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DIGITAL HEALTH EQUITY AT SEA: A SCOPING REVIEW OF COMMUNICATION, HEALTHCARE ACCESS, AND MENTAL HEALTH BARRIERS AFFECTING SEAFARERS

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ABSTRACT

Background: Seafarers are a mobile workforce that moves over 80% of trade. Despite their role, they are among the most underserved groups in accessing healthcare. Geographic isolation, limited connectivity, multicultural crews, longer periods at sea, and access to healthcare professionals contribute to health inequities. Advances in digital health, including telemedicine, electronic health record systems, mobile health applications, wearable monitoring systems, and digital mental health support, offer promising solutions. However, differences in digital infrastructure, communication networks, regulatory rules, and digital literacy impede equitable healthcare delivery at sea.

Objective: This scoping review mapped the literature on digital health equity among seafarers, focusing on communication barriers, healthcare accessibility, and mental health challenges in maritime environments.

Methods: A scoping review was conducted using Arksey and O'Malley's framework and PRISMA-ScR principles. We reviewed literature on maritime telemedicine, digital healthcare, healthcare accessibility, communication technologies, and seafarers' mental health.

Results: Telemedicine and telemedical assistant services have improved access to healthcare at sea, but challenges remain, including inconsistent satellite connectivity, limited bandwidth, delayed medical consultations, language barriers, limited electronic health record integration, and insufficient mental health support services. Digital interventions appear promising; however, evidence regarding their effectiveness, uptake, and sustainability remains limited. Digital health equity at sea is impacted by interconnected technological, occupational, organizational, and regulatory factors.

Conclusion: Digital health technologies can reduce healthcare inequities among seafarers. Achieving digital health equity at sea requires an integrated communication infrastructure, standardized maritime digital health systems, mental health-focused interventions, regulatory harmonization, and investment in connectivity and digital literacy.

Keywords: Seafarers, Digital health equity, Telemedicine, Maritime health, Mental health, Healthcare access, Communication barriers.

1 INTRODUCTION

The maritime industry is foundational to global trade, moving more than 80% of the world's goods by volume and supporting international economic growth. At the core of it all is a workforce of about 1.9 million seafarers who operate commercial vessels under unique and often challenging conditions [1]. Unlike most workers on land, seafarers remain at sea for long stretches, often for months, with limited access to healthcare services, social support networks, and emergency medical help. Their work environment is characterized by geographic remoteness, long working hours, multicultural crews, harsh working conditions, and limited contact with family members and healthcare providers. These circumstances lead to serious health challenges and widen inequalities in healthcare access compared with populations living and working onshore [2]. Healthcare delivery at sea presents a distinctive challenge, primarily because most ships lack dedicated onboard healthcare professionals, and medical supplies are often scarce. In many situations, medical emergencies and routine health problems must be handled by crew members with basic medical training, while relying on remote support from shore-based physicians and telemedicine services [3]. Geographic remoteness can impede prompt response, delaying access to advanced medical care and complicating timely diagnosis and treatment. Moreover, extended working hours, fatigue, sleep disturbances, and work-related stress elevate the risk of both physical and mental health challenges among seafarers. The multinational composition of modern crews further complicates healthcare delivery through language barriers, cultural differences, and communication. These challenges affect individuals' understanding of medical advice and their willingness to seek medical assistance.

