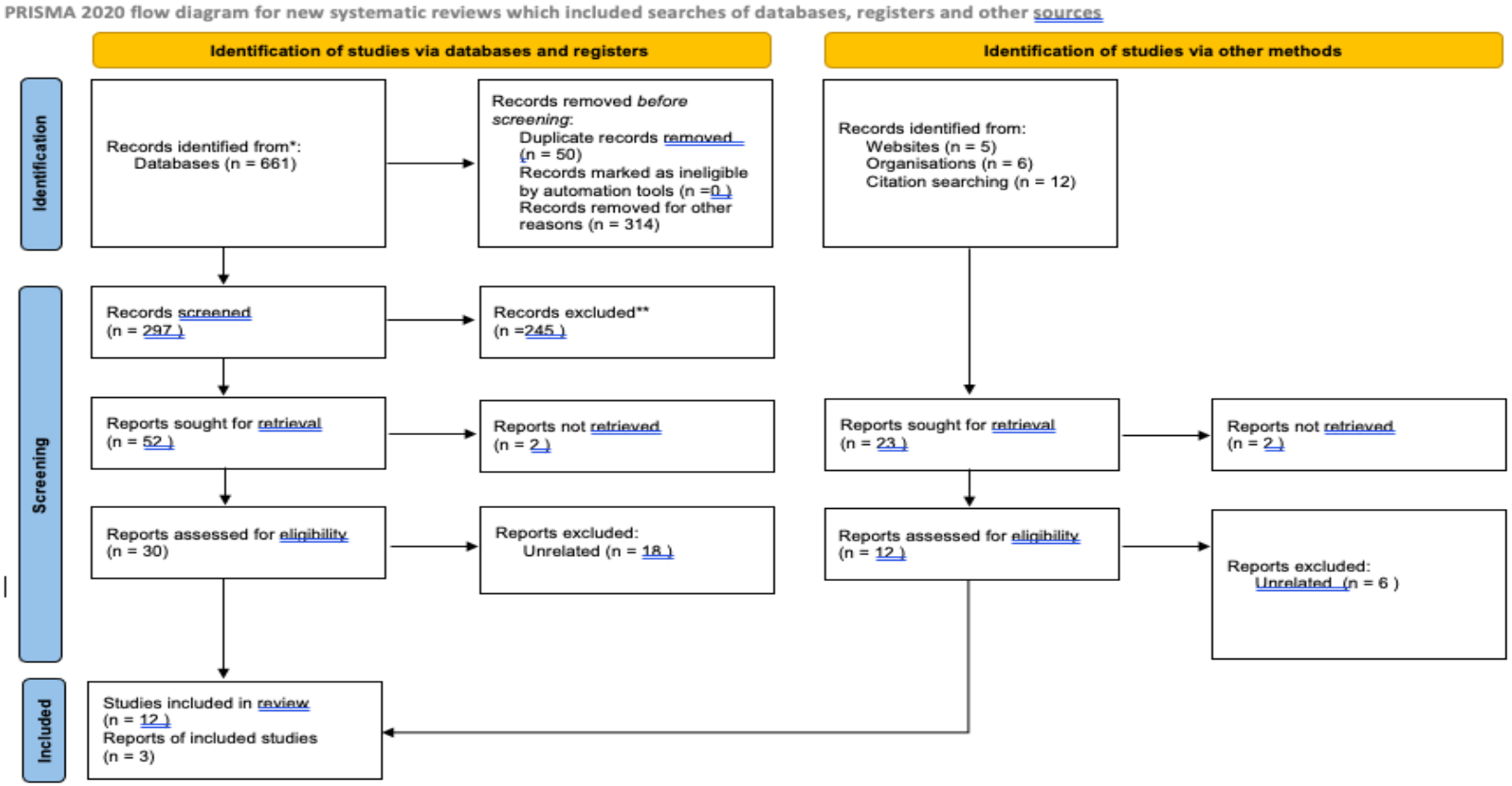
Table 1. Mixed Methods Appraisal Tool

		Responses										
Category of study designs	Methodological quality criteria	Avidan et al. (2019)	Buabbas et al. (2021)	Chang et al. (2017)	Kuriyama et al. (2021)	Larsson et al. (2019)	Mark et al. (2014)	Mobasheri et al. (2015)	Missri et al. (2019)	Nasri et al. (2022)	Sergeeva et al. (2016)	Qureshi et al. (2020)
		6/7	6/7	6/7	5/7	7/7	6/7	7/7	7/7	7/7	7/7	6/7
Screening questions (for all types)	S. Are the clear research questions?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
	S. Do the collected data allow to address the research questions?	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Qualitative	1.1. Is it qualitative approach apporatative to answer the research question?										YES	
	1.2. Are the qualitative data collection methods adequate to address the research question?										YES	
	1.3. Are the findings adequately derived from the data?										YES	
	1.4. Is the interpretation of results sufficiently substantiated by data?										YES	
	1.5. is there coherence between qualitative data sources, collection, analysis and interpretation?										YES	
Quantitative nonrandomized controlled	3.1. Are the participants representative of the target population?	YES	Can´t tell	YES	YES	YES	YES	YES	YES			YES
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	YES	YES	YES	YES	YES	YES	YES	YES			YES
	3.3. Are there complete outcome data?	YES	YES	YES	YES	YES	YES	YES	YES			YES
	3.4. Are the confounders accounted for in the design and analysis?	YES	YES	YES	Can´t tell	YES	YES	YES	YES			YES
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?	Can´t tell	YES	Can´t tell	Can´t tell	YES	Can´t tell	YES	YES			Can´t tell
Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?									YES		
	4.2. Is it sample representative of the target population?									YES		
	4.3. Are the measurements appropriate?									YES		
	4.4. Is the risk of nonresponse bias low?									YES		
	4.5. Is the statistical analysis appropriate to answer the research question?									YES		

3.4. Limitations of the Study

In our master's thesis, we employed a suitable scoping methodology to map out the available knowledge related to our research problem, aligning with the aim of this study. Dalland (2020, p. 158) defines information evaluation as the process of assessing the literature's ability to describe and illuminate a given issue, requiring an evaluation of a study's relevance and quality before utilizing it as a source. Relevance refers to a source's significance in relation to the research topic, while quality pertains to the study's nature and validity Dalland, 2020, p. 159). We deem the articles in our thesis as relevant and valid, contributing to our understanding of the research problem. However, due to their global scope, not all findings are directly applicable to the Norwegian healthcare system. Despite our systematic approach and the assistance of an expert librarian during the initial stage of the search process, we acknowledge the possibility of overlooking or failing to locate other potentially relevant studies. Although scoping reviews do not typically involve methodical appraisal or bias assessment according to Peters et al. (2021), we employed relevant appraisal tools to assess the quality of each study included in our review as mentioned above. It is crucial to recognize our limitations as novices in this field, as we may have misunderstood these tools. To ensure reliability, scoping reviews must maintain integrity and transparency (Munn et al., 2018).

Fig.1. Prisma 2020 flow diagram



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).
**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

