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Racha M. Naim

Michelle A. Badore

Justin J. Needle

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SYSTEMATIC REVIEW

Implementing Diagnosis-Related Groups for Value-Based Healthcare in Saudi Arabia: A Systematic Review of Evidence on Barriers and Facilitators

Racha M. Naim^a, Michelle A. Badore^{b,*}, Justin J. Needle^a

^a School of Health & Medical Sciences, City St George's, University of London, London, United Kingdom

^b School of Business & Management, Thomas Edison State University, Trenton, New Jersey, United States of America

ABSTRACT

Objective: To examine the barriers and facilitators to implementing Diagnosis-related groups (DRGs) in Kingdom of Saudi Arabia, aiming to identify actionable insights for policymakers and stakeholders to advance value-based healthcare (VBHC) adoption effectively.

Methods: A systematic search of bibliographic databases and relevant grey literature was conducted. Data were synthesized using the Consolidated Framework for Implementation Research (CFIR) to categorize barriers and facilitators across 5 domains.

Results: A total of 10 studies met the eligibility criteria. Key facilitators included the adoption of patient classification systems, standardized data sets, government policy support, and the availability of advanced health information systems. Barriers included incomplete clinical documentation, coding errors, inadequate training, and a lack of localized cost weights for Australian Refined DRG (AR-DRG) AR-DRG implementation. Gaps in clinician and coder awareness further hindered implementation.

Conclusion: While DRGs hold promise for achieving VBHC goals in Kingdom of Saudi Arabia, their successful implementation requires addressing technical, organizational, and cultural barriers. Policymakers should prioritize improving clinical documentation, training healthcare professionals, and localizing DRG systems to the Saudi healthcare context. These actions will help pave the way for an effective and sustainable transformation to VBHC in the country.

Keywords: Value-based healthcare, Diagnosis-related groups, Transformation, Saudi Arabia, Barriers, Implementation, VBC, DRG

Introduction

Healthcare costs continue to rise at an alarming rate around the world. There are multiple reasons identified as responsible for this rise, including population growth and an increase in aging populations. Research indicates that it is more costly to treat patients over the age of 64 than younger patients [1]. Modern lifestyle habits are leading to an increase in chronic diseases such as diabetes and

hypertension [2]. According to the World Health Organization (WHO), around 71% of global deaths are attributable to lifestyle diseases [3]. The current health expenditures of Gulf Cooperation Countries (GCC) (the Kingdom of Saudi Arabia (KSA), Kingdom of Bahrain, State of Kuwait, State of Qatar, the United Arab Emirates, and Sultanate of Oman), which average \$1,148 per capita, are lower than those in developed countries but higher than the global average [4]. Rising costs have increasingly led to

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* Corresponding author.

E-mail addresses: racha.naim@city.ac.uk (R. M. Naim), Michelle.badore@gmail.com (M. A. Badore), Justin.Needle.1@citystgeorges.ac.uk (J. J. Needle).

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demands from healthcare systems to provide “value” services, in which outcomes are measured from the perspective of the patient. Healthcare systems need to provide high-quality patient outcomes while operating within resource-constrained environments [5]. Successful implementation of effective healthcare payment systems is vital for achieving such goals.

Payment methods in healthcare. In healthcare systems, the term ‘provider payment method’ encompasses a range of interrelated elements, including contracts, management information systems, and accountability mechanisms. Beyond transferring funds to cover the cost of services, payment methods influence provider behavior and, consequently, the quality and outcomes of care [6]. While a well-structured payment method is intended to promote high-quality care, it is also expected to encourage efficient use of resources through effective allocation of resources and cost containment [6].

Globally, various payment systems are used in healthcare settings, each with its own advantages and limitations. They can be classified along several dimensions, including the source of funding (the payer), such as a government or insurance company, the recipient of the payment (the provider), such as a hospital, primary healthcare center or healthcare professional, or the type of service provided (such as admitted, non-admitted, or long-term care (LTC)) [6, 7]. Table 1 presents a summary of the different payment methods currently utilized in KSA.

Fee-for-service. The fee-for-service (FFS) model, also referred to as fee-per-service (FPS) is a traditional payment model in which providers submit a bill to payers that details all the individual services provided to patients, such as blood tests, medications, and physician consultations, along with their respective costs [8]. While the FFS model brings healthcare closer to how other industries operate and is attractive to providers on account of its straightforward billing model and ability to improve financial stability, it offers few incentives for them to deliver value-based care to patients. It also encourages providers to increase revenue by ordering unnecessary tests and interventions, leading to an overall increase in healthcare costs over time. Such services might also be provided as a form of “defensive medicine”, designed to reduce the risk of legal liability [9]. Other advantages and disadvantages of the FFS model are presented in Table 2 [2, 10, 11]. Because of these drawbacks, recent reports have called for the FFS model to be phased out from healthcare payment systems [11].

Value-based healthcare. According to value-based healthcare (VBHC) (Fig. 1), a healthcare system should consist of 6 components that reinforce its ability to produce value. First, the system must shift from being organized around medical specialties to being structured around patient needs. Second, patient-relevant outcomes must be measured alongside healthcare costs. Third, cost assessment must shift from FFS to bundled systems, such as

Table 1. Summary of payment methods [6, 7].

