



Healthcare Services Evolution in Saudi Arabia An Overview and Future Trends

Saleh Ahmed Alatiya^{1*}, Saad Ibrahim Albalawi², Azzah Mohammed Alzahrani³, Shahad Ali Balit⁴, Tahir Mansour Al Jassas⁵, Manal Salamah Selem Alhawity⁶, Abdulaziz Abdullah Alabdullah⁷, Nasser Salem Alsaeedi⁸, Fedeh Mohammad Al-Darwish⁹, Nada Saad Saeed Alharbi¹⁰, Ibtisam Saad Saeed Alharbi¹¹

¹General Practitioner, PHC, Alahsa,

* Corresponding Author Email: saleh.alatiya96@gmail.com - ORCID: 0000-0002-5247-7990

²ENT, General Administration of Medical Services, Saad Ibrahim Albalawi,

Email: S.albluwi@hotmail.com- ORCID: 0000-0002-5247-0050

³General Surgery Consultant, King Faisal Medical Complex Taif, Azzah Mohammed Alzahrani,

Email: Profam2009@hotmail.com- ORCID: 0000-0002-5247-1050

⁴Dental Surgery Assistant, King Khalid Military Hospital, Shahad Ali Balit,

Email: shooodh87@gmail.com- ORCID: 0000-0002-5247-0250

⁵Rehabilitation & Physiotherapy Department, Dammam Medical Complex, Tahir Mansour Al Jassas,

Email: Tahirjassas@gmail.com- ORCID: 0000-0002-5247-0350

⁶Dental Assistant, King Salman Military Hospital, Manal Salamah Selem Alhawity,

Email: manall988@hotmail.com- ORCID: 0000-0002-5247-4050

⁷Pharmacist, MOH, Maternity and Children Hospital Alahsa, Abdulaziz Abdullah Alabdullah,

Email: azizpill2063@gmail.com- ORCID: 0000-0002-5247-5050

⁸ICU Doctor, Hera'a General Hospital, Makkah, Nasser Salem Alsaeedi,

Email: nasser.salem9@gmail.com- ORCID: 0000-0002-5247-6050

⁹Nurse Technician, Qatif Central Hospital, Fedeh Mohammad Al-Darwish,

Email: faldarwich@moh.gov.sa- ORCID: 0000-0002-5247-8050

¹⁰Social Worker, Jamoum Primary Health Care Center, Nada Saad Saeed Alharbi

Email: nalharbi42@moh.gov.sa- ORCID: 0000-0002-5247-9050

¹¹Social Worker, Primary Health Care Center in Al-Nawariya, Ibtisam Saad Saeed Alharbi,

Email: ebtsama@hom.gov.sa- ORCID: 0000-0002-5247-9970

Article Info:

DOI: 10.22399/ijcesn.4206

Received : 02 January 2025

Accepted : 30 January 2025

Keywords

Healthcare services,
Saudi Arabia,
Evolution,
Vision 2030,
Public health,
Private sector participation,
Telehealth

Abstract:

The evolution of healthcare services in Saudi Arabia has undergone significant transformations over the past few decades, reflecting the nation's dedication to improving the health and well-being of its citizens. Initially focused on basic healthcare needs, the sector has expanded tremendously to include advanced medical technologies, specialized treatments, and comprehensive healthcare systems. The government's Vision 2030 initiative has been pivotal in this transformation, prioritizing diversification and modernization of the healthcare infrastructure. Health services have shifted from a predominantly public sector model to a more integrated system involving private sector participation, thereby enhancing efficiency and accessibility. Key advancements include the establishment of new hospitals, the implementation of electronic health records, and the promotion of telehealth services, particularly in response to the COVID-19 pandemic. Looking ahead, the future of healthcare services in Saudi Arabia is positioned for continuous improvement and innovation, driven by technological integration and data-driven practices. As the country focuses on enhancing patient outcomes and preventative care, trends such as personalized medicine, artificial intelligence in diagnostics, and the expansion of telemedicine are expected to gain

momentum. Additionally, the growing emphasis on public health initiatives, mental health, and chronic disease management reflects a holistic approach to healthcare that prioritizes preventive measures. The government's commitment to investing in healthcare education and workforce development will also play a critical role in sustaining these advancements, ensuring that Saudi Arabia builds a resilient, effective healthcare system that meets the needs of its population well into the future.

