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Advancing Value-Based Healthcare Through Evidence-Driven Practices, Real-World Data, and AI Technologies: Bridging Research and Reality

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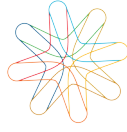
Abstract

Healthcare systems in the Middle East face critical challenges, including a growing burden of non-communicable diseases, systemic inefficiencies, and limited integration of transformative innovations such as Real-World Evidence (RWE), scientific research, and AI-powered predictive analytics. This policy paper advocates for Value-Based Medicine (VBM) as a transformative framework to address these challenges. By merging RWE with scientific research and leveraging AI, VBM enhances clinical decision-making, optimizes resource utilization, and improves patient outcomes. The paper outlines innovative solutions supported with actionable strategies to strengthen research ecosystems, reform healthcare policies, foster public-private partnerships, and establish sustainable infrastructures aligned with Sustainable Development Goal 3 (Good Health and Well-being). Additionally, it evaluates alternative approaches, including Fee-for-Service (FFS) models with enhanced regulation and Universal Health Coverage (UHC) with centralized systems. Through a comparative analysis, the paper demonstrates why VBM is the most effective and sustainable model for transforming healthcare systems in the MENA region.

Keywords: Healthcare research; Value-based healthcare; Personalized healthcare; Healthcare; Innovation

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تعزيز الصحة القائم على القيمة من خلال الممارسات المبنية على الأدلة البحثية، والبيانات الواقعية، وتقنيات الذكاء الاصطناعي: تجسير الفجوة بين البحث العلمي والواقع

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ملخص

تواجه أنظمة الرعاية الصحية في منطقة الشرق الأوسط تحديات بالغة، من أبرزها تزايد أعباء الأمراض غير السارية، والقصور الهيكلي في تقديم الخدمات، إضافة إلى ضعف توظيف الابتكارات التحويلية مثل الأدلة الواقعية (RWE)، والبحث العلمي، والتحليلات التنبؤية المعززة بتقنيات الذكاء الاصطناعي. وي طرح هذا البحث نموذج معدل «الصحة القائمة على القيمة» كإطار تحويلي لمعالجة هذه التحديات الجوهرية. فمن خلال دمج الأدلة الواقعية مع البحث العلمي، والاستفادة من قدرات البحث العلمي في الذكاء الاصطناعي والطب النانومتري، يعزز هذا النموذج من دقة اتخاذ القرارات السريرية، ويرفع من كفاءة استخدام الموارد، ويحسن مخرجات الرعاية الصحية للمرضى.

يعرض البحث حلولاً مبتكرة مدعومة باستراتيجيات قابلة للتنفيذ، تهدف إلى تقوية منظومة البحث العلمي، وإصلاح السياسات الصحية، وتعزيز الشراكات بين القطاعين العام والخاص، وإنشاء بنى تحتية صحية مستدامة تتماشى مع الهدف الثالث من أهداف التنمية المستدامة (الصحة الجيدة والرفاه). كما يتناول البحث بالتحليل نماذج بديلة مثل نموذج الدفع مقابل الخدمة (FFS) مع تعزيز التنظيم، ونموذج التغطية الصحية الشاملة (UHC) في إطار أنظمة مركزية. ومن خلال تحليل مقارن، يُبرز البحث الأسباب التي تجعل من نموذج الطب القائم على القيمة الخيار الأكثر فاعلية واستدامة لإصلاح وتطوير أنظمة الرعاية الصحية في منطقة الشرق الأوسط وشمال أفريقيا.

الكلمات المفتاحية: البحث العلمي في الرعاية الصحية، الرعاية الصحية القائمة على القيمة، الرعاية الصحية المخصصة، الابتكار في الرعاية الصحية

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List of abbreviations

Abbreviation	Full Term
MENA	Middle East and North Africa
NCDs	Non-Communicable Diseases
RWE	Real-World Evidence
EHRs	Electronic Health Records
RWD	Real-World Data
EBM	Evidence-Based Medicine
AI	Artificial Intelligence
RVBHC	Research-Centered Value-Based Healthcare
SDG	Sustainable Development Goals
FFS	Fee-for-Service
UHC	Universal Health Coverage
WHO	World Health Organization
OECD	Organisation for Economic Co-operation and Development
PROMs	Patient-Reported Outcome Measures
CROMs	Clinician-Reported Outcome Measures
PREMs	Patient-Reported Experience Measures
R&D	Research and Development

1. Introduction

Healthcare systems across the Middle East and North Africa (MENA) region face escalating pressures from rising non-communicable diseases (NCDs), aging populations, and unsustainable financial burdens. Predominantly insurance-based healthcare models, especially in Gulf countries, often restrict access for underinsured populations, while fee-for-service systems continue to reward volume over value, undermining equitable and efficient care (Katoue et al., 2022). Despite global advances in scientific research and healthcare technologies, the MENA region struggles to translate innovation into practice (World Health Organization, 2022). Key barriers include fragmented health systems and a lack of integration of scientific research, Real-World Evidence (RWE), and AI-powered analytics, hindering the region's ability to harness data for better outcomes.

RWE refers to clinical insights derived from analyzing Real-World Data (RWD), including electronic health records (EHRs), insurance claims, registries, and digital health tools, captured during routine clinical practice (Varela-Rodríguez et al., 2023).