Payment method	Definition	Type of care	Payment rate determination	Payment to provider	Financial risk
Global budget	A predetermined payment allocated to cover the total expenditures of a hospital over a specific period. This funding arrangement is designed to support the delivery of a broadly agreed-upon set of services, ensuring financial predictability and resource management.	All	Prospectively	Prospectively	Payer↓ Provider↑
Per case	A single, predetermined amount to cover all the care associated with treating a specific condition or episode of care, regardless of the actual services or costs incurred.	Admitted	Prospectively	Retrospectively	Payer- Provider -
Diagnosis-related groups (DRGs)	A classification system that groups patients that share the same diagnoses and major procedures under one group and provides a fixed payment covering of all services provided to a patient in this group.	Admitted	Prospectively	Retrospectively	Payer- Provider -
Per diem	A fixed daily rate to hospitals or providers for each day a patient stays in the facility, based on the average costs of the specific services or treatments provided.	Long Term Care	Prospectively	Retrospectively	Payer↑ Provider↓
Fee-for-service	Providers are reimbursed separately for each individual service they deliver.	Both	Prospectively	Retrospectively	Payer↑ Provider↓

Arrows indicate level of risk (high ↑, low ↓, equal -), colors indicate perceived effect (green = positive, red = negative).

Table 2. Advantages and disadvantages of the FFS model [10].

Advantages	Disadvantages
Autonomy: allows providers to independently decide which procedures to perform and determine the associated billing for each service.	Overutilization: encourages providers to perform additional tests and procedures, sometimes unnecessarily, in order to increase revenue.
Financial Rewards: incentivizes providers by offering reimbursement for every service delivered, often resulting in increased revenue.	Administrative Burden: imposes significant administrative responsibilities on providers, requiring extensive time and resources for billing and claims processing. This can lead to higher operational costs and reduced efficiency.
Patient Satisfaction: allows patients to select their preferred healthcare providers and procedures.	Increased Healthcare Costs: incentivizes higher service volumes, often resulting in elevated healthcare expenses without necessarily improving the quality of care provided.
Established Infrastructure: has led to a well-developed supporting infrastructure, including robust billing systems and efficient claims processing frameworks.	Lack of Care Coordination: discourages collaboration among health-care professionals. This fragmented approach to care can result in poorer patient outcomes and inefficiencies in resource utilization.



Fig. 1. The focus of value-based healthcare (Source: authors).

DRGs, which cover an entire patient care episode at a specified price. Fourth, healthcare systems must become integrated by defining a focused range of services and concentrating on delivery in fewer, cost-effective locations. Fifth, healthcare networks must broaden their geographic reach by establishing satellite locations connected to their primary facilities. They can also partner with community providers, leveraging existing facilities to extend their services and ensure greater accessibility for patients. Finally, a patient-centered healthcare information technology platform must be in place to support the first 5 components [12].

In addition to improving quality of healthcare, health outcomes and efficiency, VBHC produces benefits for multiple stakeholders involved in the

healthcare process. For example, shifting from volume to value is associated with increased patient satisfaction and reduced financial risk for providers [13]. Since VBHC emphasizes early disease identification, prevention and minimization of unnecessary interventions and hospitalizations, it creates a healthier society alongside significantly reduced expenditure on chronic disease. Meanwhile, other stakeholders, such as suppliers, benefit from the ability to link product pricing to positive patient outcomes and cost reduction, particularly as prescription drug expenditures rise. Industry stakeholders are advocating for manufacturers to align drug prices with their value to patients, a practice facilitated by the growth of individualized therapies [13].

Diagnosis-related groups. (DRGs), developed in the late 1960s, are patient classification systems built on the concept of case mix, defined by the Saudi Arabia Council of Health Insurance (CHI) as a “Novel concept that describes patient populations based on any number of specific patient characteristics such as age, gender, diagnoses, risk factors, treatment received, and resources used [14] page 6.” DRGs may be ‘diagnosis-driven’, where patients are classified according to their principal diagnosis, or ‘procedure-driven’, where classification is based on the procedures performed during admission. As in Kingdom of Saudi Arabia, many countries have adopted an existing DRG system that aligns with its healthcare environment and fulfills its financial, analytics, and benchmarking requirements rather than developing its own [14].

The DRG systems aim to relate the cost of care to the type (mix) of patients treated and to align service costs closely with clinical values. They are used for a variety of purposes, including service planning and budgeting, reimbursement, quality monitoring and benchmarking. They offer a range of benefits to regulators, payers and healthcare providers, including standardization of costs, reduced expenditure and

length of stay (LOS), improved healthcare outcomes, and more efficient and equitable resource allocation [14]. Globally, they have been widely adopted to reform payment systems. Of the first 12 adopting countries, 6 implemented them for payment purposes and two for budget allocation. The remaining 4 countries initially adopted them for patient classification or benchmarking but subsequently used them for payment purposes [14].

