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The Application Of Artificial Intelligence In Nursing At Saudi Arabia: A Systematic Review

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Abstract

This systematic review is to offer a comprehensive overview of the current state of artificial intelligence (AI) use in nursing practice in the Kingdom of Saudi Arabia. The review focuses on identifying key challenges, analyzing nurses' attitudes and perceptions of AI, investigating knowledge gaps and areas for improvement in AI integration, examining the benefits and limitations of AI applications in nursing, and making recommendations to improve AI adoption in nursing. Practice. A comprehensive search of internet databases from 2020 to 2024 yielded six relevant studies. The findings show various levels of preparation and acceptance of AI among Saudi nurses, underlining the importance of educational and training initiatives to bridge knowledge gaps and address concerns about career displacement and dehumanization of care. Collaboration among stakeholders is emphasized as critical to the ethical integration of AI into nursing practice. The research underlines the significance of a complete approach to implementing artificial intelligence in nursing to improve patient care outcomes and stimulate innovation in the Saudi healthcare system. Further research is needed to broaden the scope of the study and investigate a broader range of approaches in order to gain a more comprehensive understanding of the use of AI in nursing practice.

INTODUCTION

Introduction/Background

Nowadays, artificial intelligence is regarded as a game changer since it alters how people live and how the world operates (Van Bulck et al., 2022). Artificial intelligence has received significant attention in a variety of fields and has emerged as a leading tool in a number of industries, including healthcare, because AI has the potential to significantly transform nursing care processes, improve patient outcomes, and improve care delivery effectiveness (Labrague et al., 2023). Numerous healthcare AI applications strive to examine and comprehend the relationships between prospective therapies or preventative measures and patient outcomes (Hameed et al., 2023).

The integration of AI into healthcare domains is still in its early stages, owing to well-defined ethical and safety concerns about the potential endangerment of human lives. Furthermore, the range of applications for AI-based healthcare systems is extensive (Chew & Achananuparp, 2022). The most popular forms of artificial intelligence utilized in healthcare are natural language processing (NLP) and machine

learning (MLT). Structured medical data is analyzed using natural language processing, which leads in the usage of unstructured data such as medical journals and clinical records (Hameed et al., 2023).

Nurses are one of the largest groups of health workers, providing compassionate care through their nursing profession, emerging breakthroughs in artificial intelligence in nursing are likely to alter the character of the nurse-patient interaction (Buchanan et al., 2020). As a result, effective nursing leadership is required to drive this process, transformation and the ongoing provision of high-quality nursing care (Buchanan et al., 2020). Despite its benefits, AI confronts numerous problems and obstacles, including acceptance by healthcare professionals such as nurses and patients, who perceive it as a threat to future professional independence and job security (Khanijahani et al., 2022).

Artificial intelligence has starting to have a significant impact on nursing duties, workflow, and patient relationships (Van Bulck, Couturier & Moons 2022). Nurses are slowly adopting new technologies connected to artificial intelligence, and the use of artificial intelligence in nursing there is a gap in the development and spread of artificial intelligence among nurses (Shang, 2021). However, the development of artificial intelligence technologies and their thoughtful and comprehensive implementation has an impact on artificial intelligence-based technology, as it becomes easier to use and intuitive, allowing nurses to focus their efforts on basic professional care (von Gerisch et al., 2022).

Moreover, artificial intelligence helps nurses diagnose and treat patients effectively and accurately by analyzing a large amount of evidence and identifying commonalities (Buchanan et al. 2020). Second, artificial intelligence can improve patient monitoring and predictive analytics by allowing nurses to continuously monitor patients' vital signs, detect early indicators of deterioration, and receive real-time notifications (Alazzam et al., 2022).

According to (Al-Sabawy, 2023) study on nursing attitudes toward the use of artificial intelligence in nursing practice, 84% of those surveyed had a positive attitude about incorporating artificial intelligence into their nursing practices. Despite this, the study stated that there is a need to address the anxieties or discomfort connected with artificial intelligence in order to encourage its wider adoption in many disciplines of nursing (Al-Sabawy, 2023).

