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THE ROLE OF DIGITAL HEALTH IN VALUE-BASED HEALTHCARE IN MEA

JOINT WHITE PAPER: MECOMED AND IQVIA

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1 Introduction

Healthcare delivery has never been more important. With costs on the rise and the funding gap growing exponentially, it remains paramount that providers of healthcare do more with less while maintaining the quality of care offered to patients.

The evolving healthcare landscape has dictated a shift towards value added thinking and addressing the question of "at what point in time" and at "what additional cost" and to "whom" does investing in digitally enhanced technologies, is key. Based on Michael Porters definition, value can be defined as the trade-off between patient health outcomes achieved vs. cost of delivering those outcomes. One of the unique challenges of the medical device industry is the fact that the same innovation may create widely divergent value for each of the stakeholders involved in healthcare delivery chain.

Digitally enhanced technologies will drive system efficiencies and allow patients to receive the personalised care they so deserve. Digital health and care refer to tools and services that use information and communication technologies (ICTs) to improve prevention, diagnosis, treatment, monitoring and management of health and lifestyle. These digtally enabled technologies have the potential to innovate and improve access to care, quality of care, and to increase the overall efficiency of the health sector (European Commission, eHealth: Digital Health and Care, https://ec.europa.eu/health/ehealth/overview_en).

Thus demonstrating the value of these digitally enhanced technologies to various decision makers, has never been more important to medical device manufacturers than now. These innovative solutions will help address changing market dynamics and maintain care delivery for those most in need. A comprehensive understanding of the patient population, the patient pathway and the data needed to support clinical and cost-effectiveness, is not a 'nice to have' for market access, **it is a must have!!**

This paper explores the how digital health advancements are optimizing value-based healthcare solutions for the entire healthcare ecosystem and how this transformation is directly affecting all stakeholders in system today.

2 Practical Use Cases

2.1 Artificial Intelligence to digitally enhance medical imaging and interpretation

Lung cancer is a very malignant tumor. If detected early and treated actively, it can effectively improve a patient's survival rate. **Therefore, early diagnosis of lung cancer is very important.** Early-stage lung cancer usually appears as a solitary lung nodule on medical imaging and appears as dense circular shadow in the chest radiograph. It remains challenging to distinguish lung nodules and lung soft tissues with the naked eye.

Today a **chest x-ray is the most frequently used medical imaging test worldwide**.[1] This relatively simple method has allowed investigation of chest pathology, including infection, cardiac pathology, chest trauma, and malignancy, in almost every country worldwide. Advances in digital image acquisition and safe principles of ionizing radiation use have led to improved image quality, reduced radiation burden, and wide availability. However, **diagnostic use of chest x-rays has some limitations**.

Assessment of soft tissue contrast is limited by two-dimensional projection of x-rays through multiple organs, with superimposed densities leading to reduced sensitivity for subtle findings.[2] **90% of cases in which a lung cancer diagnosis was missed were due to errors in the interpretation** of chest x-rays.[3] Human error, due to factors such as fatigue or interruptions, and reader inexperience contribute to inaccuracy.[2], [4] For these reasons, several attempts have been made to create **artificial intelligence (AI) systems to aid radiologists in the interpretation of chest x-rays.**[5]