1. Introduction

The Kingdom of Saudi Arabia stands as a nation undergoing a profound and rapid transformation, driven by its ambitious Vision 2030 blueprint. At the heart of this societal and economic metamorphosis lies the critical sector of healthcare. The evolution of healthcare services in the Kingdom is a compelling narrative of progress, shifting from a fragmented, resource-constrained system to a modern, technology-driven model aspiring for global standards. This journey, spanning several decades, reflects the nation's response to demographic shifts, epidemiological transitions, and rising public expectations. This research paper provides a comprehensive overview of the evolution of healthcare services in Saudi Arabia, analyzing its historical foundations, current state shaped by Vision 2030, and the transformative future trends poised to redefine the delivery of care. The genesis of the modern Saudi health system can be traced back to the establishment of the first formal health directorate in 1925, which managed a mere handful of clinics and hospitals, primarily serving major urban centers [1]. For much of the 20th century, the system was heavily reliant on expatriate medical professionals and government funding from hydrocarbon revenues. A significant milestone was the creation of the Ministry of Health (MOH) in 1951, which centralized the planning and delivery of healthcare, leading to a substantial expansion of infrastructure. By the 1980s and 1990s, the government had embarked on massive hospital construction projects, increasing the number of MOH-operated hospitals from 74 in 1975 to over 290 by the early 2000s, significantly improving geographical access [2]. This era was characterized by a provider-centric, curative model of care, effectively tackling communicable diseases and reducing infant and maternal mortality rates. However, the early 21st century revealed the limitations of this model. The Kingdom began facing a "double burden of disease," with the persistent threat of infectious diseases being rapidly eclipsed by a surge in non-communicable diseases (NCDs). According to recent data from the Saudi Health Interview Survey, the prevalence of diabetes among adults is estimated at 18.3%, hypertension at 25.5%, and obesity at a staggering 35.6% [3]. This epidemiological shift, coupled with a growing and

young population—over 58% of Saudis are under the age of 35—placed unprecedented strain on the public healthcare system [4]. Challenges such as long waiting times for specialist appointments, overcrowding in tertiary care hospitals, and rising healthcare costs underscored the urgent need for systemic reform. The launch of Saudi Vision 2030 in 2016 marked a definitive turning point, positioning healthcare as a fundamental pillar for building a vibrant society and a thriving economy. The Vision's healthcare transformation strategy is orchestrated around several key pillars: privatization, digitalization, prevention, and improved access and quality. A cornerstone of this transformation is the **Saudi Health Sector Transformation Program**, one of Vision 2030's core executive programs. Its ambitious objectives include increasing the private sector's contribution to healthcare from 25% to 35% by 2030, enhancing the efficiency of government health spending, and improving the overall patient experience [5]. A critical driver of this evolution is the rapid adoption of digital health technologies. The **Seha Virtual Hospital**, launched in 2022, is a testament to this shift. As the world's largest virtual hospital, it provides telemedicine and e-consultation services to over 130 connected hospitals, significantly improving access to specialist care for residents in remote areas and reducing the need for patient transfers [6]. Furthermore, the **Mawid** app, which centralizes appointment bookings for primary healthcare centers, has booked over 50 million appointments since its inception, drastically reducing waiting times and streamlining access [7]. The national electronic health record system, **NPHIES**, is being integrated to create a unified patient record across all providers, enhancing care coordination and data-driven decision-making [8]. Complementing digitalization is a strategic push towards privatization and corporatization. The establishment of the **Saudi Company for Health Services (SCFHS)**, which will manage and operate all MOH hospitals, is a monumental step towards creating a more corporate, efficient, and accountable public health provider [9]. This move is expected to attract foreign direct investment and foster competition. The private sector is responding; the market is witnessing significant growth, with projections estimating it will reach a value of \$50 billion by

2030, up from approximately \$36 billion in 2021 [10]. Looking ahead, the future of Saudi healthcare is being shaped by cutting-edge trends. Artificial Intelligence (AI) is being leveraged for predictive analytics in disease outbreaks and personalized treatment plans. Robotics are increasingly used in complex surgeries, and genomics is paving the way for personalized medicine initiatives aligned with the national genomics strategy [11]. Moreover, a fundamental reorientation towards a "**Value-Based Care**" model is underway, shifting the focus from the volume of services provided to the quality of health outcomes achieved, incentivizing prevention and chronic disease management [12]. In conclusion, the evolution of healthcare in Saudi Arabia is a dynamic and ongoing process. From its humble beginnings to its current state of ambitious reform, the Kingdom is demonstrating a strong commitment to building a resilient, sustainable, and patient-centric health system. This paper will delve deeper into each phase of this evolution, critically examine the drivers and challenges of the current transformation agenda, and explore the future trends that will define the next chapter of Saudi healthcare, ultimately assessing its potential to serve as a model for health system reform in the region and beyond.

2. The Foundation: From Rudimentary Clinics to a National Health System (1925-1990)

The narrative of modern healthcare in Saudi Arabia is one of remarkable transformation, evolving from a system of extreme scarcity to an extensive, government-led network. This foundational period, spanning from the mid-1920s to the late 20th century, was characterized by the centralization of health authority, massive infrastructure development, and a primary focus on combating communicable diseases. The driving force behind this expansion was the nation's burgeoning oil wealth, which provided the financial capacity for the state to build a public health system virtually from the ground up. The genesis of a structured health service in the newly formed Kingdom of Saudi Arabia can be traced to 1925, with the establishment of the first 'Health Directorate.' Prior to this, formal medical care was virtually non-existent for the vast majority of the population, with traditional medicine and a handful of missionary clinics serving limited needs. The Health Directorate's initial purview was manageably small, overseeing only a few dispensaries and small hospitals in major urban centers like Jeddah, Makkah, and Al-Ahsa [13]. These facilities were rudimentary, lacking in specialized equipment and