Table 2. Matrix of articles

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
1. Avidan et al. (2019) **Cell phone calls in the OR and staff distractions** Observation study (Israel) https://doi.org/10.1097/PTS.0000000000000351	To evaluate the extent of cell phone use in the operating rooms during elective surgery. To evaluate whether they cause staff distractions. - 52 surgeries observed. - 455 staff member presences.	- Even though all staff members have cell phones and their use is unrestricted in the operating room, there were surprisingly few cell phone calls made during the elective surgery. - They recommend that operating surgeons turn off their cell phones before surgery.			- Incoming calls were received during all 52 surgeries, and outgoing calls were made during 7 surgeries. - 205 calls (197 incoming + 8 outgoing); average of 3 calls/surgery. - Incoming calls were related to work on 70 of 110 occasions. - None of the incoming calls was related to the patient undergoing surgery. - Most of the outgoing calls (6/8) were related directly to the patient undergoing surgery. - 30 staff distractions occurred during 29 of 197 incoming calls. - The mean duration of the distractions was 43.6 ± 22.3 seconds. During 1 call 2 persons were distracted. - On 2 of 30 occasions, distraction occurred although nobody answered the cell phone call. - 5 of 30 occasions, staff members answering their own cell phones were distracted. - Most distracted staff members were scrubbed surgeons. - No staff members were distracted during all 8 outgoing calls.		
2. Buabbas et al. (2021) **Usefulness of smartphone use among surgeons in clinical practice during the pandemic COVID-19** Cross-sectional study (Kuwait) https://doi.org/10.1186/s12911-021-01563-1	Aimed to assess the usefulness of smartphones in surgical practice during COVID-19 pandemic. - 180 surgeons/ respondents from different government hospitals in all parts of Kuwait	- This study revealed that using smartphones in surgical practice was prevalent among the respondent surgeons in Kuwait during the pandemic. - Guidelines are required for proper and legal use of smartphone devices in medical practice. Accordingly, recommendations are suggested.	- Almost all of the respondents (99.5%) used smartphones for hospital-related work, particularly for using Internet search engines to access relevant medical information. - Sixty percent of the surgeons used medical applications during their work, such as UpToDate, Medscape, MDCalc, and Touch Surgery. The majority of the respondents (88%) rated the use of smartphones in practice to be of importance, due to the benefits. - Regarding using smartphone technology for patient assessment, texting (70%) and viewing or taking images and videos using the built-in camera (60%) were the most common uses among the respondents, whether in the emergency department, outpatient clinic, ward, or operating room. - Some of the surgeons (13%) shared their comments through the open comment box in the questionnaire. Thematic analysis was performed on				The results show that almost half of the respondents (40%) always obtained consent from patients to use smartphones, and a quarter (25.5%) obtained it most of the time. Regarding obtaining consent from patients, the results show that the majority of the respondents deemed verbal consent to be sufficient (55.6%). Only 23.9% obtained written consent, and a minority did not obtain consent, as they thought it was not needed (20.5%). Furthermore, 79.4% ensured patients' awareness of their privacy rights

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
			these comments. Four surgeons reported the usefulness of smartphones in medical practice and considered it a gate to the World Wide Web (WWW). For instance, one surgeon had used the Google Translate application to help in communicating with a patient in the casualty department who could speak neither Arabic nor English. - Five surgeons suggested that smartphones should be officially adopted in hospitals for clinical practice, stressing the need for regulations and training to ensure their proper use. In addition, four surgeons mentioned the demand for the use of smartphones for teleconsultation and telemedicine to improve communications for the purpose of patient care.				regarding the clinicians' use of smartphones in clinical practice, but 20.6% did not. In terms of the use of built-in cameras for photography, 80.5% said they used them to consult other consultants.
3. Chang et al. (2017) **Nasal Colonization and bacterial contamination of mobile phones carried by medical staff in the OR** Observational cohort study (Taiwan) https://doi.org/10.1371/journal.pone.0175811	- To evaluate the incidence of bacterial contamination of the mobile phones carried by medical staff working in the OR and determine its association with bacterial colonization of this personnel. - 72 respondents from the Orthopedic Surgery OR in one hospital	- Further research into the connection between surgical-site infections (SSIs) and mobile phones is required, - Researchers recommended that there be restrictions on using personal cellphones in operating rooms. - Advise to clean up mobile phones frequently to reduce the contamination caused by cellphones.				- The overall bacteria-positive rate was 98.1% (212/216), the highest in nasal nares (100%, 72/72), followed by dominant hands (97.2%, 70/72) and MPs (97.2%, 70/72). The isolated microorganism was a possible clinical pathogen in 27.3% (59/216) of the samples, and was most frequently found in nasal nares (58.3%, 42/72), followed by MPs (13.9%, 10/72) and hands (9.7%, 7/72). - Most common clinical pathogen was SA (19.9%, 43/216), with 27 methicillin-sensitive strains (MSSA, 12.5%, 27/216) and 16 methicillin-resistant strains (MRSA, 7.4%, 16/216), followed by Enterobacter spp. (5.6%, 12/216) and Citrobacter koseri (4.6%, 10/216. - There were 70 people having a positive culture from their MPs (97.2%, 70/72). Among that, 66 (94.3%, 66/70) were found to have the same microorganism in the nares or hands (nares only, 16.7%; hands only, 4.5%; both, 78.8%). - 12 participants for whom a clinical pathogen was isolated from their MPs, the same clinical pathogen was also found in 10 participants (83.3%) in their nares or dominant hands (nares, 70%; hands, 10%; both, 20%). - SA was found in 31 (31/72; 43%) swab samples from anterior nares, 8 samples (8/72; 11.1%) from MPs, and 4 (4/72) 5.6%) from the hands. - Methicillin-resistant strains were found in 10 (32.3%), 3 (37.5%), and 3 (75%) samples from the anterior nares, MPs, and hands, respectively.	

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
						- It should be noted that among 31 SA carriers, 8 (25.8%) had growth of SA in cultures from their MPs, and all 8 medical staff who had SA in cultures from their MPs were SA carriers (6 in the anterior nares and 2 in the anterior nares and hand.	
4. Dowden et al. (2020) **Recommended cleaning practices for cell phones in the OR** Scoping Review (Canada) Recommended cleaning	The objective was to synthesize existing knowledge to identify strategies for reducing patient infection risk and provide further guidance for policy development on cleaning cell phones in OR. - Identify current cleaning practices, and explore disinfection protocols. - 8 articles are included the study settings were in ORs across the world, including the US, the UK, Turkey, France, Sri Lanka, Austria, India, and Taiwan. One study setting also included an intensive care unit in addition to the OR.	- This review found that researchers noted that disinfecting with isopropyl alcohol, at varying concentrations, in conjunction with stringent handwashing decreased the bacterial load on the surface of cell phones. - A thorough review of the literature has indicated there is a need to conduct further high-level quantitative research that will support recommendations for disinfecting cell phones within the OR.	- Cell Phone use is becoming increasingly widespread among health care professionals in acute care settings and has become indispensable for purposes of professional communication and collaboration, documentation, reference, education, and photography. - Participants rarely cleaned their cell phones. - Significant decreases in bacterial load after disinfecting cell phones. The main inconsistency was the cleaning product tested in the studies; different products were used. - Results showed that doing at least some type of decontamination would help diminish bacterial load and potentially prevent the spread of infection via cell phone users. Combining cell phone disinfection with proper handwashing was shown to improve outcomes even further.			- All eight of the studies noted a high rate of bacterial contamination and/or organic material on all types of mobile devices at the time of initial measurement. - All studies showed bacterial contamination on participants' cellphones, with some being normal flora, or non-pathogenic, and some being pathogenic, such MRSA, Vancomycin-Resistant Enterococci (VRE), and Escherichia coli (E.coli). - In studies that explored decontamination, four of the eight studies used different concentrations of isopropyl alcohol solutions or wipes and one of these four studies also used a specific surface disinfectant. - A statistically significant decrease in bacterial load on cell phones was noted after using any of these products. - The inconsistencies in cleaning procedures and variations of solution types pose difficulties in selecting the most effective product to support evidence-based practice.	
5. Kuriyama et al. (2021) **Prevalence of bacterial contamination of touchscreens and posterior surfaces of smartphones owned by healthcare workers** Cross-sectional study (Japan)	The aim was to compare the prevalence of microbial contamination of touchscreens and posterior surfaces of smartphones owned by healthcare workers in ICU). - 84 Healthcare workers employed at two ICU in a tertiary hospital in Japan	- They recommend that the posterior surface of smartphones be cleaned, similar to the touch screen, in order to avoid cross-contamination in healthcare settings.	- Only 9 (10.7%) participants reported that they regularly sanitized their smartphones. - They all used alcohol to clean their smartphones, irrespective of cleaning frequency. - Five (6.0%) and four (4.8%) participants washed their hands before and after they used their smartphones, respectively			- 66 (78.6%) participants placed a film on the touchscreen, and 69 (82.1%) used a cover on the posterior surface of the smartphone. - 23 (27.4%) participants used their smartphones at the patient's bedside. - 49 smartphones (58.3%) were contaminated with bacteria. - The touchscreen was contaminated in 27 (32.1%), posterior surface in 39 (46.4%), and both surfaces in 17 (20.2%) smartphones. - The posterior surface was more frequently contaminated than the touchscreen. - There was no significant difference in the frequency of touchscreen contamination by the use of film over the touchscreen (p =	