Transition to value-based healthcare. Value based care is gaining increased popularity globally. With countries such as the United States, Germany, and Australia adopting DRGs to achieve VBHC goals. Many other countries, including Kingdom of Saudi Arabia, are transitioning toward higher-value provider reimbursement model in alignment with national reforms as Vision 2030. A payment model that will connect the best possible outcome achieved for the patient with more efficient use of the resources [2]. Payers including government entities and insurance companies are driving this transition based on 3 key triggers: Population Health, Quality of Care, and Lower Healthcare Costs [10].

The transition is not easy. It requires significant changes to existing payment systems and faces many barriers and challenges. For example, the widespread use of FFS inhibits the adoption of VBHC in a number of ways, including a culture that prioritizes volume over value, difficulties in renegotiating longstanding contractual agreements between payers and providers, and the significant changes needed to technical infrastructure and data collection systems [15]. In addition, gaps in workforce's understanding of VBHC highlights the need for modernized management strategies encompassing recruitment, ongoing training, and talent management initiatives to enhance engagement and foster a sense of belonging.

Healthcare transformation in Kingdom of Saudi Arabia. KSA's Vision 2030, launched in 2016, aims to diversify the economy, improve government efficiency, empower citizens and improve their quality of life, and position the country as a global healthcare leader [16]. Built on national strengths, such as investment capacity, geographic centrality, vision 2030 outlines a phased approach to transformation. Initial efforts focused on foundational reforms in governance, society, and the economy, while subsequent phases accelerated sectoral investments and strategic initiatives. Current activities emphasize sustaining progress and exploring new growth opportunities and transformative projects through Vision Realization Programs (VRPs).

Vision 2030 is built on 3 pillars: “Vibrant Society”, “Thriving Economy”, and “Ambitious Nation” supported by 6 overarching objectives, 27 derivative objectives, and 96 strategic goals [16].

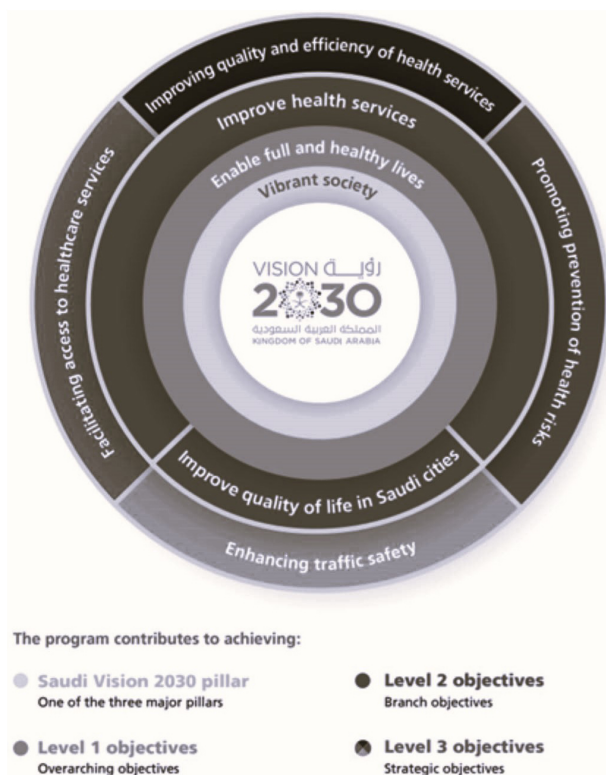


Fig. 2. Vision 2030: The “vibrant society” pillar.¹

Healthcare transformation falls under the “Improve health services” objective of the “Vibrant Society” pillar (Fig. 2), aiming to foster competition and transparency among providers to improve care quality, efficiency, and productivity, patient choice and optimized resources use [17].

In 2021, a national program was launched to establish a VBHC system incentivizing better patient outcomes [18]. To achieve this, 4 enablers were identified: an integrated health informatics infrastructure to capture, store and analyze healthcare outcomes data; a benchmarking process utilizing research and analytical tools; a value-based payment (VBP) system that incentivizes healthcare providers to achieve improved patient outcomes; and new organizational structures and care delivery processes to enhance access to healthcare with payment reform receiving particular emphasis.

Kingdom of Saudi Arabia adopted the Australian ICD-10-AM classification in 2009 and AR-DRG in 2020 [19]. In 2017, a major step was taken to facilitate the future implementation of VBP methods with the release of KSA's first Minimum Data Set (MDS) [14]; a mandatory standardized dataset, reported at national level, containing the information used for DRG classification and reimbursement claims [20]. Initially implemented in public hospitals, and a revised version was subsequently released for use by the private sector [14].

Objective. As discussed above, the successful introduction of VBHC and DRGs presents significant challenges for healthcare systems. This systematic review therefore aimed to identify and synthesize the factors (barriers and facilitators) affecting the implementation of DRGs in the KSA healthcare system that have been reported in the literature.

Methods

Information sources. The following electronic databases were searched: MEDLINE, Embase, Health Policy Reference Centre, Business Source Ultimate, EconLit, Political Science Complete, Academic Search Ultimate, Social Policy and Practice and Global Health.