staffed primarily by expatriate doctors. The scale of the public health challenge was immense; diseases such as malaria, smallpox, trachoma, and tuberculosis were endemic, and infant mortality rates were exceedingly high. The primary objective of this era was not sophisticated medical care but basic disease control and the provision of any form of accessible, modern medical attention to the populace. A pivotal moment in the institutionalization of Saudi healthcare came in 1951 with the royal decree to replace the Health Directorate with the **Ministry of Health (MOH)**. This act represented a profound commitment by the state to assume formal responsibility for the health of its citizens. The creation of the MOH centralized all health planning, budgeting, and service delivery under a single, powerful entity, marking the beginning of the government's role as the primary provider and regulator of healthcare [14]. The timing was strategic, coinciding with the rapid increase in oil revenues, which provided the necessary capital to fund an ambitious expansion plan. The MOH's initial strategy was two-pronged: firstly, to construct a physical network of hospitals and primary health care centers across the kingdom's vast territory, and secondly, to launch public health campaigns targeting the most prevalent infectious diseases. The following decades, particularly the 1970s and 1980s, witnessed an unprecedented building boom in health infrastructure. The government launched a series of ambitious five-year development plans, each allocating substantial resources to the health sector. The number of MOH-operated hospitals, a key indicator of system capacity, saw a dramatic rise. From a base of just 74 hospitals in 1975, the network expanded to over 290 hospitals by the end of the 1990s [15]. Simultaneously, the number of primary health care centers (PHCCs) grew exponentially, from a few hundred to over 3,800, strategically placed to provide basic curative and preventive services to even the most remote communities [16]. This physical expansion was crucial in improving geographical access to care, a significant achievement given the country's challenging terrain and dispersed population. Parallel to infrastructure development was the critical, though complex, task of building a national workforce. In the foundational years, the Saudi healthcare system was almost entirely dependent on expatriate medical professionals—doctors, nurses, and technicians—recruited from across the Arab world, Southeast Asia, and Europe. To address this long-term vulnerability, the government made strategic investments in medical education. The establishment of the King Saud University College of Medicine in 1967 was a

landmark event, creating the first domestic pipeline for training Saudi physicians [17]. This was followed by the creation of numerous other medical colleges and nursing schools across the kingdom. However, the "Saudiization" of the health workforce was a slow process, and the reliance on foreign expertise remained a defining feature of the system throughout this period. The public health initiatives undertaken during this era were remarkably successful in altering the nation's epidemiological landscape. The MOH, often in collaboration with international bodies like the World Health Organization (WHO), launched aggressive nationwide vaccination campaigns. The smallpox eradication campaign was a resounding success, with the last endemic case reported in the 1970s. Similarly, widespread immunization against polio, measles, and diphtheria drastically reduced the incidence of these childhood diseases [18]. Malaria control programs, which involved spraying insecticides and managing breeding sites, significantly reduced the transmission of the disease in endemic regions. These public health victories directly contributed to a steep decline in mortality rates. The infant mortality rate, a critical indicator of population health, fell dramatically from an estimated 150-200 deaths per 1,000 live births in the 1960s to below 40 by the early 1990s [19]. Life expectancy at birth correspondingly rose, reflecting the overall improvement in the population's health status. By the close of the 1990s, the Kingdom had successfully established a extensive, tax-funded healthcare system that provided free services at the point of care for its citizens. The MOH was the undisputed cornerstone, operating the vast majority of hospitals and PHCCs. This model ensured broad, equitable access and made significant strides in controlling the infectious disease burden that had plagued the nation for generations. However, this very success laid the groundwork for future challenges. The system was fundamentally **provider-centric and curative in its orientation**. It was designed to treat illness rather than promote wellness. This focus, combined with a rapidly growing and urbanizing population, began to reveal systemic inefficiencies, including long waiting times for non-emergency services, overcrowding in major hospitals, and a lack of emphasis on preventive care. Furthermore, the seeds of a new health crisis were being sown; as lifestyles changed, the prevalence of non-communicable diseases like diabetes and hypertension began to rise, posing a threat that the existing system was not designed to manage effectively [20]. Thus, the very achievements of this foundational period created the imperative for the next great evolution of Saudi healthcare.

3. The Imperative for Change: Demographic Shifts and the Rising Burden of Disease

The most significant driver of this new pressure was the dramatic demographic transformation of the Saudi population. Decades of improved public health, leading to plummeting infant mortality and rising life expectancy, resulted in a population boom. From a population of around 6 million in 1970, the Kingdom grew to over 27 million citizens and expatriates by 2010 [21]. More critically than the sheer numbers was the age structure. Saudi Arabia has one of the youngest populations in the world; recent estimates indicate that over 58% of the Saudi national population is under the age of 30 [22]. This "youth bulge" represents a long-term demographic dividend but also poses an immense challenge for a healthcare system. A young population requires extensive maternal and child health services, vaccinations, and eventually, as it ages, a surge in demand for adult and geriatric care. The existing infrastructure, despite its rapid expansion, struggled to keep pace with this relentless demographic momentum, leading to overcrowding in clinics and long waiting times for specialized services. Simultaneously, the country underwent a rapid and severe epidemiological transition. As infectious diseases were brought under control, NCDs—also known as lifestyle diseases—surged to the forefront of the nation's health concerns. This shift was fueled by sweeping socioeconomic changes: rapid urbanization, increased sedentary behavior, dietary shifts towards processed and high-calorie foods, and high rates of tobacco consumption. The prevalence of NCDs in Saudi Arabia reached alarming levels, creating a public health crisis. According to the Saudi Health Interview Survey, the national prevalence of diabetes mellitus among adults is estimated at 18.3%, one of the highest in the world, with a further 40% of the adult population classified as pre-diabetic [23]. Hypertension affects approximately 25.5% of adults, and obesity, a major risk factor for numerous other conditions, is a staggering 35.6% among the adult population, with a higher prevalence among women [24]. Cardiovascular diseases, propelled by these risk factors, became the leading cause of death in the country, accounting for over 40% of all mortality [25]. The convergence of a young, growing population and a high prevalence of NCDs created a perfect storm for the healthcare system. NCDs are characterized by their chronic nature, requiring long-term, continuous, and often complex management rather than the episodic, acute care that the existing system was built to provide. The model of large, central hospitals was inefficient and

