

Patient Flow And Waiting Time Management In Saudi Arabia

Alaa Saloum Aldabass¹, Mashael Hameed Alanazi², Muataz Saloum Aldabas³, Aljawharah Saleh Almajid⁴

¹Email: Alaaaldebase@gmail.com

²Email: Somty1412@gmail.com

³Email: Muatazaldabas@gmail.com

⁴Email: ialjawharah@gmail.com

Abstract

Background: Despite significant investments under Saudi Vision 2030, long waiting times and overcrowding in outpatient clinics and emergency departments (EDs) remain critical challenges, impacting patient satisfaction, clinical outcomes, and operational efficiency. This study provides a comprehensive analysis of the root causes of these patient flow issues and evaluates the effectiveness of current and proposed solutions.

Methods: A systematic review of academic literature, government reports, and industry analyses published between 2014 and 2025 was conducted. Data on waiting times, patient satisfaction rates, and healthcare system performance were synthesized and thematically analyzed to identify key challenges and opportunities.

Results: The primary causes of patient flow bottlenecks include infrastructural deficiencies, workforce shortages, process inefficiencies, and high patient demand for non-urgent care in EDs. While national initiatives like the 'Ada'a' program have shown success in reducing elective surgery waits, significant regional disparities and operational gaps persist. Digital solutions, particularly telehealth and AI-driven predictive analytics, demonstrate high potential for optimizing patient flow, with patient satisfaction for digital services exceeding 94% in some studies.

Conclusion: A multi-pronged strategy is essential. Recommendations include enforcing national interoperability standards for digital health, implementing data-driven workforce planning with incentives for underserved areas, standardizing process re-engineering models like case management, and strengthening the primary care system to manage demand effectively.

Keywords: Patient Flow, Waiting Time, Patient Satisfaction, Healthcare Management, Digital Health, Artificial Intelligence, Saudi Vision 2030.

1. Introduction: Background

The Saudi Vision 2030 and Health Sector Transformation

Saudi Arabia's Vision 2030 is a transformative national initiative aimed at diversifying the economy and modernizing public services, with healthcare transformation as a core objective (Al-Anezi et al., 2025). The Health Sector Transformation Program, a key part of this vision, aims to restructure the sector to become a comprehensive, effective, and integrated health system (Vision 2030, n.d.).

Key goals of the transformation include:

- **Improving Quality and Efficiency:** Enhancing the quality and efficiency of healthcare services to meet the population's expectations and achieve better health outcomes (Vision 2030 Delivery Plan, n.d.).
- **Enhancing Access to Services:** Easing access to healthcare services through a model of care that prioritizes prevention, digital health, and equitable distribution (Vision 2030, n.d.).
- **Promoting Public Health and Prevention:** Strengthening prevention against health threats and shifting focus from hospital-based systems to integrated, preventive care models (Burjeel Holdings, 2025; Vision 2030 Delivery Plan, n.d.).
- **Digitalization:** Leveraging digital transformation to create a seamless, interconnected healthcare experience for beneficiaries, including the use of unified digital medical records for 100% of the population (RMG, 2025; Vision 2030, n.d.).

This ambitious reform has led to significant investments in infrastructure, technology, and workforce development, setting the stage for a paradigm shift in how healthcare is delivered and managed across the Kingdom (Discover Medics, 2022; Alriyadh, 2025).

1. Introduction: Problem Statement

The Persistent Challenge of Waiting Times and Overcrowding

Despite significant investments and reforms, long waiting times and overcrowding in outpatient clinics and Emergency Departments (EDs) remain a critical challenge for the Saudi healthcare system (Al-Harajin et al., 2019; Alriyadh, n.d.).

- **Emergency Departments (EDs):** EDs are often described as the "mirror" of a hospital, reflecting the true level of medical services (Alyaum, 2015). Overcrowding in EDs is an international crisis that leads to delays in treatment, increased risk of adverse events, and patient harm (IHI, 2022; Dovepress, 2021). In Saudi Arabia, this is exacerbated by the misuse of EDs for non-urgent ("cold") cases, which is estimated to be as high as 70% of visits in some hospitals (Akhbarna.net, n.d.; Alriyadh, 2013).
- **Outpatient Clinics:** Patients often face lengthy waits for appointments, sometimes extending for months, and further long waits on the day of the appointment (Albiladdaily, 2019). This issue is a primary source of patient frustration and dissatisfaction (Alrasheedi et al., 2019).

These issues are not isolated to specific departments but are a "whole-of-hospital" problem, often stemming from bottlenecks in inpatient capacity, inefficient patient flow, and systemic resource misallocation (IHI, n.d.). The problem directly impacts patient satisfaction, safety, and the overall efficiency of the healthcare system, creating a barrier to achieving the core objectives of Vision 2030 (Al-Anezi et al., 2025; Al-Harajin et al., 2019).

1. Introduction: Significance of the Study

Patient waiting time is a critical indicator of healthcare quality and efficiency. Its impact extends across multiple domains:

Impact on Patient Satisfaction & Experience

- There is a well-documented inverse relationship between waiting time and patient satisfaction (Al-Harajin et al., 2019; Alrasheedi et al., 2019).
- Long waits are a primary reason for patient dissatisfaction, potentially leading to a loss of trust and patronage in a competitive healthcare system (Alrasheedi et al., 2019).
- The Ministry of Health's Patient Experience Measurement Program (PXMP) identifies waiting times as a key area for improvement to enhance overall patient satisfaction (MoH, 2024).