Saudi Arabia's economy is diversifying as it develops into a global technology hub, with the country launching an AI strategy as part of its Vision 2030, there is no doubt that AI will bring significant improvements to healthcare in the country, but it will also raise several ethical concerns, such as liability for data transfer and intellectual property (Chikhaoui et al., 2022). In the field of nursing there are concerns about the introduction of artificial intelligence-based technologies, as many fear that the technologies will replace human interaction, putting the ethics of care at risk, while others fear that artificial intelligence will replace nurses (von Gerisch et al., 2022).

Stanford University presented their Artificial Intelligence Index study in 2023, according to the report, Saudi Arabia has the second highest level of knowledge and awareness about the benefits of artificial intelligence across countries (Demaidi 2023).

The Saudi government sees artificial intelligence and digital health as crucial to improving access, efficiency, and quality of healthcare within the framework of Vision 2030 (Housawi & Lytras 2023). The development of AI technologies and their thoughtful and comprehensive implementation has an impact on AI, as it makes AI technology easy to use and intuitive, allowing nurses to focus their efforts on essential interprofessional care (von Gerisch et al., 2022).

According to one study conducted in the Kingdom of Saudi Arabia, the use of artificial intelligence in various aspects of health care would become increasingly frequent in the future, with an emphasis on clinical workflow (Sayed and Basil, 2023). Adoption and acceptance of artificial intelligence by nurses is regarded as critical for its successful implementation, as health policymakers must devise measures to improve nurses' ability to use artificial intelligence correctly (Sabra et al., 2023).

According to previous studies and articles, we conclude that, despite the enthusiasm for artificial intelligence in nursing in the Kingdom of Saudi Arabia, there is fear, as Abdullah and Faqih's study (2020) highlighted the concerns of health care workers, particularly nurses, about the possibility of replacing their roles with artificial intelligence at the same time. According to the above statement, a survey conducted by

Al- Al-Sabawy (2023) found that the majority of nurses are open to using artificial intelligence into their practice.

According to our knowledge and our search for previous studies in the Kingdom of Saudi Arabia, there is a lack of systematic reviews that shed light on literature reviews that combine previous studies on what they have discovered regarding the application of artificial intelligence in nursing in the Kingdom of Saudi Arabia, in terms of challenges, obstacles, knowledge, attitudes and perceptions. specific that you are facing.

As a result, our systematic review aimed to provide an overview of previous studies on the application of AI in nursing, as well as to serve as a reference for decision makers and policy makers in developing appropriate solutions based on the findings. And recommendations of previous studies and research articles.

Significance of the Review

Artificial intelligence (AI) has the potential to transform nursing care processes, improve patient outcomes, and increase care delivery effectiveness (Van Bulck et al., 2022). Nursing has not been immune to ethical issues regarding this technology, particularly concerns about its potential to replace nurses (Labrague et al., 2023). However, the benefits of AI have been acknowledged, and in order to ensure effective integration, healthcare workers, particularly nurses, must be effectively taught and equipped to employ these technologies to improve patient care outcomes (Abdullah and Fakih, 2020).

Alhashmi et al. (2020) underline the need of identifying the elements that influence AI application, particularly in nursing practice. Al-Momani (2023) investigates factors impacting AI adoption in businesses across sectors, emphasizing the relevance of understanding these elements in the context of nursing practice.

Abdullah and Fakieh (2020) found that healthcare workers' attitudes have a major impact on the acceptability and utilization of AI technologies, particularly in nursing practice. The systematic review of the use of artificial intelligence in nursing practice in Saudi Arabia is particularly relevant to the country's Vision 2030 aspirations for integrating innovative technologies into healthcare (Chikhaoui et al., 2022).

In conclusion, a comprehensive review of the use of artificial intelligence in nursing in Saudi Arabia will make a significant contribution to comprehending the region's current landscape of AI utilization in nursing practice. By synthesising existing literature and highlighting major obstacles, attitudes, and opportunities, this study can influence policy creation, decision-making, and future research initiatives aimed at improving the integration of AI technology in nursing care in Saudi Arabia.

General Objective

- The review aimed to provide a comprehensive overview of the current state of AI implementation in nursing in Saudi Arabia and offer recommendations for future research and policy development in this area.