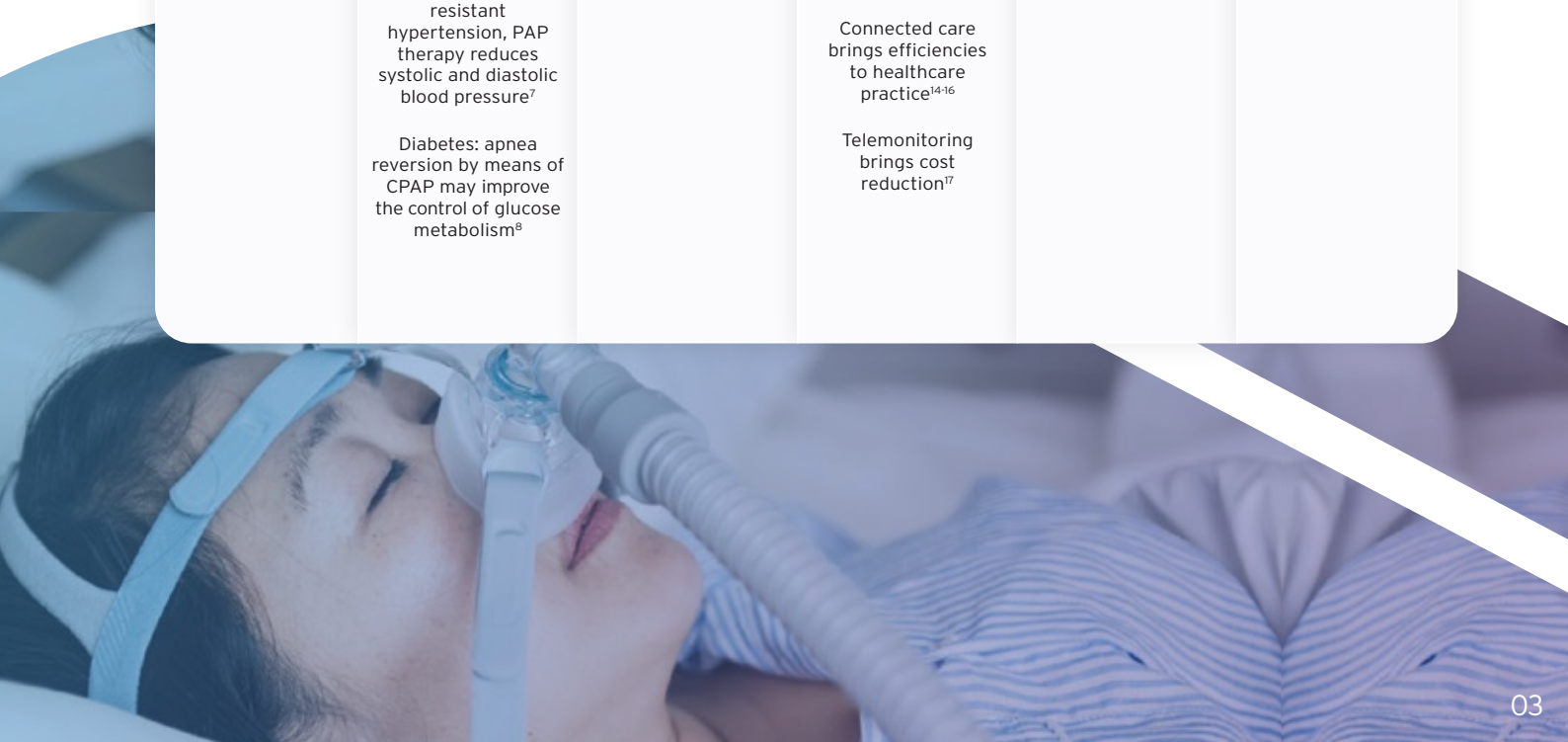
Use Case	Clinical Impact (outcomes)	Organisational impact	Care Delivery Revenue & Cost Impact	Public and Population Impact	Transparency, Data Integration & Connectivity
AI in medical imaging	Detection of lung lesions in Chest X-Ray images with high sensitivity, leading to improved quality of care	Reduce misdiagnosis & unnecessary delays in patient administration, with high quality chest X-Ray reports [2, 4]	Detecting lesions with more accuracy earlier in treatment pathway may lead to cost savings in treatment of patients [2, 4]	Clinical studies demonstrate in 90% of lung cancer cases, the initial lesion is mis-diagnosed. Using AI allows for early detection of lung lesions in chest X-ray this identifying malignant cases at much earlier stage for patients. For economically active employees this may lead to a reduction in productivity lost & lower healthcare system costs[3]	Integration of AI capabilities into a hospital's PACS, enables the results of assessment to be easily and quickly viewed by radiologist

2.2 Optimizing the patient pathway in Obstructive Sleep Apnea (OSA) through integrated & connected medicine

Sleep Disordered Breathing (SDB) is a **widespread disease whose treatment poses new challenges** for healthcare professionals and patients across the Globe. OSA, is a condition in which breathing stops involuntarily for brief periods during sleep and **affects 20% of the adult population worldwide** equating to 1 billion people.[1] Standard treatment is PAP therapy ("positive airway pressure therapy").

Bringing Integrated digital solutions allow healthcare systems to provide effective and optimized care along the patient journey while reducing the economic burden of care.