In recent years, digital health technologies have emerged as promising tools for addressing healthcare challenges in remote and underserved populations [4]. Digital health is the use of information and communication technologies to strengthen health services, shape healthcare delivery, and improve health outcomes. This is evident in telemedicine, electronic health records (EHRs), mobile health applications, wearable monitoring devices, artificial intelligence-driven systems, and digital mental health platforms [5,6]. These technologies can overcome geographic barriers, improve access to healthcare professionals, ensure more consistent care over time, and support disease prevention and health promotion. For seafarers, digital health solutions might help reduce the constraints of working at sea and improve access to essential healthcare services. In a maritime setting, digital health equity is especially relevant. Digital health equity is the fair and just opportunity for every person to access, use, and benefit from digital health technologies, regardless of location, socioeconomic status, job type, technical skills, or other social determinants [7]. Although digital technologies can improve access to healthcare, outcomes are not always distributed equally. Factors such as inadequate internet connectivity, weak technological infrastructure, insufficient digital literacy, language barriers, and concerns about privacy and data security can prevent some groups from benefiting from digital health innovations [8]. For seafarers specifically, achieving digital health equity means having reliable communication systems, access to telemedicine services, secure electronic health records, digital mental health resources, and adequate training to use these technologies effectively.

Maritime healthcare has long relied on communication technologies to support medical care at sea. In the early days, telemedicine relied primarily on radio communication, allowing ships to seek help from shore-based medical professionals when onboard treatment options were insufficient. Advances in satellite communications and internet technologies have enabled real-time consultations, the transmission of medical images, remote monitoring, and the exchange of electronic health data with relative ease. Modern telemedicine services in the maritime industry have become an essential part of healthcare at sea, helping reduce unnecessary medical evacuations and improving clinical decision-making in remote areas. In addition, emerging digital tools such as mobile health applications, wearable devices, and online counseling services have paved new pathways to support both physical well-being and mental resilience among seafarers [9]. Despite these improvements, substantial barriers persist, limiting the effectiveness and accessibility of digital healthcare at sea. Communication challenges remain among the most significant obstacles. Several vessels operate in areas with poor satellite coverage or insufficient bandwidth, limiting the quality and reliability of telemedicine consultations [10]. The high cost of connectivity can further limit access to digital health services, especially for smaller shipping companies or vessels operating in remote regions. Language differences among multinational crews may complicate communication between seafarers and healthcare providers and reduce the quality of care received.

Barriers to healthcare access extend beyond communication challenges. Variations in digital infrastructure, organizational resources, and inconsistent deployment of telemedicine systems lead to unequal healthcare access within the maritime industry. Moreover, the absence of standardized electronic health records impedes continuity of care, particularly for seafarers who transition between vessels, employers, and healthcare providers in different countries. These issues highlight the need for more coordinated and equitable digital health platforms in the maritime sector [11]. Mental health remains a vital part of the discussion and an essential focus. Seafarers often face various psychosocial stresses, including social isolation, separation from family, extended periods at sea, heavy workloads, and job insecurity. These factors can lead to increased risks of anxiety, depression, stress, fatigue, and burnout. While digital mental health resources such as telepsychology, online counseling, and mobile mental health applications offer

promising solutions, access to these services is inconsistent and unequal across different regions [12,13]. Additionally, concerns about stigma, privacy, confidentiality, and potential employment consequences may prevent seafarers from seeking mental health support, even when such services are available.

Although research on maritime telemedicine, digital health technologies, and seafarer well-being has expanded in recent years, the evidence remains fragmented across disciplines. There's a clear need for a more comprehensive view of how communication barriers, problems accessing healthcare, and mental health concerns intersect and affect digital health equity among seafarers. Therefore, this scoping review aims to map and synthesize existing literature on digital health equity at sea, focusing on three linked dimensions, namely communication barriers that hinder access to digital healthcare, barriers to healthcare access in the maritime environment, and mental health barriers that affect seafarers' well-being. By examining these dimensions together, the review seeks to identify ongoing challenges, point out knowledge gaps, and provide directions for future research, policy development, and the implementation of equitable digital health solutions across the maritime sector.

2 METHODS

2.1 Study Design

This review was conducted as a scoping study because the literature on digital health and seafarer health is widely dispersed, encompassing varied study designs, intervention types, and outcomes, and combining empirical and review articles. The review followed the Arksey and O'Malley (2005) framework for scoping reviews [14], and the report aligns with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Review (PRISMA-ScR) [15]. Consistent with scoping review methodology, the purpose of the review was to map the extent, nature, and thematic distribution of the available literature.