Specific Objectives

- To identify the key challenges and barriers faced in the implementation of artificial intelligence technologies in nursing practices in Saudi Arabia.
- To analyze the attitudes and perceptions of nurses and healthcare professionals towards the use of AI in nursing in the Saudi context.
- To investigate the existing knowledge gaps and areas of improvement in the integration of AI technologies in nursing care in Saudi Arabia.
- To explore the potential benefits and limitations of AI applications in nursing and healthcare delivery in the Saudi Arabian healthcare system.

- To provide recommendations for enhancing the adoption and effective utilization of artificial intelligence in nursing practice in the Kingdom of Saudi Arabia.

Research question

- What were the challenges, barriers, knowledge gaps, attitudes, and perceptions related to the application of artificial intelligence in nursing in the Kingdom of Saudi Arabia, based on existing literature and research studies?

Methods

Introduction

A comprehensive systematic study was conducted to examine the current status of the application of artificial intelligence in nursing practice in the Kingdom of Saudi Arabia. The review aimed to analyze the adoption of artificial intelligence technologies, specifically in the field of nursing, in terms of knowledge of the obstacles, challenges, perceptions, knowledge gap, and nursing perceptions of the potential benefits of artificial intelligence in healthcare settings in relation to nursing, in line with the goals of the State Vision 2030 for technological progress in the field of healthcare. The systematic review used rigorous methodology, including the PRISMA flow chart, to ensure transparency and adherence to best practices.

The review methodology carefully adhered to the recommendations set out by Arksey and O'Malley (2005) for defining the scope of review methodology, emphasizing the need for a systematic and comprehensive approach to data collection and analysis. This systematic review provides valuable insights and evidence-based recommendations for health policy makers to improve the integration of AI technologies to enhance patient care by synthesizing and evaluating the available literature on AI in nursing practice in Saudi Arabia.

Search Strategies

In May 2024, a systematic search was conducted utilizing online resources such as PubMed, Google Scholar, and the Cochrane Library to uncover studies related to the use of artificial intelligence in nursing in the Kingdom of Saudi Arabia. The search phrases were paired using Boolean operators (AND, OR) to improve search results and assure relevancy to the topic matter. The search approach included phrases such as "artificial intelligence in nursing" OR "nursing perception of AI") AND "Saudi Arabia" OR "challenges of AI integration" OR "attitudes towards AI" OR "knowledge gaps in AI implementation") AND "Saudi nursing" AND "Saudi Arabia" OR "benefits of AI in nursing" OR "limitations of AI in healthcare" OR "nursing care and artificial intelligence" AND "Saudi Arabia" OR "AI adoption in nursing practice" AND "Saudi Arabia" OR " AI among health care providers in include nursing "OR "AI Technology in nursing". The systematic review of the search was narrowed to just include titles, abstracts and key words within the following characteristics: cross-sectional studies, scoping reviews, qualitative studies, experimental studies and systematic reviews published from (2020) to (2024).

Inclusion Criteria

Studies that matched the inclusion criteria specified in our systematic review of the use of artificial intelligence in Saudi nursing practice were included. First, the content must be written in English to ensure clarity and accessibility during the review process. Second: Studies that focus on the use of artificial intelligence in nursing practice in the Kingdom of Saudi Arabia. Studies that focus on artificial intelligence include healthcare teams, provided that they include nurses as part of the study results.

Furthermore, the topic of artificial intelligence or artificial intelligence-based technology in nursing practice in Saudi Arabia is clearly mentioned in the article title, abstract, or keywords. Finally, cross-sectional studies, scoping reviews, qualitative studies, experimental studies and systematic reviews published between 2020 and 2024 were considered for inclusion.

Exclusion Criteria

The systematic review excluded articles that did not meet the required criteria. This includes studies that are not related to the use of AI in nursing practice, as our review focuses on the integration of AI into nursing. Furthermore, papers not published in English were removed to ensure consistency and ease of understanding throughout the review process. Studies conducted in other countries except Saudi Arabia were also excluded. Articles on randomized controlled trials and cohort studies related to AI in nursing were excluded, as were previous studies before 2020.

Selection Process

In May 2024, the review search generated 120 results. After removing duplicate studies, 77 remained. After reviewing the titles and abstracts, 40 studies were excluded because they did not match the inclusion criteria. Thus, 20 research were thoroughly analyzed to determine eligibility; 10 studies were removed since they did not describe the original studies. As a result, 6 studies were included in this systematic review (Table 1 and Figure 1).

