Cell phone use and healthcare-associated infections: integrative review

Uso de celulares e infecções relacionadas à assistência à saúde: revisão integrativa

Uso de teléfonos celulares e infecciones relacionadas con la atención médica: revisión integradora

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ABSTRACT: **Introduction:** Health services are very concerned with quality of care, patient safety and reduction of the incidence of infections related to health care, which are considered adverse events and influence the increase in morbidity and mortality. The widespread use of cell phones is widespread, and they have become work tools for healthcare professionals. As they have a direct contact surface between hands and other objects, they become an important source of microorganisms within hospital environments. **Objective:** To conduct a search for existing publications that relate the use of cell phones with infections related to health care within the hospital environment. **Method:** Integrative review, with a search in five databases, carried out between March and April 2021. **Results:** 17 articles were included, published in English in international journals, between 2016 and 2021. **Conclusion:** Identified in all articles the occurrence of cell phone contamination. It was also shown that frequent decontamination of cell phones and hand hygiene are indicated to reduce the risk of infection.

Keywords: Smartphone. Cell phone. Hospitals. Infection control.

RESUMO: **Introdução:** Os serviços de saúde têm grande preocupação com qualidade de assistência, segurança do paciente e redução da incidência das infecções relacionadas à assistência à saúde, as quais são consideradas eventos adversos e influenciam o aumento da morbimortalidade. A disseminação do uso de celulares é generalizada, e eles têm se tornado ferramentas de trabalho para profissionais de saúde. Por terem uma superfície de contato direto entre as mãos e outros objetos, tornam-se importante fonte de microrganismos dentro dos ambientes hospitalares. **Objetivo:** Realizar busca de publicações existentes que relacionam o uso de celulares com as infecções relacionadas à assistência à saúde dentro do ambiente hospitalar. **Método:** Revisão integrativa, com busca em cinco bases de dados, realizada no período entre março e abril de 2021. **Resultados:** Foram incluídos 17 artigos, publicados na língua inglesa em periódicos internacionais, entre 2016 e 2021. **Conclusão:** Identificou-se em todos os artigos a ocorrência de contaminação dos celulares. Evidenciou-se também que a descontaminação frequente dos celulares e a higiene das mãos são indicadas para reduzir o risco de infecção.

Palavras-chave: Smartphone. Telefones celulares. Hospital. Controle de infecções.

RESUMEN: **Introducción:** Los servicios de salud están muy preocupados por la calidad de la atención, la seguridad del paciente y la reducción de la incidencia de infecciones relacionadas con la atención de la salud (IRAS), que son consideradas eventos adversos y influyen en el aumento de la morbimortalidad. El uso generalizado de los teléfonos celulares está muy extendido y se han convertido en herramientas de trabajo para los profesionales de la salud. Al tener una superficie de contacto directo entre las manos y otros objetos, se convierten en una fuente importante de microorganismos dentro de los ambientes hospitalarios. **Objetivo:** Realizar una búsqueda de publicaciones existentes que relacionen el uso de teléfonos celulares con IRAS dentro del ámbito hospitalario. **Método:** Revisión integradora, con búsqueda en cinco bases de datos, realizada entre marzo y abril de 2021. **Resultados:** se incluyeron 17 artículos, publicados en inglés en revistas internacionales, entre 2016 y 2021. **Conclusión:** Se identificó la ocurrencia de contaminación de celulares en todos los artículos. También mostraron que la descontaminación frecuente de los teléfonos celulares y la higiene de manos están indicadas para reducir el riesgo de infección.

Palabras clave: Teléfono inteligente. Teléfono celular. Hospitales. Control de infecciones.

INTRODUCTION

Health services have been concerned with the quality of care provided, patient safety and reduction of the incidence of health care-related infections (HCRI)[1-3]. HCRI are defined as infections acquired after the patient undergoes a health care procedure or hospitalization, which was not present at the time of admission[1,2]. They are considered the most frequent adverse events and a global public health problem, involving health risks, and are related to increased morbidity and mortality and hospital costs[1-5]. In addition, they impact the quality of life of patients and their families, increasing the suffering during hospitalization[5,6].

It is estimated that 30 to 35% of HCRI could be avoided, however the scarcity of data limits further analysis[3,5]. In the United States, 5 to 10% of hospitalized patients are affected by HCRI and approximately 100,000 of them die each year. A European study points out that the most frequent HCRI are related to the respiratory tract, followed by surgical site infections, urinary tract infections, bloodstream infections, and gastrointestinal infections[6].

