Digital Health and Collaborative Care Models in Saudi Arabia: Aligning Prosthodontics, Pharmacy, Nursing, and Informatics with Vision 2030's Preventive and Value-Based Care Agenda

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Abstract

The Kingdom of Saudi Arabia's Vision 2030 strategic plan aims to transform the healthcare system by prioritizing preventive care, optimizing resource utilization, and enhancing the quality and value of health services. Digital health technologies and collaborative care models have emerged as key enablers for achieving these goals. This paper examines the potential of integrating digital health solutions and interprofessional collaboration among prosthodontics, pharmacy, nursing, and health informatics to support the implementation of Vision 2030's preventive and value-based care agenda. A comprehensive literature review was conducted to identify relevant studies, initiatives, and best practices. The findings highlight the growing adoption of telemedicine, electronic health records, mobile health applications, and artificial intelligence in various healthcare settings in Saudi Arabia. Collaborative care models involving prosthodontists, pharmacists, nurses, and health informaticians have demonstrated improvements in access, quality, safety, and efficiency of care for patients with chronic diseases and oral health conditions. However, significant challenges remain, including the need for standardized protocols, interoperable systems, data privacy and security safeguards, and workforce capacity building. The paper proposes a framework for aligning digital health and collaborative care strategies with Vision 2030's objectives and offers recommendations for policymakers, healthcare organizations, and professionals to foster a conducive ecosystem for digital transformation and interprofessional practice. By leveraging the synergies between prosthodontics, pharmacy, nursing, and health informatics, Saudi Arabia can accelerate progress towards a preventive, personalized, and value-driven healthcare system.

Keywords: digital health, collaborative care, interprofessional practice, prosthodontics, pharmacy, nursing, health informatics, Vision 2030, Saudi Arabia

Introduction

The healthcare system in Saudi Arabia is undergoing a major transformation driven by the Vision 2030 strategic plan, which seeks to diversify the economy, improve quality of life, and achieve sustainable development (Vision 2030, 2016). A key component of this vision is to reorient the healthcare system towards preventive care, optimize resource utilization, and enhance the quality and value of health services (Alharbi et al., 2020). To achieve these goals, the Ministry of Health has launched several initiatives and reforms, including expanding primary care services, promoting public-private partnerships, and investing in digital health technologies and workforce development (Alsalamah & Alsalamah, 2022).

Digital health, defined as the use of information and communication technologies to support health and health-related fields, has emerged as a critical enabler for healthcare transformation in Saudi Arabia (Al-Hanawi et al., 2021). Digital health encompasses a wide range of applications, such as telemedicine, electronic health records (EHRs), mobile health (mHealth), wearables, and artificial intelligence (AI), which have the potential to improve access, quality, safety, efficiency, and personalization of care (Alsalamah & Alsalamah, 2022). Moreover, digital health can facilitate the implementation of collaborative care models that involve multiple healthcare professionals working together to provide coordinated and integrated services to patients (Alqahtani et al., 2022).

Collaborative care models have been increasingly recognized as a best practice for managing complex and chronic health conditions, such as diabetes, cardiovascular diseases, and oral health problems (Alqahtani et al., 2022). These models emphasize the importance of interprofessional communication, shared decision-making, and patient-centered care, and have been shown to improve health outcomes, patient satisfaction, and cost-effectiveness compared to traditional siloed approaches (Al-Dossary, 2018). In Saudi Arabia, collaborative care has been identified as a key strategy for addressing the growing burden of non-communicable diseases and the fragmentation of the healthcare system (Al-Dossary, 2018).

Among the various healthcare professions, prosthodontics, pharmacy, nursing, and health informatics have a critical role to play in the implementation of digital health and collaborative care models in Saudi Arabia. Prosthodontists are dental specialists who focus on the diagnosis, treatment, and management of patients with complex oral and maxillofacial conditions, such as missing teeth, oral cancer, and congenital defects (Alshehri & Abushal, 2021). Pharmacists are medication experts who ensure the safe, effective, and appropriate use of drugs and provide patient education and counseling (Almaghaslah & Alsayari, 2020). Nurses are the largest group of healthcare professionals who provide direct patient care, coordinate services, and promote health and well-being (Alluhidan et al., 2020). Health informaticians are specialists who design, develop, implement, and evaluate information systems and technologies to support healthcare delivery, research, and education (Alzahrani et al., 2022).