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
https://doi.org/10.1186/s12879-021-06379-y						0.26), sex (p = 0.64), regular disinfection of smartphones (p = 0.46), or hand washing before smartphone use (p = 0.66).	
6. Larsson et al. (2019) **Healthcare Professionals use of mobile phones in the OR** Descriptive cross-sectional study (Sweden) https://actascientific.com/ASPE/pdf/ASPE-02-0187.pdf	To describe healthcare professionals use and manage professional phones and private mobile phones in the operating theater. - 40 structure observations in the OR and 33 questionnaire surveys. - conducted in 3 surgical departments in one hospital.	- It is essential to develop guidelines regarding the use of private mobile phones in the OR. - Increased adherence to basic hand hygiene guidelines with mobile phone use. - To Improve awareness of the advantages and disadvantages of mobile phones usage in OR. - Only Bring private mobile phones that are also used for work. - Store in a designated place to reduce use for private purposes and for hygiene reasons.		- Adherence to basal hygiene guidelines before 93 (19,4%) and after 103 (21,5%) mobile phone use. - On 12 occasions, mobile phones were used with unclean gloves. - 12 (36,3%) disinfected private mobile phones every day, 10 (30,3%) weekly and 5 (15,5%) a few times a month, 2 (6%) disinfected fewer than every month and 4(12,1%) never disinfected.	- 477 phone uses, 287 (60.2%) were private mobile phones and 190 (39.8%)professional phones. - 18 (54%) use private phones in the OR to contact family, 9 (27,2%) for pleasure/ entertainment, 7(21,2%) other private purposes. - 20 (86,9%) searched for information on the internet work related, 12 (52,1%) use the calculator, 10 (43,4%) medical/nursing apps, 8 (34,7%) calendar, 6 (26%) messages, 6 (26,6%) phone calls, 4 (17,35%) photography and 3 (13,5%) other things.	- Storage of mobile phones: 55 clean tables, 48 computer tables, 43 in a special place for various types of communication equipment storage, 31 on anesthetic tables/apparatus, 2 in the OR bed, 15 other storage inside OR.	
7. Mark et al. (2014) **Mobile phones in clinical practice: reducing the risk of bacterial contamination** Quantitative descriptive study (Ireland) https://doi.org/10.1111/ijcp.12448	To investigate the level of contamination on phones used on surgical wards and identify strategies for their safe use within clinical areas. - 50 Mobile phones of healthcare workers in the OR were swabbed. - 150 healthcare workers answered a questionnaire.	We recommend continued emphasis on effective hand hygiene in clinical areas as the most effective means of ensuring the safe use of touch screen mobile phones and tablet computers in a clinical setting.	- Most common use is for communication within the hospital. - Using the internet for email and texting colleagues for clinical communication.	- 45% never washed their hands before and after, 38% occasionally and 17% always. - 63% never decontaminate, 24% use alcohol wipes daily.	- 49 (33%) used their phone for personal use only, 17 (12%) clinical practice only and 64 (43%) both private and personal use.	- 20 (40%) mobile phones had no bacterial growth, 30 (60%) some form of bacterial growth. - 38 (25%) never used their phone at work, 79 (52%) 10x or less/day, 20 (14%) 10-20x/day.	
8. Mobasheri et al. (2015) **The ownership and clinical use of smartphones by doctors and nurses in the UK**	To perform an up-to date prospective survey of doctors and nurses use of smartphones, tablet devices and mHealth apps in the clinical environment.	- The findings from this study demonstrate that smartphones have become increasingly popular among healthcare professionals who perceive them to be an excellent tool in supporting healthcare delivery.	- 252(92%) of doctors and 271 (53,2%) nurses identify their smartphone as either 'useful' or 'very useful' in helping them to perform their daily clinical duties. - 255 (93,8%) of doctors used their smartphones for communication purposes at work while 145 (28,5%) for nurses. - 128 (50,2%) doctors used smartphones instead of beepers.				- 176 (64.7%) doctors had used SMS, 90 (33.1%) had used app-based messaging and 125 (46.0%) had used phone cameras and picture messaging.

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
Cross-sectional survey study (UK) http://dx.doi.org/10.1136/bmjinnov-2015-000062	- Conducted in 5 hospitals. Survey questions were answered by 287 doctors and 564 nurses.	- The results provide strong evidence that healthcare organizations need to develop policies to support the safe and secure use of digital technologies in the workplace	- Both doctors and nurses chose positive terms such as helpful, brilliant and essential more frequently than negative terms such as unnecessary, complicated and terrible.				- 70 (13.8%), 29(5.7%) & 38 (7.4%) respectively. - 71 (27,5%) of doctors and 70 (3,6%) of nurses believed that they still had patient-related clinical information on their cell phone. - 147 (58,5%) of doctors and 100 (21,1%) of nurses preferred to use their own device rather than a trust-issued handset.
9. Missri et al. (2019) **Bacterial colonization of the healthcare workers´mobile phones in the ICU and effectiveness of sanitization** Prospective monocentric study (France) https://doi.org./10.1080/15459624.2018.1546051	To assess the prevalence of bacterial colonization of healthcare workers' mobile phones in an intensive care unit and the effectiveness of a sanitization product. - Study was conducted in a 15-bed ICU of a private hospital. - 56 mobile phones of healthcare workers + 42 mobile phones of administrative staff	- Bacterial colonization of mobile phones with pathogens occurred frequently on the phones in ICU healthcare workers and administrative staff. - Specific sanitization Protocols & recommendations regarding management of mobile phones in the ICU should be developed. - Good hand hygiene after touching mobile phones should be kept in mind to prevent cross-infections.		-10 (17,9%) HCW and 3 (7,1%) admin workers reported routine sanitization of their mobile phones with various products - 5 (8,9%) phones were sterilized after sanitization, Colonization with pathogens was less frequent (21,45) after sanitization. - No differential effect of sanitization with respect to the presence/absence of a protective case.		- All 56 healthcare workers reported keeping their mobile phones with them during shifts. - All 98 mobile phones from both groups were colonized. - The number of different bacterial species per phone was higher in devices from HCW. - Colonization with pathogens was not more prevalent in HCWs (39,3%) vs (28,6%) in admin workers. - Staphylococcus Aureus was the most common pathogen. - 1 (1,8%) colonized with MRSA.	
10. Nasri et al. (2022) **Distractions in the operating room: a survey of the healthcare team** Quantitative descriptive study (USA) https://doi.org/10.1007/s00464-022-09553-8	To explore the perception of the operating room team on multiple distractions during surgical procedures. - 26-question survey. 160 responders from one hospital (nurses, scrub techs, anesthesia team, surgeons).	- Even though auditory distraction was considered the most distracting category during the critical part of the work, the top 5 distractors belonged to equipment and environment categories. - Reduction of distractions might have an impact on the flow of surgery.			- Among the 5 proposed categories of distraction: auditory, visual, communication, equipment, and environment; auditory distraction followed by equipment were the most distracting during the critical part of the work. - Top 5 distractors belonged to the equipment and environment categories: equipment unavailability, team member unavailability, poor ergonomics, case irrelevant communication and phone calls/pagers/beepers - Distractors with higher levels of bothersome appeared to associate with a perceived negative impact on the flow of surgery.		
11. Sergeeva et al. (2016) (2012-2013)	Aims at identifying both intended and unintended effects of		- To improve OR nurses' access to information – mainly instrument lists to help prepare for surgeries.		- A negative consequence was the perceived increase in distraction from the		