While traditional Evidence-Based Medicine (EBM) emphasizes rigorously validated interventions from randomized controlled trials (RCTs), it often lacks generalizability across real-life populations. RWE complements EBM by offering timely, context-specific evidence that reflects the technological revolution and complexity of everyday clinical environments, particularly in emerging domains like personalized medicine, AI, and smart therapeutics. Within the proposed Value-Based Medicine (VBM) model, RWE serves as a critical mechanism linking scientific research with clinical implementation and continuous outcome monitoring.

This paper introduces research centered value-based healthcare (RVBHC) as a comprehensive framework to address systemic gaps in the region's healthcare landscape and provides a roadmap for innovatively implementing VBHC through strengthened research ecosystems, cross-sectoral collaboration, and scalable infrastructures, bridging the gap between research and reality across MENA healthcare systems, supports the achievement of Sustainable Development Goals (SDG 3: Good Health and Well-being) and aligns with regional strategies such as Saudi Vision 2030 (Esposti & Banfi, 2020; Smith et al., 2023).

2. Literature Review

The MENA region is witnessing a disproportionately high burden of non-communicable diseases (NCDs), particularly diabetes, cardiovascular disease, and cancer, with prevalence rates that significantly exceed the global average. According to the **IDF Diabetes Atlas (2025)**, over **73 million adults** in the region are currently living with diabetes—a number projected to **exceed 95 million by 2045**, representing one of the **highest regional growth rates globally**. Countries such as **Kuwait, Saudi Arabia, Egypt, and Qatar** report adult diabetes prevalence rates ranging between **16% and 24%**, significantly above the global average of **10.5%**. In

Egypt alone, an estimated **11 million adults** are affected, with large proportions undiagnosed or inadequately managed (Diabetes Atlas, 2025). These alarming trends are compounded by weak preventive care, late-stage diagnoses, and fragmented service delivery, leading to higher rates of complications and mortality across the region (World Bank, 2022; Obermeyer & Emanuel, 2016).

These challenges underscore the urgent need for integrated, evidence-based frameworks that leverage real-world insights, predictive analytics, and personalized care to reverse the region's growing disease burden (Seedat et al., 2024; Maha et al., 2024). Yet, most MENA countries continue to rely on outdated fee-for-service (FFS) and universal health care (UHC) models that incentivize volume over value, perpetuating inefficiencies and care variability (Katoue et al., 2022). Fragmented insurance structures further compound disparities, leaving healthcare systems ill-equipped to deliver consistent, outcome-oriented services (Dowd & Laugesen, 2020; Leao et al., 2023).

Global advancements in AI, medical science, and data analytics remain underutilized in the region due to disjointed research agendas and a lack of integration between scientific innovation and healthcare delivery (Boussetta et al., 2022). Research often occurs in isolated silos—disconnected from health priorities and policy contexts, while interdisciplinary collaboration across fields like nanomedicine, AI, and materials science remains limited (Olawade et al., 2024; Shrestha, Tang, & Hood, 2023). The underdevelopment of research-implementation pathways has stifled progress in high-potential areas such as personalized medicine and predictive diagnostics.

Telemedicine, which combines AI, diagnostics, and remote care, is similarly underleveraged due to fragmented research ecosystems and minimal coordination (Udegbe et al., 2024; Sarkar, Dey, & Mia 2025). RWE—critical for assessing the real-world data of healthcare interventions—is rarely incorporated into decision-making, in part due to the absence of data infrastructure capable of capturing and analyzing RWD systematically (Rudrapatna & Butte, 2020). This weakens the region's ability to validate clinical innovations, implement predictive models, and design scalable outcome-driven care pathways.

Without a unified framework connecting scientific research, interdisciplinary innovation, and data-driven decision-making, healthcare systems in the MENA region will continue to face growing disparities, misallocated resources, and limited progress toward SDGs, particularly SDG 3 and SDG 9.

In response, this paper proposes a research-centered Value-Based Medicine (RVBHC) model that redefines research not as a passive input but as a central engine of value creation. By embedding AI, RWE, big data, and nanotherapeutics into care delivery systems, VBM offers a responsive and sustainable approach to transforming healthcare outcomes across the MENA region.

3. Methodology

3.1 Research Approach

This policy paper employs a comparative policy analysis, using secondary data to evaluate the integration of VVBHC, RWE, and AI technologies into healthcare systems in the MENA region. A qualitative lens allows for context-sensitive exploration of structural gaps and transformative policy opportunities. The analysis compares three models: (FFS), (UHC), and RVBHC against the criteria of feasibility, sustainability, and alignment with SDG 3 and SDG 9.

3.2 Target Population

The study addresses stakeholders, including health policymakers, regulators, hospital administrators, private sector providers, researchers, and technology developers in the MENA region. These actors are key to shaping, implementing, or being impacted by the transition to RVBHC.

3.3 Data Sources and Analysis

All data used in this policy paper are secondary, derived from peer-reviewed journals, institutional reports, global policy reports (e.g., WHO, World Bank), regional strategies, and case studies on RVBHC, AI, and RWE. This approach is suitable for policy analysis, where the aim is to synthesize existing evidence to inform strategic reforms and contextual recommendations.