Grey literature sources searched included:

- The websites of KSA governmental and regulatory bodies, including the Ministry of Health (MOH), CHI and Vision 2030.
- Relevant papers published by leading vendors in the Middle East region, including 3M/Solventum, PwC and Milliman, all of which have worked closely on VBHC-related projects.
- Papers relevant to sources used checked following backward citation search.

Search strategy. The following search strategy was used to search Medline (OVID) and adapted for use with the other databases:

1. exp Saudi Arabia/
2. ("Saudi Arabia" OR KSA).tw
3. 1 OR 2
4. exp Diagnosis-Related Groups/ OR exp Value-Based Health Care/
5. ("Diagnosis-Related Group*" OR DRG* OR "Value-Based Health*" OR VBHC).tw
6. 4 OR 5
7. 3 AND 6

Eligibility criteria. All studies fulfilling the following eligibility criteria were included:

- Studies focusing on barriers or facilitators to the implementation of DRGs in the KSA healthcare system.
- Studies published in the English language only.

There were no limits relating to study design or the publication dates of the studies.

Study selection. Study selection was performed independently by 2 reviewers. The titles and abstracts of all retrieved references were screened against the eligibility criteria, and the full text of potentially eligible papers was retrieved to determine inclusion. Any disagreements were resolved through discussion between the reviewers. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram [21] was used to document the study selection process and display the number of papers retrieved, included and excluded.

Data extraction. Extraction of data from the included studies was carried out using a pre-defined data extraction form.

The following data items were extracted from each study:

- Publication details (such as article title, journal, authors, year of publication);
- Study methodology (such as setting, objectives, study design, recruitment, methods of data analysis);
- Study findings (details of DRG implementation barriers or facilitators; author conclusions).

Quality appraisal. The quality of the included studies was assessed using the Integrated Quality Criteria for the Review of Multiple Study Designs (ICROMS) tool [22].

The tool comprises 2 components:

- A set of quality criteria tailored to specific study designs, alongside criteria applicable across all designs, utilizing a structured scoring system.
- A "decision matrix" that evaluates the study's robustness and assesses its relevance to the review question.

Data synthesis. The Consolidated Framework for Implementation Research (CFIR) dated 2009, a comprehensive framework for guiding the systematic planning and evaluation of the implementation of healthcare interventions [23], was used to synthesize the findings (DRG implementation barriers and facilitators) of the included studies. The updated CFIR comprises 5 domains (Table 3), which are subdivided into 39 specific constructs [24], against which the study findings were mapped.

Table 3. The 5 CFIR domains [24].

Domain	Description
Innovation	Features of the Diagnosis Related Group (DRG) system
Outer Setting	E.g. national policies and regulations, patient expectations
Inner Setting	E.g. organizational readiness, infrastructure, leadership support
Individuals	E.g. knowledge, beliefs, and attitudes of healthcare staff regarding DRGs
Implementation Process	Measures taken to implement DRGs or overcome implementation challenges (e.g. training, stakeholder engagement), and their effectiveness