Study	Aim and Selection	Conclusion/Recommendation	Positive effect	Mobile and hand hygiene	Distraction	Risk for infection	Risk for privacy breach
Mobile devices in the OR: Intended and unintended consequences for nurses´work Case study (Netherlands) https://doi.org/10.1177/1460458215598637	the introduction and use of mobile devices on healthcare work practices, using the case of the use of mobile devices by operating room (OR) nurses. - Observation (shadowed OR nurses for a total of 31 days) and semi-structured interviews of 35 OR nurses. - 17 OR nurses responded to a survey (Advantages and disadvantages of iPod use).		- Nurses utilize the camera function to record specific arrangements of instruments on the table, or configuration of equipment, to learn and remember new or specific procedures. The camera also started to be used to take pictures of broken equipment to communicate problems to technicians or the sterilization unit, and when surgeons asked OR assistants to take a picture of something medically interesting discovered during the surgery. - Overall, OR assistants described the mobile devices as extremely useful for their work. We found many other examples of work-related use, and the benefits these devices gave: saving time, being better prepared for surgeries, improving learning, supporting knowledge transfer, facilitating external memory building and helping nurses in their interaction with surgeons and other colleagues		collaborative operating room work practices. - Mobile device use was observed during almost every surgery, but was limited to those team members who are non-sterile and to the periods during the surgery when circulating nurses were on stand-by mode and their efforts were not directly required by the operating team. - Devices were used for non-work related and sometimes recreational purposes, such as personal email, Facebook™, messaging friends and family, music, games, taking and sharing personal pictures. - Three areas of concern with the potential distractions caused by mobile device use: distraction from core clinical tasks, distraction from collaboration and distraction from learning.		
12. Qureshi et al. (2020) **Mobile phones in the Orthopedic OR: colonization and antimicrobial resistance** Cross-sectional study (Pakistan) https://doi.org/10.5312/wjo.v11.i5.252	To investigate microbial colonization on the mobile phones of health care professionals in the orthopedic operating room. - 100 mobile phones of healthcare workers were swabbed - Demographic and cell phone related factors were recorded using questionnaires and the factors associated with contamination were analyzed.	- Mobile phones belonging to health care workers are frequently contaminated with pathogenic bacteria with the potential of transferring drug resistance to nosocomial pathogens. - Studies investigating the relationship to surgical site infections need to be conducted. - The concept of “mobile hygiene” involving the change of mobile covers, replacement of cracked screens or even wiping the phone with an alcohol swab could be effective.		- Cleaning the cell phone, particularly within the last 24 h, was associated with having less or no contamination.		- 93 of the 100 tested cell phones were colonized by one or more bacterial species. The most common species isolated was the Coagulase-Negative Staphylococcus, found on 62% of the cell phone. CoNS is identified as one of the causes of SSIs. - 21/22 (95,5%) of attending phones were colonized by potentially pathogenic bacteria. - Mobile covers and cracked screens were found to be associated with microbial contamination.	

Table 3. Matrix of articles from gray literature

Study/Article	Aim and Selection	Distraction	Risk for Infection and Mobile Hygiene	Risk for Privacy Breach
1. Association of Surgical Technologist (2015) **AST Guidelines for Best Practices in Use of Mobile Information Technology in the Operating Room** https://www.ast.org/ Guidelines (USA)	AST developed the following guidelines to support healthcare delivery organizations (HDO) reinforce best practices in the use of mobile information technology (MIT) in the operating room (OR) as related to the role and duties of the Certified Surgical Technologist (CST), the credential conferred by the National Board of Surgical Technology and Surgical Assisting. The purpose of the guidelines is to provide information OR supervisors, risk management, and surgical team members can use in the development and implementation of policies and procedures for the use of MIT in the surgery department. The guidelines are presented with the understanding that it is the responsibility of the HDO to develop, approve, and establish policies and procedures for the surgery department regarding the use of MIT according to established HDO protocols.	- HDOs should establish zones or areas with Wi-Fi hotspots for the use of mobile devices for personal or non-critical care reasons. It is recommended the zones are integrated with cafes or department break rooms to ensure OR personnel are separated from work-related activities. - OR personnel should never access a mobile phone either directly or using a wireless headset during perioperative care of the patient. Additionally, OR personnel should never use the OR computer for personal use, e.g., browsing through Internet sites, checking and/or posting on social networking sites. The activities of OR personnel should be solely focused on the perioperative care of the patient in order to avoid medical errors. OR personnel who are focused on a device's screen rather than focused on the patient may miss indications of the patient's condition and/or indications of an impending medical emergency,	- Devices should be properly cleaned and disinfected on a routine basis, and before entering the surgery department or other patient care area, eg, preoperative holding and PACU. A. Mobil HDO policies should include addressing the cleaning and disinfection of mobile devices and computers for OR personnel to strictly follow.	OR personnel have the duty to responsibly use MIT without violating patient confidentiality, protected health information (PHI), and state and federal patient privacy laws. -OR personnel should avoid sending job-related messages to other HDO departments or clinicians by text messaging. -PHI should only be saved on HDO-approved, secure file servers or encrypted devices. OR personnel should access the information only through facility-approved methods.16,48 HDOs have multiple options available to assist in protecting PHI, but still allow OR personnel the ability to access information that is critical to patient care. -HDOs should establish policies addressing the use of mobile devices by patients and their family and friends in order to protect the privacy of other patients. -HDOs should establish policies that reinforce the protection of patient privacy as well as strengthen patient care by prohibiting the inappropriate use of MIT and OR computers during perioperative care of the surgical patient. The policies need to ensure that any kind of personal interruptions by mobile devices is avoided when patient care is being provided.
2. American College of Surgeons (ACS) (2016) **Statement on Distractions in the Operating Room** https://www.facs.org/ Article (USA)	This statement was developed by the American College of Surgeons Committee on Perioperative Care and approved by the ACS Board of Regents at its June 2016 meeting.	-Surgeons should be considerate of the duties of personnel in the OR suite and refrain from engaging them unnecessarily in activities, including assistance in cellular communication, that might divert attention from the patient or the conduct of the procedure. - Smartphones must not interfere with patient monitoring devices or with other technologies required for patient care. - Members of the OR team, including the operating surgeon, should only engage in urgent or emergent outside communication during an operation. - Personal and routine calls should be minimized. All phone calls should be kept as brief as possible. - Incoming calls should be forwarded to the OR desk or to the hardwired telephone in the OR to minimize the potential distraction of phones. - Incoming calls and data transmissions should be forwarded to voicemail or to memory. The ring tone should be silenced. An inaudible signal may be employed. - Distinct signal for urgent or emergent calls should be enabled. This signal may be implemented via a "page" option in most smartphones. Callers should be advised to use this function only for urgent and emergent calls if the phone is unanswered.	- The use of electronic and mobile devices or their accessories (such as earphones or keyboards) must not compromise the integrity of the sterile field.	- The use of electronic mobile devices to take and transmit photographs should be governed by hospital policy on photography of patients and by government regulations pertaining to patient privacy and confidentiality. - Special care should be taken to avoid sensitive communication within the hearing of awake or sedated patients.
3. Attri et al. (2016) **Concerns about usage of smartphones in operating room and critical care scenario** https://doi.org/ Review article (India)	Article focuses on various applications of smartphones in healthcare practices, drawbacks of the use of these devices and the recommendations regarding the safe use of these devices.	- Store personal devices out of reach and encourage use of organization provided devices that contain preinstalled job specific functions and apps - Create no mobile phone zones in sensitive areas like Intensive Care Unit, OT and critical care units. - Regulate the kind of ring tones, alert tones used by healthcare professionals. - Regulate access to social networking sites. - Establish mobile phone restricted zones as well as mobile phone friendly zones. - Create specific hotspots where personal devices may be used during breaks.	- Taking into consideration that such devices can be a contamination risk, it is recommended to use sterile bags to store smartphones when entering patient care and other sensitive zones. - Use gloves while interacting with patients. Use of new gloves after using a smart device in patient care and other sensitive zones. - Use of sanitizing wipes and or hand sanitizers at regular intervals, especially before dealing with patients.	Mobile phones with a camera facility can constitute a considerable risk. Their risks can be identified as possible breach of medical confidentiality, intrusion into patient's private life, possible contravention of data protection act 1998 and breach of patient confidentiality. Possible risk of safety and welfare of children in contravention of the children act 2007 and can be a cause of nuisance to staff and other patients. - Prior permission to be obtained before taking photos and videos at work. All must adhere to organizational ethics and conflict of interest policies. - Ensure high security computing networks with regulated use of outside devices. - Policies of sharing work related information on social networks. - Generate warning messages to indicate any possible breach in security. - Ensure high security Wi-Fi connections, set up hardware and software firewalls. - Encourage employees to regularly change passwords. Block websites with low security.

4. Results

The studies retrieved throughout the search process are presented in this chapter. We identified articles on distraction, the risk of privacy violation, the risk for infection and mobile phone hygiene.