3.4 Source Selection Criteria

Sources published in (2020–2025) were selected for policy relevance, practical application, and alignment with the paper’s core pillars: VBM implementation, AI/RWE integration, and research-health system linkage.

Inclusion criteria encompassed peer-reviewed articles, global policy reports, implementation case studies, and strategic frameworks with a regional or transferable focus.

Exclusion criteria included purely clinical trials lacking policy context, pre-2020 publications, and excluding clinical trials without a strategic context.

Key databases included PubMed, Scopus, and Google Scholar, supplemented by WHO, OECD, and regional ministry publications. Grey literature was selectively included when credible.

3.5 Policy Validity and Rigor

Although not empirical in the traditional sense, the study ensures validity through triangulation of global and regional sources, alignment with internationally accepted frameworks, and cross-comparative synthesis.

The resulting recommendations are grounded in global best practices and tailored to the MENA context for implementation feasibility and strategic relevance.

4. Analysis: Evaluating Solutions for the MENA Region

This section examines three potential solutions to address the pressing challenges faced by healthcare systems in the MENA region: RVBHC, FFS models with enhanced regulation, and UHC, with centralized systems. Each approach is evaluated based on its potential to improve healthcare quality, optimize resource utilization, and ensure sustainable delivery models.

4.1 Fee-for-Service Models with Enhanced Regulation

Retaining the traditional FFS model with stricter regulations is another potential solution. This approach introduces measures, such as price caps, mandatory outcome reporting, and penalties for inefficiencies, to control costs and improve care quality. Enhanced regulation aims to mitigate some of the inherent weaknesses of FFS systems, such as cost inflation and inconsistent care standards (Lemaire, 2011). While these regulatory measures address certain issues, they fundamentally fail to shift incentives away from service volume towards value-based outcomes. The reliance on a transactional model inherently limits its capacity to achieve long-term healthcare efficiency and quality improvements. Furthermore, the model's rigid structure and focus on service delivery volume make it inflexible in responding to sudden and large-scale disruptions, as seen during the COVID-19 pandemic. The pandemic highlighted the need for adaptable healthcare systems capable of rapidly reallocating resources, coordinating care, and addressing emerging public health crises. FFS systems, by contrast, often struggle to prioritize preventive measures, manage surges in demand, or incentivize cross-sector collaboration.

While this approach may offer incremental progress for the MENA region, it lacks the transformative potential required to meet evolving healthcare demands. Its inability to align incentives with value-based care and adapt to sudden challenges underscores its limitations in driving sustainable and equitable healthcare reforms (Carter, 2022).

4.2 Universal Health Coverage (UHC) with Centralized Systems

UHC aims to ensure equitable access to essential healthcare services for all citizens, typically financed through centralized systems such as taxation or social insurance. Many global contexts have lauded UHC for its ability to improve equity and access. However, its implementation requires significant financial resources, strong governance, and well-coordinated infrastructure, all of which pose challenges for the fragmented healthcare systems in the MENA region (Lozano et al., 2020).

Additionally, while UHC addresses access and equity, it does not inherently incentivize evidence-based, data-

driven care delivery. Without mechanisms to integrate RWD, scientific research, and advanced AI technologies, UHC risks perpetuating inefficiencies and failing to optimize resource utilization. For the MENA region, achieving UHC would require overcoming significant structural and financial hurdles, making it a less immediately viable solution compared to value-based approaches (Yanful et al., 2023).

4.3 Research-centred Value-Based healthcare (RVBM)

The proposed RVBHC represents a transformative evolution of traditional VBHC, positioning healthcare as an evidence-generating, innovation-integrated ecosystem. Unlike conventional VBHC models that focus on applying validated evidence to clinical practice, VBM institutionalizes the continuous production and application of scientific research. It integrates advances in AI, big data analytics, predictive modelling, nanomedicine, and smart biomaterials directly into healthcare delivery and policy frameworks.

Embedding research as a strategic pillar to the traditional pillars of VBHC enables real-time decision-making driven by AI-powered analytics applied to Real-World Data (RWD), Patient-Reported Outcome Measures (PROMs), and Clinician-Reported Outcome Measures (CROMs). These tools enhance patient stratification, support early diagnosis, forecast disease trajectories, and optimize resource allocation. The result is more proactive, personalized, and efficient care delivery, reducing both direct costs (e.g., hospitalization rates, treatment resistance, and procedural duplication) and indirect costs (e.g., productivity loss, caregiver fatigue, and delayed interventions) (Udegbe et al., 2024; Shrestha, Tang & Hood, 2023).

In parallel, nanomedicine and materials science contribute substantially to the personalization of care within the RVBHC framework. Intelligent drug delivery systems and nano-formulated therapies enable site-specific targeting, sustained release, and reduced systemic toxicity. These innovations improve therapeutic precision, enhance adherence, and mitigate adverse events, especially in chronic diseases such as diabetes, cardiovascular conditions, and cancer, areas with high clinical and economic burden in the MENA region (Kamel et al., 2024; Akl et al., 2023).