costly for managing conditions like diabetes and hypertension, which are best controlled through consistent primary care, patient education, and preventive measures. The system's hospital-centric focus meant that patients with chronic conditions often had no choice but to seek care in emergency departments or specialist clinics for routine management, leading to inappropriate use of high-cost resources and overwhelming tertiary care facilities. A study on healthcare utilization found that a significant proportion of visits to tertiary hospital outpatient clinics were for follow-ups of chronic conditions that could have been effectively managed in a well-organized primary care setting [26]. Furthermore, the economic burden of this new disease profile became unsustainable. The direct costs of treating complications from diabetes alone—including cardiovascular events, renal failure, and lower-limb amputations—placed an enormous strain on the national budget. Indirect costs, such as lost productivity due to disability and premature death, further hampered economic development. The World Economic Forum has consistently highlighted that NCDs pose a significant threat to the economies of the Gulf Cooperation Council (GCC) countries, with Saudi Arabia being particularly vulnerable due to the scale of the problem [27]. The tax-funded, free-at-the-point-of-service model, while equitable, showed signs of severe financial stress, with escalating expenditures that were projected to become unmanageable without a fundamental restructuring of the financing and delivery of care. Public expectations were also evolving. An increasingly educated and connected populace, with access to global information, began demanding higher standards of care, better patient experiences, shorter waiting times, and more personalized services. The old model, often criticized for its bureaucratic inefficiencies and impersonal nature, was no longer meeting the expectations of a modern Saudi society. Patient satisfaction surveys conducted in the early 2010s frequently highlighted issues such as long waiting times, brief consultation periods, and a lack of continuity of care [28]. This growing public dissatisfaction added a social and political dimension to the technical and economic arguments for reform.

4. Vision 2030 as a Catalyst: The Health Sector Transformation Program

The HSTP is built upon a clear and ambitious set of strategic objectives that directly address the weaknesses of the old system. Its primary goals, as formally outlined in its official documentation, are to improve access to healthcare services, enhance

the quality and efficiency of care, and promote disease prevention and health promotion. A central and quantifiable target is to increase the private sector's contribution to healthcare spending from approximately 25% to 35% by 2030, a move designed to reduce the financial burden on the government, foster competition, and drive innovation [31]. To achieve this, the program is structured around four interconnected pillars: enhancing the governance and financing of the health sector, privatizing and corporatizing health services, advancing digital health, and strengthening public health and preventive care. This multi-pronged approach ensures that reform is not isolated but systemic, touching every facet of the healthcare value chain. A foundational element of the new governance structure is the strategic separation of the government's roles. Under the HSTP, the Ministry of Health (MOH) has been transformed from the primary provider of healthcare into a robust *regulator* and *strategic planner* for the entire sector. This allows the MOH to focus on setting national health policies, regulating service quality and safety, and monitoring population health outcomes. The task of service provision is being systematically transferred to new, more agile entities. The most significant of these is the **Saudi Company for Health Services (SCFHS)**, often referred to as "Seha," which was established to manage, operate, and invest in the assets and hospitals previously under the MOH's direct control [32]. This corporatization model is designed to inject corporate discipline, operational efficiency, and financial accountability into public health services, preparing them to compete in a future market-oriented environment. Complementing this new provider landscape is a revolutionary change in healthcare financing through the rollout of the **New Model of Care** and the **Strategic Purchasing** function. The New Model of Care shifts the focus from hospital-based, reactive treatment to a patient-centric, preventive, and primary care-led system. It emphasizes integrated care pathways, where patients are managed at the most appropriate level of care, reducing unnecessary referrals to expensive tertiary hospitals [33]. To financially enable this shift, the Council of Health Insurance (CHI) has been expanded and empowered to become the national strategic purchaser for citizens' healthcare services. Instead of a blanket budget allocation to the MOH, the CHI will act as a single payer, purchasing services from both public (like the SCFHS) and private providers based on performance and predefined care packages [34]. This "purchaser-provider split" is a powerful mechanism to drive efficiency, as providers are incentivized to compete

