Roles, Users, Benefits and Limitations of Chatbots in Healthcare: Rapid Review

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Abstract

Background: Chatbots, or "conversational agents," have emerged as significant tools in healthcare, driven by advancements in artificial intelligence (AI) and digital technology. These programs are designed to simulate human-like conversations, addressing various healthcare needs. However, no comprehensive synthesis of healthcare chatbots' roles, users, benefits and limitations is available to inform future research and application in the field.

Objective: This review aims to describe healthcare chatbots' characteristics, focusing on their diverse roles in the healthcare pathway, user groups, benefits and limitations.

Methods: A rapid review of published literature from 2017 to 2023 was performed with a search strategy developed in collaboration with a health sciences librarian and implemented in the Medline and Embase databases. Primary research studies reporting on chatbot roles and/or benefits in healthcare were included. Two reviewers dual-screened the search results. Extracted data on chatbot roles, users, benefits, and limitations were subjected to content analysis.

Results: The review categorized chatbot roles into two themes: 'Delivery of remote health services'—including patient support, care management, education, skills-building, health behavior promotion—and 'Provision of administrative assistance to healthcare providers'. User groups spanned across chronic and cancer patients, individuals focused on lifestyle improvements, and various demographic groups such as women, families, and the elderly. Professionals and students in healthcare also emerged as significant users, alongside groups seeking mental health, behavioral change, and educational enhancement. Benefits of healthcare chatbots were classified into themes of 'Improvement of healthcare quality' and 'Efficiency and cost-effectiveness in healthcare delivery'. Identified limitations encompassed ethical challenges, medico-legal and safety concerns, technical difficulties, user experience issues, and societal and economic impacts.

Conclusions: Healthcare chatbots offer a wide spectrum of applications, potentially impacting various aspects of healthcare. While they are promising tools for improving healthcare efficiency and quality, their integration into the healthcare system must be approached with consideration of their limitations to ensure optimal, safe, and equitable use.

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Rapid Review of Roles, Users, Benefits and Limitations of Chatbots in Healthcare

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Abstract

Introduction: Chatbots, or "conversational agents," have emerged as significant tools in healthcare, driven by advancements in artificial intelligence (AI) and digital technology. These programs are designed to simulate human-like conversations, addressing various healthcare

needs. However, no comprehensive synthesis of healthcare chatbots' roles, users, benefits and limitations is available to inform future research and application in the field.
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Results: The review categorized chatbot roles into two themes: 'Delivery of remote health services'—including patient support, care management, education, skills-building, health behavior promotion—and 'Provision of administrative assistance to healthcare providers'. User groups spanned across chronic and cancer patients, individuals focused on lifestyle improvements, and various demographic groups such as women, families, and the elderly. Professionals and students in healthcare also emerged as significant users, alongside groups seeking mental health, behavioral change, and educational enhancement. Benefits of healthcare chatbots were classified into themes of 'Improvement of healthcare quality' and 'Efficiency and cost-effectiveness in healthcare delivery'. Identified limitations encompassed ethical challenges, medico-legal and safety concerns, technical difficulties, user experience issues, and societal and economic impacts.
Conclusion: Healthcare chatbots offer a wide spectrum of applications, potentially impacting various aspects of healthcare. While they are promising tools for improving healthcare efficiency and quality, their integration into the healthcare system must be approached with consideration of their limitations to ensure optimal, safe, and equitable use.

Keywords:
Chatbot, conversational agent, conversational assistant, user-computer interface, digital health, mobile health, electronic health, telehealth, artificial intelligence, health information technology.

Introduction

In the dynamic landscape of information technology and digital communication, chatbots – known as "conversational agents" – stand at the forefront, revolutionizing interactions between technology and human users. Chatbots are computer programs designed to simulate conversation through text, image, audio, or video messaging with human users on platforms such as websites, smartphone applications, or standalone computer software [1-47]. Originating from the concept 'ChatterBot', coined in 1994 [48], chatbots have undergone substantial evolution in their functionality and application.
The evolution of chatbots represents a significant technological leap, transitioning from reliance on predefined, rule-based scripted conversations to the sophisticated utilization of natural language processing (NLP) and artificial intelligence (AI). By leveraging NLP and AI, chatbots have become capable of understanding and appropriately responding to user requests [49,50]. Their versatility has facilitated applications in a variety of sectors such as education, e-commerce, finance, news, healthcare, and entertainment. Popular instances of these applications include Amazon's Alexa [51], Apple's Siri [52], Google Assistant [53], Microsoft's Cortana [54], and Samsung's Bixby [55].
A notable advancement in the field of chatbots has been the integration of generative AI and

Large Language Models (LLMs) like ChatGPT [56-58]. They have the capability to generate human-like text, enabling more natural and informative interactions [56-58]. However, their application in healthcare is still emerging. The risk of misinformation and errors is a significant concern [59,60], particularly in healthcare where accuracy is critical. The "one size fits all" approach of LLMs may not align well with the nuanced needs of patient-centered care in the health sector [59].

The promise of chatbots in healthcare is considerable, offering potential for more efficient, cost-effective, and high-quality care [62-66] as well as their broad spectrum of uses and acceptability [67, 68]. The use of chatbots to access and deliver healthcare services appears to be on the rise [23, 69-71], granting them multiple potential roles in prevention, diagnosis, and support with care and treatment, with possible impacts on the whole healthcare system.

Despite the potential benefits, healthcare chatbots face unique challenges [72-75]. The need for highly specialized and context-sensitive advice is paramount. Generic responses from current chatbot models often overlook individual health profiles and local health contexts, which are crucial for patient care [76].

While a wide range of healthcare chatbot reviews have been conducted, demonstrating the versatility of chatbots in areas such as genetic cancer risk assessment [44], oncological care [9,11,24,25], sexual and reproductive health [35,45], preconception, pregnancy, and postpartum health [36], support for smoking cessation [38], management of weight [39] and chronic conditions [6,9,20,40], vaccine communication [26], and broader healthcare acceptability [27], these reviews often exhibit significant limitations in scope and depth. They tend to concentrate narrowly on specific applications like rehabilitation for neurological conditions [28], mental health support [4,8,12-17,29,30,41,42], health behavior change [31-33,37], the language used in health communication by chatbots [43], and their use in the Covid-19 public health response [44], leading to a fragmented understanding of chatbots' roles in healthcare. For instance, while reviews [3,7] offer insights, they do not encompass a comprehensive evaluation of the broader implications of chatbots, particularly in diverse contexts. In contrast, other reviews [5,30] concentrate extensively on technical aspects and AI algorithms [24,25,76,77], yet this focus tends to overshadow a detailed exploration of the impact these technologies have on healthcare outcomes.

This approach has left significant gaps in the literature. There is an evident need for an integrative overview that thoroughly analyzes the varied roles of chatbots across different healthcare applications, capturing new trends and advancements. Furthermore, the interactions and benefits of healthcare chatbots for diverse demographic groups, especially those underrepresented, are underexplored. There is also a conspicuous absence of a deeper understanding of the potential benefits and practical limitations of healthcare chatbots in various contexts.