Use Case	Clinical Impact (outcomes)	Organisational impact	Care Delivery Revenue & Cost Impact	Public & Population Impact	Transparency, Data Integration & Connectivity
Digital connectivity in OSA to optimize patient pathway	CPAP continuation may reduce risk of all-cause mortality[2] Improvement in quality of life (QoL), outcome, mood and symptoms[3] 5 years cumulative survival rate significantly improved in patients using PAP therapy (96.4% vs. 85.5%)[4] Effective PAP treatment reduced Cardio-Vascular mortality[5] Effective PAP treatment reduces likelihood of developing coronary artery disease at least 6 fold[6] In patients with resistant hypertension, PAP therapy reduces systolic and diastolic blood pressure[7] Diabetes: apnea reversion by means of CPAP may improve the control of glucose metabolism[8]	Reduction in number of outpatient visits, physician costs and overall healthcare resources utilization[9] Patient management improved resulting from early detection of serious cardiac events[22]	Patients with SDB have higher direct medical costs for up to 10 years prior to diagnosis[11] Costs related to accidents reached $32.7 billion in 2015 in USA[10] Connected care leads to reduction in time spent (58 min to 33 min) by healthcare professional per patient[12] which may result is further cost savings 59% reduction of time spent by healthcare professional to initiate CPAP and coach patient[13] which may result is further cost savings Connected care brings efficiencies to healthcare practice[14-16] Telemonitoring brings cost reduction[17]	Indirect cost associated with untreated OSA is predicted at 1.9 billion in 2011[18-20] Improvement in work productivity and relationships[21] Reduction of 79% in Road Traffic Accidents[10]	Using connected solutions reduces waiting times for clinic appointments, doubles the clinic capacity for assessments, and increases the capacity for appointments by 60%.[15]



2.3 App based platforms to monitor patient's glucose levels

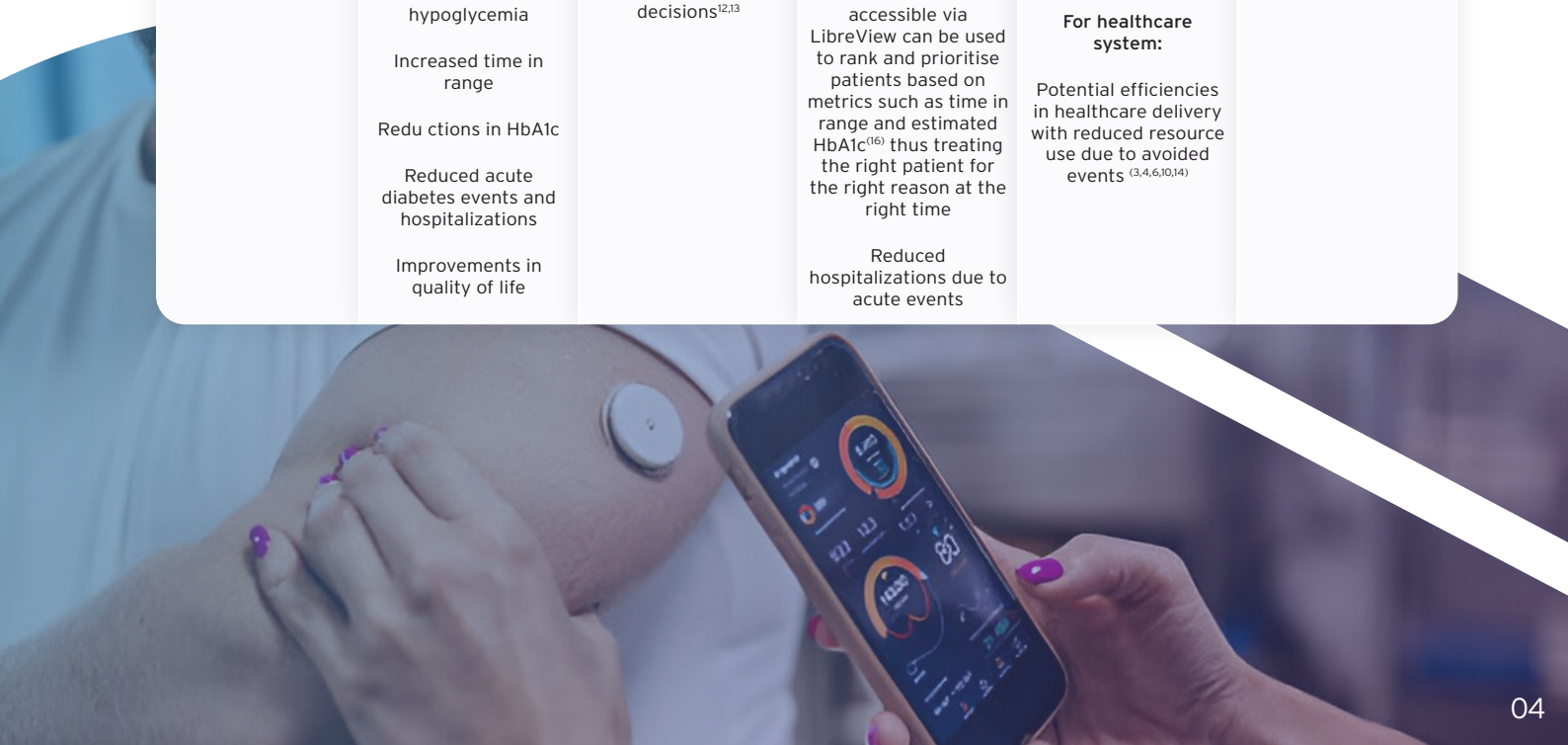
Diabetes affects 1 in 11 people between the ages of 20-79 years equating to a **463 million people globally**. Today 1 in very 2 adults with diabetes go undiagnosed resulting in 232 million people and 3 out of every 4 reside in low to middle-income countries. From a **macroeconomic perspective, 10% or $760 billion of the global health expenditure is allocated to manage diabetes**[1] (IDF Diabetes Atlas 2021, 10th edition. www.diabetesatlas.org)