Impact on Clinical Outcomes & Patient Safety

- ED overcrowding and delays are linked to significant patient harm, including increased mortality and preventable adverse events (IHI, 2022).
- Long waiting times can disrupt the continuity of care and negatively impact patient outcomes (Alrasheedi et al., 2019).
- Diagnostic errors, the most frequently reported safety problem by patients in KSA primary care (26.7%), can be exacerbated by high patient volumes and time pressures in crowded facilities (Alasqah et al., 2023).

Impact on System Efficiency & Cost

- Inefficient patient flow leads to wasted resources, increased operational costs, and a higher burden on healthcare staff (Al Harbi, 2024; Alrasheedi et al., 2019).
- Addressing these inefficiencies is crucial for the financial sustainability of the healthcare system, a key challenge identified under Vision 2030 (Al-Anezi et al., 2025).

This research provides an evidence-based analysis of the problem's root causes and evaluates proposed solutions, offering actionable recommendations for policymakers and healthcare administrators to align with Vision 2030's goals.

1. Introduction: Research Objectives & Questions

Primary Objective

To comprehensively analyze the systemic challenges of patient flow management in outpatient clinics and emergency departments within the Kingdom of Saudi Arabia, and to evaluate the effectiveness and feasibility of proposed solutions, particularly those driven by digital transformation, in alignment with Vision 2030.

Specific Objectives

1. To identify and categorize the root causes of long waiting times and overcrowding in Saudi healthcare facilities.
2. To quantify current waiting times across different healthcare settings (PHC, ED, Outpatient) and regions in KSA, and analyze their impact on patient satisfaction.
3. To review and assess the national strategies and institutional initiatives currently being implemented to address these challenges.
4. To evaluate the potential of technology-driven solutions (e.g., AI, Telehealth, Digital Management Systems) in optimizing patient flow.
5. To formulate evidence-based recommendations for policymakers and hospital administrators to create a more efficient, patient-centered healthcare system.

Key Research Questions

- What are the primary structural, workforce, and process-related factors contributing to patient flow bottlenecks in KSA?
- How do waiting times in Saudi EDs and clinics compare to international benchmarks and national targets?
- What is the measured impact of initiatives like the 'Ada'a' program and 'Mawid' application on waiting times and patient satisfaction?
- How can AI and data analytics be effectively integrated to predict patient demand, optimize resource allocation, and streamline patient journeys?
- What policy changes and operational models are required to achieve sustainable improvements in patient flow management across the Kingdom?

2. Literature Review: Waiting Times in KSA

A Multi-faceted View of Waiting Times

Waiting time is a complex metric, varying significantly by facility type, location, and stage of the patient journey. Research in Saudi Arabia provides a detailed, though varied, picture.

Outpatient & Elective Surgery

The Ministry of Health has made significant strides in reducing long-form waiting lists:

Specialty Clinics: Average wait time decreased from 23 days in 2022 to **16 days** in 2024 (a 30% reduction) (Sabq, 2025; Zawya, 2025).

Elective Surgeries: Average wait time saw a dramatic drop from 53 days in 2022 to **21 days** in 2024 (a 60% reduction) (Sabq, 2025; MoH, 2025).

However, a 2019 study in Al-Ahsa found that 40.4% of outpatients still waited longer than the recommended 20 minutes (Al-Harajin et al., 2019).

Emergency Departments (ED)

ED performance is often measured by Length of Stay (LOS). National data shows improvement:

A national study using Ada'a program data (2019-2021) found a median ED LOS of **61 minutes**, which is favorable compared to international benchmarks (e.g., 171 min in Germany, 146 min in the US) (Alharbi et al., 2023).

In 2024, **91%** of ED visitors were served in under 4 hours, an improvement from 85% in 2022 (Sabq, 2025).

However, a 2014 study at Al-Noor Hospital, Makkah, found a mean ED LOS of 3.02 hours, with 23.4% of patients experiencing delays over 4 hours (SCIRP, 2014).

Primary Health Care (PHC) Centers

PHCs show significant regional variation:

- A 2023 study in Riyadh found the median total waiting time was **30.4 minutes** in urban PHCs versus just **6.0 minutes** in rural PHCs (Almusawi et al., 2023).
- A 2019 study in Al-Qassim reported that 27.9% of patients waited **21-30 minutes** to see a physician (Alrasheedi et al., 2019).
- These times are generally within the acceptable 20-30 minute range recommended by the Institute of Medicine (Almusawi et al., 2023).

2. Literature Review: Waiting Time Data & Comparisons

Waiting Times Across Different Care Stages

Studies breaking down the patient journey reveal specific bottlenecks. A 2023 study in Riyadh PHCs provides a granular view (Almusawi et al., 2023).

Stage of Care	Urban PHCs (Median)	Rural PHCs (Median)	Overall Median
Pre-Consultation Time	6.00	7.23	~6.00
Consultation Time	7.00	4.05	6.78
Pharmacy Waiting Time	Not Recorded	22.10	N/A
Total Waiting Time	30.40	6.00	23.00

Source: Adapted from Almusawi et al. (2023). *Pre-consultation time is from registration to entering the consultation room.