2.2 Research Questions

The review addressed the following research questions:

- What communication barriers affect the implementation and utilization of digital health services among seafarers?
- What healthcare access challenges are faced by seafarers, and how are digital health technologies being used to address them?
- What mental health barriers affect seafarers, and what role do digital interventions play in supporting mental well-being?
- What gaps exist in the current literature regarding digital health equity at sea?

2.3 Eligibility Criteria

The studies were selected according to predefined inclusion and exclusion criteria.

2.3.1 Inclusion Criteria

Studies were included if they:

- Focused on seafarers, maritime workers, fishermen, offshore workers, or ship crews.
- Examined digital health technologies, such as telemedicine, telehealth, mobile health (mHealth), electronic health records, wearable technologies, digital mental health interventions, or other digital healthcare systems.
- Assessed communication barriers, healthcare accessibility, health service delivery, or mental health concerns within maritime sectors.
- Were peer-reviewed journal articles, systematic reviews, narrative reviews, conference papers, theses, dissertations, or official reports.
- Were published in English.

2.3.2 Exclusion Criteria

Studies were excluded if they:

- Focused only on land-based populations with no maritime relevance
- Examined maritime engineering or communication systems but lacked a healthcare component
- Were editorials, commentaries, opinion pieces, news articles, or publications that lacked sufficient methodological detail
- Did not address healthcare access, digital health, communication, or mental health for seafarers

2.4 Information sources and search strategy

A comprehensive literature search was conducted to identify relevant publications. The literature search included multidisciplinary databases (PubMed/MEDLINE, Scopus, Web of Science, PsycINFO, and Google Scholar) and maritime-related journals and sources, such as International Maritime Health, Journal of Transport & Health, Journal of Telemedicine and Telecare, JMIR journals, and grey literature from the IMO, ILO, WHO, ICS, and ISWAN." Keywords and search terms were developed based on the review objectives and the existing literature on digital health, telemedicine, and maritime healthcare.