Moreover, RVBHC addresses the fragmentation of MENA's healthcare systems by embedding researchers, particularly from AI, data science, bioengineering, and pharmaceutical domains, as core collaborators in clinical, managerial, and regulatory decision-making. This model facilitates interdisciplinary co-design of care pathways, reimbursement models, and public health strategies, creating a unified ecosystem where innovations are rapidly translated into real-world impact.

Financially, RVBHC supports systemic reform through outcome-based payment models. Mechanisms such as bundled payments, indication-specific pricing, and shared savings programs realign provider incentives towards measurable value, encouraging the adoption of high-impact, patient-centered interventions while curbing waste and overutilization (Porter & Kaplan, 2016; Cattel & Eijkenaar, 2020).

In summary, VBM is not merely an enhancement of existing care models; it is a paradigm shift that integrates

the dynamic creation of knowledge, precision technologies, and value-centric financial systems to deliver sustainable, high-quality care across complex health systems.

4.4 Comparative Analysis: Why research-centered Value-Based healthcare is the Best Solution?

RVBHC represents a strategic leap beyond traditional VBHC, establishing a research-integrated, innovation-driven ecosystem that addresses both clinical inefficiencies and structural fragmentation in healthcare systems. By embedding scientific research (RWE) and AI into the core of healthcare planning and delivery, RVBHC ensures that care is not only evidence-based but continuously evolving through real-time learning (El Ojeil, 2024).

Unlike FFS models, which reward service volume rather than outcomes, or UHC, which prioritizes access over quality, RVBHC transforms healthcare by generating, validating, and applying new knowledge to improve outcomes, reduce waste, and enhance system adaptability. This makes it particularly well-suited for the MENA region, where fragmented services, rising chronic disease burdens, and constrained research-to-practice translation hinder healthcare advancement (Larsson, 2023). VBM directly supports the regional shift towards knowledge-based economies and aligns with national transformation agendas such as Saudi Arabia's Vision 2030 and the UAE's National Agenda.

4.4.1 Strategic Advantages of Value-Based Medicine

a) Alignment with Governmental Visions and Sustainable Development Goals (SDGs)

RVBHC accelerates health system modernization in line with SDG 3 (Good Health and Well-being) by ensuring high-quality, equitable, and outcome-driven care. In addition, SDG 9 (Industry, Innovation, and Infrastructure) by strengthening health infrastructure through RWE and AI-driven analytics. Moreover, alignment with the National Strategies by enabling translational innovation, sustainability, and patient-centric models through targeted reforms across Gulf health systems.

b) Closing the Scientific Research Gap

RVBHC resolves the disconnect between academic research and real-world practice by institutionalizing interdisciplinary collaboration and translational implementation:

- **Coordinated Research Strategies:** Research priorities are aligned with population needs (e.g., diabetes, cardiovascular disease, cancer) and national innovation strategies.
- **Integration of Specialized Fields:** AI, nanomedicine, and materials science contribute directly to diagnostics, smart drug delivery systems, and patient-specific therapeutic solutions.
- **RWD Validation:** RWD from EHRs, claims, registries, wearables, and PROMs plays a pivotal role in implementing VBHC by reflecting routine clinical care across diverse populations. Unlike randomized

trials, RWD captures outcome variability, enabling continuous measurement of clinical results, utilization trends, and patient experiences. AI informs performance-based payment models such as bundled payments and pay-for-performance contracts (Varela-Rodríguez et al., 2023).

- It also enables real-time workflow optimization, quality improvement, and better policy planning by forecasting disease burden and aligning resources. National platforms in Sweden and the Netherlands showcase how RWD can reform chronic care delivery while improving outcomes and controlling costs (Porter & Lee, 2013).

c) Enhancing Personalized, Patient-Centered Care

VBM advances personalization through AI-enabled decision support and nanotechnology-driven targeted therapies. For example, AI technologies process vast clinical and patient-reported data to generate real-time, actionable insights. They predict risks, enable early interventions, and personalize treatments, reducing complications and costs. AI also enhances diagnostic accuracy, streamlines workflows, and supports value-based decisions across clinical and system levels. Real-time dashboards and benchmarking tools empower stakeholders to track PROMs, CROMs, and financial performance, making AI a key enabler of VBHC transformation (Meskó et al., 2020; Tariq et al., 2023; Johnson et al., 2023).

d) Reducing Direct and Indirect Costs

- Direct cost savings arise from fewer hospitalizations, minimized procedural redundancy, and optimized drug efficacy.
- Indirect savings include improved workforce productivity, reduced caregiver burden, and decreased long-term complications, especially in chronic disease management.
- AI-powered predictive analytics identify at-risk populations early and allocate resources efficiently, supporting better financial planning and lower operational burden.

e) Smart Payment Models and Cost Efficiency

VBM reorients financial incentives towards measurable outcomes through:

Bundled payments, Pay-for-performance contracts & Indication-based pricing.