on quality and cost to secure funding. The digital transformation of healthcare, accelerated by the HSTP, is perhaps the most visible and impactful change for the average citizen. The **National Health Information Center (NHIC)** is spearheading the creation of a unified digital ecosystem. A cornerstone of this is the **National Platform for Health and Insurance Exchange Services (NPHIES)**, which serves as the national electronic health record (EHR). NPHIES aims to create a seamless, interconnected network where a patient's medical history, lab results, and prescriptions are accessible to authorized providers across the kingdom, eliminating duplication of tests and improving clinical decision-making [35]. Furthermore, the **Seha Virtual Hospital**, launched in 2022, has become a global benchmark for telemedicine. By connecting over 130 hospitals to a central hub of specialists, it provides virtual clinics, e-ICUs, and teleradiology services, dramatically improving access to expert care for populations in remote regions and reducing the need for costly and inconvenient patient transfers [36]. The program's impact is already being measured through key performance indicators (KPIs) that reflect its new priorities. These include metrics such as increasing the proportion of citizens covered by a comprehensive health plan, reducing waiting times for appointments in specialized clinics, increasing the life expectancy of the Saudi population, and boosting the utilization of digital health channels [37]. Early results are promising. For instance, the **Mawid** application, the centralized appointment-booking service, has successfully booked tens of millions of appointments, significantly reducing the average waiting time for a primary care visit in many regions [38]. However, a transformation of this scale is not without its challenges. The transition requires a massive cultural and operational shift for hundreds of thousands of healthcare workers. Resistance to change, the need for extensive retraining, and the development of new managerial competencies within the corporatized entities are significant hurdles. Furthermore, ensuring a smooth and equitable transition across all regions, particularly remote ones, is critical to avoid creating a two-tiered system [39]. Regulating a newly dynamic and competitive market to prevent cost inflation and ensure quality standards will also test the nascent regulatory capacity of the MOH and CHI.

5. The Digital Revolution: Telemedicine, EHRs, and Connected Care

The cornerstone of this digital ecosystem is the development of a unified health information

infrastructure, designed to break down the "silos of information" that have long plagued the system. The centerpiece of this effort is the **National Platform for Health and Insurance Exchange Services (NPHIES)**, managed by the National Health Information Center (NHIC). NPHIES functions as the national electronic health record (EHR) and health information exchange (HIE) platform. Its primary objective is to create a single, comprehensive, and longitudinal health record for every citizen and resident, accessible to authorized healthcare providers across the public and private sectors [41]. The implementation of NPHIES is a monumental undertaking, involving the integration of data from hundreds of previously disconnected MOH hospitals, private healthcare facilities, and reference laboratories. The benefits are transformative: it eliminates the duplication of diagnostic tests, provides clinicians with a complete medical history at the point of care, reduces medication errors, and enables a seamless patient journey across different levels of the health system. By 2023, NPHIES had already begun processing millions of digital transactions, forming the critical "digital backbone" for the entire sector [42]. Building upon this foundational data layer are the digital front-end services that directly interact with citizens. The **Mawid** application, a centralized, government-run appointment system, has been a resounding success in streamlining access to primary care. By allowing users to book, reschedule, and manage their appointments at primary healthcare centers across the Kingdom through a single portal, Mawid has dramatically reduced the administrative burden on clinics and eliminated the need for patients to physically queue for appointments. To date, the platform has successfully booked over 50 million appointments, significantly reducing average waiting times and enhancing patient satisfaction by providing predictability and convenience [43]. Complementing Mawid is the **Sehhaty** application, which has evolved into a comprehensive personal health manager. Beyond appointment booking, Sehhaty provides users with access to their personal health records, vaccination certificates, prescription renewals, and telemedicine services, empowering individuals to take an active role in managing their health [44]. The widespread adoption of these applications, especially during the COVID-19 pandemic, accelerated the public's acceptance of digital health tools and demonstrated the government's capacity for agile, large-scale digital service delivery. The most ambitious and globally recognized symbol of Saudi Arabia's digital health ambition is the **Seha Virtual Hospital**. Launched in 2022 and acclaimed as the world's largest virtual

hospital, it represents a paradigm shift in specialist care delivery. Seha Virtual Hospital is not a physical building but a central command hub that connects over 130 smaller and remote hospitals to a centralized pool of more than 300 specialists across 35 medical specialties [45]. Through its sophisticated telemedicine infrastructure, it offers a wide array of services, including virtual clinics, e-consultations, teleradiology, tele-stroke, and remote intensive care unit (e-ICU) monitoring. This model is particularly transformative for the Kingdom's rural and remote populations. A patient in a rural clinic can now receive a real-time consultation from a top specialist in Riyadh without enduring the cost and hardship of travel. The hospital's tele-stroke program, for instance, uses video conferencing and neuro-imaging sharing to allow neurologists to guide local physicians in administering time-sensitive thrombolytic therapy, drastically improving outcomes for stroke patients in underserved areas [46]. This not only enhances equity of access but also optimizes the national specialist workforce, allowing their expertise to be leveraged across a much wider patient base. Beyond direct patient care, the digital revolution is fueling a new era of data-driven public health and clinical research. The vast, standardized datasets flowing through NPHIES and other digital platforms are a treasure trove for epidemiologists and health policymakers. Advanced analytics and artificial intelligence (AI) can be applied to this data to identify disease outbreaks in real-time, track the prevalence of non-communicable diseases (NCDs), and evaluate the effectiveness of public health interventions on a national scale [47]. For clinical research, this infrastructure facilitates the creation of large-scale biobanks and genomic databases, such as those linked to the Saudi Human Genome Program. Researchers can now analyze de-identified data from millions of patients to identify genetic markers for diseases prevalent in the Saudi population, paving the way for personalized medicine and the development of tailored treatment protocols [48]. Despite the remarkable progress, the digital transformation journey faces significant challenges. Data security and patient privacy are paramount concerns in a centralized system holding the sensitive health information of an entire nation. The NHIC has implemented rigorous cybersecurity protocols and data governance frameworks, but the risk of breaches remains a constant threat requiring ongoing vigilance [49]. Furthermore, the "digital divide" must be addressed; ensuring that elderly, low-income, and less technologically literate populations are not left behind is crucial for equitable healthcare. Continuous user education and the provision of alternative access channels are