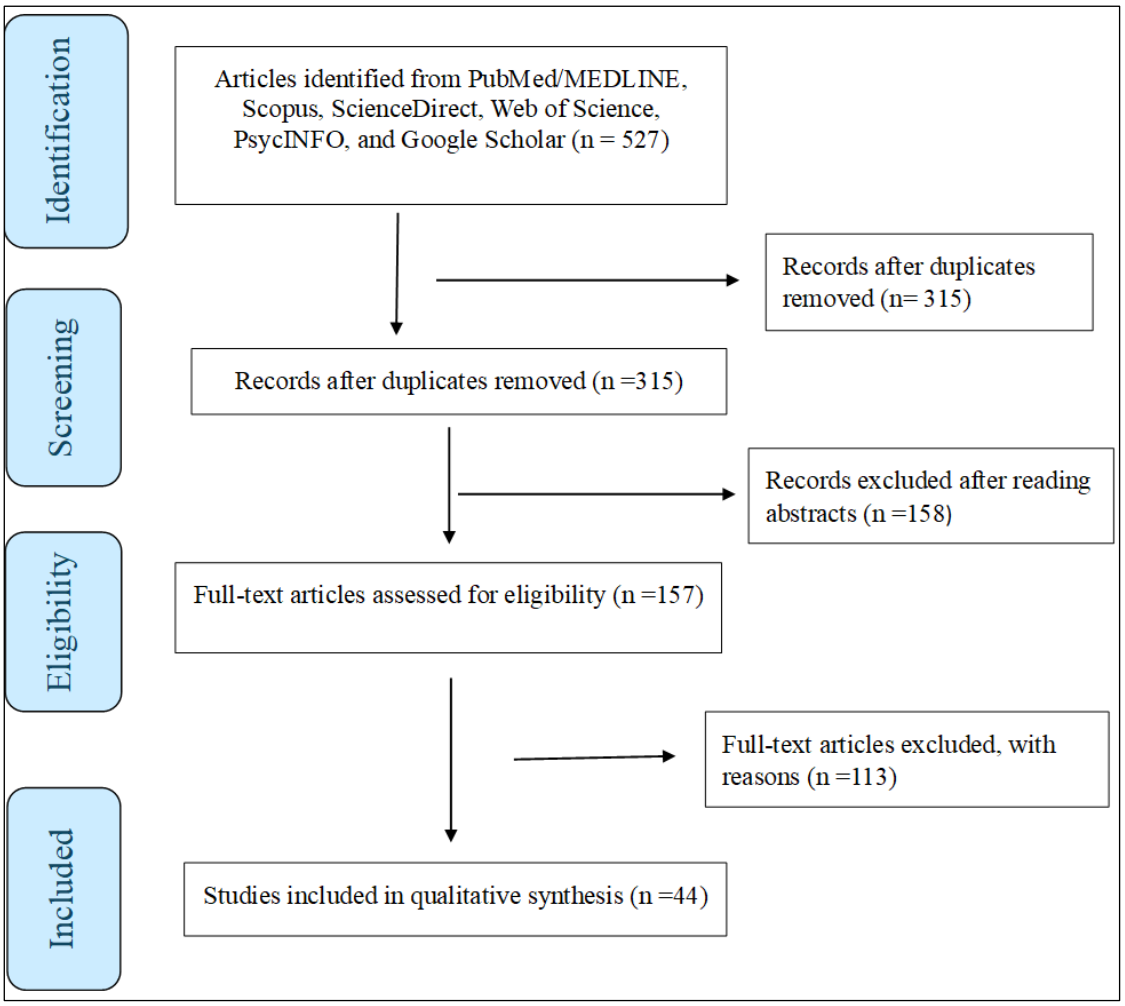


Figure 1: PRISMA Flow diagram showing the article selection process in the study.

The search strategy combined terms for seafarers and maritime workers with terms for digital health and healthcare access. Examples of search terms included: "seafarer", "maritime worker", "ship crew", "merchant seafarer", "digital health", "telemedicine", "telehealth", "e-health", "electronic health record", "mental health", "psychological wellbeing", "healthcare access", "communication barrier", "digital equity", "health equity".

Boolean operators (AND, OR) were used to combine the search terms. Reference lists of relevant studies were also reviewed to identify additional publications. A typical search string was: ("seafarers" OR "maritime workers" OR "ship crew") AND ("digital health" OR "telemedicine" OR "telehealth" OR "e-health") AND ("healthcare access" OR "communication barriers" OR "mental health" OR "health equity"). Figure 1 illustrates the PRISMA Flow diagram showing the article selection process in the study.

2.5 Study Selection

The study selection process for the study was carried out in two stages. Titles and abstracts of identified records were first screened against the inclusion and exclusion criteria. Relevant studies proceeded to full-text review. In the second stage, the full-text articles were reviewed more carefully to determine eligibility for inclusion in the review. Identified duplicates from the search were removed before the screening process. Studies that did not meet the eligibility criteria were excluded, and the reasons for exclusion were recorded where applicable. The final collection of included studies

spanned a wide range of research designs, including quantitative studies, qualitative investigations, mixed-methods research, systematic reviews, narrative reviews, and policy analyses.

2.6 Data Extraction and Charting

Data from the included studies were extracted using a consistent data-charting framework. For each study, we recorded multiple details such as:

- Bibliographic information (author, year, country)
- Study design
- Study population
- Digital health technology examined
- Key findings connected to communication barriers
- Key findings related to healthcare access
- Key findings related to mental health
- Recommendations and the research gaps that were identified.

The data extraction process was iterative, with categories refined as familiarity with the literature increased. The extracted information was then grouped thematically to facilitate comparison of findings across studies.