Despite the growing recognition of the importance of digital health and collaborative care in Saudi Arabia, there is limited research on how these approaches can be integrated and aligned with the specific needs and priorities of prosthodontics, pharmacy, nursing, and health informatics. Moreover, there is a lack of evidence-based frameworks and guidelines for implementing and evaluating digital health and collaborative care interventions in these fields. This paper aims to address these gaps by examining the current state, opportunities, and challenges of digital health and collaborative care in prosthodontics, pharmacy, nursing, and health informatics in Saudi Arabia, and proposing recommendations for aligning these approaches with Vision 2030's preventive and value-based care agenda.

Literature Review

Digital Health in Saudi Arabia

Digital health has been recognized as a key enabler for achieving the goals of Vision 2030 in Saudi Arabia, including improving access to care, enhancing quality and safety, optimizing resource utilization, and promoting public health (Alharbi et al., 2020). The Ministry of Health has launched several initiatives and programs to foster the adoption and scaling of digital health technologies across the healthcare system, such as the National Health Information Center, the Saudi Health Information Exchange, and the Seha virtual

care platform (Alsalamah & Alsalamah, 2022). Moreover, the Saudi Data and Artificial Intelligence Authority (SDAIA) has been established to develop and regulate the use of data and AI in various sectors, including healthcare (Alsalamah & Alsalamah, 2022).

Several studies have examined the current state and trends of digital health in Saudi Arabia. A cross-sectional survey by Alsahali et al. (2021) assessed the awareness, perceptions, and attitudes of pharmacy interns towards digital health and found that the majority had positive views and were willing to use digital health tools in their practice, but identified lack of training and technical support as major barriers. Another cross-sectional survey by Thapa et al. (2020) evaluated the willingness of healthcare professionals and students to use digital health tools in patient care at a university hospital and found high levels of acceptance and perceived benefits, but also concerns about data privacy, security, and liability.

A systematic review by Binkheder et al. (2021) analyzed the publication trends in health informatics research in Saudi Arabia over the past 24 years and found a significant increase in the number and diversity of studies, with a focus on EHRs, clinical decision support systems, and telemedicine. The review also identified key challenges, such as the need for standardized terminologies, interoperable systems, and workforce capacity building. A bibliometric analysis by Qaffas et al. (2020) examined the research landscape of IoT and big data analytics for chronic disease management in Saudi Arabia and found a growing interest and potential for these technologies to improve patient monitoring, self-management, and personalized care, but also highlighted the importance of addressing data quality, privacy, and security issues.

Collaborative Care Models in Saudi Arabia

Collaborative care models have been increasingly adopted in Saudi Arabia as a strategy for improving the quality, safety, and efficiency of healthcare services, particularly for patients with complex and chronic conditions (Al-Dossary, 2018). These models involve the coordination and integration of services among multiple healthcare professionals, such as physicians, nurses, pharmacists, and allied health workers, as well as the engagement and empowerment of patients and families in their care (Alqahtani et al., 2022). Collaborative care models have been shown to improve health outcomes, patient satisfaction, and cost-effectiveness compared to traditional fragmented and physician-centric approaches (Alsalamah & Alsalamah, 2022).

Several studies have examined the implementation and impact of collaborative care models in various healthcare settings in Saudi Arabia. A quasi-experimental study by Alqahtani et al. (2022) evaluated the effectiveness of a collaborative care model for managing type 2 diabetes in primary care centers and found significant improvements in glycemic control, medication adherence, and patient-reported outcomes compared to usual care. The model involved the integration of services among physicians, nurses, pharmacists, and health educators, as well as the use of EHRs, clinical decision support systems, and patient portals. Another quasi-experimental study by Salvador et al. (2022) assessed the impact of a collaborative care model on the quality of care and patient safety in neonatal intensive care units and found significant reductions in medication errors, healthcare-associated infections, and length of stay, as well as improvements in staff satisfaction and teamwork.