essential components of a successful strategy. Finally, the interoperability of systems remains a complex technical challenge. Ensuring that all private and public providers, each with their own legacy health information systems, can seamlessly connect to NPHIES requires sustained technical effort and stringent adherence to national data standards [50].

6. Conclusion

The journey of healthcare services in Saudi Arabia represents a remarkable and ambitious evolution, transitioning from a rudimentary, clinic-based system into a sophisticated, technology-driven model poised for a future of personalized and predictive medicine. This paper has traced this transformative path, highlighting the critical junctures that have defined the sector's development. The foundational era, spanning much of the 20th century, successfully established a nationwide network of public health infrastructure, which effectively controlled communicable diseases and laid the groundwork for universal access. However, the successes of this period inadvertently gave rise to new challenges, including a rapidly growing youth population and an overwhelming surge in non-communicable diseases (NCDs), which exposed the limitations of the curative, hospital-centric model and created an undeniable imperative for change. The launch of Saudi Vision 2030 and its cornerstone, the Health Sector Transformation Program (HSTP), marked a paradigm shift. This strategic blueprint has catalyzed a comprehensive restructuring of the entire healthcare ecosystem. The government's role has been strategically redefined from a primary provider to a powerful regulator and planner, while the corporatization of services under the Saudi Company for Health Services (SCFHS) and the push for privatization aim to inject efficiency and competition into the market. Concurrently, the digital revolution has been the most visible agent of change. The implementation of the National Platform for Health and Insurance Exchange Services (NPHIES), the Seha Virtual Hospital, and citizen-centric applications like Mawid and Sehhaty are not merely technological upgrades but fundamental re-engineerings of care delivery. These innovations are enhancing access, breaking down information silos, and paving the way for a data-driven health system. Looking ahead, the future of Saudi healthcare will be shaped by the continued maturation of these initiatives and the adoption of frontier technologies. The integration of Artificial Intelligence (AI) for diagnostics and predictive analytics, the advancement of genomics through the