Data Extraction

A review search was carried out, all titles and abstracts were given, inclusion and exclusion criteria were used, reasons for inclusion and exclusion were documented, and duplicates were removed. The four phases of the systematic review method were illustrated with a PRISMA flowchart. **Figure 1** displays the flowchart for the systematic Review. The features of the included studies (n = 6) were retrieved and listed in Table 1. The summary data was then analyzed. The author(s), study design, results, and conclusions were all extracted and examined.

Results

The results of the research included in the systematic review provide some crucial insights into the current stage of AI deployment in Saudi nursing. First, the data indicate that Saudi nurses have various levels of readiness and acceptance for the use of AI in healthcare. While some nurses have a positive attitude and awareness of AI's potential benefits in enhancing patient care and clinical results, others are concerned that the technology may replace traditional nursing duties.

Second, the results show a strong need for educational and training activities to improve nurses' knowledge and skills in using AI tools efficiently. Many Saudi nurses apparently lack experience in AI applications and could benefit from specialized training programs to close this knowledge gap. Integrating AI-related themes into nursing curricula and continuing professional development programs could help nurses learn the skills needed to use AI technology in their practice.

Furthermore, the findings emphasize the necessity of addressing nurses' concerns and apprehensions regarding artificial intelligence, such as job displacement or dehumanization of care. Collaboration among legislators, healthcare executives, educators, and technology developers is required to ensure the smooth and ethical incorporation of AI into nursing practice. Initiatives promoting an open, transparent, and collaborative decision-making culture around AI adoption could assist to assuage nurses' concerns and establish a supportive environment for accepting new technology.

The systematic review's findings highlight the importance of taking a comprehensive strategy to AI application in nursing in Saudi Arabia. By understanding the benefits and constraints of AI adoption, healthcare stakeholders may create targeted strategies to assist nurses in harnessing AI technology to improve patient care outcomes and foster innovation in the healthcare industry. See **Table 1.**

Table 1. Summary of selected studies

Author(s)	Study Design	Results	Conclusion
(Surbaya et al., 2024)	Cross sectional	In this study, 36% of the participants were nurses, with median Awareness, Attitude,	The study stated that there is an urgent need to educate and raise

		and Behavioral scores for AI of 5/6 (IQR 3-6), 5/8 (IQR 4-7), and 0/3 (IQR 0), respectively, indicating that only half of the individuals were willing to employ AI while making future medical decisions.	awareness among health care personnel, particularly nurses, about artificial intelligence's potential impact on health care.
(Makhlouf et al., 2024)	A quasi-experimental	The study involved seventy-three male and female nurses. The study was conducted to assess nurses' knowledge of artificial intelligence, their perceptions of the usage of chatbots in nursing, and their attitudes toward the use of nursing chat programs. The study found that knowledge-based chatbot systems (artificial intelligence) for nurses improved significantly after the intervention (p = 0.001).	Integrating an artificial intelligence chatbot system into a nursing training program gives nurses easy access to reliable, evidence-based knowledge because AI systems provide instant answers, explanations, and up-to-date resources, allowing nurses to make informed decisions.
(Elnaggar et al. 2023)	Cross sectional	The study's findings, which included (280) 27.3% of Saudi Arabian nurses, revealed that more than half (55.2%) of respondents, including nurses, have a good understanding of artificial intelligence, and 48.1 percent are familiar with its applications in their specialty. A substantial percentage (73.3%) of healthcare providers, including nurses, feel that artificial intelligence will replace them in their jobs.	The study found that Saudi healthcare personnel, especially nurses, have a positive impression of artificial intelligence.
(Shyaani et al., 2023)	Systematic Review	One of the research investigated the impact of developing technology on nursing and patient outcomes. The study discovered that digital health tools, including artificial intelligence, improve nurse practice and patient outcomes in Saudi Arabia.	The study concluded that policymakers, health care leaders, educators, and technology developers must all work together to improve patient care by using technological advancements.