Factors Influencing Waiting Time

Multiple studies confirm that waiting times are influenced by a range of demographic and operational factors:

- **Facility Location (Urban vs. Rural):** Urban centers consistently show longer waiting times due to higher patient volume (Almusawi et al., 2023; AlShammari, 2025).

- **Patient Demographics:** Age, marital status, and educational level have been shown to be significant factors influencing waiting times (Almusawi et al., 2023; Alrasheedi et al., 2019).
- **Time of Visit:** Patient arrivals in the morning often lead to longer waits compared to afternoon visits (Almusawi et al., 2023).
- **Clinic Type:** A study in Al-Ahsa found that family medicine clinics had shorter waiting times and higher satisfaction scores compared to other specialized clinics (Al-Harajin et al., 2019).

2. Literature Review: Patient Satisfaction Landscape

The Direct Link Between Waiting Time and Satisfaction

Patient satisfaction is a cornerstone of Vision 2030's healthcare goals and a key performance indicator for quality of care. Research in KSA consistently demonstrates a strong negative correlation between waiting times and patient satisfaction.

- A study in Al-Ahsa found that over **56.1%** of dissatisfied patients had waited more than 20 minutes for their consultation (Al-Harajin et al., 2019).
- In Al-Qassim, patients were mainly dissatisfied with waiting times for medication dispensing (40.5%), vital signs measurement (39.2%), and dental consultations (37.2%) (Alrasheedi et al., 2019).
- A 2023 study in Riyadh PHCs found **59.1%** of patients were dissatisfied with waiting times, citing it as a major complaint alongside management issues (Almusawi et al., as cited in AlShammari, 2025).

Overall Satisfaction Rates in KSA

Despite challenges, overall satisfaction rates show a positive trend, especially with the advent of digital services.

Study/Report	Context	Reported Satisfaction Rate
MoH PXMP Report (2024)	General Patient Experience (National)	83.38% (Improved from 80.71% in 2023)
Alasiri et al. (2024)	Systematic review of Academic Hospitals	Rates ranged from 78% to 95.2%
Alodhialah et al. (2024)	Riyadh (Public vs. Private)	Higher in private facilities ($p < 0.001$)
Alkhashan et al. (2020)	Telehealth (937 & Seha App)	95.8% (Overall consumer satisfaction)
Mahfouz et al. (2023)	"Mawid" Appointment App (Jazan)	94.3%

Sources: Alwatan, 2025; Alasiri et al., 2024; Alodhialah et al., 2024; Alkhashan et al., as cited in AlShammari, 2025; Mahfouz et al., 2023.

Key Insight: While long physical waits decrease satisfaction, the high satisfaction rates for digital services like 'Mawid' and telehealth highlight the public's positive reception of technology-driven convenience and efficiency.

3. Methodology

Research Design

This presentation is based on a comprehensive systematic review of existing literature and data pertaining to patient flow, waiting times, and healthcare management in the Kingdom of Saudi Arabia. The methodology is designed to synthesize evidence from diverse sources to provide a holistic and multi-faceted analysis.

Data Sources

A wide range of materials published between 2014 and late 2025 were analyzed, including:

- **Peer-Reviewed Academic Journals:** Databases such as PubMed, Springer, MDPI, ScienceDirect, and Google Scholar were searched for cross-sectional studies, systematic reviews, and empirical research on patient satisfaction, waiting times, ED overcrowding, and digital health in KSA.
- **Official Government Publications:** Reports and statistical yearbooks from the Saudi Ministry of Health (MoH), Saudi Health Council (SHC), and the General Authority for Statistics (GASTAT). This includes data from the 'Ada'a' performance program and the Patient Experience Measurement Program (PXMP).
- **International Health Organization Reports:** White papers and frameworks from institutions like the World Health Organization (WHO) and the Institute for Healthcare Improvement (IHI).
- **Industry Analyses and News Media:** Reports from consulting firms (e.g., McKinsey & Company, Roland Berger) and articles from reputable national and international news outlets (e.g., Al-Riyadh, Okaz, Aawsat, Reuters).

Data Synthesis and Analysis

- **Thematic Analysis:** Information was categorized into key themes, including root causes, impacts, current initiatives, and proposed solutions.
- **Quantitative Synthesis:** Statistical data, such as waiting times, satisfaction rates, and performance indicators, were extracted, tabulated, and compared across different studies, regions, and facility types to identify trends and disparities.
- **Framework Application:** Findings were contextualized using established theoretical frameworks, including Lean Management, Systems Theory, and the Technology Acceptance Model (TAM), to provide a structured analysis of challenges and solutions.

4. Findings I: Root Causes of Patient Flow Issues

The challenges of patient flow management are complex and multifactorial. Our analysis identifies four interconnected domains that contribute to waiting times and overcrowding in Saudi healthcare facilities. These root causes create a cascade of inefficiencies that impact the entire patient journey.