Mobile phone use in the healthcare sector has several advantages, including improved documentation, communication, and information access for medical personnel. In a study conducted by Mark et al. (2014), mobile phones are mostly utilized for clinical communication, including on-call duties, collaboration among departments, and collegial consultation. According to Buabbas et al. (2021) and Mobasheri et al. (2015), most doctors text other healthcare professionals on patient care using mobile phones. The ease of access to information is the second beneficial application of mobile phones. Almost all of the surgeons utilized mobile phones for work-related tasks in hospitals, especially to acquire pertinent medical information using internet search engines (Buabbas et al., 2021). According to a study on the use of mobile phones by operating room nurses, the main purpose of these devices are to read and learn about specific procedures or instruments, check unknown medications and abbreviations, and obtain information about instrument lists to help with surgery preparation (Sergeeva et al., 2016).

Nonetheless, there are disadvantages to using a mobile phone in the medical setting. We divided the detrimental effects into three categories based on the subjects of concern: distraction, risk of a privacy breach and risk of infection The latter category includes hand hygiene and mobile phone disinfection.

4.1. Distraction

A study on the utilization of mobile phones by healthcare professionals in operating rooms indicated that 477 phone calls were made overall during the course of 40 observations, with more than half of the population using personal mobile phones and the remaining using work phones (Larsson et al., 2019). As reported by Avidan et al. (2019), incoming calls were received in all 52 surgeries they observed, and outgoing calls were made during 7 of those. Out of the

205 calls made in total - 197 incoming and 8 outgoing - an average of three calls were made per surgery. Reportedly, more than half of incoming calls were for surgeons and a quarter were for nurses. Finally, Nasri et al. (2023) did a study on distractions in the operating room, which revealed that auditory distractions were the most distracting elements.

4.2. Risk of a privacy breach

Areas that could be in danger when using mobile phones in the healthcare context have been identified by Attri et al. (2016). These include potential violations of patient confidentiality, invasion of privacy, potential violations of the UK Data Protection Act of 1998, and breaches of medical confidence. Majority of surgeons use their mobile phones' built-in cameras to take pictures for medical consultations, according to Buabbas et al. (2021). Similarly, throughout a surgical procedure, surgeons can request other OR staff to snap a photo of noteworthy things they find during surgery (Sergeeva et al., 2016). Consequently, 27,5% of doctors and 3,6% of nurses believed that they still had patient-related clinical information on their personal mobile phones (Mobasheri et al., 2015). Regarding obtaining patients' permission for physicians to use a mobile phone during patient consultations, half of the surgeons said that verbal consent was enough, a minority did not get consent because they believed it was unnecessary, and a quarter of surgeons obtained written consent (Buabbas et al., 2021).

4.3. Risk for infection

In a study by Missri et al. (2019) on the bacterial colonization of healthcare personnel´s mobile phone use in the intensive care unit, they found that all of the participants' mobile phones were colonized. Healthcare professionals' mobile phones had 2.45 distinct bacterial species per mobile phone, compared to 1.81 for administrative workers. Nonetheless, the prevalence of pathogen colonization on the mobile phones of healthcare personnel did not increase. In a separate study, by Kuriyama et al. (2021) half of mobile phones had bacterial contamination; of these, 32.1% had contamination on the touchscreen, 46.4% on the posterior surface, and 20.2% on both surfaces. Thus, compared to the touch screen, the posterior surface was more frequently contaminated. Researchers Chang et al. (2017) found that of the 72 participants in their survey, almost all had a positive culture from their mobile phones. Among them, 94.3%

had the same microbe in their hands or nares, the hands alone making up 4.5%, the nares 16.7%, and both 78.8%. A scoping review found similar results and suggested that mobile phones may be a vector for cross-contamination within the operating room setting (Dowden et al., 2020). The bacterial contamination in the included studies is comprised of normal flora, or non-pathogenic, with some being pathogenic, such as Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-Resistant Enterococci (VRE), and Escherichia coli. Furthermore, using mobile phone covers and having cracked screen displays on their mobile phones raised the chance of contamination (Qureshi et al., 2020).

4.3.1. Mobile phone disinfection and hand hygiene

In one study, it was revealed that only 17.9% healthcare workers and 7.1% administrative staff stated they regularly sanitized their mobile phones using different disinfection products and at different frequencies (Missri et al., 2019). A different study by Larsson et al. (2019) revealed that 36.3% of participants cleaned their personal mobile phones daily, 30.3% once a week, and 15.5% a few times each month. Just two individuals cleaned their personal mobile phones less frequently than once a month, while four participants never cleaned their mobile phones at all. According to another survey, only half of the participants had cleaned their mobile phones in the previous 24 hours (Qureshi et al., 2020). Consequently, it has been revealed that a little over half of healthcare workers never clean their mobile phones (Mark et al., 2014). In a modified scoping review on mobile phone disinfection by Dowden et al., (2020) they discovered that different concentrations of isopropyl alcohol solutions or wipes were utilized during disinfections. Nevertheless, they observed notable reductions in the bacterial load following mobile phone disinfection, despite variations in the product being used and in cleaning techniques. Following sanitization, 8.9% mobile phones were sterilized, harmful bacterial colonization was decreased by a third of a fraction, and the number of CFUs/mL dropped to more than half (Missri et al., 2019).

When asked whether personnel regularly wash their hands after using a mobile phone, 45% said "never," 38% said "occasionally," and 17% stated "always" (Mark et al., 2014). In the study conducted by Kuriyama et al. (2021) five individuals and four participants cleaned their hands before and following their use of mobile phones. According to eight observations, there

were twelve instances of mobile phones being used in the operating room with dirty gloves (Larsson et al., 2019). Furthermore, only 19.4% of people adhered to basic hygiene requirements prior to using a mobile phone, and 21.5% did so following phone use.

5. Discussion

This chapter discusses relevant theories related to the use of mobile phones by healthcare personnel in the operating room, along with the findings from the relevant studies that we found. We have chosen to further divide this chapter into three sections: distraction of the operating room personnel, risk to patient privacy, and risk of infection and mobile phone disinfection.

5.1 Distraction of the Operating Room Personnel

Numerous studies have been conducted on distraction caused by mobile phones in operating rooms, which only highlights how prevalent this problem is. These distractions have been categorized by Nasri et al. (2023) into five main categories: auditory, visual, communication, equipment, and environment. They have, however, identified auditory distractions such as mobile phones, pagers, beepers and case-relevant communications as the most distracting, especially during the most critical phase in surgery. Similarly, Sergeeva et al. (2016) have identified three areas of concern when the circulating nurse is using a mobile phone during surgery: distraction from learning, distraction from collaboration-, and diversion from core clinical activities. NSFLOS (2023) requires the operating room nurse to always be situationally aware, able to recognize and assess risks, create a plan of action in response to those risks, and possess prompt decision-making and foresight. However, when the non-sterile staff is so preoccupied with a mobile phone, their response time may be delayed and their audio-visual reaction time to work-related duties can be impaired (Sergeeva et al., 2016). The circulating nurse is responsible for ensuring that the patient avoids surgical complications such as infections, unnecessary heat loss, and unintentional physical harm, and supplies the surgical field with the equipment needed for a successful operation (NSFLOS, 2023). A circulating nurse cannot perform these duties and responsibilities efficiently if they are preoccupied by using a mobile phone.

In a study on mobile phone calls in the operating room by Avidan et al. (2019) more than half of the answered calls were related to work, but surprisingly, none were related to the patient

being operated on. Contrarily, most of the outgoing calls were related directly to the patient undergoing surgery. Many staff members were distracted during some of the incoming calls, but no staff members were distracted on any outbound calls. They concluded that this might be possible because, unlike incoming calls, which are highly unexpected, outgoing calls are made consciously by the mobile phone user. However, it should come as no surprise that the surgeon received the highest number of calls and is, therefore, the most distracted surgical team member (Avidan et al., 2019). On the other hand, the usage of personal mobile phones in the operating room is more than half as common as using work-issued mobile phones, according to a study by Larsson et al. (2019). They also discovered that many of the operating room personnel use their mobile phones for personal purposes every day. Half of those respondents replied that they use private mobile phones in the operating room for contact with their relatives; a number use them for pleasure or entertainment; and several use them for other private purposes (Larsson et al., 2019). These results are consistent with a case study conducted by Sergeeva et al. (2016), which found that work-issued mobile phones in the operating room were also utilized for non-work-related and occasionally leisure activities, like checking personal emails, browsing Facebook, messaging friends and family, playing games, listening to music, and taking and/or sharing private photos.