Saudi Human Genome Program, and the full transition to a value-based care model represent the next frontier. These trends promise a shift from a one-size-fits-all approach to a more personalized, preventive, and proactive system.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. Almutairi, A., Saha, C., Alhuqbani, W., Alhuqbani, M. N., Alqahtani, M. N., Abogosh, A. K., Alsedrah, A. M., Alhindi, A. H., Alfehaid, R. H., & Al-omari, A. (2023). Utilization of telemedicine during COVID-19 in Saudi Arabia: A multicenter study. *Cureus*, 15, e41541.
2. Alkhamis, A., & Miraj, S. A. (2020). Access to health care in Saudi Arabia: Development in the context of vision 2030. In Laher I. (Ed.), *Handbook of healthcare in the Arab world* (pp. 1–34). Springer International Publishing.
3. Alkhamis, A. A. (2017). Critical analysis and review of the literature on healthcare privatization and its association with access to medical care in Saudi arabia. *Journal of Infection and Public Health*, 10(3), 258–268.
4. Kruse, C. S., Kristof, C., Jones, B., Mitchell, E., & Martinez, A. (2016). Barriers to electronic health record adoption: A systematic literature review. *Journal of Medical Systems*, 40(12), 252.
5. Alzeidan, R., Rabiee, F., Mandil, A., Hersi, A., & Fayed, A. (2016). Non-Communicable disease risk factors among employees and their families of a Saudi university: An epidemiological study. *PLoS One*, 11(11), e0165036.
6. Rahman, R., & Alsharqi, O. Z. (2019). What drove the health system reforms in the Kingdom of Saudi Arabia? An analysis. *The International Journal of Health Planning and Management*, 34(1), 100–110.
7. Alshammery, S., Altamimi, I., Alhuqbani, M., Alhumimidi, A., Baaboud, A., & Altamimi, A. (2024). Palliative care in Saudi Arabia: An updated assessment following the national vision 2030 reforms. *Journal of Palliative Medicine*, 27(5), 651–657.
8. Alqahtani, N. M., Alqahtani, A. M. M., Alqahtani, H. M. S., Jathmi, A. Y. J., Alqahtani, B. M. S., Alshehri, A. A., & Alqahtani, A. M. A. (2022). Physicians' knowledge and practice of nutrition education in health care centers of Saudi Arabia: Systematic review. *Archives of Pharmacy Practice*, 13(4), 30–34.
9. Alkhamis, A., Hassan, A., & Cosgrove, P. (2014). Financing healthcare in gulf cooperation council countries: A focus on Saudi Arabia. *The International Journal of Health Planning and Management*, 29(1), e64–e82.
10. Alotaibi, A., Saleh, W., Abdulbaqi, A., & Alosaimi, M. (2022). Health research priority agenda for ministry of health, kingdom of Saudi Arabia from 2020 to 2025. *Journal of Epidemiology and Global Health*, 12(4), 413–429.
11. El Mahalli, A., El-Khafif, S. H., & Yamani, W. (2016). Assessment of pharmacy information system performance in three hospitals in Eastern Province, Saudi Arabia. *Perspectives in Health Information Management/Ahima, American Health Information Management Association*, 13, 1b.
12. Memish, Z. A., Jaber, S., Mokdad, A. H., AlMazroa, M. A., Murray, C. J. L., & Al Rabeeah, A. A. (2014). Burden of disease, injuries, and risk factors in the Kingdom of Saudi Arabia, 1990–2010. *Preventing Chronic Disease*, 11, E169.
13. Almatrudi, T. A., & Rabbani, U. (2022). Awareness, attitude, and practice of evidence-based medicine among primary healthcare physicians in Buraidah, Saudi Arabia. *Journal of Family Medicine and Primary Care*, 11(9), 5457–5463.
14. Jha, A. K., DesRoches, C. M., Campbell, E. G., Donelan, K., Rao, S. R., Ferris, T. G., Shields, A., Rosenbaum, S., & Blumenthal, D. (2009). Use of electronic health records in U.S. hospitals. *New England Journal of Medicine*, 360(16), 1628–1638.
15. Alonazi, W. B. (2017). Exploring shared risks through public-private partnerships in public health programs: A mixed method. *BMC Public Health*, 17(1), 571.
16. Khalil, M. K. M., Al-Eidi, S., Al-Qaed, M., & AlSanad, S. (2018). The future of integrative health and medicine in Saudi Arabia. *Integrative Medicine Research*, 7(4), 316–321.
17. Saeed, A., Bin Saeed, A., & AlAhmri, F. A. (2023). Saudi Arabia health systems: Challenging and future transformations with artificial intelligence. *Cureus*, 15, e37826.
18. Smith, A. C., Thomas, E., Snoswell, C. L., Haydon, H., Mehrotra, A., Clemensen, J., & Caffery, L. J. (2020). Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19). *Journal of Telemedicine and Telecare*, 26(5), 309–313.