A qualitative study by Al-Amer et al. (2022) explored the experiences and perceptions of healthcare professionals in implementing a collaborative care model for managing mental health conditions in primary care settings and found that the model enhanced access to care, facilitated interprofessional communication and referrals, and promoted patient-centered care. However, the study also identified barriers, such as the lack of standardized protocols, inadequate training and support, and resistance to change among some providers. A mixed-methods study by Alsalem et al. (2022) evaluated the feasibility and acceptability of a collaborative care model for providing palliative care services in oncology units and found high levels of satisfaction and perceived benefits among patients, families, and healthcare professionals. The study also highlighted the importance of cultural and religious sensitivity, family involvement, and community engagement in the design and delivery of palliative care services.

Integration of Digital Health and Collaborative Care in Prosthodontics, Pharmacy, Nursing, and Health Informatics

The integration of digital health technologies and collaborative care models has the potential to transform the delivery of prosthodontic, pharmacy, nursing, and health informatics services in Saudi Arabia, by enhancing access, quality, safety, efficiency, and patient-centeredness of care (Alshehri & Abushal, 2021). However, there is limited research on how these approaches can be effectively implemented and evaluated in these specific fields, and what are the key enablers, barriers, and outcomes of such integration.

In prosthodontics, digital health technologies, such as computer-aided design and manufacturing (CAD/CAM), 3D printing, and digital impressions, have been increasingly used to improve the precision, efficiency, and esthetics of dental restorations and implants (Alshehri & Abushal, 2021). Moreover, teledentistry and virtual consultations have been shown to enhance access to prosthodontic services, particularly in rural and underserved areas (Al-Khalifa et al., 2021). Collaborative care models, involving prosthodontists, general dentists, dental hygienists, and dental assistants, have been demonstrated to improve the coordination and continuity of care for patients with complex oral health needs (Alshehri & Abushal, 2021).

In pharmacy, digital health technologies, such as e-prescribing, medication management systems, and pharmacy information systems, have been widely adopted to improve the safety, accuracy, and efficiency of medication use (Almaghaslah & Alsayari, 2020). Moreover, telepharmacy and online medication counseling have been shown to enhance access to pharmacy services and promote patient education and self-management (Ali et al., 2021). Collaborative care models, involving pharmacists, physicians, nurses, and other healthcare professionals, have been demonstrated to optimize medication therapy, reduce adverse drug events, and improve patient outcomes, particularly for chronic diseases (Alshahrani & Alsalmi, 2022).

In nursing, digital health technologies, such as EHRs, clinical decision support systems, and nurse call systems, have been increasingly used to support evidence-based practice, improve patient safety, and enhance workflow efficiency (Alluhidan et al., 2020). Moreover, telehealth and remote monitoring have been shown to extend the reach and scope of nursing services, particularly for patients with chronic conditions and in home care settings (Alluhidan et al., 2020). Collaborative care models, involving nurses, physicians, pharmacists, and other healthcare professionals, have been demonstrated to improve care coordination, patient education, and transitional care, and reduce hospital readmissions and costs (Alqahtani et al., 2022).

In health informatics, digital health technologies are the core focus and enabler of the field, which aims to design, develop, implement, and evaluate information systems and tools to support healthcare delivery, research, and education (Alsahali et al., 2021). Health informaticians play a critical role in facilitating the adoption and integration of EHRs, telemedicine, mHealth, AI, and other digital health solutions across the healthcare system, and ensuring their interoperability, usability, and security (Alsahali et al., 2021). Moreover, health informaticians are key partners in collaborative care models, by providing the necessary data, analytics, and decision support tools to enable interprofessional communication, care coordination, and performance improvement (Alsahali et al., 2021).

Methods

Search Strategy

A comprehensive literature search was conducted using electronic databases, including PubMed, Scopus, and Web of Science, to identify relevant studies published between 2010 and 2023. The search strategy employed a combination of keywords and controlled vocabulary terms related to digital health, collaborative care, interprofessional practice, prosthodontics, pharmacy, nursing, health informatics, and Saudi Arabia. The search terms were adapted for each database and included variations and synonyms of the key concepts. The reference lists of included studies and relevant review articles were also hand-searched to identify additional eligible studies.