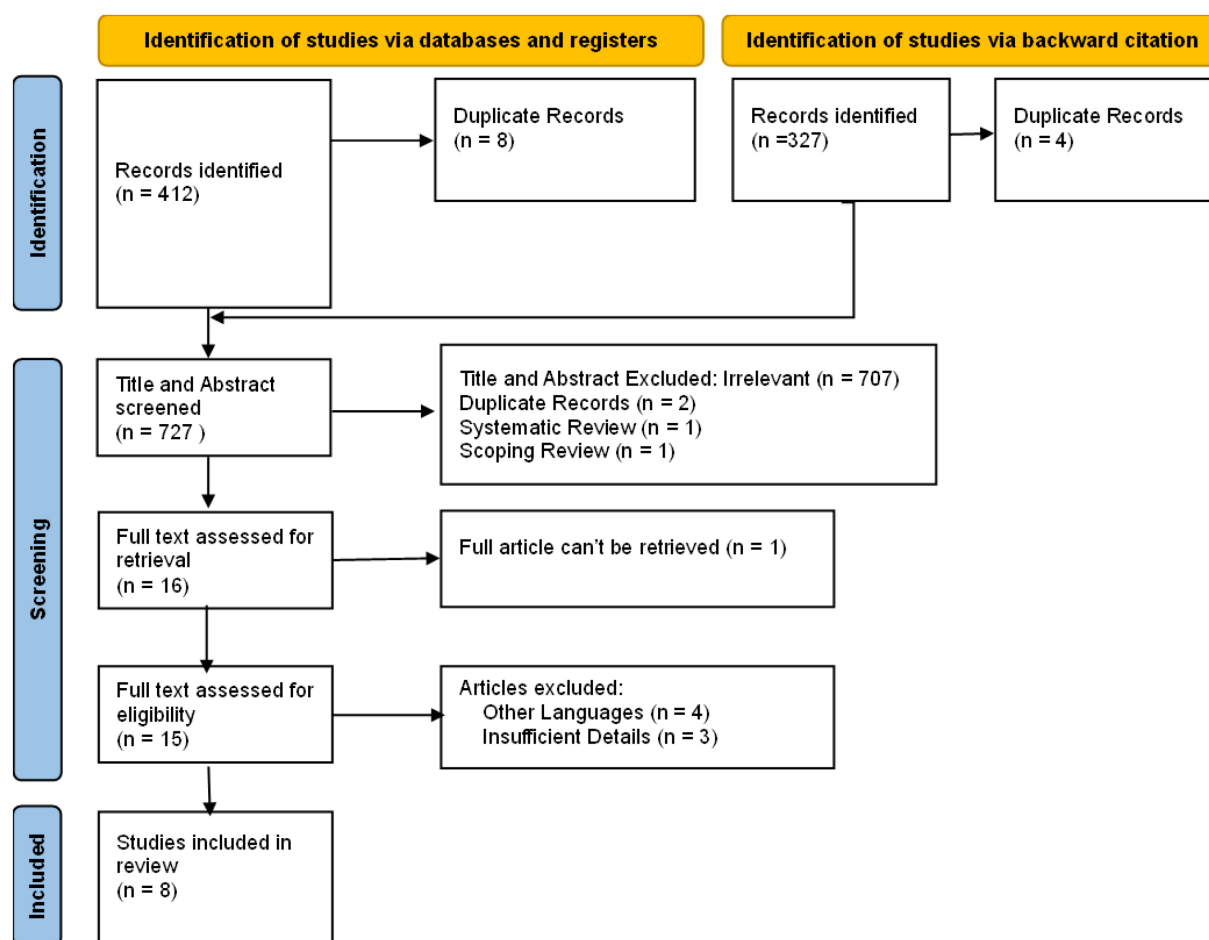


Fig. 3. PRISMA flow diagram of the study selection process.

Results

Characteristics of the included studies. Database and backward citation searches retrieved 739 articles. After excluding 12 articles identified as duplicates, the titles and abstracts of 727 articles were screened, resulting in the exclusion of 711 articles. Of the remaining 15 articles for which the full text could be obtained, four were excluded because they were not written in English language and three because they contained insufficient details relating to DRG implementation. A total of eight articles were identified as fulfilling the eligibility criteria and were included in the review. The PRISMA flow diagram shown in Fig. 3 summarizes the study selection process.

The main characteristics of the studies [25–31] included are summarized in Table 4 and their quality appraisal scores are presented in Table 5. In Table 5, each study had the potential to reach a perfect score of 2 in each of the categories, with a total of 28 representing the highest quality. The minimum score accepted is 16, and the average of the sources is 24.3

Synthesis of findings. The findings of the included studies, mapped against the CFIR domains and constructs, are presented in Table 6.

Innovation. Evidence strength and quality. The review found consistent evidence supporting the role of DRG-based costing as an effective tool for resource allocation and cost estimation. Three studies [25, 26, 32] highlighted its role in enabling policymakers to define patient groups, identifying resource consumption patterns for various treatment options, and predicting expected services required in the future, ultimately supporting VBHC initiatives. However, 2 studies [28, 32] noted concerns about variability in cost data accuracy due to incomplete or inconsistent coding and clinical documentation.

Complexity. Barriers related to the complexity of DRG implementation were reported in all 8 studies. Many requirements, such as the adoption of a standardized clinical coding system (such as ICD-10-AM) and DRG tool, an adequate data collection infrastructure, a sophisticated Hospital Information System (HIS), and appropriately trained personnel,

Table 4. Characteristics of the included studies.

Study details		Methods				Main findings	
No	Reference	Settings	Study type	Method	Objective	Facilitators	Barriers
1	[25]	Tertiary-level hospital with 500 beds	Comparative study (cross-sectional, retrospective)	Data extraction from 11,599 patient records	To compare the average cost of care to the actual case mix cost of healthcare services provided to inpatients	Adoption of a standardized patient classification system (ICD-10-AM) Availability of national average cost and cost weights	Missing standardized data in patient records, including age, gender, admission date, etc. (MDS) Social norms, e.g. separate male/female wards affecting the DRG costs
2	[26]	Tertiary-level hospital with 500 beds	Qualitative study (cross-sectional, retrospective)	Data extraction from 12,979 patient records (diagnoses and procedures)	To develop and implement a case-mix classification system	Use of a standardized DRG software tool Standardized data in patient records, including age, gender, admission date (MDS)	Not adopting a standardized patient classification system (ICD-10-AM) needed to group patients into their DRGs based on procedures and diagnosis codes Need for trained coders and staff training Selection of comorbidity effecting the DRG is responsibility of treating physicians Lack of focus on the data entry process and the validation of collected patient data
3	[27]	Six healthcare facilities (two hospitals, two clinics, two dispensaries)	Pilot study	Cross-sectional (survey)	To assess the extent to which healthcare systems in the Eastern Region are following international reimbursement standards	Adoption of a standardized patient classification system (ICD-10-AM)	
4	[28]	67 Ministry Of Health (MOH) hospitals	Cross-sectional (retrospective-analytic)	Data collected through a web-based submission platform designed by MOH	To assess the efficiency of using a case mix index approach	Availability of complete hospital data Policy makers and healthcare providers prioritizing evidence-based decisions	Incomplete encounter data as per MDS Issues with clinical documentation Issues with coding Improper assignment of additional diagnoses and comorbidities Inadequate coordination between healthcare providers Fragmented care delivery models Improper use of technology and information systems Use of Australian relative weights inconsistent with the local context