Therefore, the objectives of this review are to bridge these existing knowledge gaps. Our review aims to provide a comprehensive exploration of chatbots' functional roles, analyze the specific populations they serve, and examine in detail their potential and reported benefits, as well as the limitations of these innovative tools in healthcare. This endeavor will offer a more holistic and nuanced understanding of chatbots in the healthcare sector, addressing critical areas overlooked in previous studies.

Methods

Design and search strategy

This study is a rapid review, which refers to an accelerated, resource-efficient process of knowledge synthesis through streamlining or omitting specific methods associated with more

traditional review processes [79-81]. Hence, a rapid review assesses what is already known in a given area within a relatively short period.

Our search strategy, detailed in Table 1, was developed in collaboration with a health science librarian and performed within the Medline and Embase databases on February 5th, 2022. Recognizing the dynamic nature of our study field, we conducted two subsequent updates to our search: the first on April 22nd, 2022, and the second on October 30th, 2023. The strategy also included searches within reference lists and websites (e.g., Google Scholar) for relevant material. We exported our search records to Endnote.

Our search was limited to records published in English, as suggested by the Cochrane rapid reviews guide [82], from 2017 to 2023. This timeframe was chosen based on preliminary searches which indicated that the largest number of relevant articles was published during this interval [83]. Furthermore, it allowed us to focus on chatbots incorporating more recent technological advancements. No limitations were set based on the study population.

Our rapid review adheres to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, as depicted in Figure 1 [84].

Table 1. Search strategy for Medline and Embase

Search terms
1. user-computer interface/ or (Chatbot* or chat bot* or User-Computer Interface* or (conversational adj2 (agent* or assistant*)).mp
2. Limit 1 to yr = "2017 - Current"
3. Limit 2 to English

Study selection

We included primary research studies that utilized a text- or voice-based chatbot as an intervention or a means to deliver an intervention, reporting original data on the roles and/or benefits of chatbots within the healthcare setting or system.

Studies not meeting the inclusion criteria were excluded as were studies reporting any of the following: engineering or computer science data; pre-intervention data about future initiatives such as protocols; and studies in the pre-intervention or pre-development phase. We also excluded interventions based solely on non-behavioral actions such as gestures and facial expressions without text or voice interaction; interactions with an actual robot (as opposed to a conversational interface); and virtual reality chatbots. Additionally, abstracts lacking sufficient details were also excluded.

Data extraction and synthesis

Two reviewers (ML and YM) dual-screened 15% of the titles/abstracts and full texts to calculate the percent agreement and interrater reliability, employing Cohen's Kappa [85]. Any discrepancies were resolved through discussion. ML conducted all remaining screenings. Data extraction was performed using Microsoft Office, capturing key study characteristics, including, title, authors, month and year of publication, journal, study design, chatbot users, the chatbot's medical specialty, whether the chatbot uses AI or is animated, and country of origin. Additionally, we extracted information about the roles of chatbots, their benefits to healthcare, as well as their pitfalls. Depending on their source (original research findings or author opinion), they were defined as either empirical or potential, respectively, as illustrated in Appendix 1. While author opinions on potential roles, benefits, and limitations of chatbots, such

as those expressed in the discussions and conclusions of the included studies, may not be directly based on empirical results, they are crucial for constructing a comprehensive picture of healthcare chatbot capabilities and characteristics.

To synthesize these diverse pieces of information, relevant data underwent content analysis to generate sub-categories, categories, and overarching themes [86].

While our research centers on chatbots, we have chosen to use the number of studies, rather than the chatbots themselves, as the basis for presenting most of our results. This approach accounts for the diverse adaptations to the identified chatbots across different contexts. Many of the chatbots we studied were modified to serve varied roles, cater to different user groups, and in some cases, were given entirely different names in separate studies, as indicated in the results section. Each study, therefore, contributes unique and distinct information regarding the chatbot's applications, roles, and user demographics. By focusing on the individual studies, we capture a more detailed and context-specific understanding of each chatbot's functionality and versatility, which would be obscured if we merely counted each chatbot once, regardless of its various adaptations.