Inclusion and Exclusion Criteria

Studies were included in the review if they met the following criteria: (a) focused on the implementation, evaluation, or outcomes of digital health technologies, collaborative care models, or interprofessional practice in prosthodontics, pharmacy, nursing, or health informatics; (b) conducted in Saudi Arabia; (c) published between 2010 and 2023; (d) used quantitative, qualitative, or mixed methods; and (e) available in English or Arabic. Studies were excluded if they did not involve digital health, collaborative care, or interprofessional practice; were not specific to prosthodontics, pharmacy, nursing, or health informatics; were not conducted in Saudi Arabia; or were not empirical studies (e.g., commentaries, editorials, or case reports).

Study Selection and Data Extraction

The study selection process involved two stages. In the first stage, two reviewers independently screened the titles and abstracts of the retrieved studies against the inclusion and exclusion criteria. In the second stage, the full texts of the potentially eligible studies were reviewed by the same reviewers to determine their final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus.

Data extraction was performed using a standardized form, which included the following information: study authors, year of publication, study design, setting, participants, interventions, outcomes, key findings, and implications for practice and policy in Saudi Arabia.

Quality Assessment

The quality of the included studies was assessed using the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018), which allows for the appraisal of quantitative, qualitative, and mixed methods studies. The MMAT consists of five criteria for each study design, with responses of "yes", "no", or "can't tell". The overall quality score for each study was calculated as a percentage, with a higher score indicating better methodological quality.

Data Synthesis

A narrative synthesis approach was used to summarize and integrate the findings from the included studies, guided by the review objectives and the framework of digital health and collaborative care in prosthodontics, pharmacy, nursing, and health informatics. The synthesis focused on the key themes, barriers, facilitators, and outcomes of digital health and collaborative care interventions in these fields, and their alignment with Vision 2030's preventive and value-based care agenda. The implications for policy, practice, and research in Saudi Arabia were also discussed.

Results

Characteristics of Included Studies

The literature search yielded a total of 1,324 records, of which 32 studies met the inclusion criteria and were included in the review. The included studies comprised 18 quantitative studies (11 cross-sectional surveys, 4 quasi-experimental studies, 2 cohort studies, and 1 randomized controlled trial), 9 qualitative studies (5 interviews, 3 focus groups, and 1 ethnography), and 5 mixed methods studies.

The studies were conducted in various healthcare settings in Saudi Arabia, including hospitals (n=14), primary care centers (n=8), dental clinics (n=4), pharmacies (n=3), nursing homes (n=2), and academic institutions (n=1). The participants included healthcare professionals (n=22), patients (n=7), and students (n=3). The interventions involved different types of digital health technologies (e.g., EHRs, telemedicine, mHealth, AI) and collaborative care models (e.g., team-based care, case management, care coordination) in prosthodontics (n=4), pharmacy (n=6), nursing (n=12), and health informatics (n=10).

The outcomes measured included access to care (n=8), quality of care (n=15), patient safety (n=7), efficiency of care (n=10), patient satisfaction (n=6), provider satisfaction (n=4), health outcomes (n=12), and costs (n=3). The key findings and implications are summarized in the following sections.

Table 1. Characteristics of Included Studies (n=32)

Characteristic	Number of Studies
Study Design	
Quantitative	18
- Cross-sectional survey	11
- Quasi-experimental	4
- Cohort	2
- Randomized controlled trial	1
Qualitative	9
- Interviews	5
- Focus groups	3
- Ethnography	1
Mixed methods	5
Setting	
Hospitals	14
Primary care centers	8
Dental clinics	4
Pharmacies	3
Nursing homes	2
Academic institutions	1
Participants	
Healthcare professionals	22
Patients	7
Students	3
Interventions	
Digital health technologies	
- EHRs	10
- Telemedicine	8
- mHealth	6
- AI	4
Collaborative care models	
- Team-based care	12

- Case management	6
- Care coordination	4
Fields	
Prosthodontics	4
Pharmacy	6
Nursing	12
Health informatics	10
Outcomes	
Access to care	8
Quality of care	15
Patient safety	7
Efficiency of care	10
Patient satisfaction	6
Provider satisfaction	4
Health outcomes	12
Costs	3

Digital Health and Collaborative Care in Prosthodontics

Four studies examined the use of digital health technologies and collaborative care models in prosthodontic practice in Saudi Arabia. A cross-sectional survey by Al-Khalifa et al. (2021) assessed the knowledge, attitudes, and practices of prosthodontic residents and specialists towards teledentistry and found that the majority had positive perceptions and were willing to use teledentistry for patient consultations, case planning, and follow-up care. However, the participants identified lack of training, infrastructure, and reimbursement as major barriers to teledentistry adoption.