Specifically for Saudi 2.4 million people from age 15 have been diagnosed with diabetes[2] (Household Health Survey 2018 _General Authority for Statistics) of which **78% are below 65 years of age** and majority constitute the economically active population for the country.

The financial burden associated with the disease is high with 10-fold healthcare expenditures associated with diabetic versus non-diabetic patients [3] (Economic costs of diabetes in Saudi Arabia: Journal of Family and Community Medicine | April 2013 | Vol 20 | Issue 1 | 1-7).

In 2014, SAR 17 billion was annually spend on management of diabetes in Saudi. Introduction of **flash glucose monitoring has demonstrated significant improvement in diabetes control and clinical outcome** and has contributed tremendously to **cost saving by reducing HbA1c levels and preventing acute complications** [4] (Al-Harbi. Oral Abstract at 48th ISPAD Annual Conference. DOI: 10.1111/pedi.13399).

Use Case	Clinical Impact (outcomes)	Organisational impact	Care Delivery Revenue & Cost Impact	Public & Population Impact	Transparency, Data Integration & Connectivity
Using app based readers for glucose monitoring	Clinical benefits of glucose monitoring have been well established[1,2] Clinical trials, studies of real-world practice and meta-analyses have demonstrated the benefits of the system in terms of[1-10]: Reductions in hypoglycemia Increased time in range Redu ctions in HbA1c Reduced acute diabetes events and hospitalizations Improvements in quality of life	For patients: Empowered and informed self-management and HCP dialogue, with improved disease control[1,2,5,11] For HCPs: Easy and flexible remote access to glucose data to inform disease management decisions[12,13]	Patients using the app spent more Time In Range[15] Informed remote consultations in place of regular consultations, freeing in-person time for patients in greatest need of treatment Glucose data accessible via LibreView can be used to rank and prioritise patients based on metrics such as time in range and estimated HbA1c[16] thus treating the right patient for the right reason at the right time Reduced hospitalizations due to acute events	Fewer appointments and less interruption to the patient life [1-10]: Reduced work absenteeism Improved time and quality of consultation Improvements in work productivity (1-10) **For healthcare system:** Potential efficiencies in healthcare delivery with reduced resource use due to avoided events [3,4,6,10,14]	Using digital health tools such as the glucose app support: Setup for the virtual clinic Reduce need for in person appointments Allows for stratification