(AlDafeeri et al., 2022)	Qualitative study	One study conducted in Riyadh on Saudi nurses to explore their opinions on the use of artificial intelligence discovered that thirty nurses participated in the study, and the benefits of artificial intelligence were recognized in order to improve and enhance efficiency, improve care coordination, and reduce errors, but there are concerns. Regarding the over-reliance on technology, the loss of skills, and the dehumanization of practice,	The study indicated that, despite the benefits of artificial intelligence, incorporating AI/informatics into practice risks alienating nurses from their expertise. Strategic efforts to address the mentioned difficulties and misunderstandings will help ensure easy adoption among Saudi nursing professionals.
(Abdullah & Fakieh, 2020)	Cross sectional	The results, in which 250 employees, including nurses, from the top hospitals in Riyadh participated, discovered that a percentage of participants, including nurses, were concerned that artificial intelligence will replace them. They had a general lack of expertise about artificial intelligence, and they were not They are aware of the common advantages and limitations of AI-related applications.	The study concluded that personnel, including nurses, should be trained in artificial intelligence applications.

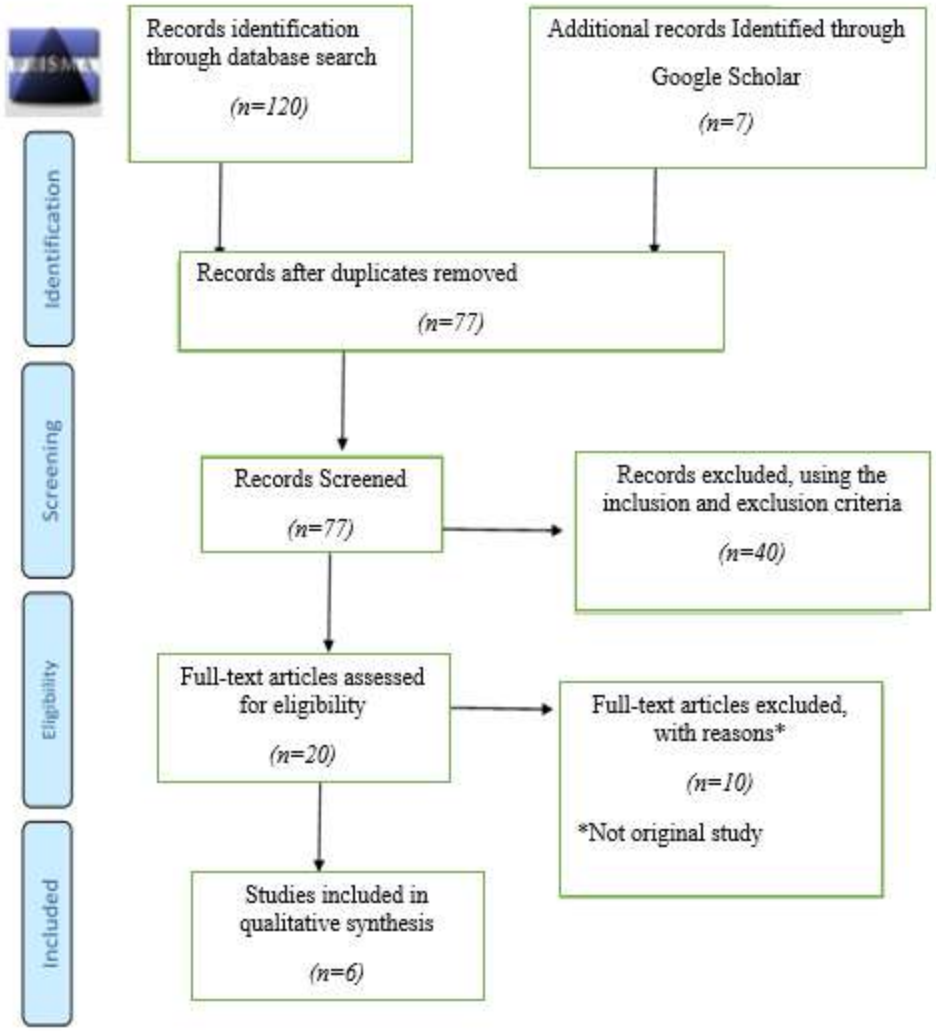

Fig. 1. PRISMA 2009 Flow Diagram

Discussion

Introduction

In this section, the results of this review will be discussed with the results of previous studies in terms of differences and consensus, and recommendations and conclusions will be presented in addition to limitations and strengths.