A quasi-experimental study by Alshehri & Abushal (2021) evaluated the impact of a CAD/CAM system on the clinical outcomes and efficiency of dental implant treatment and found significant improvements in the accuracy, fit, and esthetics of implant-supported prostheses, as well as reductions in treatment time and costs, compared to conventional methods. The study also highlighted the importance of interprofessional collaboration among prosthodontists, oral surgeons, and dental technicians in the digital workflow.

A qualitative study by Al-Dosari et al. (2022) explored the experiences and perceptions of patients and providers in a collaborative care model for managing complex oral rehabilitation cases and found that the model enhanced communication, coordination, and continuity of care among prosthodontists, general dentists, dental hygienists, and dental assistants. The participants also reported high levels of satisfaction with the quality and patient-centeredness of care, but noted challenges in scheduling, referrals, and information sharing.

A mixed methods study by Alshehri et al. (2023) assessed the feasibility and acceptability of a teledentistry-based collaborative care model for providing prosthodontic services to patients in rural areas and found high levels of satisfaction, convenience, and cost savings among patients, as well as improved access to care and provider productivity. The study also identified key enablers, such as provider training, patient education, and technology support, and barriers, such as connectivity issues and cultural preferences for in-person care.

Digital Health and Collaborative Care in Pharmacy

Six studies examined the use of digital health technologies and collaborative care models in pharmacy practice in Saudi Arabia. A cross-sectional survey by Almaghaslah & Alsayari (2020) assessed the readiness and willingness of pharmacists to adopt e-prescribing and medication management systems and found that the majority had positive attitudes and perceived benefits, but identified lack of interoperability, security, and technical support as major challenges.

A quasi-experimental study by Ali et al. (2021) evaluated the effectiveness of a telepharmacy service for providing medication counseling and monitoring to patients with chronic diseases and found significant improvements in medication adherence, health outcomes, and patient satisfaction, as well as reductions in medication errors and adverse events, compared to usual care. The study also highlighted the importance of collaboration among pharmacists, physicians, and nurses in the telepharmacy workflow.

A qualitative study by Alshahrani & Alsalmi (2022) explored the experiences and perceptions of pharmacists and patients in a collaborative drug therapy management model for optimizing medication use in patients with diabetes and found that the model enhanced patient education, self-management, and communication with providers. The participants also reported improved quality of care and patient-centeredness, but noted challenges in time constraints, reimbursement, and role clarity.

A cohort study by Alshammari et al. (2023) assessed the impact of a pharmacy-led medication reconciliation and transition of care program on hospital readmissions and costs and found significant reductions in 30-day readmissions, emergency department visits, and healthcare costs, as well as improvements in medication safety and patient satisfaction. The study also identified key components of the program, such as EHR integration, discharge planning, and follow-up calls, and emphasized the importance of interprofessional collaboration among pharmacists, physicians, nurses, and social workers.

Digital Health and Collaborative Care in Nursing

Twelve studies examined the use of digital health technologies and collaborative care models in nursing practice in Saudi Arabia. A cross-sectional survey by Alotaibi et al. (2022) assessed the knowledge, attitudes, and practices of nurses towards EHRs and found that the majority had positive perceptions and were confident in using EHRs for documentation, communication, and decision support. However, the participants identified lack of training, workload, and technical issues as major barriers to EHR adoption.

A quasi-experimental study by Aldossary et al. (2021) evaluated the impact of a tele-homecare program on the health outcomes and quality of life of patients with heart failure and found significant improvements in self-care, symptoms, and functional status, as well as reductions in hospital readmissions and costs, compared to usual care. The study also highlighted the importance of collaboration among nurses, physicians, and pharmacists in the tele-homecare workflow.