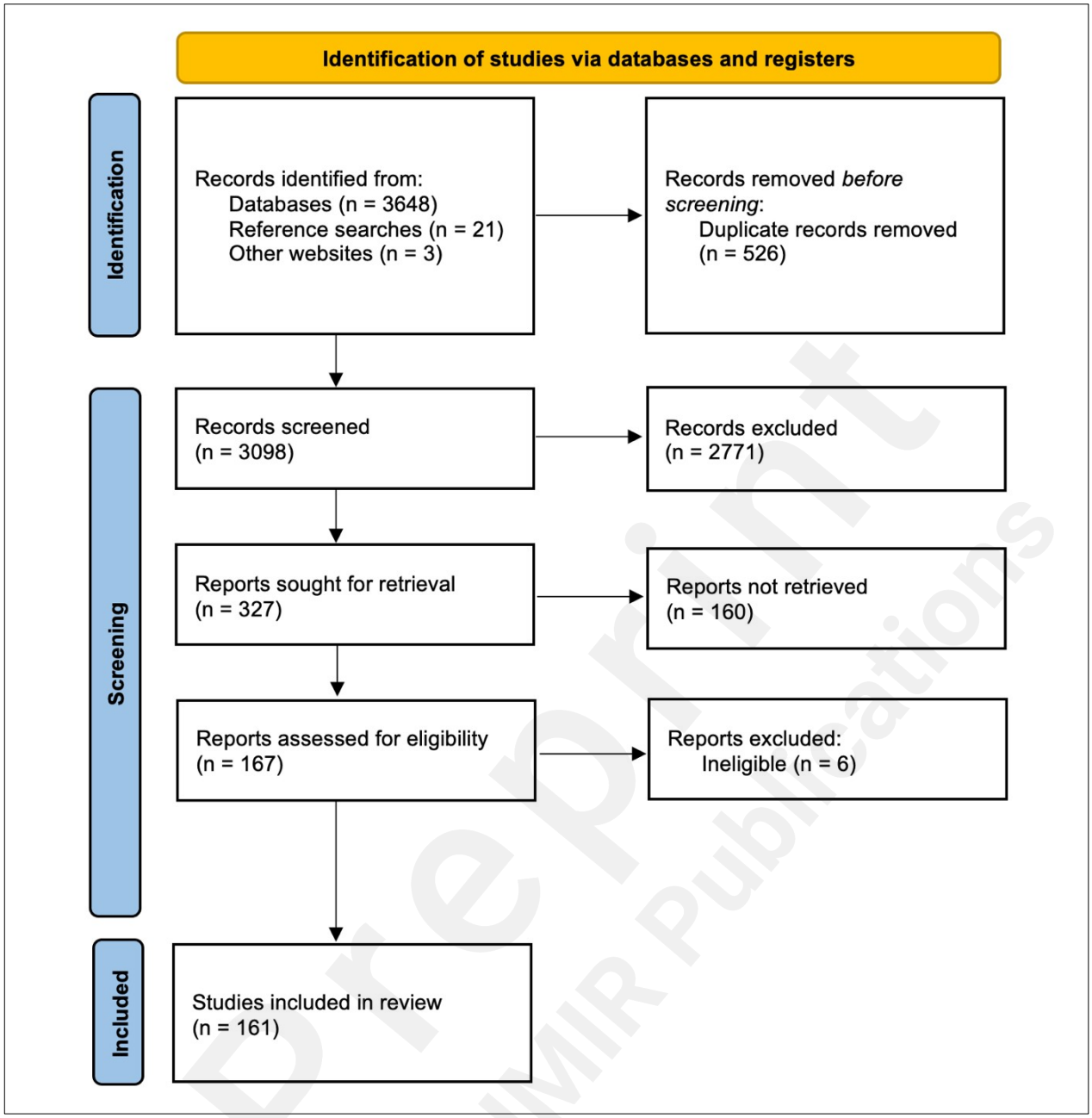
Results

Database searches

Our search yielded a total of 3,672 records. After removing 526 duplicates, 3,122 records remained for title/abstract screening. During this screening phase, we achieved a 97% agreement rate and a Cohen's Kappa of 0.85, indicating substantial agreement beyond chance. Subsequently, 327 full texts were reviewed [87-247] (Figure 1), with 94% percent agreement and a Cohen's Kappa of 0.88 among reviewers. Interrater reliability, covering both the screening and final study inclusion, as well as data extraction process between the two reviewers, ranged from 64–81%, indicating strong agreement [85]. This ensures the reliability and validity of the study selection and data extraction phases of our review.

We ultimately included 161 studies that reported the roles and/or benefits of chatbots. All studies (100%) reported on the roles of chatbots, 157 (98%) mentioned their benefits and 157 (98%) addressed their limitations. Each study also reported on the targeted user group(s) the chatbot was designed to assist.

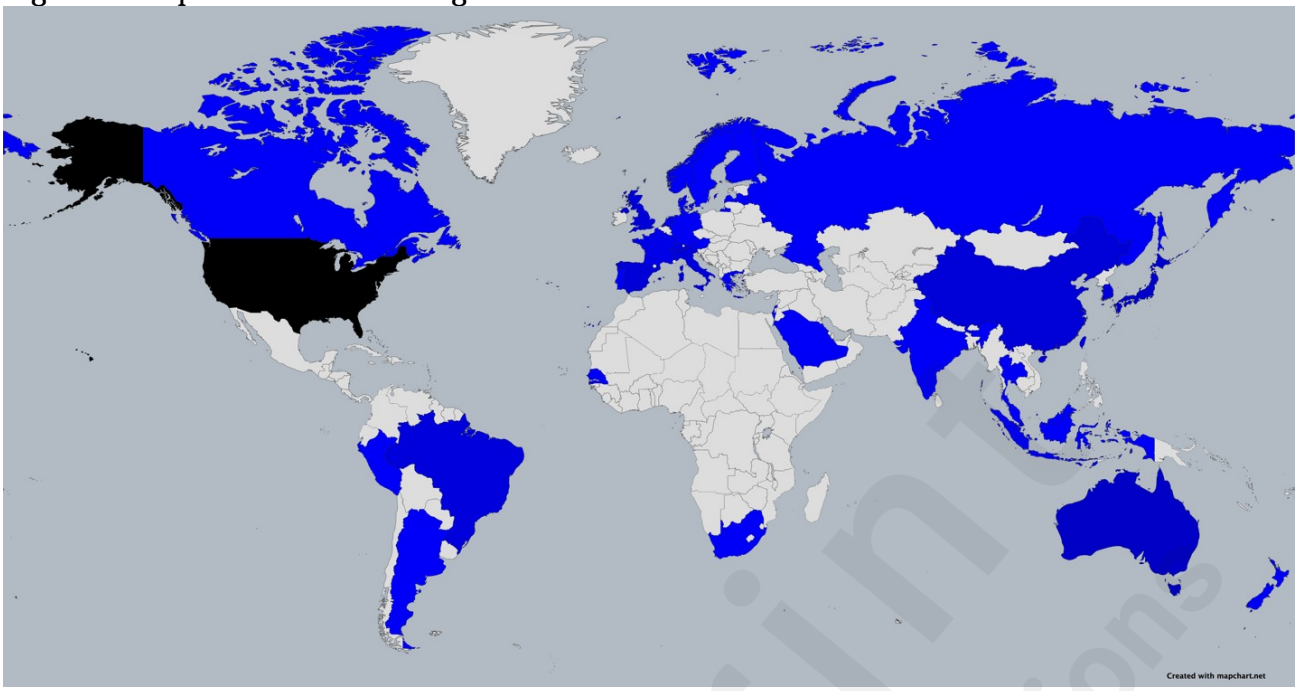
Figure 1. Search PRISMA flowchart



Origins of the included studies

Over a quarter of the studies originated from the United States, with 46 studies (29%) conducted there. China, with 15 studies (9%), Australia, with 10 studies (6%), and Japan, with 9 studies (6%), followed, while Spain contributed 7 studies (4%). Countries like Italy, Switzerland, the United Kingdom (UK), Singapore, Brazil, and South Korea each had 6 studies, each constituting about 4%, while France and the Netherlands presented 4 studies each, around 2% individually. Single studies (1%) came from New Zealand, Greece, Russia, Norway, Malaysia, India, Senegal, Peru, Portugal, Canada, Latvia, South Africa, Indonesia, Argentina, Thailand, Saudi Arabia, Germany, and Austria. Notably, some studies were multinational, such as one encompassing Switzerland, Austria, Germany; Northern Ireland, the Republic of Ireland, Scotland, Sweden, and Finland; Thailand, Hong Kong, Singapore; India, North America, and the UK; Finland, Denmark, Netherlands; Norway and Switzerland; Netherlands and Scotland. contributed one study each, accounting for about 1% collectively.

Figure 2. Map of the contributing countries



In our review of 161 studies, certain chatbots were the focus of multiple studies, particularly in countries like the United States, Australia, South Korea, Switzerland, New Zealand, and Singapore. For instance, two specific chatbots were each the subject of four separate studies (Gabby [96,101,103,116] and Woebot [88,94,121,175]). Additionally, 11 chatbots were each studied twice (Todaki [92,104], GAMBOT [99,135], Laura [100,123], Vik [110,188], Termbot [153,197], ChatPal [160,170], a chatbot in a virtual ward [182,196], Corowa-kun [183,199], Dokbot [191,194], BotMaria [195,207], and COUCH [238,239]). Among these, a unique situation was observed in five studies where the same original chatbot was presented under five different names [91,106,109,126,242]. These studies often shared several co-authors, indicating a common origin but with adaptations for different populations and roles. However, it is important to note that not all studies with mutual co-authors clearly indicated a shared origin of the chatbots.

Chatbot roles

All studies (n=161; 100%) stated the role(s) of the chatbot utilized, with at least one role per study. Our analysis yielded fourteen sub-categories of primary roles (in single quotations), grouped into five categories, which were organized into two overarching themes, as summarized in Table 2.