HCRI can be prevented with the collective engagement of all professionals in relation to the adoption of good practices in hospital environments, surveillance programs, control, and intensive hygiene. Nurses are considered the professionals who provide the most favorable environments for the reduction of HCRI, as they are primarily responsible for implementing evidence-based interventions[7]. On the other hand, the omission of nursing care, seen in all hospital environments, contributes to the increase in HCRI[6].

The spread of cell phone use is widespread in recent years. In addition to personal use, cell phones have become work tools for health professionals. Various applications are used in hospital environments with the aim of improving professional practice, facilitating quick access to quality information based on scientific evidence[5,8]. However, as it has a direct contact surface between hands and other objects, it becomes an important means of transmission of microorganisms and can lead to infections within hospital environments[8]. There are important factors for the risk of transmissibility between cell phones and people within the hospital environment, such as the type of pathogens and the amount of them present on the hands or surfaces, as well as the size of the contact area of the device and how many times it is touched[8], conditions of the patient on admission, the physiological aspects, care, and treatments given to the patient[5].

OBJECTIVE

The objective of this study was to search for existing publications that relate the use of cell phones with infections related to health care within the hospital environment.

METHOD

This is an integrative review, which allows the search and critical assessment of evidence found in clinical practice, supporting decision-making. Its purpose is to group and synthesize with methodological rigor and order the research results of the question raised, enabling the improvement of clinical practice and revealing gaps that need to be filled with new knowledge[9,10].

The construction of the integrative review followed the six steps indicated:

1. Identification of the theme and formulation of the research question;
2. Determination of inclusion and exclusion criteria for studies; choice of databases;
3. Definition of the information to be extracted from the selected studies;
4. Evaluation of the studies chosen for the review;
5. Evaluation, interpretation, and discussion of results;
6. Presentation of the synthesis and knowledge produced[10].

The guiding question was defined as: what are the existing publications that relate the topic of cell phones with infection within the hospital environment? Inclusion criteria established were: full scientific articles published online in the last five years (2016 to 2021); in English, Portuguese, and Spanish; that respond to the theme of the research question; that address any sector of the hospital area. As exclusion criteria, the following were considered: veterinary hospital environment, outpatient and emergency services not located in hospitals, articles on COVID-19 not related to the research question, and articles not available in full.

The databases chosen for the searches were: Cumulative Index to Nursing and Allied Health Literature (CINAHL Complete), Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed), Science Direct, Scopus, Web of Science, and Science Direct.

The search for articles took place between March and April 2021, using the controlled descriptors related to the study topic and obtained from Descriptors in Health Sciences

(DeCS) and Medical Subject Headings (MeSH): smartphone; cell phone; hospitals; infection control.

A total of 1,082 articles were found. After reading the titles and abstracts, removing the repeated articles in different databases and evaluating inclusion and exclusion criteria, a total of 29 articles[11-27] were selected, as shown in Table 1. After full reading, 18 articles were left in the sample. One of these became unavailable for full reading during the review process and was excluded; thus, the final sample included 17 articles. The flowchart for the selection of articles included in the study is presented in Figure 1[28].

The selected articles were organized in a database with title, database, journal, year, country of origin, language, method, level of evidence, objective, and conclusion, as shown in Table 1. Next, the articles were analyzed regarding the level of evidence (LE).

In the stage of evaluating and classifying the scientific rigor of the articles, the instrument based on the Rating System for the Hierarchy of Evidence for Intervention/Treatment Question was used, which classifies the LE of the studies, as shown in Chart 1[29].

RESULTS

17 scientific articles that met the previously established inclusion criteria were included. All selected articles were published in English and in international journals between 2016 and 2021, with a peak of productivity in 2019 (n = 4). Regarding the number of articles found in the databases: in PubMed, eight were selected (47%); at Scopus, five (29%); at ScienceDirect, four (24%). The publications were produced in eleven different countries: three in the United States; three in France; Saudi Arabia and Peru had two publications each country; Bangladesh, China, Ethiopia, Italy, Nepal, Pakistan, and the United Kingdom one publication each country.

Table 1 presents the description of publications in terms of title, database, journal, year, country of origin, language, method, level of evidence, objective, and conclusion.