These mechanisms encourage providers to prioritize patient value and discourage low-value interventions.

f) Scalable Innovation with Adaptive Governance

VBM supports a phased, scalable rollout starting with high-impact disease areas and expanding across the system. AI dashboards and RWE-informed governance tools help policymakers monitor performance, adjust policies, and accelerate best-practice dissemination.

g) Emphasis on Prevention and Long-Term Sustainability

VBM integrates predictive modelling and continuous monitoring to support early detection and lifestyle-based prevention strategies. This shift, reducing disease progression, healthcare burden, and long-term expenditures.

h) Reducing the Burden of Non-Communicable Diseases (NCDs):

RVBHC offers a comprehensive strategy to mitigate the clinical and economic burden of NCDs, particularly diabetes, cardiovascular disease, and cancer, by embedding prevention, early detection, and personalized treatment into a continuous value framework. Drawing on lessons from national systems such as Ireland and Wales, RVBHC applies RWD, population segmentation, and AI-driven risk stratification to identify high-risk individuals and deliver tailored interventions that delay disease onset and reduce complications.

Programs like the All Wales Diabetes Prevention Programme and Ireland's community-based diabetic retinopathy screening illustrate how RVBHC reduces downstream costs by targeting upstream determinants. Moreover, the integration of PROMs and PREMs into chronic disease management enhances patient engagement and aligns services with real-world needs. Financially, eliminating low-value care (e.g., unnecessary glucose strip use) and transitioning towards community-led, team-based care have demonstrated measurable cost savings and improved outcomes (Ganju, A., 2020; Meskó & Görög, 2020).

These components position RVBHC not merely as a treatment model but as a scalable public health strategy that reduces avoidable hospitalizations, supports patient autonomy, and builds sustainable, high-value chronic disease systems.

Finally, Value-Based Medicine is not an incremental improvement but a paradigm shift. It embeds the research engine within health system design and positions the MENA region to achieve a high-performance, patient-centred, innovation-ready model. In contrast to reactive or fragmented alternatives, RVBHC offers the most coherent and strategic pathway towards equitable, effective, and sustainable healthcare transformation.

Table 1: Comparative Analysis between RVBHC, FFS, and UHC

Aspect	Value-Based Medicine (VBM)	Fee-for-Service (FFS)	Universal Health Coverage (UHC)
Definition	A patient-centered framework focusing on measurable outcomes and cost efficiency.	A transactional model where providers are paid for each service delivered.	A system ensuring healthcare access for all citizens, often funded by taxes or insurance.
Primary Objective	Optimize quality and cost-effectiveness by aligning incentives with outcomes.	Maximize service volume without direct linkage to quality or outcomes.	Achieve equity and accessibility for all, focusing on universal service delivery.
Alignment with Outcomes	Strong alignment; incentivizes improved patient outcomes and resource efficiency.	Weak alignment; focuses on quantity over quality of care.	Moderate alignment; emphasizes access but does not inherently prioritize outcomes.

Aspect	Value-Based Medicine (VBM)	Fee-for-Service (FFS)	Universal Health Coverage (UHC)
Integration of Technology	Incorporates RWD, AI, and predictive analytics to enhance decision-making.	Limited integration; primarily transactional and reactive.	Can leverage technology, but varies based on implementation and resource availability.
Cost Control	Reduces costs through prevention, resource optimization, and personalized care.	Prone to cost inflation due to unnecessary services and inefficiencies.	Can control costs but requires robust governance and financial resources.
Personalization	Enables personalized care through evidence-based and real-world insights.	Limited personalization; focuses on service provision rather than patient needs.	Personalization depends on system design and resource allocation.
Scalability	Scalable with appropriate infrastructure and stakeholder collaboration.	Easily scalable but inefficient and unsustainable over the long term.	Scalability depends on funding capacity and administrative efficiency.
Flexibility	High flexibility; adaptable to evolving needs and technologies.	Limited flexibility; struggles to respond to sudden healthcare challenges (e.g., pandemics).	Moderate flexibility; effectiveness depends on governance and infrastructure.
Equity	Promotes equity by prioritizing outcomes and aligning resources with needs.	Often inequitable; favors insured or paying patients.	Strong focus on equity; ensures access to essential services for all.
Challenges	Requires robust data infrastructure, legal frameworks, and stakeholder alignment.	Encourages inefficiencies, overuse of services, and a lack of outcome orientation.	Demands significant financial resources, robust governance, and administrative capacity.
Global Examples	Sweden's quality registries and bundled payment models.	Common in the U.S. but criticized for inefficiency and cost inflation.	The NHS in the UK ensures universal access but faces resource limitations.
MENA Applicability	Well-suited for addressing cost, quality, and fragmentation challenges.	Provides incremental progress but lacks transformative potential.	Enhances access but requires substantial resources and reform of governance.

5. Policy Actions and Implementation

RVBHC represents a transformative approach to healthcare delivery, emphasizing measurable patient outcomes, cost efficiency, and systemic quality improvements. Globally, VBM models have demonstrated their ability to address key healthcare challenges. For instance, the United States Bundled Payments for Care Improvement (BPCI) initiative reduced costs and improved recovery outcomes in joint replacements. Similarly, Sweden's National Quality Registries employ standardized metrics to enhance care quality, while the Netherlands achieved cost savings and better diabetes management outcomes through condition-specific bundled payments.