Theme 1: Delivery of remote health services. This theme refers to health services offered at a distance as an alternative or complement to usual on-site modes of care delivery. It includes three categories and seven sub-categories of roles, with 158 studies (98%) contributing to this theme.

Patient support and care management

This category refers to the facilitation of medical consultations or the delivery of advice or support by providing counseling or treatment advice, triaging patients' complaints, and fostering self-management and monitoring.

Overall, 103 studies (64%) contributed to this category. Among these, 46 (29%) mentioned using chatbots for 'Mental health support'. Twenty-six studies (16%) reported providing 'Counseling and treatment advice' through chatbots, while 22 studies (14%) included chatbot

use for improving the ‘Self-management or monitoring for chronic conditions’. Furthermore, fourteen studies (9%) described chatbot use for 'Triaging, screening, risk assessment, and referral'. Eight studies each (5%) reported its use for 'Self-care and monitoring for COVID-19' and 'Rehabilitation guidance', whereas for 7 studies (4%) it was employed to provide 'Reminders'.

Education and skills-building

This category included the dissemination of educational material or medical information, or skill development material (e.g., exercising, using a medical device) for users, including patients, healthcare providers, or nursing and medical students.

In all, 41 studies (25%) contributed to this category. Twenty-three (14%) reported promoting 'Health literacy' of the targeted population with the chatbot. Twelve (7%) reported using chatbots in ‘Medical education and clinical skills for healthcare professionals and medical students’. Additionally, 'Psychoeducation' was reported by 5 studies (3%) to enhance mental wellbeing.

Health behavior promotion

This category included the promotion of healthy lifestyles such as physical activity, a healthy diet, or stress management. Thirty-nine studies (24%) contributed to this category, with 'Healthy lifestyle behavior' encouraged through the chatbot in thirty (19%). Another six studies (4%) reported 'Self-monitoring for health behavior change' as a chatbot role.

Theme 2: Provision of administrative assistance to healthcare providers. This theme refers to all types of administrative work done by the chatbots, grouped within two categories, health-related administrative work and research purposes, with nine studies (6%) contributing to this theme.

Health-related administrative tasks

This category included the completion of healthcare providers' routine administrative work, such as data collection (e.g., medical history taking), entry, or transferring data to patients' medical records. Six studies (4%) reported using the chatbot for ‘Data collection and storage in patient electronic medical records’ and charts, as well as for patient-reported outcome data, which could be captured by chatbots to replace collection by healthcare providers.

Research purposes

This category refers to chatbot use for the completion of research-related work such as participant recruitment, the consent process, or data collection through surveys. Three studies (2%) contributed to this category, reporting the use of chatbots for participants’ ‘Recruitment and data collection’ through a self-administered questionnaire, in addition to obtaining e-consent from individuals to participate in the study.

Table 2. Healthcare chatbot roles

Theme	Category	Sub-category	Contributing studies of 161	
			Number	Percent
Delivery of remote health services	**Patient support and care management**	Mental health support	46	29%
		Counseling and treatment advice	26	16%
		Self-management and monitoring for chronic conditions	22	14%
		Triaging, screening, risk	14	9%

		assessment and referral		
		Self-care and monitoring for COVID-19	8	5%
		Rehabilitation guidance	8	5%
		Reminders	7	4%
	Education and skills-building	Health literacy	23	14%
		Medical education and clinical skills for healthcare professionals and medical students	12	7%
		Psychoeducation	5	3%
	Health behavior promotion	Healthy lifestyle behavior	30	19%
		Self-monitoring for health behavior change	6	4%
Provision of administrative assistance to healthcare providers	**Health-related administrative tasks**	Data collection and storage in patient electronic medical records	6	4%
	Research purposes	Recruitment and data collection	3	2%

Chatbot users

All 161 studies specified the intended chatbot user population. The content analysis yielded 21 sub-categories of chatbot users (in single quotations), grouped into eight broader categories of users, as summarized in Table 3.

Lifestyle and general well-being enthusiasts

This category, with 69 studies (43%), addressed individuals aiming to improve or maintain their health and well-being. 'Healthy adults', with 44 studies (27%), focused on adults who are in good health, without any significant or chronic medical conditions. 'General public', a sub-category with 16 studies (10%), targeted the broader and more inclusive population that encompasses all segments of the population, regardless of their health status. 'Lifestyle improvement seekers', encompassing 9 studies (6%), included individuals motivated to change their lifestyle.

Health condition-focused groups

This category, comprising 46 studies (29%), included patients with specific health conditions across 4 sub-categories. 'Mental health seekers', the largest sub-category with 23 studies (14%), referred to adults with conditions such as attention deficit and panic symptoms. 'Chronic patients' covered 10 studies (6%) and focused on individuals with conditions like irritable bowel syndrome and hypertension. 'Cancer patients', with 7 studies (4%), targeted those with breast cancer and those at risk for hereditary cancer. 'Recovering patients' included 6 studies (4%), focusing on patients in various stages of recovery.

Demographic and family-centric groups

Addressing specific demographic groups and family dynamics, this category included 25 studies (16%). 'Women', with 14 studies (9%), focused on various women's health issues. 'Parents and children', with 7 studies (4%), centered on the health issues of children and adolescents. 'Families', with 4 studies (2%), looked at family dynamics and health.

Unlike age-based groups that are defined solely by the age of individuals, demographic and family-centric groups consider a wider range of factors including gender, family roles, and the interplay of relationships within a family unit.

Age-based user groups

With 23 studies (14%), this category targeted specific age groups or life stages. 'Elderly individuals', with 11 studies (7%), focused on older adults and age-related health concerns. 'Young mental health seekers', with 8 studies (5%), focused on mental health support for young adults. 'Children', comprising 4 studies (2%), targeted health issues specific to children.

Underserved populations

With 22 studies (14%), this category focused on inclusive and accessible healthcare. 'Culturally diverse groups', consisting of 14 studies (9%), targeted ethnic and cultural groups. 'Individuals with disabilities', with 8 studies (5%), focused on the unique healthcare needs of people with disabilities.

Healthcare professionals or students

Encompassing 15 studies (9%), this category targeted healthcare professionals and students. 'Medical and nursing students', with 8 studies (5%), covered educational aspects for students in medical and nursing fields. 'Healthcare professionals', with 7 studies (4%), focused on training and professional development with this group.

Behavioral health and change seekers

Comprising 15 studies (9%), this category focused on behavioral health and lifestyle changes. 'Behavioral change seekers', with 8 studies (5%), included studies on individuals seeking to change health-related behaviors. 'Addiction recovery individuals', with 7 studies (4%), targeted those dealing with addictions.

Educational and skill enhancement seekers

Including 15 studies (9%), this category involved the use of chatbots for educational purposes. 'Non-medical professionals', with 8 studies (5%), focused on skill enhancement for various professionals. 'Healthcare training users', with 7 studies (4%), concerned chatbot use to train healthcare professionals.

While the 'Healthcare professionals' subcategory within 'Healthcare professionals and students' focuses on the professional development and training of individuals in the healthcare field, the 'Educational and skill enhancement seekers' category addresses a broader spectrum of users, including non-medical professionals, and emphasizes the role of chatbots as a tool for educational purposes across various sectors.