To reduce distraction from mobile phone conversations in the operating room during surgery, the American College of Surgeons (ACS) (2016) has issued a few guidelines. First, during an operation, all members of the surgical team, including the operating surgeon, should restrict their external communication to problems that are urgent or acute. Second, calls that are personal or routine should be kept to a minimum and should be brief (ACS, 2016). We could argue that the implementation of these first two recommendations requires a restructuring of the hospital system as a whole, with a specific emphasis on the responsibilities allocated to surgeons and anesthesiologists. According to Helse Stavanger HF (2021) surgeons, on average, have several responsibilities to complete in one hospital shift. They must first oversee the care of patients in both outpatient clinics and wards. Secondly, they provide consultation assistance to other hospital departments, such as the emergency room. Finally, throughout their shift, they carry out elective and emergency surgical procedures. This suggests that every department that might need a surgeon at any given time should be able to get in touch with one, and the same

holds true for anesthesiologists. The third ACS (2016) recommendation is that incoming calls should be routed to the operating room desk or the fixed-line phone in the operating room wherever possible. Fourth, incoming calls and data transfers should be routed to voicemail and the ringtone should be silenced; an inaudible signal can be used, but it is best to activate a separate signal for critical or emergency calls. Lastly, surgeons should be mindful of the responsibilities of staff members in the operating room and avoid using them needlessly for tasks such as helping with the use of mobile phones that could take focus away from the patient or the operation itself (ACS, 2016). We contend that these last three recommendations would require an operator outside the operating room to answer and screen the calls' urgency. Since the circulating nurse has been performing this function for a long time, we believe that this strategy may be very helpful for the surgeons as well as the operating room nurses. However, we think that it should be made clear that the hospital should hire an operator for answering these calls rather than relying on the operating room nurses who are stationed in the hallways. In an already limited budget, the hospital would need to increase funding for the operating room department in order to implement the above-mentioned solutions.

The Association of Surgical Technologists (AST), AST (2017) has also developed guidelines for minimizing distractions from mobile phone use in the operating room. First and foremost, they suggest that no member of the surgical team should ever utilize a mobile phone while giving perioperative care to a patient, either directly or through a wireless headphone. However, as was already mentioned, the healthcare industry is presently going through a digital revolution. Enabling healthcare professionals to communicate with patients and simultaneously collect data digitally is one of the goals of digitalization in the Norwegian healthcare system (Direktorat for e-helse, 2023). This implies that limiting the use of mobile phones during interactions with patients in the operating room is unfeasible since it goes against the purpose of digitalization. Finally, since ringtones or noticeable vibrations can obstruct team communication in the operating room, AST (2017) advises that all mobile phones be kept in silent mode. The sound of an equipment alert may be overlooked since it can be confused with a mobile phone ringtone. The surgical team should remember that the patient's dominant sense in the operating room is hearing, especially in the moments before general anesthetic takes full effect, and if the procedure is performed under local sedation, the patient may experience

unwarranted anxiety (AST, 2017). Likewise, preventing the patient from experiencing any stress related to surgery is the responsibility of the operating room nurse (Eikemo, 2023; NSFLOS, 2016).

Concerning the use of mobile phones for personal use, Attri et al. (2016) suggested keeping personal mobile phones out of reach and promoting the use of work-issued phones that come preconfigured with applications and features tailored to the task. Likewise, they also advised that access to social networking sites should be regulated in the healthcare setting. Second, both the AST (2017) and Attri et al. (2016) have recommended for healthcare personnel to limit their usage of personal mobile phones to the non-critical care areas of hospitals by setting up zones or places with Wi-Fi hotspots in cafeterias or break rooms, for example. We argue that if we go back at least ten years to a time when mobile data was less common and faster, this strategy would have been successful. However, nowadays mobile data allows internet access wirelessly using 3G, 4G, or 5G networks on the mobile phone (Samsung.com, n.d.). A little over 80% of Norway had 5G coverage in 2022, meaning quick and easy internet access at any time or place (NKOM, 2023).

A novel non-technical skill assessment tool for circulating and sterile operating room nurses has been developed by (Sirevåg et al., 2021). One of the non-technical skills an operating room nurse possesses is conducting respectful care and practice. This is demonstrated by the actions and interventions taken by the operating room nurse to keep the patient from experiencing postoperative complications. Likewise, equivalent non-technical skill assessment tools are available for the other members of the surgical team. While surgeons employ the Non-Technical Skills for Surgeons (NOTSS) (Edinburgh Research Group, n.d.), anesthetists use the Anesthetist's Non-Technical Skills (ANTS) (Fletcher et al., 2003). It is imperative to highlight that every member of the surgical team bears responsibility for patient safety, not just the operating surgeon (Anestesisykepleierne NSF, 2016).

5.2 Risk to Patient Privacy

Mobile phones and other mobile devices are widely used in the healthcare sector for a number of reasons, and its use was highly visible during the COVID-19 pandemic, primarily given

social distancing, quarantine restrictions, and regulations to minimize the transmission of the virus (Buabbas et al., 2021). Remarkably little research has been done on the subject of patient privacy and mobile phone use, even though data shows that all healthcare workers carry their mobile phones with them throughout their shifts (Missri et al., 2019). Mobile phones can generally be used for various purposes, but we consider using the built-in cameras to be the most controversial, knowing that, according to Oslo University Hospital (OUS) (Oslo Universitetssykehus, 2023), audio and video recordings can never be considered anonymous. Protecting patient privacy is governed by several laws and regulations, including the Patient and User Rights Act (Pasient- og brukerrettighetsloven, 1999) and the Health Personnel Act (Helsepersonelloven, 1999). Processing of personal data or information, including health and medical information, must abide by existing laws safeguarding confidentiality and be treated with the utmost care (Pasient- og brukerrettighetsloven, 1999). According to Ehelse (2021), personal information includes any information that can be used to identify an individual, whether directly or indirectly, including images, audio, and videos, in which the patient is clearly identifiable. Under the Health Personnel Act (Helsepersonelloven, 1999), healthcare personnel are also required to maintain the confidentiality of any health and personal information they handle, including audio, video, and image data (Ehelse, 2021). Protecting the patient's integrity is one of the main responsibilities of an operating room nurse (NSFLOS, 2016), and managing patient data securely is one way to do so (Ehelse, 2022). Furthermore, Sirevåg et al. (2021) pointed out that for an operating room nurse to exhibit the non-technical skill ethical competence, they prioritize their patients' well-being at all times, particularly while the patient is incapacitated or sedated. Conversely, professional accountability is another non-technical skill that an operating room nurse should possess. It refers to the operating room nurse's ability to organize and supervise particular procedures as well as their ability to monitor the patient, equipments, protocols, and coordination needed to ensure the patient receives safe and effective care (Sirevåg et al., 2021).

Based on a study conducted in the UK on mobile phone ownership and its clinical use, half of nurses and the majority of doctors find their mobile phones to be very useful when performing their daily clinical duties (Mobasheri et al., 2015). The built-in camera on mobile phones is one of its most popular feature since, in comparison to using a regular camera, the high-quality

photos captured by the built-in camera increases the efficiency of obtaining and transferring photographs, which can then be utilized for assessing visible skin lesions, burns, and alternative pathologies, for example (Buabbas et al., 2021). Sending patient-related information to a colleague for clinical assessment or consultation is another of the mobile phone´s most widely used functions in healthcare. In a study on usefulness of mobile phones among surgeons in clinical practice, half of the surgeons reported using the built-in camera for taking pictures or videos, while most surgeons reported using short-message-script (SMS) to share patient-related information to a colleague (Buabbas et al., 2021). Mobasheri et al. (2015) found similar results, but many doctors use the application-based messaging, such as WhatsApp, as well. Likewise, healthcare professionals who participated in the study have expressed their need for a secure messaging application that would enable them to safely share patient-related information with colleagues. In regards to obtaining patient´s consent before utilizing the mobile phone´s audio-visual feature during consultation, only half of the doctors consistently obtain consent, whereas a significant number of doctors never obtain it at all (Buabbas et al., 2021). Additionally, this study showed that most responding doctors thought verbal consent was adequate, many doctors, however, obtained written consent, while a small percentage of doctors believed that no consent was required and obtained none at all. Nonetheless, the majority of these doctors made sure that patients understood their right to privacy.