Figure 1: Interconnected Domains of Patient Flow Challenges

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1. **Structural & Infrastructural Deficiencies:** Physical limitations of facilities, including bed capacity and outdated layouts, that fail to meet growing demand.
2. **Workforce Challenges:** Shortages and maldistribution of skilled healthcare professionals, leading to increased workload and burnout.
3. **Process & Management Inefficiencies:** Suboptimal administrative procedures, lack of standardized workflows, and poor inter-departmental coordination.
4. **Patient-Related Factors & Behavior:** High volume of non-urgent cases in EDs, low public health literacy, and cultural preferences for hospital-based care.

These foundational issues are further compounded by gaps in digital transformation, which limit the potential for technology to mitigate these problems (Al-Anezi et al., 2025).

4. Findings I: Structural & Infrastructural Deficiencies

Infrastructure limitations are cited as one of the most pressing concerns by healthcare professionals in Saudi Arabia, directly impacting service quality and accessibility (Al-Anezi et al., 2025).

Key Deficiencies

- **Insufficient Bed Capacity:** A primary cause of ED overcrowding is the lack of available inpatient beds, leading to "boarding"—where admitted patients are held in the ED, occupying space and resources needed for new emergencies (IHI, n.d.; Alriyadh, 2013).
- **Uneven Geographic Distribution:** Healthcare facilities and resources are heavily concentrated in major urban centers like Riyadh, Makkah, and the Eastern Province. These three regions, with 67.3% of the population, have 41.1% of PHCs and 46.4% of physicians, while more remote regions are underserved (A'aqoulah et al., 2024). This disparity forces patients to travel, increasing the load on central hospitals.
- **Limited Capacity for Growing Demand:** Rapid population growth has outpaced the development of healthcare infrastructure, leading to a mismatch between patient demand and the absorptive capacity of both public and private institutions (Albiladdaily, 2019; Alriyadh, 2024).
- **Physical Layout and Access Issues:** In some older facilities, the physical design can impede patient flow. Furthermore, external factors like insufficient parking and traffic congestion around major medical complexes (e.g., Dammam Medical Complex) can delay patient arrival and add to frustration (Alyaum, 2025).

Sectoral Disparity: A 2025 study found that professionals in public hospitals perceive challenges in capacity and infrastructure more acutely than their counterparts in private hospitals, suggesting systemic inequalities in resource allocation and development (Al-Anezi et al., 2025).

4. Findings I: Workforce Challenges

Workforce shortages and skill gaps are consistently identified as the most critical challenge facing the Saudi healthcare system, directly impacting service quality, patient safety, and waiting times (Al-Anezi et al., 2025).

Core Workforce Issues

- **Shortage of Specialized Professionals:** There is a significant lack of specialized staff, particularly in emergency medicine, family medicine, and nursing (Alriyadh, n.d.; Burjeel Holdings, 2025). This shortage is a primary driver of long waits (Great Place to Work, n.d.).
 - The ratio of emergency medical service (EMS) providers in KSA is 1:3871, which is low compared to benchmarks like Australia's 1:1400 (Al-Wathinani et al., 2023).
- **Maldistribution of Workforce:** Similar to infrastructure, the healthcare workforce is unevenly distributed. A 2025 study on the nursing workforce found significant regional inequalities, with nurse-to-population ratios varying from 3.13 to 9.89 per 1,000 people across regions (Kattan et al., 2025).
- **High Workload and Burnout:** Staff shortages lead to increased workload, burnout, and high turnover rates, which further exacerbates the problem and can lead to lower quality of care (Al-Anezi et al., 2025). Many physicians are hesitant to specialize in emergency medicine due to its demanding nature and impact on work-life balance (Alriyadh, 2013).
- **Communication and Cultural Barriers:** A significant portion of the nursing staff are expatriates. Language and cultural differences can create communication barriers with patients, potentially leading to misunderstandings and patient safety issues (Alasqah et al., 2023).

Addressing these challenges requires comprehensive workforce planning, strategic recruitment, and robust retention strategies, including incentives for working in underserved areas (Al-Anezi et al., 2025; Alwatan, 2025).

4. Findings I: Process & Management Inefficiencies

Beyond physical and human resource limitations, inefficient internal processes and management practices are a major contributor to patient flow delays and bottlenecks.

Key Inefficiencies

- **Fragmented Care Coordination:** Poor coordination and communication between hospital departments (e.g., ED, labs, radiology, inpatient wards) leads to delays in diagnosis, treatment, and discharge (Al-Anezi et al., 2025). This is a "whole-of-hospital" issue, not just an ED problem (IHI, n.d.).
- **Complex and Routine-Driven Procedures:** Patients often face "killer routine procedures" and excessive paperwork, which can be more exhausting than the illness itself. This includes long waits for registration, even with a pre-booked appointment (Albiladdaily, 2019).
- **Lack of Standardized Patient Flow Management:** Many hospitals lack a structured, hospital-wide approach to managing patient flow. A 2024 study at Al Hada Armed Forces Hospital demonstrated that implementing a structured case management program dramatically improved patient flow, reducing average hospital length of stay from 11.5 to 4.4 days and ED boarding time from 11.9 to 1.2 hours (Al Harbi, 2024).
- **Weaknesses in Administrative Management:** Studies point to issues like poor administrative organization, lack of clear vision from senior management regarding quality improvement, and insufficient delegation of authority as barriers to efficient operations (Mahmoud, 2014, as cited in EIMJ, n.d.).
- **Ineffective Appointment Scheduling:** Traditional scheduling systems often fail to distribute patients evenly, leading to peaks of overcrowding and long waits, followed by periods of underutilization (Scribd, n.d.).