Table 3. Intended healthcare chatbot users

Category of users	Sub-category	Contributing studies of 161	
		Number	Percent
Health-condition focused groups	Mental health seekers	23	14%
	Chronic patients	10	6%
	Cancer patients	7	4%
	Recovering patients	6	4%
Lifestyle and general well-being enthusiasts	Healthy adults	44	27%
	General public	16	10%
	Lifestyle improvement seekers	9	6%

Demographic and family-centric groups	Women	14	9%
	Parents and children	7	4%
	Families	4	2%
Age-based user groups	Elderly individuals	11	7%
	Young mental health seekers	8	5%
	Children	4	2%
Underserved populations	Culturally diverse groups	14	9%
	Individuals with disabilities	8	5%
Healthcare professionals or students	Medical and nursing students	8	5%
	Healthcare professionals	7	4%
Behavioral health and change seekers	Behavioral change seekers	8	5%
	Addiction recovery individuals	7	4%
Educational and skill enhancement seekers	Non-medical professionals	8	5%
	Healthcare training users	7	4%

Healthcare chatbot benefits

Most studies (n=157; 98%) described the benefits of using chatbots in healthcare. The content analysis yielded 7 different sub-categories of benefits (in quotation marks), grouped into five categories, which were organized into two broad themes, as summarized in Table 4.

Theme 1: Improvement of healthcare quality. This theme refers to the processes of enhancing the standards, personalization, and accessibility of healthcare services delivered to the targeted chatbot users. It included six sub-categories grouped into two categories of benefits, with 121 studies (75%) contributing to the overarching theme.

Improvement in health outcomes and patient management

Sixty-five studies (40%) in this category addressed the benefits of chatbots to improve health outcomes and patient management. Forty-two (26%) reported 'Improved mental health and well-being' and fifteen studies (9%), 'Enhanced self-management'. An additional eight (5%) reported 'Improved physical health' as outcomes of using chatbots.

Personalization through patient-centered and equitable care

Sixty-two studies (39%) reported promoting personalization through patient-centered and equitable care. Chatbot personalization refers to customizing its interactions, content, and functionalities to suit individual needs and preferences, ensuring that it provides relevant, user-specific advice and support, enhancing its effectiveness and user experience. Health equity refers to minimizing disparities and inequality based on social determinants of health, including differences between groups in terms of socioeconomic factors, gender, and ethnicity [247]. Patient-centered care addresses patients' specific healthcare needs and concerns, improving the quality of personal, professional, and organizational relationships, and aiding

patients to actively participate in their own care [249,250].

Sixty studies (37%) discussed chatbot use benefits in terms of 'Increased accessibility and reach of healthcare', by helping engage diverse populations to access health services for minor health concerns that do not require emergency visits, with convenience and 24/7 availability.

Moreover, 16 studies (10%) discussed using a chatbot to achieve 'Engaged and satisfied users'. In these studies, user acceptance was assessed by measuring the users' positive feedback and their willingness to use the chatbot. This was often gauged through surveys or user feedback sessions post-interaction. The studies also highlighted that friendly interactions facilitated by the chatbot could enhance self-disclosure, further contributing to user satisfaction and engagement.

Another four studies (2%) described chatbot use benefits for 'Supported vulnerable groups and reduced biases in healthcare delivery', particularly for marginalized groups (e.g., black women and older users) facing stigma in healthcare settings and for people with low technological literacy.

Theme 2: Efficiency and cost-effectiveness in healthcare delivery. This theme refers to chatbot use as favoring efficient care for targeted users. Providing efficient care means producing desired results with minimal or no waste of time, costs, materials, or personnel [251]. Three categories of benefits contributed to this overarching theme.

Optimization of resources

In all, 75 studies (47%) indicated reduced administrative or financial burdens for the healthcare system through chatbots as they can help relieve the burden of managing chronic health conditions, staffing shortage, and overwhelmed primary care settings. These studies indicated that chatbots could provide 'Saved time and cost of health interventions', especially compared to other routine interventions.

Scalability of health interventions

Four studies (2%) indicated the feasibility of using chatbots for the implementation of large-scale health interventions to capture and assess large-scale public health situations, providing evidence for researchers and policymakers. Also addressed was the significance of user data collected during the COVID-19 pandemic to evaluate the public health situation and aid decision-making by policymakers, public health authorities, and researchers.

Data quality and research support

Four studies (2%) pointed out the benefits of enhancing data collection and clinical research quality by chatbots, providing timely, consistent, and standardized data collection, reducing human error, increasing patient engagement, and assisting in recruiting a diverse participant pool.

Table 4. Reported healthcare chatbot benefits

Theme	Category	Sub-category	Contributing studies of 161	
			Number	Percent
Improvement of healthcare quality	**Improvement in health outcomes and patient management**	Improved mental health and well-being	42	26%
		Enhanced self-management	15	9%
		Improved physical health	8	5%
	Promotion of patient-centered care and health	Increased accessibility and reach of healthcare	60	37%
		Engaged and satisfied users	16	10%
		Supported vulnerable groups	4	2%

	equity	and reduced biases in healthcare delivery		
Efficiency and cost-effectiveness in healthcare delivery	**Optimization of resources**	Saved time and cost of health interventions	75	47%
	Scalability of health interventions		4	2%
	Data quality and research support		4	2%

Healthcare chatbot limitations

Most studies (157/161; 98%) identified specific limitations of chatbots in healthcare, presented as twelve sub-categories, grouped into five categories.

Challenges in user experience and overreliance

With 157 studies (98%) contributing to this category, it addresses the tendency of 'Overconfidence and overreliance' among users who overestimate the capabilities of chatbots or rely excessively on them for healthcare needs, as noted in 154 studies (96%). Overconfidence in chatbots can lead to users substituting professional medical advice with chatbot suggestions, while overreliance might result in users neglecting other essential aspects of healthcare or disregarding the need for human healthcare professional intervention. This sub-category highlights the importance of maintaining a balanced perspective on the capabilities and limitations of chatbots in healthcare contexts.

Additionally, this category encompasses the 'Usability and accessibility issues' related to the ease with which users can interact with chatbots and the extent to which these chatbots are accessible to a diverse range of users, as referred to in most studies (135; 84%). It includes considerations of user interface design, the intuitiveness of chatbot interactions, the chatbots' adaptability to different user needs, and their accessibility to individuals with varying levels of tech-savviness or disabilities. Challenges in this category can lead to user dissatisfaction, reduced effectiveness of the chatbot, and potentially lower engagement with the healthcare service it provides.

Technical challenges

This category refers to the broad spectrum of technological difficulties encountered in the design, development, and implementation of these systems, with 32 studies (20%) contributing to it. This category underscores the need for sophisticated technology that can handle the nuances of healthcare communication and patient interaction while being accessible and practical for real-world application.

It includes the 'Complexity of effective language and communication processing', as noted in 24 studies (15%), to ensure accurate and relevant medical information, and the chatbot's ability to understand and respond to a range of user inputs, including those related to emotional states and complex healthcare queries.