Discussion the Results

Surbaya et al.'s (2024) findings can be compared with various previous studies that have investigated healthcare professionals' opinions and attitudes concerning the integration of artificial intelligence (AI) technology in healthcare settings, notably among nurses. Surbaya et al., (2024) distinguish themselves from studies such as Abdullah and Fakieh (2020) by focusing on a specific topic and scope. While Abdullah and Fakieh (2020) researched health care professionals' opinions of AI applications.

Furthermore, comparing Abdullah and Fakieh (2020) to Alami et al., (2020), who investigated organizational preparation for AI in healthcare, reveals a broader perspective on AI adoption. While

Abdullah and Fakieh (2020) focused on healthcare staff' worries and lack of competence, Alami et al., (2020) investigated the organizational elements that can help or impede the adoption of AI in healthcare settings. The comparison of these two studies emphasizes the importance of a multifaceted approach that considers both individual and organizational readiness to adopt AI technology in healthcare.

In contrast to Abdullah and Fakieh (2020), who found that healthcare employees, including nurses, were concerned about AI replacing their roles and lacked expertise in AI applications, Makhlouf et al., (2024) found that AI chatbot systems had a positive impact on nurses' knowledge and decision-making processes. The incorporation of AI chatbots into nursing training programs provided nurses with immediate access to evidence-based knowledge, allowing them to make informed decisions.

Elnaggar et al., (2023) investigate Saudi Arabian nurses' opinions of AI, demonstrating both a strong comprehension of AI applications and fears regarding job displacement. Elsayed and Sleem (2021) and Hameed et al., (2023) address similar concerns, emphasizing the importance of considering the influence of AI on healthcare practitioner duties.

When compare the findings of Shyaani et al. (2023) and AlDafeeri et al. (2022) to other relevant studies, it is clear that the benefits and obstacles of incorporating artificial intelligence into nursing practice in Saudi Arabia are well understood. For example, Elnaggar et al. (2023) emphasized nurses' positive opinions of AI applications while simultaneously raising worries about potential job displacement. Similarly, Elsayed and Sleem (2021) and Hameed et al. (2023) stressed the importance of taking into account the influence of AI on the country's healthcare providers.

Furthermore, Chikhaoui et al., (2022) and Khanijahani et al., (2022) investigated the ethical, legal, organizational, and professional challenges associated with AI adoption in healthcare, echoing the concerns raised by AlDafeeri et al. (2022) about the risk of alienating nurses from their expertise with the incorporation of AI into practice. The findings emphasize the importance of discussing the benefits and potential limitations of AI technology in order to promote successful acceptance and deployment among Saudi nursing practitioners.

Strength of the Review

One of the systematic review's primary features is its broad approach to analyzing the current state of artificial intelligence application in Saudi nursing practice. The use of a rigorous methodology and the PRISMA flow chart promotes transparency and adherence to best standards in data gathering and analysis. The methodical search technique, inclusion criteria, and selection procedure all help to ensure the review's conclusions are complete and valid. Furthermore, the focused particular objectives offer clear advice for investigating crucial areas of AI deployment in the Saudi nursing setting.

Limitations of the Review

Despite the virtues of this systematic review, some limitations should be noted. One disadvantage is the focus on English language studies alone, which may have excluded valuable research published in other languages. The review's focus on studies conducted between 2020 and 2024 may also limit the area of study, perhaps leaving out older research that could provide significant insights. Furthermore, the exclusion of randomized controlled trials and cohort studies on AI in nursing may have limited the scope of evidence reviewed in the study.

Recommendation

Based on the findings of this systematic review, it is advised that future research on the use of artificial intelligence in nursing practice in the Kingdom of Saudi Arabia should look at a broader range of languages in order to include all relevant studies. We also recommend that health policymakers and decision-makers use strong and effective strategies based on previous research to reduce fears and aspects of anxiety among nurses when applying artificial intelligence in nursing practice by expanding nurses' knowledge through training and experimental campaigns.

Conclusion

Finally, this systematic research sheds light on the current state of artificial intelligence deployment in Saudi nursing practice. The findings highlight the necessity of tackling difficulties, improving training and education, and encouraging collaboration among healthcare stakeholders to ensure the successful incorporation of AI technology in nursing care. Policymakers, educators, and healthcare professionals may collaborate to use AI to enhance patient care outcomes and foster innovation in the Saudi healthcare system by following best practices and taking into account the recommendations presented in this research.

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