These process-related failures undermine the effectiveness of even well-resourced facilities and highlight the need for systemic re-engineering of hospital workflows.

4. Findings I: Patient-Related Factors & Behavior

Patient behavior and public perceptions play a significant role in creating demand-side pressures, particularly on Emergency Departments.

Demand-Side Drivers of Overcrowding

- **Inappropriate Use of Emergency Departments:** A major cause of ED congestion is the high volume of patients presenting with non-urgent conditions (often called "cold cases") that could be managed at a Primary Health Care (PHC) center (Alriyadh, 2013; Akhbarna.net, n.d.).
 - Some reports estimate that up to **70%** of ED visits are for non-emergency conditions like the common cold, simple fevers, or skin allergies (Akhbarna.net, n.d.).
 - This misuse is often driven by a patient perception that EDs provide faster service than waiting for a PHC appointment (Alriyadh, 2013).
- **Lack of Public Health Literacy:** There is a general lack of public awareness about which conditions warrant an emergency visit versus a PHC visit. This contributes to the "culture of going to the emergency room" (Alriyadh, 2013; Al-Anezi et al., 2025).
- **Preference for Hospital-Based Care:** Some patients bypass PHCs, preferring to go directly to hospitals, even for chronic disease follow-ups. This may be due to a perception of higher quality care or the desire to see a specialist directly (Burjeel Holdings, 2025).
- **High Number of Patient Companions:** The presence of numerous companions with each patient can contribute to physical crowding and a stressful environment, especially in waiting areas (Akhbarna.net, n.d.).

Addressing these factors requires a dual approach: strengthening the PHC system to make it a more attractive first point of contact and launching targeted public awareness campaigns to educate the community on the appropriate use of healthcare services (Alriyadh, n.d.).

4. Findings I: Gaps in Digital Transformation

While digital transformation is a cornerstone of Vision 2030, its implementation faces significant barriers that hinder its potential to solve patient flow issues. These gaps are identified as a top-three challenge by healthcare professionals (Al-Anezi et al., 2025).

Key Digital Gaps

- **Lack of Interoperability:** The absence of seamless data exchange between different Electronic Health Record (EHR) systems across hospitals and clinics is a major obstacle. This fragmentation affects patient data sharing, hinders clinical decision-making, and leads to service duplication (Al-Anezi et al., 2025; McKinsey, 2022).
- **Slow and Uneven Adoption:** The pace of adopting digital health solutions is slow and fragmented. A 2022 study in the Eastern Province found that private facilities scored higher on digital transformation readiness than governmental ones. Predictive analytics and interoperability were the least implemented dimensions (Al-Kahtani et al., 2022).
- **Data Security and Privacy Concerns:** Both patients and providers express concerns about data privacy and cybersecurity, which can hinder the adoption of new technologies and the willingness to share data (Al-Anezi et al., 2025; Aldogher, 2025).
- **Insufficient Digital Literacy and Training:** There is a recognized gap in digital literacy and a lack of adequate training for healthcare professionals on how to use new digital tools effectively. This can lead to resistance to change and underutilization of implemented systems (Al-Anezi et al., 2025; Alriyadh, 2025).
- **Cultural Barriers:** A cultural preference for face-to-face consultations and resistance to AI-aided diagnostics can slow the adoption of telehealth and other digital solutions (Aldogher, 2025).

Bridging these gaps requires not just technological investment but also a focus on creating robust cybersecurity frameworks, standardized interoperability protocols (like NPHIES), and comprehensive training programs for the workforce (McKinsey, 2022; Al-Anezi et al., 2025).

5. Findings II: National & Institutional Responses

In response to these challenges, the Saudi government and healthcare institutions have launched a portfolio of strategic initiatives aligned with Vision 2030.

Policy, Governance, and Performance Measurement

- **Health Sector Transformation Program:** The overarching national strategy to restructure the healthcare system, focusing on a new model of care, privatization, and digitalization (Vision 2030, n.d.).
- **'Ada'a' (Performance) Program:** Launched by the MoH, this program tracks over 40 key performance indicators (KPIs) across 7 domains in most government hospitals. It is a central tool for monitoring and improving efficiency, including waiting times in EDs and clinics (Alwatan, 2025; MoH, 2018).
- **Patient Experience Measurement Program (PXMP):** A third-party program to systematically measure patient satisfaction across all MoH facilities, providing crucial feedback for quality improvement (MoH, 2025; SPA, 2019).
- **Saudi Health Council (SHC) & CBAHI:** The SHC provides strategic oversight, including the approval of mandatory KPIs for EDs. The Central Board for Accreditation of Healthcare Institutions (CBAHI) enforces strict quality and data reporting standards (SHC, n.d.).

Infrastructure and Workforce Development

- **Infrastructure Expansion:** Ongoing projects to expand and develop hospitals and EDs, such as at Al-Iman Hospital in Riyadh and Dammam Medical Complex, to increase capacity and modernize facilities (The Arab Hospital, n.d.).