(Continued)

Table 4. Continued

Study details		Methods				Main findings	
No	Reference	Settings	Study type	Method	Objective	Facilitators	Barriers
5	[29]	Tertiary-level hospital	Quantitative (observational)	Three observed data items relating to each patient (Length Of Stay ((LOS)), age at admission and DRG)	To model the relationship between diseases and hospital LOS	Availability of patient data to facilitate the assignment of patients to DRGs	
6	[30]	Various settings	Qualitative (interviews)	Questionnaire survey of 307 public health and preventive medicine physicians	To assess the level of awareness of the healthcare transformation program among preventive medicine and public health physicians	Introduction of standardized minimum data sets (MDS) Implementation of a patient classification system (AR-DRG, SBS) Launch of National Platform for Health and Insurance Exchange Services (NPHIES) Training in clinical coding Understanding of population health	Staffing shortages Inadequate healthcare information system software
7	[31]	Various settings	Qualitative	60-minute interviews with 10 participants from diverse backgrounds to ensure the representation of several stakeholders	To understand healthcare system reform in the Kingdom of Saudi Arabia (KSA) and its potential challenges	Current use of the ICD-10-AM patient classification system for KSA Training in clinical coding	
8	[32]	50-bed multi-specialty hospital	Cross-Sectional (retrospective analytic)	Data extraction from 750 patient records	To explore the relationship between coding errors, patient safety and service quality, while estimating the potential financial impact of these errors through DRG/case mix calculation	Accuracy of clinical coding Coders' knowledge and experience Internal training for coders	Coding errors Unclear documentation Outdated coding and computer systems

posed significant challenges for hospitals with limited resources. One study [30] identified a lack of standardized data and misclassification of principal or additional diagnoses as a major risk, leading to the inability to accurately group patients into their respective DRGs and, consequently, to financial impacts due to reimbursement errors.

Adaptability. Two studies [25, 28] highlighted the fact that, when a DRG system is imported from another country, such as KSA's adoption of AR-DRG, it is crucial to adapt it for use in the local context. For instance, the average relative weights for the DRGs used in AR-DRG, which were specified within Australian settings, often did not reflect, for example, healthcare

Table 5. Quality appraisal scores for the included studies.

Study	Quality score
[25]	27
[26]	27
[27]	15
[28]	26
[29]	27
[30]	22
[31]	23
[32]	28

practices, resource utilization patterns and economic conditions within KSA.

Individuals. Knowledge and Beliefs about the Intervention. Although 80% of the public health and preventive medicine physicians surveyed in one study reported being aware of the Saudi healthcare transformation program [30], other studies highlighted awareness gaps relating to DRGs and case mix among various stakeholders [26, 30, 32]. While policymakers and senior administrators might recognize the value of DRG-based costing, clinicians and clinical coders often lacked relevant knowledge. Studies emphasized the need for hospital administrators to make efforts to alter the behavior of clinicians regarding the implementation of DRG systems, to provide orientation and targeted training to enhance awareness and understanding of the case-mix system and the importance of clinical coding accuracy, and to improve clinical documentation practices and clinicians’ communication with clinical coders.

Inner Setting. Structural Characteristics. Four studies [28–30, 32] reported that, while some hospitals had advanced health information systems and comprehensive patient-level data, indicating the capacity to implement a DRG system, others struggled with fragmented systems and suboptimal use of technology, which significantly impacted progress towards DRG implementation.

The lack of a unified data system made it challenging for hospitals to accurately capture, standardize, and integrate patient information, leading to gaps in data completeness and reliability. In facilities with fragmented systems, coding and classification processes tended to be inefficient, increasing the risk of errors and inconsistencies in assigning patients to DRGs. Additionally, difficulties in extracting and analyzing essential clinical and financial data hindered their ability to generate meaningful insights into hospital performance and the accuracy of reimbursement processes.

Hospitals with robust, well-structured patient-level data systems demonstrated higher ability in implementing DRG frameworks, as noted in 2 studies [25,

26]. However, resource-limited settings struggled to develop the necessary capabilities to ensure accurate cost estimation and reporting.

Culture. One study [25] focused on the impact of cultural norms on the implementation of DRGs and on variations in DRG costs. For example, in gender-segregated wards, which are especially common in Saudi public hospitals, the cost incurred per DRG category was different between male and female wards, arising from operational differences. This highlights the need for culturally informed cost adjustments.

Readiness for implementation. The hospitals featured in the included studies varied widely in terms of their organizational readiness for DRG implementation. Five studies [25–27, 30, 31] emphasized the importance of adopting a patient classification system, such as ICD-10-AM, and structured patient datasets (MDS) as prerequisites for implementing a DRG system.

Outer Setting. External Policies and Incentives. Externally imposed requirements, such as the mandated use of the ICD-10-AM classification system and the need to align with the goals of Vision 2030, were important drivers for DRG implementation. Four studies [25, 26, 28, 30] emphasized the role of national policies in prioritizing VBHC and moving away from FFS models. Initiatives by regulators such as CHI and MOH, including the National Platform for Health Insurance Exchange Services (NPHIES), government portals for data collection, and the implementation of MDSs, were found to have facilitated standardization and benchmarking across healthcare facilities.

