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RECOMMENDED CLEANING PRACTICES FOR CELL PHONES IN THE OPERATING ROOM: A MODIFIED SCOPING REVIEW

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ABSTRACT

Cell phone use among operating room (OR) personnel is increasingly common. Cell phones in the operating room can have high levels of bacterial contamination, with the potential to lead to increased risk for surgical site infections (SSI). No universally accepted guidelines exist for cleaning or disinfecting cell phones in the OR. The authors completed a modified scoping review of eight articles to examine researched cleaning practices for cell phones in the OR. Cleaning protocols and products differed among the studies, but each type of cell phone disinfection showed significantly decreased bacterial load especially when combined with proper handwashing. There is a need for more research to determine specific evidence that can guide future policy and nursing practice for cleaning cell phones in the OR.

INTRODUCTION

The introduction of bacteria within the operating room (OR) setting is minimized and controlled by strict adherence to cleaning procedures and surgical aseptic technique by OR staff.[1,2] In recent years, the presence of cell phones within the OR has drastically increased. Questions regarding cleanliness, and methods of cleaning cell phones in the OR, have emerged but as of yet no universal guidelines exist.[3,4] The goal of this article is to examine cell phones in the OR as a source of contamination, identify current cleaning practices, and explore disinfection protocols.

BACKGROUND

Bacteria is present on 95% of cell phones used by hospital workers and has the potential to transmit nosocomial infections to patients.[3] In the OR, surgical aseptic technique is of the utmost importance and contamination can lead to detrimental patient outcomes such as SSIs.[1,2] Several research study reports demonstrate that most healthcare personnel do not regularly clean their cell phones.[3,5] Manufacturers, furthermore, discourage wiping cell phones with disinfectants or abrasive materials as this may cause screen damage.[5]

The authors conducted a modified scoping review looking for research on cleaning practices for cell phones in the OR.

Cell phones have become an integral part of healthcare professionals' lives and have enhanced communication, collaboration, and access to information.[6] Research indicates a high level of bacterial contamination living on the surface of mobile devices.[3,4,6-11] Currently, there are no universally accepted guidelines for disinfecting cell phones in the OR.[3,7-11] ORNAC provides no recommendations for nurses utilizing or cleaning cell phones in the OR.[2] AORN guidelines for practice identify that cell phones can lead to distractions and recommends muting or leaving cell phones outside of the theatre when possible.[9] AORN states that telephones and mobile communication devices within the OR should be cleaned and disinfected but does not describe the products or methods to use.[9] This lack of guidelines, standards, and policies for cleaning cell phones in the OR indicates a need for further research.

METHOD

The authors conducted a modified scoping review looking for research on cleaning practices for cell phones in the OR. Scoping reviews provide a broad conceptual range that are commonly policy directed and intended to synthesize research and information from an array of sources.[12]

Keywords in the Literature Search

The authors performed an initial systematic limited search in a selection of relevant databases to find research-based articles on cleaning practices for cellphones in the OR. Keywords for the literature search included various key terms, mesh terms, and subject headings (see Table 1). Priori protocol of inclusion and exclusion criteria, related to the question and objective, were developed. Results were screened based on the inclusion criteria of participants working in the OR, interventions of cleaning cell phones, outcomes of recommending cleaning interventions for cell phones in the OR, and context of the OR setting. The types of sources included were quantitative research-based studies, available in full-text format, that were relevant and answered the research question. The exclusion criteria were types of sources such as opinion letters and guidelines which were considered to be not particularly appropriate or useful in meeting the objectives of this scoping review.[14] Only English language articles were included as this was unfunded research with no ability to access other languages. The timeframe for performing the literature search was from February 10 to 20, 2019, due to the authors' coursework restrictions.

Rapid Review

After identifying the question and relevant key terms a rapid review, using Arskey and O'Malley's (2005) framework,[13] was conducted. The research question is an area of interest as it focuses on patient safety by emphasizing the prevention of negative patient outcomes. The objective for performing this scoping review 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 the OR.