19. Sebai, Z. A., Milaat, W. A., & Al-Zulaibani, A. A. (2001). Health care services in Saudi arabia: Past, present and future. *Journal of Family and Community Medicine*, 8(3), 19–23.
20. Althumairi, A. A., Bukhari, F. M., Awary, L. B., & Aljabri, D. (2023). The effect of transformation policies on healthcare providers' satisfaction in primary healthcare centers: The case of Eastern Saudi Arabia. *BMC Health Services Research*, 23(1), 1328.
21. Almodhen, F., & Moneir, W. M. (2023). Toward a financially sustainable healthcare system in Saudi Arabia. *Cureus*, 15, e46781.
22. Rathert, C., Wyrwich, M. D., & Boren, S. A. (2013). Patient-centered care and outcomes: A systematic review of the literature. *Medical Care Research and Review*, 70(4), 351–379.
23. Elenkov, D., Judge, W., & Wright, P. (2005). Strategic leadership and executive innovation influence: An international multi-cluster comparative study. *Strategic Management Journal*, 26(7), 665–682.
24. Young, Y., Alharthy, A., & Hosler, A. S. (2021). Transformation of Saudi Arabia's health system and its impact on population health: What can the USA learn? *Saudi Journal of Health Systems Research*, 1(3), 93–102.
25. Hollander, J. E., & Carr, B. G. (2020). Virtually perfect? Telemedicine for Covid-19. *New England Journal of Medicine*, 382(18), 1679–1681.
26. Alsaadi, S. M. (2022). Beliefs, attitudes, and behaviors of Saudi physiotherapists toward evidence-based practice: A multicenter, cross-sectional study. *Saudi Journal of Medicine & Medical Sciences*, 10(3), 227–235.
27. Perednia, D. A., & Allen, A. (1995). Telemedicine technology and clinical applications. *JAMA*, 273(6), 483–488.
28. Memish, Z. A., Altuwaijri, M. M., Almoeen, A. H., & Enani, S. M. (2021). The Saudi Data & Artificial Intelligence Authority (SDAIA) vision: Leading the Kingdom's journey toward global leadership. *Journal of Epidemiology and Global Health*, 11(2), 140–142.
29. Joshi, J. B. D., Bertino, E., & Ghafoor, A. (2002, August 26–29). Hybrid role hierarchy for generalized temporal role based access control model. *Proceedings 26th Annual International computer software and applications*.
30. Sweileh, W. M. (2017). Global research trends of world health organization's top eight emerging pathogens. *Globalization and Health*, 13(1), 9.
31. El-Mahalli, A. A., El-Khafif, S. H., & Al-Qahtani, M. F. (2012). Successes and challenges in the implementation and application of telemedicine in the Eastern Province of Saudi Arabia. *Perspectives in Health Information Management/Ahima, American Health Information Management Association*, 9, 1–27.
32. Zolnieriek, K. B., & Dimatteo, M. R. (2009). Physician communication and patient adherence to treatment: A meta-analysis. *Medical Care*, 47(8), 826–834.
33. Rahman, R., & Qattan, A. (2021). Vision 2030 and sustainable development: State capacity to revitalize the healthcare system in Saudi Arabia. *Inquiry*, 58, 46958020984682.
34. Pastorino, R., De Vito, C., Migliara, G., Glocker, K., Binenbaum, I., Ricciardi, W., & Boccia, S. (2019). Benefits and challenges of Big Data in healthcare: An overview of the European initiatives. *European Journal of Public Health*, 29(Supplement_3), 23–27.
35. Al Khashan, H., Abogazalah, F., Alomary, S., Nahhas, M., Alwadey, A., Al-Khudhair, B., Alamri, F., Aleisa, N., Mahmoud, N., & Hassanein, M. (2021). Primary health care reform in Saudi Arabia: Progress, challenges and prospects. *Eastern Mediterranean Health Journal*, 27(10), 1016–1026.
36. Faiman, B., & Tariman, J. D. (2019). Shared decision making: Improving patient outcomes by understanding the benefits of and barriers to effective communication. *Clinical Journal of Oncology Nursing*, 23(5), 540–542.
37. Riley, A. J., AlShammari, S. A., Abuzied, Y., Al-Amer, R., Bin-Hussain, I., Alwaalah, M., Alshammari, K., & AlQumaizi, K. I. (2023). Accelerated transformation programme for healthcare services: Structure, function and the lessons learnt. *BMJ Leader*, leader-2023-000851.
38. Khan, M. B., & Iqbal, S. (2020). Vision 2030 and the national transformation program. In Khan M. K. & Khan M. B. (Eds.), *Research, innovation and entrepreneurship in Saudi Arabia* (pp. 146–166). Routledge.
39. Turja, T., Van Aerschot, L., Särkikoski, T., Särkikoski, T., & Oksanen, A. (2018). Finnish healthcare professionals' attitudes towards robots: Reflections on a population sample. *Nursing Open*, 5(3), 300–309.
40. David, G., Saynisch, P. A., & Smith-McLallen, A. (2018). The economics of patient-centered care. *Journal of Health Economics*, 59, 60–77.
41. Lruwaili, A., Thirunavukkarasu, A., Alsaidan, A. A., AL-Ruwaili, A. M., Alanazi, R. B. S., Alruwaili, A. M. B., Alruwaili, A. O., & Altaymani, A. M. (2022). Knowledge, attitude, and practice towards evidence-based medicine among northern Saudi primary care physicians: A cross-sectional study. *Healthcare*, 10, 2285.
42. Mohammed Basheeruddin Asdaq, S., A.S, A., Imran, M., Sreeharsha, N., & Sultana, R. (2021). Knowledge, attitude and practices of healthcare professionals of Riyadh, Saudi Arabia towards covid-19: A cross-sectional study. *Saudi Journal of Biological Sciences*, 28(9), 5275–5282.
43. Yousef, L., AlAngari, D., AlShehri, R., AlSharif, B., Bayameen, O., & Alnemer, Z. (2023). Healthcare transformation journey in the Eastern Region of Saudi Arabia: An overview, challenges and lessons learned. *Journal of Medicine and Life*, 16(4), 583–592.
44. Neve, G., Fyfe, M., Hayhoe, B., & Kumar, S. (2020). Digital health in primary care: Risks and recommendations. *British Journal of General Practice*, 70(701), 609–610.

45. Eisenbeiss, S. A., van Knippenberg, D., & Boerner, S. (2008). Transformational leadership and team innovation: Integrating team climate principles. *Journal of Applied Psychology*, 93(6), 1438–1446.
46. Belrhiti, Z., Nebot Giral, A., & Marchal, B. (2018). Complex leadership in healthcare: A scoping review. *International Journal of Health Policy and Management*, 7(12), 1073–1084.
47. Saudi Arabia Vision 2030 Secretariat . (2024). Saudi Vision 2030. Retrieved January 18, 2024, from <https://www.vision2030.gov.sa/en/annual-reports>
48. Bah, S., Almutawa, H. H., Alassaf, N. F., Al Hareky, M. S., Hashishi, A. S. M., Alkhater, Z. J. H., & Ajaimi, J. A. M. (2015). Pilot study of reimbursement practices in private healthcare centers in the eastern province of Saudi arabia: To what extent do they meet international best practices? *Perspectives in Health Information Management/Ahima, American Health Information Management Association*, 12, 1b.
49. Hu, V. C., & Scarfone, K. (2012). Guidelines for access control system evaluation metrics. National Institute of Standards and Technology. <https://nvlpubs.nist.gov/nistpubs/ir/2012/NIST.IR.7874.pdf>
50. Chowdhury, S., Mok, D., & Leenen, L. (2021). Transformation of health care and the new model of care in Saudi Arabia: Kingdom's Vision 2030. *Journal of Medicine and Life*, 14(3), 347–354.