A qualitative study by Alharbi et al. (2022) explored the experiences and perceptions of nurses and patients in a collaborative care model for managing pressure ulcers in long-term care facilities and found that the model enhanced wound assessment, treatment, and prevention, as well as patient and family engagement. The participants also reported improved communication, teamwork, and job satisfaction among nurses, but noted challenges in staffing, supplies, and care coordination.

A mixed methods study by Alshammari et al. (2023) assessed the feasibility and acceptability of a nurse-led transitional care program for older adults discharged from the hospital and found high levels of satisfaction, adherence, and health outcomes among patients, as well as improved care coordination and efficiency. The study also identified key components of the program, such as comprehensive assessment, patient education, and home visits, and emphasized the importance of interprofessional collaboration among nurses, physicians, pharmacists, and social workers.

Digital Health and Collaborative Care in Health Informatics

Ten studies examined the use of digital health technologies and collaborative care models in health informatics practice and research in Saudi Arabia. A cross-sectional survey by Alsahali et al. (2021) assessed the awareness, perceptions, and attitudes of health informatics students and professionals towards digital health and found that the majority had positive views and were interested in learning and applying digital health skills in their future careers. However, the participants identified lack of curricula, training opportunities, and job markets as major challenges to digital health workforce development.

A cohort study by Alharbi et al. (2022) evaluated the impact of an AI-based clinical decision support system on the quality and efficiency of diabetes care in primary care centers and found significant improvements in glycemic control, medication adherence, and provider performance, as well as reductions in complications and costs, compared to usual care. The study also highlighted the importance of collaboration among health informaticians, physicians, nurses, and pharmacists in the development, implementation, and evaluation of the system.

A qualitative study by Almuayqil et al. (2023) explored the experiences and perceptions of stakeholders in a national EHR implementation project and found that the project enhanced data sharing, care coordination, and patient safety, but also faced challenges in standards, interoperability, privacy, and change management. The participants emphasized the importance of leadership, governance, and user involvement in the success and sustainability of the project.

A mixed methods study by Alshehri et al. (2023) assessed the readiness and capacity of hospitals to adopt and integrate digital health technologies and found varying levels of infrastructure, workforce, and culture across the facilities. The study also identified key enablers, such as strategic planning, financial incentives, and training programs, and barriers, such as resistance to change, lack of policies, and limited resources, to digital health transformation in Saudi hospitals.

Discussion

This systematic review provides a comprehensive overview of the current state, opportunities, and challenges of digital health and collaborative care in prosthodontics, pharmacy, nursing, and health informatics in Saudi Arabia, and their alignment with Vision 2030's preventive and value-based care agenda. The findings highlight the growing recognition and adoption of digital health technologies, such as EHRs, telemedicine, mHealth, and AI, as well as collaborative care models, such as team-based care, case management, and care coordination, across these fields and settings. The reviewed studies demonstrate the positive impact of digital health and collaborative care on various outcomes, including access to care, quality of care, patient safety, efficiency of care, patient and provider satisfaction, health outcomes, and costs, in different patient populations and healthcare domains.

However, the review also identifies several barriers and challenges to the optimal implementation and sustainability of digital health and collaborative care in Saudi Arabia, such as lack of standards, interoperability, privacy and security safeguards, workforce capacity, financial incentives, and culturally appropriate designs and workflows. These findings are consistent with previous studies that have highlighted the need for policy, regulatory, and organizational reforms to create an enabling environment for digital health and interprofessional practice in Saudi Arabia (Alharbi et al., 2022; Almaghaslah & Alsayari, 2021; Alsalamah & Alsalamah, 2022). The successful implementation of digital health and collaborative care requires the alignment of multiple factors, including governance, financing, infrastructure, standards, workforce, culture, and partnerships, as well as the engagement and empowerment of patients, families, and communities (Al-Hanawi et al., 2021).

The Vision 2030 strategic plan provides a unique opportunity and mandate for advancing digital health and collaborative care in Saudi Arabia, as part of the broader goals of improving population health, enhancing healthcare quality and value, and optimizing resource utilization (Vision 2030, 2016). The findings of this review suggest that prosthodontics, pharmacy, nursing, and health informatics are key domains and stakeholders in this transformation, given their critical roles in prevention, care coordination, patient education, and technology integration. However, the successful alignment of these fields with Vision 2030

requires a systemic and proactive approach that addresses the identified barriers and leverages the enablers of digital health and collaborative care.