DISCUSSION

The analysis of the selected articles made it possible to divide them into three main themes: contamination of cell phones by pathogens[12,14-21,23,27], disinfection, and decontamination of cell phones[13,22,24,26] and contamination of student cell phones[11,25].

Contamination of cell phones by pathogens

Cell phones are used by health professionals as a quick way to access and update information about patients, as a follow-up tool, to communicate with each other, to consult updated guidelines, and for health research in general[19,26]. Such devices can act as a means of transmitting pathogens[12,14-20,23,27]. A study showed that users touch their cell phones an average of 150 times a day and they are often not properly sanitized, functioning as a means of transmitting infections[18].

Another study compared the contamination of cell phones of professionals in an intensive care unit (ICU) with cell phones of administrative staff and found a higher rate of pathogens on the devices of ICU professionals. The most common pathogen in both groups was coagulase-negative *Staphylococcus*, followed by *Staphylococcus Aureus*[20].

A survey compared the rate of contamination of devices with and without screen protectors. It was found that the contamination rate on cell phones with screen protectors was 17.2% higher than on devices without. The overall contamination of the devices was 75%, and the most common bacteria were coagulase-negative *Staphylococcus*[15].

Another study, which aimed to determine the rate of gram-negative bacteria producing extended-spectrum beta-lactamase on cell phones of healthcare professionals, found that the rate of contamination by gram-negative bacteria was 79%. In addition, it was observed that the devices of professionals who worked for more than five years in the hospital presented a higher degree of contamination when compared to those who worked for less than two years[27]. A survey carried out in Peru identified the rate of extended-spectrum beta-lactamase-producing bacteria on healthcare professionals' cell phones; it was found that 30% of the devices had at least one bacterium of this type, and the most common pathogens were *Enterobacter spp*, *E coli*, *Klebsiella pneumoniae* and *Klebsiella oxytoca*[12].

Cell phone disinfection and decontamination

All studies related to this category have identified that decontamination and disinfection of healthcare professionals' cell phones is effective against many pathogenic microorganisms[13,22,24,26].

One of the studies that aimed to compare the bacterial flora, through the application of a standardized decontamination protocol, before and after the device decontamination process, identified that cell phone contamination rate was 94% before protocol application. There was a significant

Table 1. Description of publications.

Article/journal/year of publication/country	Objectives	Method	Level of evidence	Conclusion
"Bacterial contamination of cell phones of medical students at King Abdulaziz University, Jeddah, Saudi Arabia". J Microsc Ultrastruct; 2016. Saudi Arabia[11]	To investigate the presence of pathogenic bacteria in cell phones frequently used by medical students.	Cross-sectional study; total of 105 samples collected from cell phones of medical students, who were asked to fill in a questionnaire for data collection.	N6	Cell phones can act as transmission vehicles for microorganisms. It suggests offering training in medical schools on hand hygiene and cell phone decontamination.
"Extended-spectrum β-lactamase–producing Enterobacteriaceae in cell phones of health care workers from Peruvian pediatric and neonatal intensive care units". Am J Infect Control; 2016. Peru[12]	To describe the levels of contamination by Enterobacteriaceae on cell phones in Peruvian intensive care units (ICU) and to investigate the potential risk factors associated with contamination.	Cohort study; Swabs were collected from the cell phones of 114 healthcare professionals every two weeks in three ICUs for five months.	N4	Enterobacteriacea in the cell phones of health professionals was frequent in hospitals, cell phones can be considered as potential bacterial reservoirs of multidrug-resistant bacteria.
"Microbial flora on cell-phones in an orthopedic surgery room before and after decontamination". Orthop Traumatol Surg Res; 2016. France[13]	To evaluate bacterial contamination of cell phones used by healthcare professionals in an orthopedic operating room, compare bacterial flora before and after cell phone decontamination, determine users' cleaning habits.	Cross-sectional study; cell phone samples that were taken to the operating room of a university hospital. Collections were performed before and after cell decontamination. Participants answered a questionnaire about habits of use and cleaning of the cell phone and hands after use.	N6	Cell phones are contaminated by potentially pathogenic agents. Decontamination by Surfanios® wipes is effective. The implication in the spread of nosocomial infection remains unproven, but educational training should be carried out.
"Nasal colonization and bacterial contamination of mobile phones carried by medical staff in the operating room". PLos One; 2017. China[14]	To evaluate the colonization status of orthopedic medical staff working in a surgical center in terms of nostrils, hands, and cellular and to identify the bacteria involved.	Observational cohort study; collection of bacterial cultures from cell phones, nostrils, and dominant hands of medical teams working in the operating room.	N4	A high rate of nasal colonization and cell phone contamination was found among the medical staff of the operating room, posing a risk to patients.
"Surface microbiology of smartphone screen protectors among healthcare professionals". Cureus; 2017. Pakistan[15]	To determine the risk of collecting pathogens from cell phones and to compare their frequencies with or without the use of screen protectors.	Cross-sectional observational study; cell phone samples from healthcare professionals. Samples were collected in the screensaver area and in the bare area of the same cell phone.	N6	Healthcare workers' cell phones can harbor pathogens. Coagulase-negative Staphylococcus followed by Bacillus were the most common bacteria.
"Multidrug-resistant bacteria associated with cell phones of healthcare professionals in selected hospitals in Saudi Arabia". Can J Infect Dis Med Microbiol; 2018. Saudi Arabia[16]	To identify bacteria on cell phones and determine the antibiotic resistance of the isolates.	Cross-sectional study; samples collected from cell phones of volunteers from three different hospitals.	N6	Cell phones of healthcare professionals can be contaminated by a wide range of bacteria, including multidrug-resistant ones. There is a lack of knowledge about the use of cell phones, which may contribute to a risk of transmission of multidrug-resistant bacteria.