In the MENA region, adopting RVBHC necessitates tailoring global models to address the region's unique challenges, such as fragmented healthcare systems, a high prevalence of non-communicable diseases, and

disparities in access to care (Mjåset et al., 2020). This framework builds on proven methodologies while customizing them to align with regional priorities, such as the expanding digital health infrastructure, reliance on insurance-based systems, and strategic national visions like Saudi Arabia's Vision 2030 and Qatar's Vision 2030. To enable a successful transition to VBM, a phased implementation strategy focusing on innovation, interdisciplinary collaboration, and incentive alignment is essential.

5.1 Comparative International Models

Global experiences in value-based care provide practical insights for designing and implementing the Research-Centred Value-Based Medicine (RVBHC) framework in the MENA region.

In the Netherlands, bundled payment models for chronic disease, such as diabetes, have successfully reduced costs and improved care coordination by aligning provider incentives (Karimi et al., 2021). Similarly, the United Kingdom's NHS Right Care programme uses standardized outcome metrics and regional benchmarking to reduce unwarranted care variation, enhancing both efficiency and equity (Jain et al., 2025; Tsiachristas et al., 2023).

Ireland has implemented nationally coordinated screening and prevention programs such as diabetic retinopathy screening and community-led diabetes prevention, which leverage real-world data to improve early detection and optimize resource use (O'Donnell et al., 2023).

Across Europe, countries like Sweden and Germany have adopted key elements of VBM, including PROMs, RWD platforms, and integrated care delivery. A systematic review highlights how these models embed outcome measurement and research directly into healthcare systems (García-Lorenzo et al., 2024)

In the **United States**, the Bundled Payments for Care Improvement (BPCI) initiative achieved a 10% reduction in joint replacement costs while maintaining care quality, illustrating how payment reform can support value delivery (Porter & Lee, 2013; Leao et al., 2023).

While these international models often implement one or two innovation levers in isolation, such as bundled payments, AI tools, or PROMs, the proposed Research-Centred VBM framework goes further by integrating scientific research as its core engine. It brings together AI, RWD, predictive analytics, nanomedicine, and telemedicine within a unified structure, offering a more comprehensive and future-ready approach tailored to the MENA region's digital transformation and sustainability ambitions.

5.2 Proposed Framework: Research-Centred Value-Based Medicine (RVBHC)

- This paper introduces a modified VBHC framework presented in Figure 1 that retains the core pillars of traditional models, such as those developed by Porter and Lee (2013), ICHOM (2021), and the WHO (2020). Still, it proposes a paradigm shift wherein scientific research is no longer a passive input into evidence-based medicine but is redefined as the central engine of value creation. This framework advances the field by embedding continuous, interdisciplinary innovation directly into the structure of healthcare delivery and reform.

The proposed Research-Centred Value-Based Healthcare (RVBHC) framework was developed by the author as an original conceptual model. It was not derived from any previously published source, but rather constructed through a multi-step process: (i) comparative analysis of alternative healthcare models (FFS, UHC, VBHC); (ii) thematic synthesis of contemporary literature (2020–2025) on AI, real-world evidence, nanomedicine, and digital health; (iii) identification of systemic gaps within MENA healthcare systems, including high NCD burdens and limited research translation; and (iv) alignment with global and regional strategic priorities such as SDG 3, SDG 9, Saudi Vision 2030, and UAE Centennial 2071.

This model positions scientific research as the central engine of value creation, supported by innovation-driven enablers, to deliver a sustainable and context-specific pathway for healthcare transformation, spanning basic, translational, clinical, and implementation science, which generates the knowledge, tools, and insights that power all other dimensions of the framework. Surrounding this core are four innovation-derived enablers, as illustrated in Figure 1, that differentiate RVBHC from conventional models:

- **AI & Predictive Analytics:** These tools analyze complex datasets, identify patterns in patient trajectories, and support precision diagnosis and treatment planning (Jiang et al., 2017; Topol, 2019).
- **Big Data & RWD:** RWD provides insights from everyday clinical settings, supporting continuous performance monitoring and adaptive clinical decision-making.
- **Nanomedicine & Smart Therapeutics:** Advanced materials and nanotechnology enable targeted, biocompatible drug delivery, reducing systemic toxicity and enhancing patient adherence (Kamel et al., 2025; Akl et al., 2023).
- **Telemedicine & Digital Health:** Digital platforms facilitate remote monitoring, early intervention, and population-wide access to care, especially in underserved or resource-limited contexts (Meskó et al., 2020).

These enablers support real-time transformation of data for enhancing efficiency, equity, and patient outcomes, and discovery into applied value, bridging the gap between innovation and system-level impact.

Surrounding these innovation arms are the foundational pillars of value-based care, retained from existing frameworks, but are now strengthened by the research core:

- **Patient-Centred Care**
- **Outcome Measurement** (PROMs, PREMs, CROMs)
- **Cost-Effectiveness & Financial Reform**
- **Sustainability**
- **Governance & Quality Improvement**
- **Integrated Care Delivery**

This configuration addresses key limitations in fragmented health systems, particularly within the MENA region, by ensuring that research is not external to care delivery but co-evolves with it. The model also enables policymakers and healthcare providers to make decisions informed by locally relevant evidence, real-time performance data, and innovations grounded in multidisciplinary collaboration.