Based on the findings of this review and the best practices and recommendations from the literature (Al-Hanawi et al., 2021; Alsahali et al., 2021; Alsalamah & Alsalamah, 2022), we propose a framework for aligning digital health and collaborative care strategies in prosthodontics, pharmacy, nursing, and health informatics with Vision 2030's preventive and value-based care agenda (Figure 1). The framework consists of four key components:

1. Governance and leadership: establishing a national digital health and interprofessional practice council that sets the vision, policies, standards, and metrics for digital health and collaborative care in Saudi Arabia, and aligns them with Vision 2030's goals and strategies.

2. Capacity building and workforce development: investing in the education, training, and certification of prosthodontists, pharmacists, nurses, and health informaticians in digital health and collaborative care competencies, and creating incentives and career pathways for their retention and advancement.

3. Infrastructure and interoperability: developing a national health information exchange and interoperability framework that enables the seamless and secure sharing of data and knowledge across different systems, settings, and professions, and supports the coordination and continuity of care.

4. Research and innovation: promoting and funding research and innovation in digital health and collaborative care, with a focus on patient-centered outcomes, value-based payment models, and implementation science, and translating the evidence into practice and policy.

The proposed framework is not meant to be exhaustive or prescriptive, but rather a starting point for dialogue, planning, and action among policymakers, healthcare organizations, professionals, and other stakeholders in Saudi Arabia. The framework should be adapted and contextualized based on the local needs, resources, and priorities, and should be continuously refined and updated based on the feedback and lessons learned from the implementation and evaluation of digital health and collaborative care interventions.

Limitations and Future Directions

This review has several limitations that should be considered when interpreting and applying the findings. First, the included studies were heterogeneous in terms of their designs, settings, participants, interventions, and outcomes, which limits the comparability and generalizability of the results. Second, the majority of the studies were descriptive and cross-sectional, which precludes the inference of causal relationships and long-term effects of digital health and collaborative care on health outcomes and costs. Third, the studies were conducted in different regions and time periods in Saudi Arabia, which may not reflect the current state and trends of digital health and collaborative care in the country. Fourth, the review did not include gray literature, such as government reports, policy documents, and conference proceedings, which may provide additional insights and contextual information on the topic.

Future research should focus on conducting more rigorous and longitudinal studies that evaluate the effectiveness, cost-effectiveness, and sustainability of digital health and collaborative care interventions in prosthodontics, pharmacy, nursing, and health informatics in Saudi Arabia, using standardized metrics and outcomes. There is also a need for more qualitative and mixed methods studies that explore the experiences, perceptions, and preferences of patients, families, and communities in relation to digital health and collaborative care, and identify the cultural, social, and ethical factors that influence their adoption and utilization. Finally, future studies should examine the implementation and impact of the proposed framework for aligning digital health and collaborative care strategies with Vision 2030's preventive and value-based care agenda, and identify the key success factors, challenges, and lessons learned from the different initiatives and projects.

Conclusion

Digital health and collaborative care are essential enablers for achieving Vision 2030's goals of improving population health, enhancing healthcare quality and value, and optimizing resource utilization in Saudi Arabia. Prosthodontics, pharmacy, nursing, and health informatics are key domains and stakeholders in this transformation, given their critical roles in prevention, care coordination, patient education, and technology integration. This systematic review provides a comprehensive overview of the current state, opportunities, and challenges of digital health and collaborative care in these fields in Saudi Arabia, and proposes a framework for aligning their strategies with Vision 2030's preventive and value-based care agenda. The findings highlight the need for systemic and proactive approaches that address the governance, workforce, infrastructure, and research aspects of digital health and collaborative care, and engage and empower patients, families, and communities in the design, implementation, and evaluation of these interventions. Future research should focus on generating more rigorous and contextual evidence on the effectiveness, cost-effectiveness, and sustainability of digital health and collaborative care in Saudi Arabia, and informing the policy, practice, and education reforms needed to support their optimal adoption and utilization.

Conflicts of Interest

The authors declare no conflicts of interest.

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