Table 1. Continuation.

Article/journal/year of publication/country	Objectives	Method	Level of evidence	Conclusion
"Multidrug-resistant bacteria isolated from cell phones in five intensive care units: Exploratory dispersion analysis". Germs; 2018. Peru[17]	To characterize bacterial isolates and explore their dispersion in five ICUs over time.	Observational cohort study. Samples obtained from the cell phones of professionals in five ICUs every 15 days for five months.	N4	Cell phones are contaminated with highly harmful bacteria and can keep them on for extended periods. These devices can be considered a potential source of HCRI in the ICU.
"Presence of multidrug-resistant bacteria on mobile phones of healthcare workers accelerates the spread of nosocomial infection and regarded as a threat to public health in Bangladesh". J Microsc Ultrastruct; 2018. Bangladesh[18]	To investigate the prevalence of microbiological contamination of cell phones belonging to doctors in Bangladeshi hospitals.	Cross-sectional study; total of one hundred samples collected from cell phones of different healthcare professionals in different hospitals.	N6	Cell phones have multi-resistant bacteria. An approach is needed to minimize infections, which promotes proper hand hygiene and maintenance of cellphone cleanliness.
"Antibiotic-resistant bacteria on personal devices in hospital intensive care units: Molecular approaches to quantifying and describing changes in the bacterial community of personal mobile devices". Infect Control Hosp Epodemiol; 2019. USA[19]	To investigate the alteration of the bacterial microbiome and the presence of antibiotic resistance genes in the cell phones of ICU nurses during a single work shift.	Cross-sectional study; samples were obtained from the hands of nurses in an ICU. Samples were collected at the beginning and end of the 12-hour shift.	N6	Seven genera were found with the highest relative abundance, Streptococcus was one of the most abundant and is common among hospital-acquired infections.
"Bacterial colonization of healthcare workers mobile phones in the ICU and effectiveness of sanitization". J Occup Environ Hyg; 2019. France[20]	To describe the bacterial colonization of healthcare workers' cell phones in an ICU compared to administrative staff cell phones and report the findings of a sanitization protocol.	Prospective monocentric study; conducted in the ICU, with smears on both sides of healthcare workers' cell phones; comparison of results with the cell phones of the administrative team.	N3	Bacterial cell colonization with pathogens frequently occurred on the cell phones of ICU workers and administrative staff.
"Mobile phones as fomites for potential pathogens in hospitals: microbiome analysis reveals hidden contaminants". J Hosp Infect; 2020. United Kingdom[21]	To characterize the amount and diversity of microbial contamination of cell phones of hospital employees.	Case-control study; study carried out over a period of six months; cell phone samples from 250 hospital staff and 191 control group participants were analyzed. A questionnaire was used to record the participants' cleaning habits and details of cell phone use.	N4	Almost all (99.2%) cell phones of the hospital staff were contaminated with pathogens.