To uphold patient privacy protection, healthcare institutions should implement policies that prohibit the improper use of mobile phones and other mobile devices in the operating room (AST, 2017). Similarly, they advised healthcare personnel to refrain from sending patient-related messages to other departments or personnel in the hospital through text messaging, since texting has its limitations and is therefore not ideal for discussions about patient care. Thus far, we have not come across any safe messaging platforms that are being used in Norwegian institutions in our literature search. On the other hand, OUS has recommended that when used outside of a hospital's secure ICT system, personal and health information be made anonymous (Oslo Universitetssykehus, 2023). However, they explained that it is important to think about whether or not the attributes of the person shown will allow others to identify them when anonymizing photos and videos. In addition, it is imperative that the person being portrayed is unable to recognize themselves when using images of individuals who have not

given permission for the photo to be shared; tattoos or any other external traits of the person being portrayed cannot be exhibited (Oslo Universitetssykehus, 2023). The AST (2017) added that operating room personnel should only access patient-related data through the institution's own system, and personally identifiable information should only be saved on devices that have been approved by the institution. Moreover, Attri et al. (2016) have proposed four guidelines to lower the likelihood of patient privacy violation. The first step is to establish regulations for sharing work-related information, with a particular emphasis on social media. Ensuring high-security networks and enforcing regulations governing the usage of mobile phones that are not provided by the workplace come in second. Thirdly, they recommended blocking websites with inadequate security and implementing a warning message generation system to notify healthcare personnel of possible security breaches. Finally, they recommended that all medical personnel frequently change their passwords. These recommendations are compliant with Section 3-2 of the Specialist Healthcare Act, Spesialisthelsetjenesteloven (1999), which mandates that hospitals and other special institutions must ensure the security of their information systems and medical records. In terms of obtaining a patients' consent for a healthcare professional to utilize a mobile phone concerning patient treatment, Attri et al. (2016) advised that a patient's consent must be obtained before a healthcare provider can take the patient's picture or record a video of them. This is also true to capturing images of other patient-related data. Ehelse (2021) recommends healthcare personnel provide patients with concise and easily understood explanation of how the institution handles their personal data. Written or spoken communication may be used to provide this information. Furthermore, ACS (2016) recommended that the use of mobile phones for capturing images and sharing in the healthcare sector should be governed by hospital regulations on patient photography as well as legislation safeguarding patient confidentiality and privacy.

As reported by Mobasheri et al. (2015), half of the doctors used their personal mobile phones to take pictures of a patient's injury/anomaly or radiological findings and shared them with a colleague for consultation. This was also the case here in Norway, and perhaps it still is according to a news article from NRK in 2019 (NRK, 2019). The article states that doctors at OUS, the largest hospital in the country, were dissatisfied with the hospital's outdated ICT system. The doctors had to use their personal mobile phones to capture pictures of, for example,

patient injuries in order to obtain immediate collegial consultation, as the hospital's ICT system did not support this function. They also expressed concern about the security of the images given that cloud platforms can allow the picture's automatic sharing. This situation constitutes a clear violation of Chapter Three, Section Six, of the Patient and Users Rights Act. However, a month after that article was published, the Norwegian Minister of Health approved doctors to utilize their personal mobile phone if it is necessary to deliver accurate and timely emergency care (Grimse, 2019). This predicament only serves to emphasize the necessity of establishing explicit guidelines on the usage of mobile phones within the healthcare sector since reliable information security and privacy protection are essential for the healthcare industry to successfully embrace digitalization (Ehelse, 2022).

5.3 Risk of infection and mobile phone disinfection

To break the chain of infection and reduce the risk of SSIs, several types of infection control strategies are employed in the operating room (Dåvøy et al., 2018). Hand hygiene, hand disinfection, surgical skin disinfection, and disinfection and sterilization of instrument and surgical equipment are some of these precautions, to name a few. However, regardless of preventive measures, surgical wounds are always colonized with bacteria, including potentially pathogenic ones, which can lead to SSI (NHI, 2022). According to the National Prevalence study for HAIs in Norway, there has been an average incidence of 4,5% of SSIs for the last two years (Helsedirektoratet, 2019). On a daily basis, HAIs results in prolonged hospital stays, long-term disability, increased resistance of microorganisms to antibiotics, massive additional costs for healthcare systems, high costs for patients and their family, and even unnecessary deaths (WHO, 2010). In the operating room, implementing infection control measures is the main responsibility of the operating room nurse (Eikemo, 2023).

The mobile phones used by medical professionals in hospitals have been shown to have varying rates of bacterial contamination. Studies by Chang et al. (2017), Qureshi et al. (2020) and Missri et al. (2019) revealed that nearly all mobile phones are contaminated with bacteria, while investigations by Kuriyama et al. (2021) and Mark et al. (2014) revealed that only half of the mobile phones of healthcare personnel are contaminated. At the same time, Chang et al. (2017)

identified that the bacteria found in healthcare personnel's mobile phones are identical to the type found in their hands or nasal nares. However, Staphylococcus aureus is the most prevalent pathogen in each of the five investigations, and a tiny portion of those pathogens are methicillin-resistant (Chang et al., 2017; Missri et al., 2019). Despite the fact that Staphylococcus aureus is one of the primary causes of SSIs (Myrvang (2023), researchers are yet to investigate the possibility that SSI rates are related to mobile phone use in the operating room (Dowden et al., 2020). As already mentioned, one of the primary responsibilities of operating room nurses is to make sure the patient does not experience surgical complications such as SSIs (NSFLOS, 2023).

According to numerous studies, only a small number of healthcare professionals routinely disinfect their mobile phones while the rest either disinfect rarely or never at all (Kuriyama et al., 2021; Mark et al., 2014; Missri et al., 2019; Qureshi et al., 2020). Different types of cleaning agents were used in all the disinfection processes. Three studies used alcohol wipes with isopropyl concentration ranging from 2% to 70%, while two studies used detergent wipes. Surprisingly, according to a study by Kuriyama et al. (2021), the posterior surface of the mobile phone was more contaminated with bacteria than the touchscreen itself, regardless of whether a protective case was used or not. We unfortunately found no guidelines on mobile phone cleaning for healthcare professionals throughout our literature search, instead, we were only able to locate instructions for the general public. This was corroborated by Dowden et al. (2020), who asserted that there are currently no standardized, evidence-based standards for cleaning mobile phones, including recommendations for the type of disinfection to be used. Furthermore, in a study conducted by Mark et al. (2014), they reported that just a small number of healthcare personnel consistently wash or disinfect their hands after using a mobile phone, and nearly half of them never do. However, combining mobile phone disinfection with proper handwashing or hand disinfection was found to reduce bacterial contamination on mobile phones even further (Dowden et al., 2020).

Apple (2023) and Samsung (n.d.) have both approved the use of 70% alcohol-based wipes to gently clean the outside surfaces of mobile phones, either in addition to or instead of using a lint-free cloth that has been lightly moistened with soap and water. The CDC has also

recommended using a wipeable cover on mobile phones to make cleaning and disinfecting easier (CDC, 2023). Nevertheless, a study by Quereshi et al. (2020) found that mobile phones with protective covers and those with damaged or cracked screens have a noticeably higher chance of contamination. Following disinfection, some of the mobile phones were sterilized and all of the mobile phones showed a significant drop in CFUs/ml, whether or not a protective case was used (Missri et al., 2019). The AST (2017) recommends that mobile phones should be properly cleaned and disinfected on a routine basis before entering the operating room and other critical care units in the hospital. To prevent screen damage by disinfection, they also advised using an antibacterial wipe that has been approved by the manufacturer. Kuriyama et al. (2021) highly suggest including the mobile phone's posterior surface in the disinfection process. Another portable piece of equipment that is frequently utilized in healthcare is the ultrasound device. In contrast to mobile phones, this device has established cleaning guidelines such as the one developed by Haukeland University Hospital (HUH) (Helse Bergen HF, 2021). They recommended that ultrasound equipment be cleaned after each patient, using a damped cloth first and thereafter wiping with a dry one. Additionally, they advise using Antibac H2O20 5%, an alcohol-free surface disinfectant that is efficient against bacteria and other organisms, to clean the device on a daily and as-needed basis. We contend that the same disinfection process can be applied to both mobile phones and ultrasounds because they are both handheld devices and are regarded as delicate equipment. The AST (2017) further stated that, in addition to mobile phones, computers in the operating room should also be frequently cleaned to lower the risk of cross-contamination.