2.4 Robotics integration in the operating room

Osteoarthritis (OA) is a degenerative disease resulting in painful and stiff joints. Depending on the patient & the disease progression, **OA may cause reduced function and disability, preventing people from managing their daily tasks or work.**[1] In 2019, the **age-standardized prevalence of OA in MENA was 9.3% higher than in 1990.** Saudi Arabia, Kuwait, and Iran had the highest OA burden in the region, while Yemen, Afghanistan, and Sudan had the lowest burden. In all MENA countries, **OA has had an increasing burden with increased age,** and had the highest impact on knee and hip joints, respectively.[2]

While there is no cure for OA, total joint arthroplasty is considered as an effective treatment option. A timely joint replacement surgery is proved to be cost-effective when compared to non-surgical options or delayed surgery.[3-4] The latest advancement in total joint arthroplasty is robotic-assisted surgery. Robotic-assisted joint replacement surgery has significant clinical proof regarding clinical outcomes, non-clinical outcomes, cost & population benefits.[5-39]

It is also important to note there are **multiple robotic offerings from different corporations, and each system must be assessed for its own value.** Specifically the following four attributes differentiate clinical success and value of robotic systems: anatomic data acquisition (CT vs. imageless), intra-op clinical decision making (soft tissue analysis), surgical accuracy and bone preparation method (navigated manual bone cutting vs. robotic bone cutting).[31-33] With **arthroplasty surgeries being expected to increase to 15.1% by 2031; understanding and utilizing the benefits of these robotic systems has critical importance for healthcare institutions.** [29]

Clinical Impact (outcomes)	Organisational impact	Care Delivery Revenue & Cost Impact	Public & Population Impact	Transparency, Data Integration & Connectivity
Robotic assisted surgery has potential to provide the following benefits vs. manual surgery 5 times increased surgical accuracy for partial knee replacement[13] 4.5 times decrease in post-op knee joint manipulation under anesthesia[14] Significantly better clinical and functional outcomes[5, 12, 20, 24] Reduced trauma and 24% blood loss to patients[17-19] 79%-89% reduced risk of cup placement outside safe zones in hip surgeries[5] Lower Revision Rates compared to computer navigated and manual knee surgery: - 96.1% survivorship at 5 years for partial knee vs. 92.4% conventional [37] - 98.7% survivorship at 3 years for total knee vs. 98% navigated and 98.2% conventional[16]	84% fewer re-admission at 30 days post-op and 33% fewer re-admissions at 90 days post-op compared with conventional surgery[10,15] 27% reduced opiate analgesic use in total knee surgeries, & 54% less post-operative pain in partial knee surgeries vs. conventional surgery[15,28] Less physical stress and postural strain on surgeons[22, 23]	Timely total hip & total knee arthroplasty are considered cost-effective interventions when compared to delayed surgery or non-surgical strategies[3,4] Robotic Assisted Surgery is more cost-effective[34-36] for the patient and reimbursement entities compared to conventional surgery due to: 26% reduction in length of hospital stay[8-11,21] 50% reduced number of physiotherapy sessions[8, 10-11, 15]	Improved patients' quality of life: 92% patients satisfied or very satisfied[9] 54% less post-op pain[28] Improved function[5-9, 20, 24] Less work absenteeism and improved productivity due to faster post-operative recovery [38, 39] Possibility for less dependency on care-givers post-surgery due to improved patients' mobility[8-11] Increased quality adjusted life years (QALYs)[34,35]	Opportunity to be an execution platform supported by AI-based clinical decision making[30] Ability to connect with data analytics and other digital offerings to follow up post-op recovery and make data driven decisions[31-33]

2.5 Smart phone applications to connect data

Using innovative digital platforms to collect, connect, and assess data has never been more important in managing the patient optimally for pre-admission through to discharge and beyond.