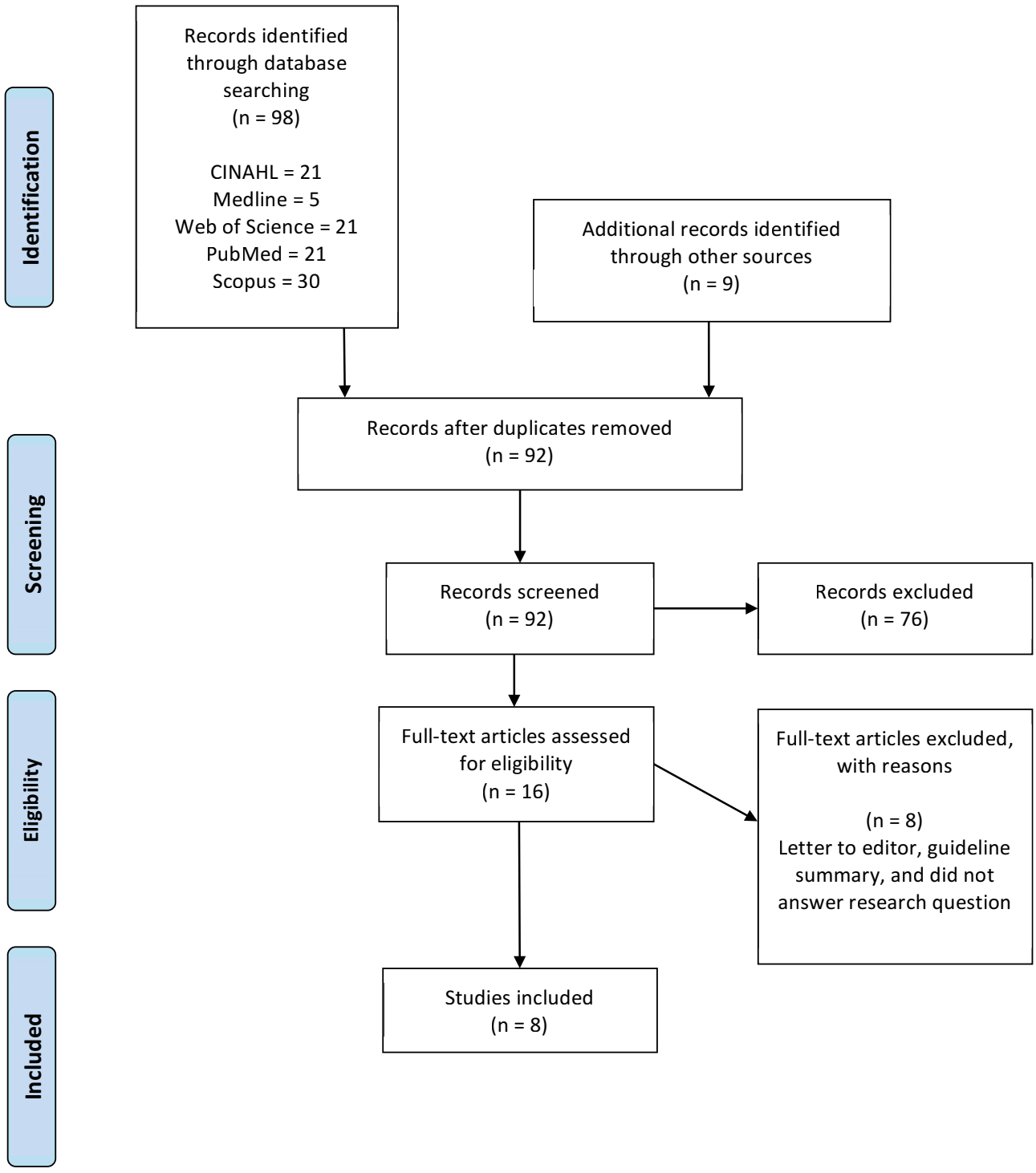
Table 1. Key search terms.

Operating room	AND	Cell phones	AND	Clean
Operating theatre		Mobile phones		Disinfect
Operating room nurses		Mobile devices		Sanitize
Operating room staff		Electronic devices		
Operating room personnel		Smartphones		

List of Databases Searched

A literature search was performed using all the identified keywords in five relevant databases: Cumulative Index to Nursing & Allied Health (CINAHL), Medline, Web of Science, PubMed, and Scopus. Additional records from other sources, such as Google Scholar and articles from the reference lists of all identified articles, were also searched. Details of the search and screening are in Figure 1 (PRISMA Flow Diagram). Two reviewers conducted the initial screening and extracted articles based on the relevance of the title and abstract which resulted in 16 articles meeting the inclusion criteria. Four reviewers then

Figure 1. PRISMA Flow Diagram for the scoping review process.



Reproduced from Joanna Briggs Institute (2015).[14]

read the 16 full-text selected articles and determined that eight of these studies did not meet the inclusion criteria. Two articles were excluded for being guideline summaries, one for being a letter to the editor, and five as they did not answer the research question. The remaining eight articles were included in the scoping review.

The literature found on cell phone cleaning practices in the OR was scarce and not all of it was current.

CHARACTERISING THE STUDIES

The literature found on cell phone cleaning practices in the OR was scarce and not all of it was current. Study designs included descriptive cross-sectional, observational, quasi-experimental, and experimental. Thus, some evidence was high-level while other evidence was low-level. None of the studies identified a research framework but there were implicit frameworks.[15]

Researchers clearly defined each study setting. 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. All selected articles used convenience sampling. There were varied sample sizes from 16 participants (n = 16) to 200 participants (n = 200). Among the studies reviewed, the average sample size was 51 participants (n = 51).

The results of these studies were statistically significant but were weak due to small sample sizes. Robust sampling procedures and processing, however, lent strength to the studies. Researchers clearly defined the samples' inclusion criteria and the participant role for each study. The appropriate institutional review boards, of either the university or hospital, ethically approved all of the studies.