Ultimately, the Research-Centred VBM model not only restructures the operational dimensions of healthcare but also enables system-wide transformation at the macro level. By embedding innovation directly into the heart of care systems, this framework achieves:

- Improved Quality and Equity through real-time outcome monitoring, precision therapies, and a focus on patient experience and safety.
- Cost Containment and Efficiency Gains by reducing low-value interventions, preventing complications through early detection, and supporting financially sustainable payment models.
- Sustainability and Scalability by promoting continuous learning, reducing overutilization, and aligning system growth with scientific advancement.
- Stronger Policy Integration through aggregated RWD and AI-driven dashboards that inform national strategies and regulatory decisions.
- Resilience and Adaptability by establishing a feedback loop where healthcare systems evolve with emerging challenges, technologies, and population needs.

5.3 Strategic Policy Actions

To operationalize the VBM model and transform healthcare in the MENA region into a sustainable, research-centered, and data-driven system, the following strategic policy actions are recommended:

5.3.1 Institutionalize the National RVBHC Framework

Governments should formally recognize RVBHC as a national strategic priority by developing unified frameworks with measurable goals and key performance indicators (KPIs). These should go beyond traditional clinical metrics to include scientific innovation outputs, RWD utilization rates, PROMs/PREMs adoption, and AI integration readiness. Establishing a national VBM task force comprising clinicians, researchers, economists, data scientists, and policy experts will ensure cross-sector alignment (Karimi et al., 2021).

5.4 Transition to Value-Aligned Payment Models

Shifting from volume-based reimbursement (fee-for-service) to outcome-based models is essential. Recommended payment reforms include:

- Bundled Payments: Encourage coordination across care episodes by integrating services under a single payment.

- Pay-for-Performance (P4P): Incentivize providers based on quality indicators like reduced readmission rates or PROM improvements.
- Indication-Based Pricing and Shared Savings: Align therapeutic pricing with real-world outcomes and share financial gains from improved efficiency.

5.5 Build Research and Data Ecosystems:

RVBHC's success depends on a robust infrastructure that enables continuous generation and application of evidence. Policymakers must:

- Create **interoperable national health data platforms** that integrate EHRs, registries, PROMs/PREMs, and wearable data.
- Fund **translational and applied research** in AI, nanomedicine, predictive analytics, and smart therapeutics.
- Establish **innovation clusters** linking universities, R&D centers, and hospitals to align research with clinical and policy needs (Porter & Lee, 2013).

5.6 Standardize Metrics and Benchmarking

A unified outcomes framework and VBM metrics should encompass Clinical outcomes (e.g., mortality, readmissions), PROMs/PREMs, and R&D productivity metrics, as it is critical for accountability and comparability (Jain et al., 2025).

6. Scale Public–Private Innovation Alliances

Collaboration across sectors is essential to scale VBM tools. Governments should:

- Develop AI-powered clinical decision-support tools through co-funded R&D.
- Pilot data-sharing agreements and risk-sharing contracts with private insurers.
- Incentivize co-development of nanotherapeutics and diagnostics targeting NCDs.

7. Implement Phased Rollout and Innovation Pilots

Due to structural diversity across MENA countries, a gradual, learning-oriented rollout is essential. Governments should:

- Launch pilot programs focused on high-burden NCDs.
- Embed implementation science frameworks to monitor fidelity and adaptation.

- Use AI and RWD platforms to conduct real-time pilot evaluations.

8. Monitor, Evaluate, and Iterate

Evidence-based continuous monitoring using AI-powered dashboards and real-world feedback loops is essential for success through:

- Tracking PROMs, clinical outcomes, innovation uptake, and cost-effectiveness.
- Enabling dynamic updates to care protocols, financing rules, and research priorities.
- Rewarding scalability and real-time improvement using adaptive payment contracts.

Finally, these nine strategic actions create a holistic foundation for embedding innovation, evidence, and personalization into MENA's healthcare architecture. By shifting from a reactive, volume-driven model to a continuously learning, research-based system, this VBM framework not only advances the region's alignment with SDGs and national visions but also ensures long-term sustainability, equity, and excellence in patient care.

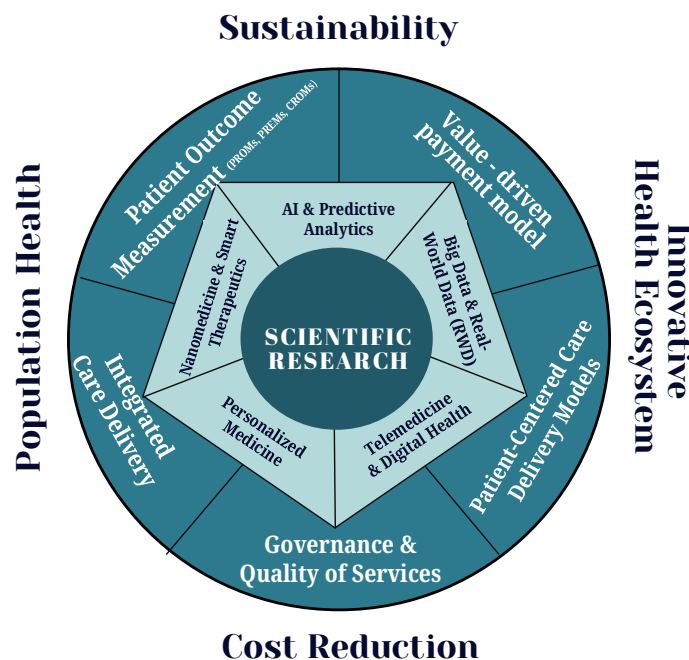


Fig. 1: Research-Centred Value-Based Healthcare (RVBHC) framework

9. Policy Recommendations

To advance sustainable, evidence-driven, and personalized healthcare systems in the MENA region, this policy

paper proposes the following integrated and actionable recommendations. These recommendations embed **scientific research and innovation** as core engines of value creation, moving beyond traditional evidence application towards continuous value generation through multidisciplinary integration of AI, real-world data, nanomedicine, and outcome-based practices.