Implementation Process. Planning. Successful implementation of DRGs requires comprehensive planning, particularly in relation to training and health information system upgrades. Two studies [30, 31] identified the importance of training programs for coding staff, physicians, and administrative personnel in improving the accuracy of data collection.

Reflecting and Evaluation. Evaluation of DRG adoption in 3 studies [25, 27, 29] identified measurable cost reductions and improved efficiency. At the same time, one study [30] warned of the potential increase in the LOS of patients under specific DRG groups based on the age of patients, especially older people with more complex care needs. Factors that may increase DRG-related costs can impede the assessment of how implementing the DRG system affects overall cost reduction.

Discussion

This systematic review explored barriers to and facilitators of the implementation of DRG systems in

Table 6. Mapping of review findings against CFIR domains and constructs.

CFIR Domain	Construct	Definition	Findings		References
			Barriers	Facilitators	
Innovation	Evidence of Strength and Quality	Perceived quality of evidence supporting the intervention	Lack of costing data accuracy due to inconsistent and incomplete coding and clinical documentation		[28, 32]
	Complexity	Perceived difficulty in the intervention's implementation	Lack of ICD-10-AM, Hospital Information System (HIS), Diagnosis Related Group (DRG) tools; lack of trained staff; issues with coding accuracy and clinical documentation completeness, leading to DRG assignment errors		[25–28, 30–32]
	Adaptability	The degree to which the intervention can be adapted to local contexts	Missing localization of cost and average cost weights for Saudi settings		[25, 28]
Individuals	Knowledge and Beliefs	Stakeholders' understanding and beliefs about the intervention	Gaps in DRG and case mix knowledge among clinicians and coders	Targeted training and improved clinical documentation practices	[26, 30, 32]
Inner Setting	Structural Characteristics	Physical and technological infrastructure characteristics of the setting		An advanced HIS; complete patient data	[28–30, 32]
	Culture	Norms, values, and assumptions shaping behavior in the organization	The need for culturally informed cost adjustments		[25]
	Readiness for Implementation	Tangible and immediate indicators of organizational readiness for change	Resource-limited hospital settings struggle Lack of focus on the data entry process and the validation of the collected patient data needed for DRG implementation Staffing shortages	Adoption of ICD-10-AM and Minimum Data Set (MDS) Higher self-efficacy in hospitals with robust data systems	[25–27, 30, 31]
Outer Setting	External Policies and Incentives	Influence of external policies, regulations, or mandates on implementation		National policies such as classification mandates; initiatives such as National Platform for Health and Insurance Exchange Services (NPHIES) and MDS	[25, 26, 28, 30]
Implementation Process	Planning	Processes for preparing for implementation		Training programs for staff, physicians, and administrators for accurate data collection and coding	[30, 31]
	Reflecting and Evaluation	Strategies to evaluate implementation progress and impact	The age of the patient especially in the older age category affects the DRG assignment and increases the Length Of Stay (LOS)		[25, 27, 29, 30]

KSA. The findings revealed that, while such systems offer a reliable payment model with significant benefits - including more accurate cost estimation, improved resource allocation and utilization, and a better understanding of patient needs and the services they are likely to need in the future - several challenges hinder their successful implementation. Barriers included the complexity of implementation, lack of standardized patient classification systems and datasets, lack of localization, variable hospital readiness, and gaps in stakeholder knowledge and training. Facilitators included the adoption of ICD-10-AM and standardized DRG tools, and appropriate training in their use. External drivers, such as national policies and regulations, also played a pivotal role in accelerating adoption.

These findings are congruent with those of a systematic review of DRG implementation in countries such as Ghana, Germany, the United Kingdom (UK) and the USA [33], which faced challenges including availability of patient data, classification issues such as lack of standardized coding systems and inaccurate coding, lack of knowledge regarding DRGs among clinicians, poor adherence to standards and guidelines, and shortages of trained staff. Another systematic review of DRG implementation in three WHO regions (Eastern Mediterranean, South-East Asia and Western Pacific) [34] reported similar barriers and facilitators to those identified in the current review, including missing patient data, the quality of clinical documentation, and the importance of standardized classification systems, clinician awareness, and appropriate training. The review also emphasized the importance of adapting DRG systems developed for use in other countries to local organizational and cultural contexts (such as, in the case of KSA, the existence of gender-segregated wards), and of establishing pilots to identify adoption factors, most notably any regulatory changes that may be required.

Additional challenges arise as DRG systems move into more advanced stages of implementation. A study conducted in Iran [35] found that DRG implementation efforts were hampered by technological issues, such as lack of integration with HISs, frequent management turnover, organizational and cultural barriers, such as lack of senior management support, and decreasing quality of care due to early patient discharge. The study highlighted the need for improved strategic alignment and greater leadership engagement. Another study carried out in Kazakhstan [36] identified challenges such as institutional resistance to data sharing, incomplete coding of secondary diagnoses and co-morbidities, and the influence of highly specialized hospitals skewing reimbursement systems. Such hospitals can

exert market power, potentially driving up costs and influencing insurance reimbursement. The study emphasized the impact of such challenges on the accuracy of the cost estimation for DRGs.