2.7 Data Analysis and Synthesis

A descriptive and thematic method was used to analyze and synthesize the findings. Quantitative summary statistics outlined publication trends, study features, and research areas where relevant. Additionally, qualitative thematic analysis identified common patterns, ideas, and issues across the literature.

The findings were categorized into three themes.

- Communication Barriers, such as connectivity limitations, language barriers, communication infrastructure challenges, and digital literacy problems.
- Healthcare Access Barriers, including telemedicine implementation, healthcare services accessibility, continuity of care, emergency medical support, and electronic health record systems.
- Mental Health Barriers, including stress, isolation, psychological distress, stigma, access to counseling services, and digital mental health interventions.

The report identified and summarized emerging technologies, policy considerations, and future research priorities.

2.8 Quality Appraisal

In line with standard scoping review methodology, a formal assessment of methodological quality or risk of bias was not conducted. The main aim of the review was to map the breadth and scope of available evidence rather than to evaluate the effectiveness of specific interventions. However, study features and methodological approaches were examined to interpret the outcomes and identify areas where robust evidence is needed.

2.9 Ethical Considerations

Since this work mainly involved reviewing and synthesizing publicly available literature, no human participants were recruited, and no primary data were collected. Therefore, ethical approval was not needed. The review was conducted in accordance with established principles of academic integrity, transparency, and responsible research reporting.

3 RESULTS

A total of 44 studies were included in the final synthesis, reflecting a heterogeneous body of literature spanning empirical studies, reviews, narrative syntheses, and policy- or practice-oriented publications. The evidence base seemed concentrated around three broad domains: telemedicine and remote clinical support, communication and connectivity constraints affecting care delivery, and mental health needs among seafarers. Fewer studies focused specifically on EHR implementation, interoperability, data governance, or rigorous evaluation of emerging technologies such as wearables and AI-enabled decision support. The literature was more descriptive than interventional, with many studies documenting barriers, service models, or perceived needs rather than testing effectiveness outcomes. This pattern is important for interpreting the review's findings because it suggests that current knowledge is better aligned with identifying challenges than with demonstrating long-term health impact.

3.1 Communication Barriers Affecting Digital Health Equity

3.1.1 Connectivity & Internet Accessibility

Limited internet connectivity has been reported as the most common issue across literature while at sea. Effective digital healthcare delivery depends on reliable communication systems that enable telemedicine consultations, data transmission, and easy access to online health resources [7]. However, many vessels persistently experience inadequate connectivity because they depend on satellite communications systems, which are costly, bandwidth-limited, and prone to disruptions. Multiple studies indicate that weak connectivity can hinder telemedicine consultations by limiting real-time contact between onboard personnel and shore-based clinicians [16]. Video consultations, which significantly improve diagnostic accuracy, are often difficult to conduct due to unreliable internet connections. In some cases, healthcare providers must revert to voice conversations or rely on delayed transmissions of medical information, potentially affecting clinical decisions and patient outcomes. Connectivity issues are more evident in remote ocean areas where satellite coverage is weak, and communication costs are high [16]. Smaller vessels and those handled by firms with limited financial means often have less advanced communication infrastructure. This creates disparities in accessing digital health services across various sectors of the maritime industry.

3.1.2 Language and Cultural Barriers

The diverse composition of modern ship crews presents a significant hurdle to effective healthcare communication. Seafarers typically originate from various linguistic and cultural backgrounds, with English serving as the common operational language on ships. However, the varying levels of language proficiency among crew members, healthcare providers, and telemedicine specialists can complicate understanding and agreement on medical information [17]. Numerous studies indicate that language barriers often lead to misunderstandings regarding symptoms, medical histories, treatment instructions, and medication usage [18]. These communication issues can diminish the effectiveness of telemedicine consultations and raise the risk of diagnostic errors. Additionally, cultural differences influence individuals' healthcare utilization, mental health disclosure, and trust in digital health technologies [19].