Continue...

Table 1. Continuation.

| Article/journal/year of publication/country	Objectives	Method	Level of evidence	Conclusion
"Routine disinfection of mobile communication devices in the postanesthesia care unit". J Perianesthesia Nurs; 2019. EUA[22]	To explore the effect of routine cell phone disinfection in the post-anesthesia care unit.	Experimental design of repeated measures; cell phones of professionals in the post-anesthesia care unit (PACU) were routinely disinfected for 10 days, every 12 hours. Mean basal bacterial adenosine triphosphate (ATP) counts were evaluated.	N3	Routine disinfection of cell phones in the PACU defined by time and method obtains and maintains the approved cleaning level.
"Longitudinal study of viral and bacterial contamination of Hospital Pediatricians' mobile phones." Microorganisms; 2020. France[23]	To evaluate the contamination by infectious agents of cell phones handled by senior pediatric physicians during a period of 23 weeks.	Prospective longitudinal study; samples of ten cell phones of pediatric professionals, used only at work, during 23 weeks were analyzed for bacterial and viral contamination of their surface.	N3	The study highlights the persistence of viral genomes with bacteria, as well as the ability for some of them to be transferred from one cell to another, probably by hand.
"Shining a light on the pathogenicity of health care providers' mobile phones: Use of a novel ultraviolet-C wave disinfection device". Am J Infect Control; 2020. USA[24]	Decrease the risk of HCRIs caused by cell phones safely and effectively, without using up valuable resources.	Prospective investigational study; swabs were used to swab the surfaces of healthcare workers' cell phones; four cultures per cell, before and after the 30-second disinfection cycle of the ultraviolet – C (UV-C) device, at the beginning and end of a 12-hour shift.	N3	UV-C cleaner is effective in reducing total bacteria and pathogens on cell phones by more than 90 – 99%.