- **Health Clusters:** Restructuring service delivery into integrated regional networks (clusters) to improve coordination and resource management (The Arab Hospital, n.d.).
- **Workforce Training:** The Saudi Commission for Health Specialties (SCFHS) and MoH are expanding postgraduate training programs, especially in family medicine, and offering continuous professional development to upskill the workforce (SCFHS, n.d.; EMRO WHO, 2020).

6. Findings III: Proposed Solutions - Digital Transformation

Digital health is positioned as the primary catalyst for resolving patient flow challenges, with the potential to generate economic savings of \$15-27 billion by 2030 (McKinsey, 2022). Key solutions fall into several domains.

1. Digital Platforms for Access and Scheduling

- **'Mawid' & 'Sehhaty' Applications:** These national platforms enable patients to book, reschedule, or cancel appointments at PHCs and hospitals, access their health records, and receive virtual consultations. They are central to organizing patient flow and reducing administrative burdens (RMG, 2025; MoH, n.d.).
 - Studies show extremely high satisfaction with these apps (e.g., 94.3% for Mawid in Jazan), demonstrating strong public adoption (Mahfouz et al., 2023).

2. Telehealth and Virtual Care

- **SEHA Virtual Hospital:** The world's largest virtual hospital, connecting over 150 hospitals and offering 30+ specialized services. It reduces the need for patient travel, decreases internal referrals, and provides access to specialists in remote areas (Alriyadh, 2025; Aldogher, 2025).
- **Virtual Consultations:** Telehealth services have proven effective and popular, with satisfaction rates reaching 95.8%. They help manage non-urgent cases outside of physical clinics, freeing up capacity (Alkhashan et al., as cited in AlShammari, 2025).

3. National Health Information Exchange

- **NPHIES ('Nafis'):** The National Platform for Health and Insurance Exchange Services aims to create an interoperable, unified digital health record for every individual. This is critical for eliminating data fragmentation and ensuring seamless care coordination across all providers (McKinsey, 2022; MoH, 2025).

6. Findings III: Proposed Solutions - AI & Data Analytics

Artificial Intelligence (AI) and advanced data analytics offer powerful tools to move from a reactive to a predictive and proactive healthcare model, directly addressing the root causes of inefficiency.

Key AI Applications for Patient Flow

- **Predictive Analytics for Demand Forecasting:**
 - AI algorithms can analyze historical data (admissions, seasonal trends, etc.) to predict patient volumes in EDs and clinics. This allows hospitals to proactively adjust staffing, bed allocation, and resource planning to match anticipated demand (Arabicscholar.com, 2024; CADTH, 2023).
 - Mayo Clinic has successfully used ML models to predict ICU bed availability, demonstrating the concept's viability (Select Training, 2025).
- **AI-Powered Triage and Patient Screening:**
 - AI systems can perform initial patient screening and triage, helping to quickly identify urgent cases and reduce crowding in EDs. This allows staff to focus on critical patients (McKinsey, 2022; usrij.com, 2025).

- AI-driven chatbots and voicebots can handle routine patient inquiries, freeing up call centers and administrative staff (Botpress, 2025).
- **Intelligent Patient Flow and Bed Management Systems:**
 - Software solutions help hospital administrators manage bed occupancy and patient movement in real-time, preventing unnecessary long stays and optimizing resource use (McKinsey, 2022; Ibtikar, n.d.).
 - These systems can automate and optimize the entire patient journey, from admission to discharge (CADTH, 2023).
- **Clinical Decision Support (CDS):**
 - AI-powered CDS tools analyze patient data to provide treatment recommendations, warn of potential drug interactions, and reduce diagnostic errors, thereby speeding up the decision-making process and improving patient safety (McKinsey, 2022; APSE, n.d.).

6. Findings III: Proposed Solutions - Process Re-engineering

Technology alone is insufficient; it must be paired with fundamental changes to clinical and administrative workflows. Process re-engineering focuses on optimizing the entire patient journey.

Key Management Models and Strategies

- **Case Management (CM) Implementation:**
 - A structured CM program is a powerful tool for improving patient flow. Case managers coordinate all aspects of a patient's care, from admission to discharge, identifying and removing barriers in real-time (Al Harbi, 2024).
 - **Case Study: Al Hada Armed Forces Hospital.** The implementation of a CM program led to a reduction in average hospital LOS from 11.5 to 4.4 days and ED boarding time from 11.9 to 1.2 hours, with a net cost saving of 123 million SAR over 3 years (Al Harbi, 2024).
- **Lean Management & Waste Reduction:**
 - Applying lean principles helps identify and eliminate "waste" in the patient journey, such as unnecessary delays, redundant paperwork, and inefficient movement of patients or staff (IHI, 2020).
 - The IHI Hospital Inpatient Waste Identification Tool is a key resource for this process (Al Harbi, 2024).
- **Centralized Bed Management:**
 - Creating a central authority to manage all hospital admissions, transfers, and bed placements ensures optimal use of bed capacity and matches demand with available resources (Al Harbi, 2024).
- **Discharge Planning (SAFER Bundle):**
 - Implementing structured discharge protocols like the SAFER bundle (Senior review, All patients have a discharge date, Flow of patients, Early discharge, Review of stranded patients) ensures timely and safe patient discharge, freeing up beds sooner (Al Harbi, 2024).