3.1.3 Digital Literacy Challenges

As digital technologies become more integrated into maritime operations, not all seafarers have the same level of digital literacy; studies show that age, education, and early exposure to technology influence adoption [20]. Some studies have found that age, educational background, prior exposure to technology, and the availability of training opportunities can shape seafarers' ability to use digital health platforms effectively. When digital literacy is limited, seafarers may disengage from telemedicine systems, struggle with electronic health records, or fail to use mobile health applications as intended. A few studies also noted that simpler, user-friendly interfaces and robust training programs are crucial for improving adoption and day-to-day use of digital health services. Without adequate support, technology advances may unintentionally widen existing disparities among seafarers rather than help reduce them.

3.1.4 Privacy and Confidentiality Concerns

Privacy concerns frequently appeared in the literature, particularly regarding mental health care, with studies showing that fear of surveillance can discourage workers from seeking support. Seafarers often expressed discomfort with digital consultations, fearing that their employers might access their personal health data. Fear of negative job-related consequences was often mentioned as the reason people avoid mental health support services [21]. The literature highlights that strong cybersecurity measures, clear and transparent data governance policies, and confidential communication channels are important for building trust in digital health systems and for encouraging healthcare utilization among maritime workers.

3.2 Healthcare Access Barriers and Digital Health Solutions

3.2.1 Geographic Isolation and Limited Medical Resources

Geographic isolation remains a defining characteristic of maritime work and a major determinant of healthcare access [22]. In contrast to land-based populations, seafarers often spend extended periods far from healthcare facilities, limiting opportunities for routine medical checkups and immediate care during emergencies. Most vessels carry only basic medical supplies and depend on a few designated crew members to provide initial treatment. Many studies have reported that in the absence of an onboard physician, the crew becomes more dependent on remote medical support services [23,24]. As a result, delays in accessing specialist care, diagnostic services, and emergency interventions can worsen health outcomes in cases involving serious injuries or acute illnesses.

3.2.2 Telemedicine as a Primary Healthcare Resource

Telemedicine emerged as the most visible digital health intervention in the maritime literature, with Telemedical Assistance Services (TMAS) playing a pivotal role by providing remote medical guidance to vessels via shore-based

healthcare professionals who assist with diagnosis, treatment planning, and emergency decision-making [25]. Many studies emphasize the benefits of telemedicine for seafarers, including improved access to medical expertise, faster clinical decision-making, reduced reliance on costly medical evacuations, and consistent management of acute and chronic conditions. However, the implementation faces challenges due to communication barriers, uneven technological infrastructure, inconsistent onboard staff training, and varying regulations across countries [26,27]. Consequently, the success of telemedicine largely depends on reliable connectivity, robust digital infrastructure, and effective operational support systems.

3.2.3 Electronic Health Records and Health Information Management

Electronic health records (EHRs) are often viewed as a vital part of the future maritime healthcare system. Digital health records can promote continuous care by making medical information accessible to healthcare providers regardless of the seafarer's location. Some studies also suggest that interoperable EHR systems could simplify chronic disease management, improve emergency response, and support more consistent long-term health tracking [11,28]. However, adoption remains limited across much of the maritime sector. Challenges include technical interoperability issues, data security concerns, a lack of standardization, and varying regulatory standards across jurisdictions [10].

3.2.4 Emerging Digital Health Technologies

Beyond telemedicine, the literature identified a growing fascination in advanced digital health technologies. Wearable devices intended to monitor vital signs, fatigue levels, and physical activity have been proposed as practical aids for improving health surveillance among seafarers [29]. An artificial intelligence application is being tested for disease prediction, medical decision support, and analysis of telemedical records. While these technologies demonstrate significant potential, there is still limited evidence regarding their effectiveness in maritime environments. Most research indicates the need for additional studies to assess their feasibility, user acceptance, and the possible long-term health impacts [30].