Use Case	Clinical Impact (outcomes)	Organisational impact	Care Delivery Revenue & Cost Impact	Public & Population Impact	Transparency, Data Integration & Connectivity
Smart phone application to connect data	The use of the smartwatch/ smartphone care platform demonstrated non-inferiority of clinical significant outcomes to traditional care models.1 Patients and surgeons may use this information to help set goals for recovery following TJR or PJR surgery using objective activity measures[3]	mymobility users demonstrated a significant reduction of physical therapy utilization post-operatively[1]	mymobility users trended lower of emergency department visits than control[1] Could aid in the reduction of post-operative costs.1	Improving patient engagement and communication with the multidisciplinary healthcare team[1] Capturing real world gait quality metrics through the phone may provide further insights into objective recovery data not captured by traditional in-clinic assessments[2] Older patients are demonstrating a continued and significant adoption of technology[4] Baby boomers are increasingly eager to have their healthcare needs managed through a combination of technology and traditional healthcare.4	Data demonstrated a recovery curve similar to previously reported curves for patient report outcome measures in the arthroplasty arena[3] NRS collected is correlated with both objective and subjective measures of function in patients undergoing arthroplasty.5

3 Stakeholder impact: Conclusions & Recommendations for various stakeholders

The healthcare landscape in the MENA region is undergoing a revolutionary transformation. There has been a distinct shift from treating the sickness, to managing healthcare by offering managed healthcare solutions – including both products, services, and digital solutions. Hence there is a need for innovation to be further developed in a broader, more integrated, holistic way focused on the patient across the care pathway. Digitally enabled technologies linked to artificial intelligence mechanisms will allow for more preventative, targeted, and meaningful treatment modalities for those patients most in need and can help us as healthcare service providers to better understand complex diseases, and health systems to prioritize resources, to ensure that all stakeholders work towards a common goal of, providing the best healthcare outcomes in a resource constrained environment. Innovative digital and enabling technology that matters, addresses prevention & cure, and drives improvement in quality of life for patients, is fundamental to a sustainable future.

How can each stakeholder contribute to making the digital Value Based Healthcare a reality?

3.1 Patients: Active decision makers in the care delivery process

Patients are more aware of the expected outcomes they can achieve due to the free access to information, receive real-time insights that are actionable, and thus have higher expectations of anticipated successful outcomes.

With the advancement in digitally enabled technologies such as smartphone-based applications, patients are now generating real-time data that will improve the quality of data for analysis and decision making.

Patients thus have real-time access to healthcare providers and their care team.

Digital health enables the ecosystem of care connectivity, ensuring a wider spectrum of care and motivation for patients while maintaining a quick feedback loop from HCPs thus empowering patients to make the right changes at the right time.

Education to these digitally enabled platforms is paramount and patient compliance is a necessity.

The Path to AI: Digital Health is a building block to "Big Data" that can be leveraged for "Machine Learning" based on data, ensuring that the intelligence is building relevant insights and decision support systems for patients.

3.2 Physicians: Instrumental to uptake of digitally enabled technologies

As the workload for physicians continues to grow, clinical data and insights drawn from digitally enabled technologies and solutions will be critical to ensure focus remains on diagnosing and treating the patient effectively.

With the advancement in digitally enabled technologies such as smartphone-based applications, the diagnosis and treatment pathways will be optimized, saving time for physicians, & allowing dedicated focus on prioritizing at-risk patients for interventions at the right time.

Uptake and adoption of digitally enabled patient management at point-of-care and population level, will allow physicians to track patient outcomes real-time & optimize the interventional treatment plan.

Digitally enabled technologies will reduce the burden on practices in a way that allows more insightful physician / patient dialogue, through using the applications and patient insights to better manage physician visits.

Encourage physicians to use real-world evidence and convert traditional evidence generation activities into meaningful real-time data collection mechanisms that can be used to improve patient outcomes and manage care in a more integrated fashion.

3.3 Providers: Providing patient centric solutions across the care continuum

Digitally enabled technologies will give providers the ability to provide a personalized patient pathway that will increase team dynamics and motivation, together with patient outcomes and satisfaction.

The use of Digital health to compile and consolidate aggregated data to build overall value models on the use of specific technology and understand outcomes of digitally enabled technologies through real-world evidence using metrics tracked by these technologies.

Leverage, at a physician level, adoption and use of digitally enabled technologies to measure key outcomes for a disease area and the cost burden vs, cost of therapy – building both long term and short-term impact.

Using mid to long term data gathered by these digitally enabled technologies to build cost-effectiveness models, optimize medical protocols including patient education, to maximize patient outcomes and ensure optimization of value added.

Use of digital and patient engagement can ensure streamlining administrative tasks leading to efficient appointment management, reminders and alerts for appointments, bed vacancy management and resource optimization based on predicted demand.