6. Findings III: Proposed Solutions - PHC & Public Awareness

Strengthening the foundation of the healthcare system—Primary Health Care (PHC)—and educating the public are crucial long-term strategies to manage demand and reduce the burden on hospitals.

Strengthening Primary Health Care

- **Expanding the Role of Family Medicine:** Promoting the family physician model as the first point of contact for all non-emergency care helps ensure continuity and reduces unnecessary specialist visits and ED use (Alriyadh, n.d.). Vision 2030 aims to address the 40% shortage of primary care physicians (Burjeel Holdings, 2025).
- **Improving Access and Services at PHCs:**

- Extending PHC operating hours, including evening and weekend clinics, provides a convenient alternative to EDs for working individuals (Akhbarna.net, n.d.; MoH, 2025).
- Integrating more services at the PHC level, such as mental health and basic diagnostics, reduces the need for hospital referrals (WHO, 2025).
- **Leveraging PHCs for Chronic Disease Management:** Proactive management of chronic diseases at the PHC level can prevent acute complications that lead to emergency visits (Multqa Asbar, 2022).

Enhancing Public Health Literacy

- **Targeted Awareness Campaigns:** Launching national and regional campaigns to educate the public on the proper use of EDs versus PHCs, and what symptoms constitute a true emergency (Raha Health, n.d.; Alriyadh, 2013).
- **Patient Education via Digital Platforms:** Using apps like 'Sehhaty' to deliver targeted health information and guidance, empowering patients to make more informed decisions about their care (Mktc.journals.ekb.eg, 2025).

7. Discussion: Synthesizing the Findings

A System in Transition: Progress and Persistent Gaps

The Saudi healthcare system is undergoing a monumental transformation. The data clearly shows significant progress, particularly in reducing waiting lists for elective procedures and improving high-level ED performance metrics (Sabq, 2025; Alharbi et al., 2023). This success is largely attributable to top-down strategic initiatives like the 'Ada'a' program and the rapid deployment of digital patient-facing applications ('Mawid', 'Sehhaty').

However, persistent challenges remain at the operational and foundational levels. The core issues of workforce shortages, infrastructural maldistribution, and process inefficiencies continue to create bottlenecks that technology alone cannot solve (Al-Anezi et al., 2025).

Public vs. Private Sector Performance

A recurring theme is the performance gap between public and private sectors. Studies consistently show that private facilities report higher patient satisfaction and loyalty (Alodhialah et al., 2024). This is often attributed to:

- **Resource Allocation:** Private hospitals may have greater flexibility to invest in infrastructure and technology (Al-Kahtani et al., 2022).
- **Patient-Centered Incentives:** The competitive nature of the private market drives a stronger focus on service quality and patient experience.
- **Operational Agility:** Public hospitals face greater challenges with infrastructure, care coordination, and financing, while private hospitals report more significant challenges with workforce and digital transformation (Al-Anezi et al., 2025).

The Double-Edged Sword of Technology

Digital transformation is undeniably the most powerful tool for change. The high satisfaction rates with telehealth (95.8%) and appointment apps (94.3%) prove that when technology is user-friendly and solves a clear problem (like convenience), adoption is high (Alkhashan et al., as cited in AlShammari, 2025; Mahfouz et al., 2023). However, the full potential is unrealized due to a lack of interoperability, insufficient provider training, and cultural resistance, highlighting that technology implementation must be part of a broader change management strategy (Al-Anezi et al., 2025; Aldogher, 2025).

7. Discussion: Regional Disparities in KSA

A critical aspect of the patient flow challenge is the significant disparity in healthcare resources and outcomes across the Kingdom's 13 administrative regions. These inequalities create systemic bottlenecks and affect equitable access to care.

Disparities in Resources and Patient Load

- **Population vs. Resources:** The three most populous regions (Riyadh, Makkah, Eastern Province) host 67.3% of the population but have a disproportionately lower share of PHCs (41.1%). Conversely, less populated regions have a higher number of PHCs relative to their population, but may lack specialized services (A'aqoulah et al., 2024).
- **Workforce Distribution:** The distribution of physicians and nurses is also skewed. A 2024 study showed that the correlation between population size and the number of doctors and nurses was not statistically significant in most regions, indicating a maldistribution of human resources (A'aqoulah et al., 2024).

Impact on Waiting Times and Satisfaction

These resource imbalances directly translate into varied patient experiences.

Metric	High-Density/Urban Area	Low-Density/Rural Area	Source
Median PHC Waiting Time	30.4 min (Riyadh Urban)	6.0 min (Riyadh Rural)	Almusawi et al., 2023
Patient Satisfaction (PXMP 2024)	90.49% (Riyadh First Cluster)	73.83% (Al-Qurayyat Cluster)	Alwatan, 2025

Implication: Patients in major urban centers face longer waits due to high demand, while those in remote areas may suffer from a lack of access to specialized care, forcing them to travel and add to the burden on central hospitals. This highlights the need for region-specific strategies that both build capacity in urban centers and enhance service delivery in peripheral areas.

8. Recommendations: A Multi-Pronged Approach

Addressing the complex issue of patient flow requires a coordinated, multi-pronged strategy that targets the identified root causes. No single solution will suffice. We propose a framework built on four strategic pillars.