3.3 Mental Health Challenges and Digital Support Interventions

3.3.1 Mental Health Burden Among Seafarers

Mental health emerged as one of the most significant concerns in the literature. Seafarers face a range of psychosocial stressors, including long periods of separation from family, social isolation, fatigue, high workloads, a multicultural workplace environment, and uncertainty about employment conditions [12]. These stressors contribute to an increased risk of anxiety, depression, stress, burnout, and loneliness. The COVID-19 pandemic further exacerbated these challenges. Crew-change restrictions prevented many seafarers from returning home after their contracts ended, thereby increasing psychological distress [31,32]. Many studies documented a decline in mental well-being during the pandemic, highlighting how vulnerable maritime workers can be to mental health crises [33].

3.3.2 Stigma and Barriers to Help Seeking

Despite increasing awareness of mental health challenges, stigma continues to prevent individuals from seeking help [34]. Many seafarers expressed concerns that discussing mental health issues might affect their careers, job prospects, or their relationships with employers negatively. The maritime culture tends to prioritize resilience and self-reliance, which may discourage individuals from seeking psychological assistance [35]. Furthermore, limited availability of mental health professionals and concerns over confidentiality contribute to low utilization of mental health services [34].

3.3.3 Digital Mental Health Interventions

Digital technologies have emerged as useful tools for addressing mental health challenges among seafarers, largely by providing access to telepsychology services, online counseling platforms, mental well-being applications, peer-support networks, and digital cognitive behavioral therapy programs [36]. A major advantage lies in the ability to provide psychological support regardless of location and to offer greater privacy and anonymity, which may reduce stigma and increase willingness to seek help. Improved communication technologies have enabled more frequent contact with family members, contributed to reduced isolation, and improved psychological well-being. However, the effectiveness of these interventions is still constrained by challenges such as limited connectivity, privacy concerns, language barriers, and differences in digital literacy [30]. There remains limited evidence on their long-term performance and sustainability in maritime settings.

4 DISCUSSION

The findings of this scoping review indicate that digital health technologies have enhanced healthcare delivery in maritime settings [11]. Nonetheless, significant disparities in access and usage among seafarers persist. Communication

plays a crucial role in digital health equity, as dependable internet is essential for telemedicine, electronic health records, remote monitoring, and digital mental health services. Despite improvements in satellite communication technologies, the connectivity gap remains, with disparities across vessel types, shipping companies, and geographical regions [37,38]. Limited bandwidth, high communication costs, and inconsistent network coverage remain barriers, especially for seafarers on smaller vessels or in remote areas, hindering their access to care and vital health information [36]. These findings suggest that improving digital connectivity is key to reducing healthcare inequalities and enhancing the well-being of maritime workers. The review also highlights the key role of telemedicine and other digital health solutions in addressing barriers to healthcare access stemming from geographic isolation. Telemedical Assistance Services (TMAS) have become foundational to maritime healthcare, enabling remote consultations, supporting clinical decision-making, and reducing the need for expensive medical evacuations [39]. Electronic health records and emerging technologies such as wearable monitoring devices offer opportunities to enhance continuity of care and long-term health management among seafarers. However, the effectiveness of these technologies is influenced by factors such as infrastructure quality, technological readiness, workforce training, and regulatory inconsistencies. achieving more equitable healthcare access at sea requires technological innovation and coordinated efforts to standardize digital health systems and strengthen healthcare governance across the maritime sector.