"Taking screenshots of the invisible: a study on bacterial contamination of mobile phones from University Students of Healthcare Professions in Rome, Italy". Microorganisms; 2020. Italy[25]	To assess the microbial contamination of cell phones of undergraduate health students in Rome, all actively attending medical or surgical units.	Cross-sectional study; samples were obtained from the cell phones of students from health courses who were undergoing internships in health establishments. A questionnaire was carried out with items related to the habit of using cell phones.	N6	Training on the possible risks associated with the use of cell phones in the field of HCRIs can be an example of good practice to be implemented in undergraduate health courses.
"Covid-19 and mobile phone hygiene in healthcare settings". BMJ Glob Health; 2020. United Kingdom[26]	Discuss cell phones as a potential vector for the spread of severe acute respiratory syndrome-CoV-2.	Expert opinion reports; good practices on cell phone hygiene.	N7	Actions aimed at information and education on cell phone use are important for infection prevention.
"Extended-spectrum beta-lactamase-producing gram-negative bacteria on healthcare workers' mobile phones: evidence from Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia". Risk Manag Healthc Policy; 2021. Ethiopia[27]	To determine the rate of extended-spectrum beta-lactamase-producing gram-negative bacteria on healthcare professionals' cell phones to assess their antimicrobial susceptibility patterns and associated factors.	Laboratory-based cross-sectional study; 572 sample swabs from the front, back, keyboard, and metal surfaces of healthcare workers' cell phones using the simple random sampling technique.	N6	Extended-spectrum beta-lactamase-producing gram-negative bacteria were isolated from 8.3% of healthcare professionals' cell phones. Up to 79.4% of the isolates were multidrug resistant.
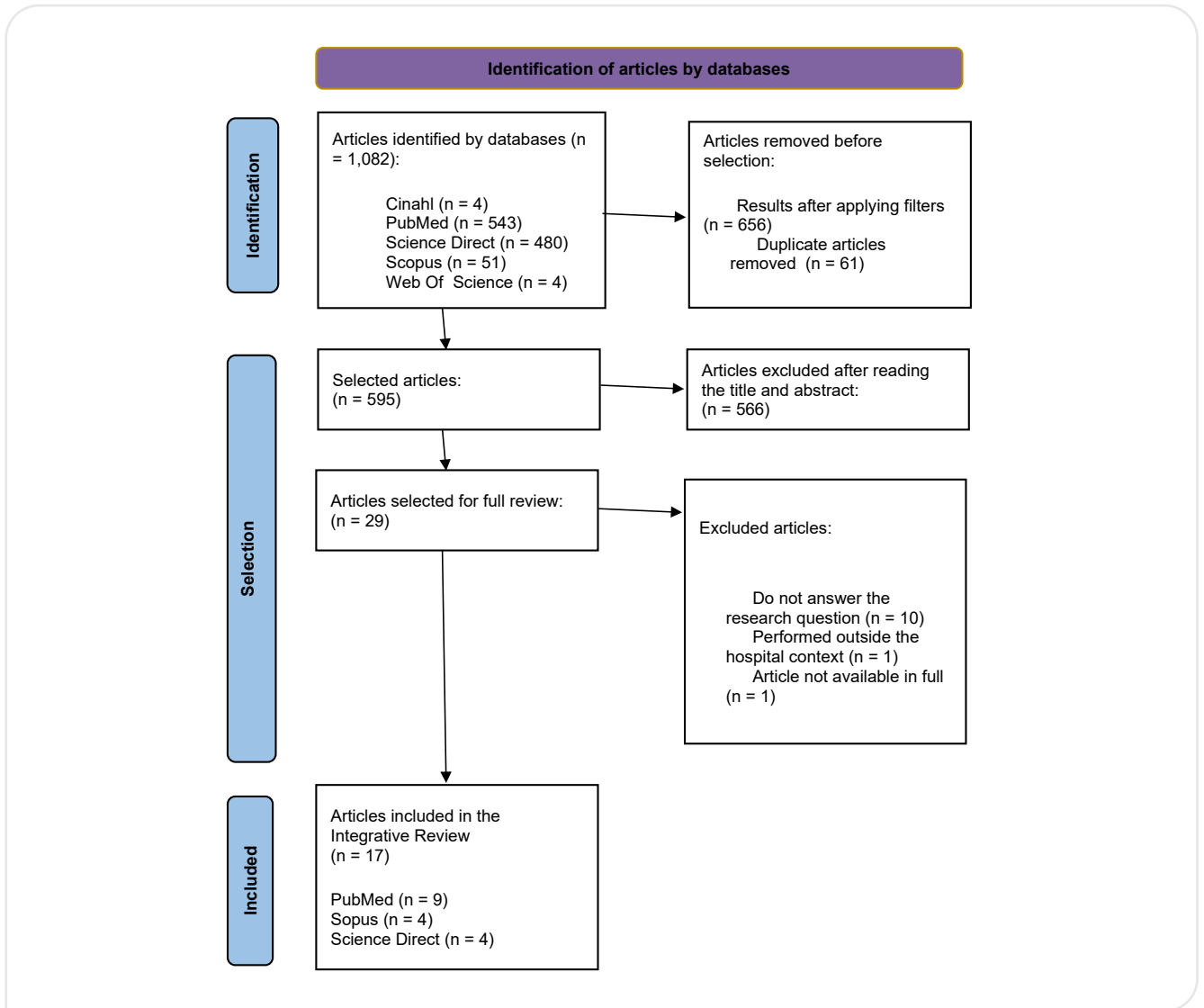
Figure 1. Prisma 2020 flowchart for new systemic reviews that only included database and record searches[28].