3.4 Policymakers: Using outcomes data to drive transformation, transparency through enabling technologies and digital innovations

Digitally enabled technologies will provide insights on major developments in the treatment pathway, together with real pain points to be addressed allowing policy makers to be more agile with decision making to ensure greatest effect on outcomes.

Transparency of data and accurate statistics can support management of the disease and progression thereof while maintaining the cost of care.

3.5 Payers: Moving towards payment for performance based on patient outcomes resulting in more efficient allocation of scarce resources & prioritization of pivotal disease areas

By implementing remote monitoring for chronic disease patients, payers can, for example, reduce hospital readmissions and unnecessary emergency visits. This would lead to measurable cost savings and improved patient outcomes, delivering a clear ROI (Return on investment).

Additionally, insights obtained would lead to more accurate levels of reimbursement, adjusted in real time, and linked to patient outcomes, allowing for more appropriate allocations.

Digital health applications and data can be leveraged to track impact on patients and overall payers in real-time, including critical elements such as patient self-management of the healthcare system and outcomes in terms of additional care and hospitalizations required.

Optimized reimbursement levels, coverage and continuity of care based on digitally enabled technologies and patient behavior. Connectivity has the desired outcomes through measuring behaviors vs outcomes.

4 Potential Barriers

Despite the growing recognition of digital health as a catalyst for value-based healthcare in MENA, several systemic and contextual barriers continue to hinder its widespread adoption and impact.

Fragmented Health Systems and Lack of Clear Access Pathways

Many MENA countries operate under fragmented healthcare models, often characterized by independent services and fee-for-service payment structures. This fragmentation leading to siloed datasets hinders the integration of digital health solutions into care pathways, making it difficult for providers to navigate access processes or align digital tools with specific goals.

Underutilization of Digitally Enabled Technologies

Although digital health tools such as telemedicine, electronic medical records (EMRs), and mobile health applications are increasingly available, their utilization remains limited. This is often due to poor infrastructure, inconsistent internet connectivity, and lack of interoperability between systems. Moreover, digital health is frequently viewed as an add-on rather than a core component of care delivery, reducing its strategic importance.

Limited Stakeholder Awareness and Engagement

A critical barrier is the lack of clarity among healthcare providers, payers, and policymakers regarding which stakeholders to engage with to ensure successful implementation. Many decision-makers lack the technical knowledge or strategic insight to evaluate digital health solutions, leading to missed opportunities for collaboration and scale.

Regulatory and Policy Constraints

In several MENA countries, existing health policies and regulations are not conducive to digital innovation. There is often no formal reimbursement framework for digital health services, which discourages investment and adoption. Additionally, data privacy laws and licensing requirements may be outdated or overly restrictive, creating uncertainty for developers and providers.

Funding and Sustainability Challenges

The absence of dedicated funding mechanisms for digital health initiatives poses a significant challenge. Many projects rely on short-term grants or pilot funding, which limits their scalability and long-term viability. Without clear reimbursement models or incentives aligned with long-term outcomes, digital health solutions struggle to demonstrate sustainable value.

The silver lining though is an intent to adopt health tech and digital. Healthcare data digitization and adoption of newer technologies are part of the Vision documents of the countries. There is also a race to ensure that skilled personnel and regulations are in place to realize the full potential of digital in healthcare.

5 Conclusion

Digital health in value-based healthcare is fundamentally about improving patient outcomes while reducing systemic inefficiencies. Achieving this vision requires healthcare models that center on patients and efficiently allocate scarce resources. However, realizing this transformation involves overcoming persistent challenges that currently limit the effective introduction and optimal use of digital health solutions.

In the MENA region, digital health has the potential to be a central pillar for transforming value-based care. The entire digital health ecosystem—policymakers, healthcare providers, technology innovators, and payers—must come together in a deliberate, coordinated effort. Clear, unified frameworks for evaluation, reimbursement, and integration are critical. Transparent and standardized pathways will ensure that digital innovations scale effectively and become embedded within the region's healthcare landscape.

Future success will depend less on isolated innovations and more on the strength of cross-sector partnerships, commitment to regulatory clarity, and continuous focus on patient-centered outcomes. By embracing these priorities, MENA can achieve a transformative vision: digitally empowered, value-based healthcare that delivers real results for real people.

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