Mental health has become a significant concern in much of the reviewed literature, indicating that seafarers face a higher risk of mental health issues than onshore workers [40]. Seafarers experience various psychosocial stressors, such as social isolation, long periods away from family, heavy workloads, fatigue, and job insecurity. These combined factors often elevate the risk of anxiety, depression, stress, burnout, and loneliness. Digital mental health solutions, such as telepsychology services, online counseling, and mobile mental health applications, show promise in improving access to care, especially for workers in remote locations [41]. Digital platforms may also help reduce stigma, allowing seafarers to seek help confidentially without in-person explanations. However, challenges such as connectivity issues, digital literacy gaps, privacy concerns, and workplace culture hinder the use and effectiveness of mental health services, highlighting the need for broader organizational and policy interventions with technical solutions [42]. The findings show that digital health equity at sea is a complex challenge influenced by technological, organizational, social, and regulatory factors. Digital health technologies can improve healthcare access and outcomes for seafarers, but these benefits are constrained unless fundamental disparities, such as infrastructure shortages, gaps in digital literacy, privacy concerns, and limited mental health support, are effectively addressed. Future efforts should focus on ensuring reliable connectivity, expanding telemedicine, creating interoperable health information systems, and enforcing policies that promote equitable access to digital healthcare [13]. Such measures are essential to ensure that all seafarers, regardless of location, nationality, or employment circumstances, can benefit from advances in digital health and experience improved health and well-being.

4.1 Research gaps

Despite growing interest in digital health and maritime healthcare, significant research gaps hinder a full understanding of digital health equity among seafarers [11]. Most studies are cross-sectional and qualitative, with limited longitudinal evidence on how digital interventions affect health outcomes. Additionally, research is concentrated in high-income regions, leaving the experiences of seafarers from low- and middle-income countries underreported. Comparability across studies is also challenging due to the lack of standardized evaluation frameworks, uniform outcome measures, and shared definitions [43]. Furthermore, critical topics such as digital health literacy, digital mental health interventions, and emerging technologies, including digital therapeutics, artificial intelligence, wearable devices, and predictive analytics, receive limited attention. Practical issues related to data privacy, cybersecurity, governance, cost-effectiveness, workplace culture, organizational policies, and the regulatory environment remain underexplored [44]. Addressing these gaps is essential to developing robust evidence and creating effective, equitable, and sustainable digital health policies and interventions tailored to the diverse needs of seafarers worldwide.

4.2 Implications for Policy and Practice

This review emphasizes the importance of coordinated efforts to improve digital health infrastructure, healthcare delivery, and workforce support within the maritime sector. Policymakers should prioritize reliable internet access as a foundation for equitable telemedicine, electronic health records, remote monitoring, and digital mental health services. Collaboration among policymakers, maritime regulators, and shipping companies is crucial for establishing minimum connectivity standards, expanding telemedicine options, and creating interoperable health information systems to maintain continuity of care. Additionally, digital health equity involves addressing human and organizational factors through initiatives such as digital health literacy training, confidential mental health support, anti-stigma programs, and supportive workplace policies. An essential component is the development of robust data privacy and cybersecurity frameworks to protect sensitive health information and foster trust in digital healthcare. Achieving equitable digital health at sea requires ongoing cooperation among governments, international maritime organizations, healthcare providers, shipping companies, and technology developers to build a more inclusive, resilient, and sustainable care environment for seafarers worldwide.

5 CONCLUSION

This scoping review shows that digital health technologies have strong potential to improve healthcare access and reduce health inequalities among seafarers, largely by overcoming barriers associated with geographic isolation, scarce medical resources, and limited healthcare access. Telemedicine, electronic health records, digital communication platforms, and emerging health technologies have made healthcare delivery at sea more effective, while digital mental health interventions provide an avenue to address the psychological burdens that maritime workers face. However, persistent obstacles remain, including connectivity, communication infrastructure, digital literacy, privacy concerns, and uneven access to the technology itself, meaning "digital health equity" has not yet been fully achieved. The review also highlights important research gaps, particularly the long-term effectiveness of digital health interventions, emerging technologies, mental health support systems, and policy frameworks. Coordinated actions are required to strengthen the communication network, expand telemedicine services, improve digital literacy, support mental health, and establish standardized policies and regulations to ensure that seafarers benefit from advances in digital healthcare and to promote equitable, accessible, and sustainable healthcare delivery across the global maritime industry.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

No conflict of Interest to be disclosed.

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