The limitations extend to 'Challenges in empathy and personal connection,' which refer to the difficulties chatbots face in simulating human conversations and establishing rapport with users. This is a critical aspect in healthcare settings where patient trust and comfort are paramount, as highlighted in 17 studies (11%).

Additionally, this category involves considering the 'Challenges with resource allocation and cost efficiency' of developing and maintaining these systems, to ensure they are not only

technologically advanced but also financially viable and sustainable, as indicated in 2 studies (1%).

Medico-legal and safety concerns

With six contributing studies (4%), this category includes 'Regulatory and legal issues' encompassing the implications of chatbot advice and overall patient safety, as highlighted in 3 studies (2%). These issues include chatbots' compliance with healthcare regulations and patient privacy laws, liability for misdiagnosis or inadequate advice, and the need for specific regulatory guidelines for their development and application.

Furthermore, challenges extend to 'Concerns about content and information quality', such as the medical accuracy of information provided by chatbots, like the potential for misdiagnosis, and the reliability of medical content. It also concerns limitations tied to the chatbot's 'Challenges in emergency response and expertise' capabilities. Each of these sub-categories was noted in 2 studies (1%).

Societal and economic challenges

This category refers to the wider implications of healthcare chatbots on the broader societal context and the economy, with 5 contributing studies (3%). It covers the influence of social, political, and economic factors on the adoption and effectiveness of chatbots in different communities.

It includes 'Social, economic, and political challenges' and considerations, as noted in 5 studies (3%). This subcategory scrutinizes the challenges arising from the integration of chatbots into the healthcare system, such as ethical considerations, potential shifts in social norms, and the influence on economic policies and political decision-making in healthcare.

This category also includes 'Issues of inequality in accessibility', as highlighted in 4 studies (2%). This subcategory delves into the challenges related to unequal access to chatbot technology. It focuses on how chatbots might inadvertently exacerbate existing disparities in healthcare, particularly for underprivileged groups, thereby highlighting the need for equitable distribution and accessibility of these technologies.

Ethical challenges

This category deals with the ethical implications of using chatbots in healthcare, with 3 studies (2%) contributing to it. It includes patient 'Privacy and confidentiality concerns' related to the use of patient data. This category also includes 'Ethical and safety concerns' encompassing the need to maintain transparency with users about the chatbot being a non-human agent and ensuring ethical standards in patient interactions. Each of these 2 sub-categories was discussed in 2 studies (1%).

Table 5. Reported healthcare chatbot limitations

Category	Sub-category	Contributing studies of 161	
		Number	Percent
Challenges in user experience and overreliance	Overconfidence and overreliance	154	96%
	Usability and accessibility issues	135	84%
Technical challenges	Complexity of effective Language and communication processing	24	15%
	Limitations in empathy and personal connection	17	11%
	Challenges with resource allocation and cost efficiency	2	1%
Medico-legal and safety	Regulatory and legal issues	3	2%

concerns	Concerns about content and information quality	2	1%
	Challenges in emergency response and expertise	2	1%
Societal and economic challenges	Social, economic, and political challenges	5	3%
	Issues of inequality in accessibility	4	2%
Ethical challenges	Privacy and confidentiality concerns	2	1%
	Ethical and safety concerns	2	1%

Discussion

Principal findings

This rapid review revealed that chatbot roles in healthcare are diverse, ranging from patient support to administrative tasks, and they show great promise in improving healthcare accessibility, especially for marginalized groups. It also highlighted critical gaps in the literature addressed in the following section.

Global trends in chatbot research indicate its predominance in higher-income countries and opportunities in lower-income regions.

With 15 countries represented by the studies in this review, the topic is clearly of global interest. However, 22% of included studies originated solely from the USA, with the remainder conducted in high or upper-middle-income countries [252]. The concentration of chatbot research in high-income countries reflects underlying disparities with low or lower-middle income countries in technology access and healthcare investment. This gap highlights the need for more research focused on these regions, considering their unique digital infrastructure and resource challenges to democratize health technology and address chronic conditions and health literacy [20,253-256].

Chatbots have varied roles in the enhancement of healthcare delivery and user-centric services.

Our review underscores the transformative roles of chatbots in healthcare, particularly in delivering remote health services and enhancing patient support, care management, and mental health support. Consistent with previous literature [256-259], our findings affirm chatbots' potential to improve healthcare accessibility and patient management. The findings' emphasis on education and skills-building, particularly to enhance health literacy (aligned with past literature [257,260]) and to support behavioral change (also highlighted by past research [257]), aligns with the growing need for patient empowerment in healthcare. The administrative efficiency of chatbots, noted in our review, resonates with previous findings [23,35,257,260] on the importance of resource optimization in healthcare settings.

Our findings indicate that chatbots also play a key role in facilitating clinical research, consistent with past work [261], a potential that needs further exploration, especially considering AI's evolving role in healthcare [73,261-264].

The diverse user base of chatbots shows their potential to support equity and bridge the access gap in healthcare services.

Our analysis indicates a broad and diverse user base for healthcare chatbots. From individuals focused on general well-being to those with specific health conditions, chatbots have been designed to cater to a wide array of needs. Notably, their use by demographic and family-centric groups, and their accessibility to underserved populations, underline the inclusive capacity of chatbots and their role in enhancing healthcare access and equity, especially for

marginalized groups, in line with existing research [12,68,257,265-267].

Additionally, our findings show the significant use of chatbots in mental health support for various age groups, reflecting the pressing need for accessible mental health services highlighted by others [4,8,12-17,29,30].

Furthermore, chatbots emerge as tools for reducing stigma [12,267], linking users to health services [268-270], and protecting sensitive information [271]. Their empathetic and multilingual capabilities, as seen in our results [109,113,114,122,124,128-130,134] and past literature [272-273,275-278], are vital to reach diverse populations. They are particularly critical in light of the digital divide and the need for inclusive and accessible healthcare solutions [256,260,265,279,280].

The use of artificial intelligence in chatbots is a promising but still evolving field.

The studies included in our review show a substantial number of AI-based chatbots, with fewer relying on non-AI platforms. AI in healthcare is recognized for its potential to improve health outcomes and the quality of life, globally [262]. Given advances in machine learning and AI, expanding the scope of chatbots is expected to cause a mutation in their role in the healthcare system to assist clinicians and potentially take over some of their duties [73,263,264]. The synergy between big data and AI, coupled with the increasing availability of data in healthcare, suggests that AI-based chatbots could effectively utilize extensive healthcare data [261,281]. This aligns with one of the included studies [96], which discusses the utilization of collected data as a key benefit of chatbots. However, while AI integration in chatbots offers enhanced functionalities, it is imperative to address ethical considerations such as data privacy and algorithmic biases. Responsible AI deployment in healthcare settings is crucial for maintaining trust and fairness [74].

Studies included in this review indicate that the use of avatars in these chatbots to simulate social behaviors, including voice, hand gestures, gaze cues, and other movements, can enhance user engagement and trust. This form of chatbot technology is found to be particularly appealing in patient interactions and medical education to establish trust and therapeutic alliances between healthcare professionals and patients, and to improve the communication skills of medical students and healthcare professionals [120,125,132,133,282].