Operating room staff members should wash their hands thoroughly both before and after using a mobile phone, especially when tending to patients, according to both AST (2017) and Attri et al. (2016). In addition, the latter has two suggestions to reduce the risk of bacterial contamination. First, sterile bags can be utilized for storing mobile phones when entering critical patient care areas like operating rooms. Secondly, gloves should be worn when interacting with patients, and that should be changed after each usage of a mobile phone. The latter suggestion, in our opinion, is both theoretically incorrect and unethical. Only when a patient is on an isolation regimen should gloves be worn throughout all patient interactions, according to FHI´s (2017) infection control program. Furthermore, incorrect glove use is not

sustainable for the environment, which goes against the operating room nurse's duty to use resources responsibly and contribute to environmentally sustainable development (NSFLOS, 2023).

Recommendations for mobile phone disinfection and hand hygiene should be implemented for all hospital personnel, in addition to those who provide direct patient care. This is due to a study by Missri et al. (2019) which demonstrated that hospital administrative staff's mobile phones had the same pathogen colonization rate as healthcare personnel, even though the mobile phones of the latter had a greater incidence of bacterial colonization. In the medical ward where one of us is working, there are alcohol wipes available for employees to use on both mobile phones and computers. Furthermore, it is encouraged to disinfect work-issued mobile phones, desk phones and computer keyboards before each shift. During our internship in the operating room, the absence of this routine and that of readily available disinfection wipes was unexpected. Under professional accountability in the non-technical skills of scrub personnel, Sirevåg et al. (2021) highlighted the operating room nurse's autonomy, bravery, and confidence. In light of this, it is our opinion that the operating room nurse is crucial in providing a solution to the infection risk associated with using a mobile phone in the operating room. Operating room nurses can use their voices to encourage every member of the surgical team to contribute to the prevention of SSI by regularly disinfecting their mobile phones and washing or disinfecting their hands before and after using them. Following this, infection control is a core responsibility of the operating room nurse, as is practicing evidence-based nursing (NSFLOS, 2023).

6. Conclusion

The purpose of this study was to ascertain how research defines the safe use of mobile phones in the operating room. Our scoping review revealed that, considering today's wave of digitalization, mobile phones are a necessary tool in the operating room. It is also apparent there are hazards and drawbacks to its use. To make mobile phone use in the operating room safe, we found three issues that need to be resolved. These issues include infection risk, risk to patient privacy, and distraction of operating room staff.

Moreover, our review of the literature suggests measures that can be taken to minimize these risks. Studies indicate that leaving personal mobile phones outside of the operating room and establishing a clear policy prohibiting the use of work-issued phones for personal use inside operating rooms can help lower the risk of distraction for the surgical team. Similarly, the risk to patient privacy can be reduced by creating a secure messaging application and installing it on work-issued mobile phones. Finally, the risk of SSI can be decreased by developing a routine for hand and mobile phone disinfection inside the operating room. However, this study has brought to light the critical role that operating room nurses play in ensuring patient safety. As the patient's advocate, operating room nurses should voice out anything that can possibly increase the patient´s risk of developing SSI.

6.1. Implications for Research

It is noteworthy to observe that, despite the fact that mobile phones have been used extensively in hospital settings for the past 20 years, little research has been done on the risks associated with their use. Thus, we think that in order to make mobile phone use in operating rooms safe, more high-quality, large-scale research needs to be conducted. However, to develop measures to reduce infection, the focus should be given to figuring out how mobile phone use and the prevalence of SSI are associated. Nonetheless, since operating room nurses are the coordinators in the operating room and are considered experts in patient safety, we believe that they should spearhead research efforts on this issue.

6.2. Implications for Practice

Since patient safety is the cornerstone of surgical nursing care, we contend that while we wait for more research study, some regulations pertaining to mobile phone use in operating rooms should be put in place right away. We suggest the following measures should be applied inside the operating room:

1. Routine hand disinfection before and after mobile phone use

2. Routine disinfection of both personal and work-issued mobile phones

3. The availability of antibacterial wipes inside all operating rooms to make mobile phone disinfection easier

4. Prohibition on the use of mobile phones for private purposes during surgeries

5. Only using work-issued mobile phones for all work-related tasks

6. Operating room nurses should launch a mobile phone hygiene campaign that demonstrates the proper hand and mobile phone disinfecting techniques.

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Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist http://prisma-statement.org/Extensions/ScopingReviews

Attachment 1. PCC form

Population		Concept		Context
patient safety patient privacy scrub- or surgical- or operating- or theater nurse anesthesia nurse anesthesiologist anesthetist anesthesia crna surgeon or surgery intensive care unit or ICU or critical care	AND	mobile phones smart phones cell phones distractions interruptions disruptions	AND	operating room operating theater surgery

Attachment 2. Search strategy

CINAHL, MEDLINE, CINAHL with Full Text

Search ID#	Search Terms	Search Options	Actions
S1	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones AND privacy	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	51
S2	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones) AND intensive care unit or icu or critical care	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	82
S3	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones AND distraction	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	72
S4	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones AND patient safety	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	88
S5	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones AND patient privacy	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	14
S6	anestesia nurse AND anesthesiologist or anesthetist	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	17
S7	anestesia nurse AND anesthesia or anesthesiologist or anesthetist AND mobile phones or smart phones or cell phones	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	0

S8	surgeon or surgery AND mobile phones or smart phones or cell phones AND patient privacy	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	15
S9	operating room OR operating theater OR surgery OR surgical theater AND mobile phones OR smartphones OR cell phones OR cellular phones) AND nurse anesthetist or anesthetist or crna or nurse anesthesia	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	18
S10	operating room or operating theatre or surgery AND mobile phones or smart phones or cell phones AND scrub nurse or surgical nurse or operating nurse or theatre nurse	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	20
S11	smartphone or smart phone or mobile phone or mobile phone or cellphone or cell phone AND operating room or operating theatre or operating suite or surgery room or surgery theater or surgery suite or operation room or operation theatre or operation suite	**Expanders** - Apply equivalent subjects **Search modes** - Boolean/Phrase	284

Attachment 3. PRISMA-ScR Checklist

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	Tittle
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	Introduction
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	Background
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	Method
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	Method (Keywords in the Literature Search)
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	Method
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Method (Keywords in the Literature Search)
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	Method (Keywords in the Literature Search)
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	Methods (Characterizing the studies)
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Methods (List of Databases Searched)
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	Methods (List of Databases Searched)

Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	Methods (List of Databases Searched)

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	Characterizing the studies
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Characterizing the studies
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	Characterizing the studies
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Characterizing the studies
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	Fig.1, Table 1
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	Discission
Limitations	20	Discuss the limitations of the scoping review process.	Discussion
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	Conclusions
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	Not fulfilled

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

2 A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

3 The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

4 The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Attachment 4. Co-writing Agreement

UNIVERSITETET I STAVANGER

Studentene som skriver sammen, forpliktet seg til å bidra likt. Den enkeltes bidrag skal spesifiseres, og signeres av studentene og veileder ved innlevering av masteroppgave.

STUDENT 1

Navn Ann Nacianeina Lawas

Spesialisering i: Operasjonssykepleier

Bidrag:

Introduksjon
Teori
Metode
Diskusjon

STUDENT 2

Navn Natalia Krosby

Spesialisering i: Operasjonssykepleie

Bidrag

Metode
Resultat
Diskusjon
Kildeføring

Signatur:

Student 1 Ann Lawas Student 2 Natalia Krosby

Veileder: Britt Sæbø Haugen
Malin m. P

35