Chart 1. Classification of levels of evidence.

Level of evidence	Acronym	Study design
Level 1	N1	Systematic reviews or meta-analyses of relevant randomized clinical trials
Level 2	N2	Randomized clinical trials
Level 3	N3	Controlled clinical trials without randomization
Level 4	N4	Case-controls and cohort studies
Level 5	N5	Systematic reviews of descriptive studies and qualitative studies
Level 6	N6	Evidence from a single descriptive or qualitative study
Level 7	N7	Expert opinion reports/Experience report

reduction in this number after decontamination, reducing contamination rate to 75%. Professionals participating in the survey who claimed to clean their cell phones routinely carried an average of 220 colony-forming units, while those who did not had an average of 279 units on their cell phones[13].

Although cell phones are increasingly widespread in hospital environments, there is little research that identifies them as potential sources of contamination, as well as there are no protocols and guidelines for their use.

Another study identified that routine cleaning with wipes impregnated with a cleaning and disinfection product (didecyldimethylammonium chloride 0.76%, ethanol 7.5%, isopropanol and inert ingredients 76.74%) of cell phones, defined

by time and method, is effective in maintaining an acceptable level of cleanliness with the application of the established disinfection schedule. Using a luminometer, the number of ATP in each device was verified, and cleaning was defined as failure when the amount of ATP was greater than 1,000 and effective when the number of ATP was 500 or less. After the ten days of collection every 12 hours, the ATP count was below 500. After 36 months of the beginning of the project and continuing the cleaning schedule with the use of tissues, another collection was made and maintained a number of ATP low, evidencing that the use of tissues according to the established schedule is effective[22].

In one of the studies, an ultraviolet ray – C (UV-C) device was used to disinfect mobile devices. The method was also effective in reducing colonies of pathogenic bacteria. With two disinfection cycles over the course of the 24-hour shift, the total bacterial load was reduced by 99.9%. This study also identified that pathogens found on mobile devices are similar to those found on hands. In this way, hand cleaning, in addition to cell phone decontamination, is an important factor for the prevention of HCRI[24].

A recent study that addresses the topic of COVID-19 presents data from other studies that corroborate previous findings regarding the presence of pathogens on cell phone surfaces. They are currently considered as the surfaces most touched by the hands of professionals, in addition to doorknobs, keyboards, counters, among others. The article presents recommendations for the use of devices in the context of the pandemic, such as reducing the use of cell phones in hospital environments, cleaning, not sharing devices and earphones and hand hygiene[26].

Contamination of students' cell phones

The articles included here address questions about undergraduate students in the health area and the relationship with the use of cell phones in a hospital environment and their contamination.

One of the selected studies, with only medical students, shows that 96.2% of the cell phones tested had bacterial contamination. Of the students who participated in the survey, 59% claimed to having used their cell phone in the bathroom and all said to use it at least once during their period of work in the hospital environment. Coagulase-negative staphylococci represented the majority of samples collected, more than 68% of them. Most cell phones were contaminated

with more than one organism, *Staphylococcus Aureus* was found in 16.2% of them, which is a high rate of contamination with pathogenic bacteria, often found in bathrooms. Training programs are suggested to early stage students to raise awareness of hand hygiene, frequent cell phone decontamination, pathogen transmission, and HCRI prevention. It was also identified that two thirds of the cell phones in the study were never decontaminated[11].

Another study carried out with students from health courses identified that all mobile devices included in the sample had some degree of bacterial contamination, varying in quantitative and qualitative terms[25], unlike other articles included in this review. Most respondents (93.5%) reported that they use their device within the hospital environment, and 13.9% of students said they had never cleaned their cell phone. The highest bacterial loads were identified in male cell phones, corroborating findings from another study[13,25]. According to the analysis of the study, the presence of *Enterococci* and *Staphylococcus Aureus* coliforms are markers of insufficient personal hygiene habits, fecal contamination, and insufficient quality of hygiene on surfaces in hospital environments. The authors bring the importance of correct hand hygiene inside and outside the work environment, the importance of a more comprehensive educational intervention in relation to microbiological risks, in line with indications already pointed out in previous studies[13,25].

CONCLUSIONS

The present study identified, in all selected articles, the occurrence of cell phone contamination, the most common bacteria being coagulase-negative *Staphylococcus* and *Staphylococcus Aureus*. No national publications were found, only international studies.

The limitations of the study are related to the lack of research on the subject and the fact that infections are multifactorial and, therefore, the exact cause of HCRI cannot be stated.

Studies have shown that frequent decontamination of cell phones and hand hygiene are indicated to reduce the risk of infection. There was no evidence in the association of the risk of infection, however, if the professional during the care handles contaminated equipment and concomitantly touches the patient with low immunity, there is an increased risk of transmission of pathogens and, consequently, of infection. Therefore, frequent decontamination of cell phones associated with hand hygiene is recommended.

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CONFLICT OF INTERESTS

The authors declare there is no conflict of interests.

AUTHORS' CONTRIBUTION

MJ: Conceptualization, Data curation, Investigation, Methodology, Resources, Writing –original draft, software. AFF: Conceptualization, Data curation, Investigation, Methodology, Resources, Writing – original draft, Software. LDM: Project administration, Writing – review & editing, Visualization. RCAC: Project administration, Formal analysis, Writing – review & editing, Supervision, Validation, Visualization.

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