9.1 Institutionalize Scientific Research as a Strategic Engine of Health Reform

Despite the growing need for innovation, research remains insufficiently embedded within healthcare decision-making processes. National health strategies must formally recognize scientific research as a primary pillar of value-based healthcare transformation.

Governments should establish national research councils linked to healthcare outcomes, prioritize funding streams aligned with non-communicable diseases (NCDs), personalized medicine, and digital health, and legislate for cross-sectoral R&D collaborations (e.g., linking AI, material science, and clinical practice). Such reforms will ensure that research outputs drive healthcare planning, policy innovation, and long-term system resilience.

9.2 Create National Data-Science Ecosystems for Value Tracking

Governments should establish national data platforms that integrate electronic health records (EHRs), **RWD**, **PROMs**, and **CROMs** into national health performance dashboards. These platforms should support AI-enabled dashboards to inform policymaking, budget allocation, risk prediction, and performance benchmarking across public and private providers.

9.3 Align Payment Models with Value Signals

Current payment systems remain tied to volume-based incentives that undermine innovation and personalization. A shift towards outcome-based reimbursement is needed to support RVBHC transformation.

These systems must incorporate **value signals derived from PROMs, CROMs, and economic evaluations**. Introduce risk-adjusted bundled payments, AI-guided disease costing, and pilot **payment-for-research-participation** schemes to promote system learning.

9.4 Embed Innovation Interfaces within Healthcare Provider Systems

Hospitals and health systems should house dedicated **innovation interfaces**, structured partnerships between research teams and clinical/operational leadership. These teams pilot AI tools, smart therapeutics, and new diagnostics while measuring impact on outcomes and cost.

9.5 Institutionalize PROMs and CROMs as Operational Norms

Although patient- and clinician-reported outcomes are key indicators of value, they remain inconsistently implemented across MENA healthcare systems. By adopting a dual-outcome model, **PROMs** are to capture patient-defined value, and **CROMs** are to ensure clinical fidelity and safety. PROMs should be used to drive team-level quality improvement, staff incentives, and patient engagement, while CROMs serve as the professional benchmark for safety and treatment success.

9.6 Reorient Academic Research Towards Health System Value Delivery

Research institutions must shift their orientation from pure discovery to **value relevance**. Projects should be explicitly designed to improve health outcomes, reduce risk, or enhance care efficiency. Research studies in **AI, personalised medicine, predictive analytics, and outcome modelling** should demonstrate applicability within clinical and operational settings. Funding criteria should favor applied research with real-world relevance and collaboration between academic, clinical, and regulatory stakeholders.

9.7 Co-Design AI and RWE-Informed Decision Tools for Real-World Use

Academic and research institutions should partner with health systems to develop **real-world, AI-enhanced decision-support tools**. These tools must be informed by local patient data, PROMs, and longitudinal outcome patterns. Importantly, they should also be **interdisciplinary in origin**, drawing on data science, clinical insight, and social determinants of health. Evaluation should follow real-world implementation science principles, including feedback loops for iterative refinement.

10. Conclusion

The healthcare systems across the Middle East and North Africa (MENA) region are at a pivotal moment, grappling with the escalating burden of non-communicable diseases, aging populations, rising healthcare costs, and system inefficiencies. While traditional models such as Fee-for-Service (FFS) and Universal Health Coverage (UHC) offer partial responses to these challenges, they remain structurally misaligned with the region's evolving priorities. In particular, they fall short of fulfilling national strategic visions such as Saudi Vision 2030, Egypt Vision 2030, and the UAE Centennial 2071, which emphasize digital transformation, cost-efficiency, governance, intersectoral collaboration, sustainability, and innovation-driven growth.

This paper proposes a transformative alternative through the Research-Centered Value-Based Medicine (VBM) model. This framework retains the foundational pillars of traditional VBHC, such as patient-centered care, outcome measurement, and financial reform, but repositions scientific research as the engine of value creation. By embedding AI, big data, real-world evidence, nanomedicine, and personalized therapeutics at the core of healthcare delivery, VBM fosters a dynamic, evidence-generating ecosystem capable of responding to both clinical and system-level challenges in real time.

The RVBHC framework aligns seamlessly with the region's broader policy commitments to integrated care, accountability, and innovation-based economic development. To implement it successfully, this paper recommends actionable reforms, including the development of research and data infrastructure, outcome-linked payment models, and cross-sector partnerships to translate research into impact. By adopting RVBHC, the MENA region cannot only enhance quality and efficiency but also position itself as a global leader in next-generation, research-powered value-based healthcare.

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