While the integration of AI in healthcare chatbots offers significant transformative potential to enhance data use and user interactions, this advancement brings ethical challenges, such as data privacy and algorithmic bias. Balancing AI's benefits with these concerns is crucial for its responsible implementation in healthcare, shaping the future of patient care and medical education in a way that is both innovative and ethically sound.

Despite the potential revolutionary roles of chatbots in healthcare, critical challenges and limitations exist.

This review stresses that despite their roles and benefits, chatbot use comes with various challenges, including ethical, technical, medico-legal, and user-experience concerns, as also discussed in past literature [3,4,5,23,25,30,73,75,283-285].

While studies included in our review have highlighted chatbot use to address minor health concerns and provide off-hour information, there is a noticeable gap in evaluating their technical limitations, especially in complex healthcare scenarios, as underscored by past literature [3-5,23,25,30,73,75,283-285]. This raises concerns about patient safety and the accuracy of health management, emphasizing the need for comprehensive assessment and

iterative improvement of chatbot technologies [22,25,73,69,256,285,286].

The findings in our review indicate the regulatory and ethical landscape for chatbots as another area of concern. This agrees with past studies highlighting the need for ethical use, data privacy, and transparent communication about chatbots' capabilities and limitations [4,74,75,256,283,287,288]. The absence of specific laws and regulations addressing healthcare chatbot use introduces risks around liability and medico-legal issues [73,289,290]. These challenges are further complicated by ethical dilemmas, such as privacy and confidentiality in non-anonymous interactions [72,73,300], and safety concerns in medical emergencies due to limited chatbot expertise [73].

Technical issues identified by this review, including difficulty in language processing and lack of empathic response, can lead to trust issues and increased clinical workload and align with past literature [3-5,69,73,74,282,292]. Overreliance on chatbots for self-diagnosis and healthcare decisions may lead to misjudgments, potentially exacerbating health issues [4,69,74]. Additionally, the financial motives of private companies in the health sector raise ethical concerns about the primary purpose and application of health chatbots [74]. The requirement for sophisticated AI technology also implies increased demands on human resource expertise and storage services, potentially escalating costs [74,290].

Our results indicate that chatbots serve a wide range of populations from various groups in terms of age, sex, ethnicity, and socioeconomic and educational status due to their promising acceptability and usability [293]. However, the digital divide [294-296], algorithmic ethical concerns [297], and the potential misuse of chatbots in replacing established health services [298] present risks. These factors, along with social, economic, and political influences [299], could inadvertently widen health disparities, highlighting the importance of inclusive and equitable chatbot development and deployment.

Considering their strengths and weaknesses, as outlined in this paper and past literature, chatbots appear as a promising solution to various healthcare challenges. Nevertheless, further research is needed to address their limitations and ensure their impacts for better integration into clinical practice towards efficient, safe, and equal health service provision.

Chatbots represent a transformative element in the healthcare landscape, with the potential to democratize access, enhance service quality, and optimize resource use. Their successful integration into clinical practice depends on overcoming current challenges through innovative research, responsible AI integration, and inclusive design strategies.

Limitations

This review, while insightful, is not without its limitations. Although rapid and systematic reviews are often considered comparable in their conclusions, each methodology has its own set of constraints [300,301]. Specifically, this rapid review was limited by a noncomprehensive search strategy that included only two databases. Additionally, the inclusion criteria were restricted by date and language, which potentially led to the exclusion of some pertinent studies. Another limitation was the concentration of screening and analysis tasks on a single reviewer (ML), which might have introduced bias or overlooked nuances in the data. Moreover, a formal quality appraisal of the included studies was not conducted due to the descriptive nature of this review. Consequently, this limitation may affect the depth of understanding and the strength of the conclusions drawn.
One critical aspect of our methodology was the combination of empirical findings and opinion-

based data from the discussions in the included studies. We did not distinguish between these two types of data but rather treated them as a unified source of information. This approach, while allowing for a comprehensive overview of chatbots in healthcare, might have led to a potential bias in favor of chatbot benefits, as both empirical results and positive speculative insights were reported together. However, this potential bias is somewhat mitigated by our consistent reporting of the challenges associated with chatbots, as identified in the included studies. By presenting both the potential benefits and the challenges, we aimed to offer a balanced view, reducing the likelihood of a one-sided interpretation favoring chatbot benefits.

Additionally, this review might have overestimated the results due to depending on the discussion sections of each study, which may have overcounted the results and miscounted those that may have disagreed or contradicted the results of those included studies. However, this did not significantly impact the study's aim to provide an exploratory and descriptive overview of healthcare chatbots, mapping out the landscape of their applications in healthcare. In such a context, a broad, inclusive approach that captures diverse opinions and trends is more important than precise quantification.

Moreover, one of the potential limitations of this review is the exclusion of generative AI and LLMs, such as ChatGPT. However, among the studies we reviewed, a standout comparison involved a healthcare chatbot, specialized in medical terminology, and ChatGPT. This unique comparison serves to highlight the advanced capabilities of LLMs like ChatGPT in enhancing the delivery and accuracy of remote health services [59,76]. Nonetheless, a significant challenge persists in guaranteeing the contextual relevance and appropriateness of chatbot responses, particularly in intricate medical scenarios [59,60]. Additionally, the personalization of healthcare interactions and the precision of information provided by these AI-driven systems are critical areas necessitating extensive future research and rigorous evaluation of their outputs [59-61].

Finally, the results were presented solely as a narrative summary [79], which might limit the breadth of perspectives and interpretations that a more diverse methodological approach could have provided. Nevertheless, the inclusion of both benefits and challenges in our reporting suggests that the review may not be significantly biased toward a positive portrayal of chatbots, providing a more nuanced understanding of their role in healthcare.

Conclusions

This review underscores the significant potential of chatbots in healthcare, evident in their diverse roles, benefits, and user populations. Additionally, it explores the current limitations and challenges of chatbot development and implementation in healthcare. Finally, it underscores significant research gaps in the field. As such, this review aims to contribute to academic discourse on this important topic and offer insights into the effective design, implementation, and investigation of chatbots in healthcare.

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ML and YM dual-screened 15% of titles/abstracts and full-texts. ML performed all other screenings. ML analyzed and interpreted the results and wrote the manuscript. DL reviewed the results. All authors reviewed and edited the manuscript and approved the final version of this manuscript.

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Conflicts of Interest

The authors declare that there is no conflict of interest.