Figure 2: Four-Pillar Strategic Framework for Improving Patient Flow

【Dynamic Chart: unknown】 - This section contains an interactive chart generated by JavaScript (Container: unknown)

1. **Accelerate & Deepen Digital Integration:** Move beyond basic implementation to achieve full system interoperability and leverage advanced technologies like AI.
2. **Strategic Workforce Planning & Development:** Implement data-driven strategies to recruit, train, retain, and equitably distribute healthcare professionals.
3. **Mandate & Standardize Process Re-engineering:** Adopt proven patient flow management models as a standard of care across all hospitals.
4. **Strengthen PHC & Empower Patients:** Reinforce the primary care system as the gatekeeper and invest in public education to manage demand effectively.

8. Recommendations: Pillars 1 & 2

Pillar 1: Accelerate & Deepen Digital Integration

- **Enforce Interoperability Standards:** Mandate the adoption of the NPHIES platform for all public and private providers to create a truly unified health record. This is the single most critical step to enable seamless data flow (McKinsey, 2022).
- **Invest in AI for Operational Management:** Fund pilot projects for AI-driven patient flow management, predictive demand forecasting, and automated triage systems in high-volume hospitals. Success stories (e.g., KFSHRC's AI center) should be scaled nationally (KFSHRC, 2024).
- **Expand Telehealth Infrastructure:** Build on the success of the SEHA Virtual Hospital by expanding its specialty services and integrating it more deeply with PHCs to manage chronic diseases and post-discharge follow-ups remotely.

Pillar 2: Strategic Workforce Planning & Development

- **Implement Data-Driven Workforce Planning:** Use population health data to forecast workforce needs by specialty and region, addressing the maldistribution of staff (A'aqoulah et al., 2024).
- **Incentivize Underserved Specialties and Regions:** Offer significant financial incentives, housing benefits, and career progression pathways for professionals (especially in emergency and family medicine) to work in remote or underserved areas (Alwatan, 2025; Argaam, n.d.).
- **Mandate Digital Health Training:** Integrate mandatory digital literacy and health informatics modules into all medical and nursing education curricula and continuing professional development programs to bridge the skills gap (Al-Anezi et al., 2025; McKinsey, 2022).

8. Recommendations: Pillars 3 & 4

Pillar 3: Mandate & Standardize Process Re-engineering

- **Adopt Case Management as a National Standard:** Based on the success at Al Hada Hospital, the MoH and CBAHI should develop and mandate a national case management framework for all tertiary hospitals to improve patient flow and discharge planning (Al Harbi, 2024).
- **Implement Hospital-Wide Flow Committees:** Require each hospital to establish a multidisciplinary patient flow committee, led by senior management, responsible for monitoring KPIs and implementing continuous quality improvement using methodologies like Lean or IHI's frameworks (IHI, 2020).
- **Streamline Administrative Processes:** Use technology to automate routine administrative tasks such as registration, billing, and insurance verification. Visitor management systems can reduce registration time from minutes to seconds (VisitorFlow.app, n.d.).

Pillar 4: Strengthen PHC & Empower Patients

- **Enhance PHC Attractiveness:** Continue expanding PHC operating hours and the scope of services. Promote the "Family Physician for Every Family" model to establish PHCs as the default first point of contact for care (Alriyadh, n.d.).
- **Launch National Public Awareness Campaigns:** Develop clear, simple, and multilingual campaigns to educate the public on when to use the ED versus a PHC. Utilize social media, schools, and digital health apps for dissemination.
- **Empower Patients Through Technology:** Continue to enhance patient-facing apps ('Sehhaty') with features for self-management of chronic diseases, personalized health education, and symptom checkers that guide them to the appropriate level of care (Scnsoft, n.d.).

9. Conclusion

The challenge of managing patient flow in Saudi Arabia's clinics and emergency departments is a complex, systemic issue deeply intertwined with the nation's ambitious healthcare transformation under Vision 2030. While significant progress has been achieved in reducing wait times for scheduled procedures and leveraging digital tools for patient access, foundational problems persist.

Summary of Key Findings

- **A Multifactorial Problem:** Overcrowding and delays are not caused by a single factor, but by a confluence of infrastructural deficits, workforce shortages, inefficient processes, and patient behavior patterns.
- **Digital Transformation is Key:** Technology, particularly AI, data analytics, and telehealth, offers the most powerful set of tools to create a predictive, efficient, and patient-centered system. The high public adoption of existing digital services demonstrates a clear appetite for such solutions.
- **Process is as Important as Technology:** The full benefits of technology can only be realized when coupled with fundamental process re-engineering, such as standardized case management and lean workflows.
- **Strengthening the Foundation is Crucial:** A robust primary care system and an educated public are essential to managing demand and ensuring that hospital resources are reserved for those who need them most.

Future Outlook

Successfully tackling patient flow challenges is not merely an operational goal; it is a prerequisite for achieving the core objectives of Vision 2030—improving quality, enhancing access, and ensuring the financial sustainability of the healthcare system. By adopting the recommended multi-pronged strategy, the Kingdom can build upon its recent successes and create a resilient, efficient, and truly world-class healthcare system for all its residents.

Thank You

- Questions & Answers

Contact: research.group@ksu.edu.sa

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