As mentioned, the conceptual frameworks within the studies were implicitly defined and, therefore, the independent and dependent variables were clear within the methodology of the studies. The independent variable(s) included disinfection process, disinfection solution, decontamination/cleansing protocol, handwashing, and/or cell phone use. The dependent variable was consistent within the eight studies as being bacterial contamination or bacterial presence on mobile devices. The measurement of the dependent variable involved pre-test and post-test in cross-sectional, quasi-experimental, and experimental study designs. Researchers employed direct measurement of bacterial contamination in the observational study design. The authors clearly articulated data collection within the methodology, for all the reviewed studies, and acknowledged the reliability and validity of measurement techniques. All of the reviewed studies tested mobile phones using a swab test for microbiology specimen collection. One of these studies also measured the bacterial load on participants' hands with a Replicate Organism Detection and Counting plate (Rodac®).[9] Approved laboratories cultured and processed all microbiology swabs. In all reviewed studies microorganisms were isolated, identified, and analyzed, according to the methodology indicated in each study.

While literature regarding cell phone cleaning practices was limited the findings within the available literature had common threads that shed light on different aspects of the research question. 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.[3,8,10] In the studies that tested both hands and cell phone found the bacterial presence on cell phones was similar to that on hands of participants, which suggested that cell phones may be a vector for cross-contamination within the OR setting.[3,6,8,11] 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.[3,4,7,10] The inconsistencies in cleaning procedures and variations of solution types pose difficulties in selecting the most effective product to support evidence-based practice.[3,4,10]

DISCUSSION

This review of the literature on OR personnel's cell phone cleaning strategies revealed inconsistencies and opportunities for improvement. Salient points of knowledge about this content area were similar among the studies. Cell phone use is becoming increasingly widespread among healthcare professionals in acute care settings and has become indispensable for purposes of professional communication and collaboration, documentation, reference, education, and photography.[4,6-11] Cell phones are, nevertheless, reservoirs of pathogenic microorganisms that can become vectors for nosocomial infections significantly impacting morbidity and mortality.[3,4,6-11] There are, however, currently no consistent, universal, evidence-based cell phone cleaning guidelines for healthcare professionals in the OR.[3,7-11]

Several important themes emerged in the findings from the literature. All reviewed studies showed bacterial contamination on participants' cell phones, with some being normal flora, or non-pathogenic, and some being pathogenic, such as Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-Resistant Enterococci (VRE), and Escherichia coli (E. coli).[3,4,6-11] Studies that also collected data via questionnaires found that participants rarely, if ever, cleaned their cell phones.[10,11] The researchers that tested disinfectants or cleaning strategies found significant decreases in bacterial load after disinfecting cell phones.[3,4,7,10] The main inconsistency was the cleaning product tested in the studies: Clens 32% isopropyl alcohol and detergent wipes

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(Shakir 226), 70% isopropyl alcohol (White 582), 2% isopropyl alcohol (Channabasappa 438), and surface disinfectant detergent (Murgier 1093). While this demonstrates a lack of consistent cell phone cleaning protocol the 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.[3,4,7,10] Combining cell phone disinfection with proper handwashing was shown to improve outcomes even further.[9]

There are gaps in the literature where knowledge needs to be bolstered. While researchers studied bacterial load and methods of decontamination, researchers have not investigated the link establishing an association between cell phone use in the OR and actual nosocomial infection rates for patients.[3,4,6-11] This is likely a result of the relative newness of research related to mobile devices in healthcare. Overall, researchers need to further examine the frequency and efficacy of disinfecting agents for cell phones in the OR to provide the basis for evidence-based guidelines.[3,4,6-11]

Research into whether cell phone contamination leads to increased infection rates in patients is a logical next step in knowledge development in this area.[3,4,6-11] It must be noted as a limitation that there is scarce and aging literature in the area, and the eight studies represent eight different countries, none of which represent Canada.

While five of the reviewed articles did involve multiple types of healthcare professionals three included only one profession: physicians. It would be best if future studies included all OR personnel as each healthcare team member has the chance to affect patient outcomes with their use and cleaning of personal cell phones. Various healthcare professions could also contribute to education and guidelines for reducing the bacterial load on cell phones.

Additionally, healthcare directors and professional organizations along with infection control experts in hospitals could work directly with mobile device manufactures to develop suitable decontamination protocols that safeguard the integrity of the product. Given the extent of cell phone use, as additional equipment in the OR, decontamination protocols may be an unexplored area for manufactures and could lead to new product development.

Researchers could also further test the effectiveness of cell phone disinfectants to identify a robust, universal cleaning agent. There are also additional research opportunities for developing alternative decontamination strategies such as UV light or antibacterial cell phone coatings.[3,7-11]

CONCLUSIONS

Mobile devices within the OR have been found to bear significant bacterial contamination.[3,4,6-11] The presence of cell phones within the OR environment has raised concerns among researchers, regarding effective cleaning protocols, as universal guidelines have yet to be developed.[3,4] 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. The literature, however, included studies with a range of cleaning products and methods. 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.

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