Abbreviations

AI: Artificial Intelligence
NLP: Natural Language Processing
LLMs: Large Language Models
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
UK: United Kingdom
ECAs: Embodied Conversational Agents

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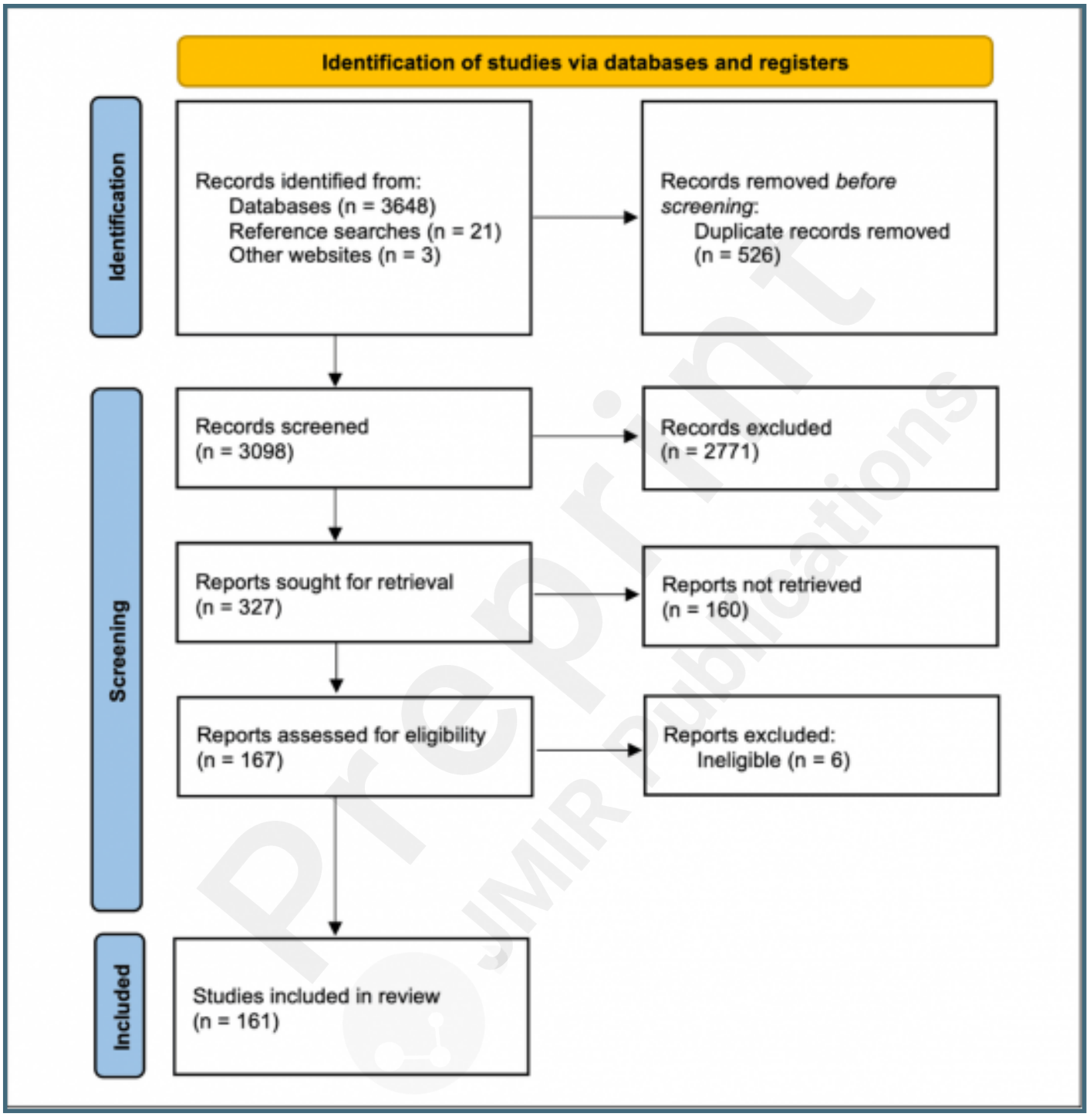
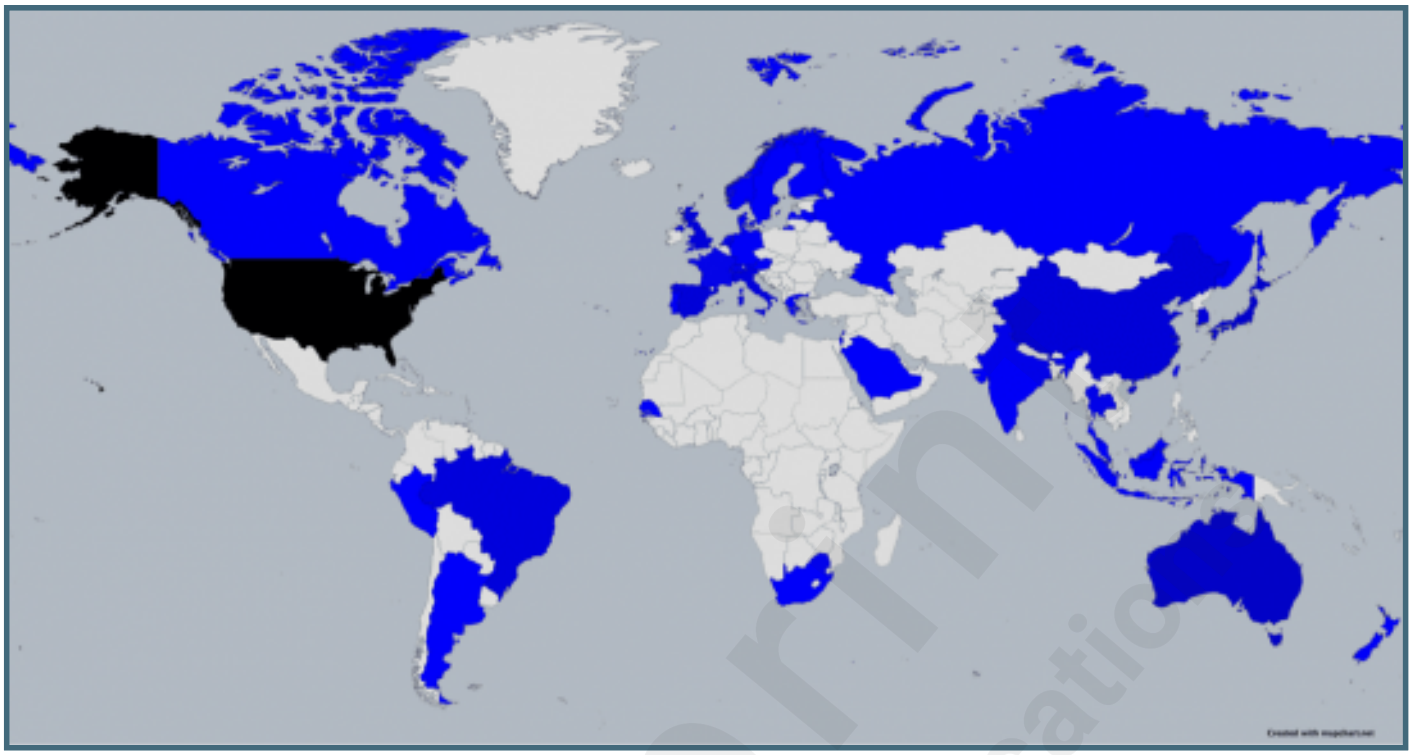
Supplementary Files

Figures

Search prisma flowchart.



Map of the contributing countries.



Multimedia Appendixes

Relevant extracted data.
URL: http://asset.jmir.pub/assets/fa8751e01664cc83d209e914b7a3b136.docx