Implications for policy and practice. Improved training and knowledge dissemination. The review highlighted significant gaps in knowledge among clinical coders, clinicians, and administrators. Policymakers should invest in comprehensive publicity, education and training programs to ensure all stakeholders involved in the implementation process understand the principles and benefits of DRGs. These include initiatives to raise awareness of DRGs and their implementation, and regular workshops to improve clinical documentation and coding accuracy, similar to those already put in place by KSA regulators, especially CHI.

Infrastructure and data standardization. Variable hospital readiness, particularly in relation to healthcare information systems and adequate patient-level data quality, is a key barrier. Investment in digital infrastructure, such as well-structured HISs and the integration within them of DRG-related tools, is essential. Initiatives such as MDSs that are mandated by regulators in both the public and private sectors, and the launch of NPHIES, can serve as platforms for data standardization and benchmarking.

Localized adaptation of DRGs. The adoption and implementation of DRG systems must account for the Saudi healthcare context. Customizing relative weights, addressing cultural practices, and aligning with local resource utilization patterns are required to enhance the appropriateness and equity of DRG systems.

Continuous monitoring and evaluation. Policymakers should establish mechanisms for evaluating DRG system performance over time to address any unintended consequences and optimize outcomes.

Strengths and limitations. This systematic review provided a synthesis of the available evidence on the barriers to and facilitators of the implementation of DRGs in KSA, a country in the early stages of DRG adoption. It aimed to identify key challenges, opportunities and actionable insights for policymakers and other healthcare stakeholders as the country continues its DRG implementation journey. The review also highlighted critical gaps in the evidence base, providing a foundation for further research on optimizing DRG implementation within similar healthcare systems.

The limitations of the review include, first, the small number of available studies of DRG implementation conducted in KSA, which limits the conclusions that can be drawn regarding the long-term impact on the country's healthcare system of introducing

DRGs and the generalizability of the findings to other country contexts; and, second, the inclusion of studies published only in English, which may have missed relevant studies published in other languages.

In the conclusion, the adoption of DRG systems in KSA offers a pathway to achieving key VBHC goals, however, successful implementation requires addressing significant barriers. To optimize the effectiveness of DRG implementation, it is vital that policy-makers and healthcare leaders take steps to identify and mitigate these challenges early on, particularly in areas such as coding accuracy and completeness, information technology integration, and leadership engagement and support. They should also prioritize investments in training, infrastructure, and localized adaptation. By leveraging national initiatives, such as Vision 2030, KSA can position itself as a leader in healthcare transformation. Future research should focus on evaluating the long-term impact of DRG adoption in KSA and similar healthcare systems.

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References

- Mendelson DN, Schwartz WB. The effects of aging and population growth on health care costs. *Health Aff (Millwood)* 1993;12:119–125. <https://doi.org/10.1377/hlthaff.12.1.119> PMID:8509013
- Baveja L, Bazell C, Counihan A. Six challenges to successful adoption of value-based care in the Middle East 2019. <https://www.milliman.com/en/insight/six-challenges-to-successful-adoption-of-value-based-care-in-the-middle-east> (Accessed: 8 October 2024).
- Balwan WK, Kour S. Lifestyle Diseases: The Link between Modern Lifestyle and Threat to Public Health 202. <https://www.paho.org/en/topics/noncommunicable-diseases> (Accessed: 8 October 2024).
- PWC. Value Based Healthcare Foreword 2021. <https://www.pwc.com/m1/en/publications/documents/value-based-healthcare.pdf> (Accessed: 15 October 2024).
- Hurst L, Mahtani K, Pluddemann A, Lewis S, Harvey K, Briggs A, *et al.* Defining value-based healthcare in the NHS CEBM 2019. <https://www.cebm.ox.ac.uk/resources/reports/defining-value-based-healthcare-in-the-nhs> (Accessed: 15 October 2024).
- Langenbrunner J, Cashin C, O'dougherty S. Designing and Implementing Health Care Provider Payment Systems How-To Manuals EDITED.OKR 2009. <https://openknowledge.worldbank.org/entities/publication/e8891855-6094-58c3-903d-02bb775287af> (Accessed: 27 October 2024).
- Donev D, Kovacic L. Payment methods and regulation of providers. 2013;(I):366-375. https://www.researchgate.net/publication/257830675_Payment_methods_and_regulation_of_providers (Accessed: 28 October 2024).
- Reka H. Value-based health care in Saudi Health Insurance Market. council of health Insurance 2022. <https://chi.gov.sa/ResearchLibrary/VBHC%20White%20Paper%20Version%20Final.pdf> (Accessed: 28 October 2024).
- Zheng J, Lu Y, Li W, Zhu B, Yang F, Shen J. Prevalence and determinants of defensive medicine among physicians: a systematic review and meta-analysis. *Int J Qual Health Care* 2023;35:mzad096. <https://doi.org/10.1093/intqhc/mzad096> (Accessed: 29 October 2024).
- Ahmed T. Fee-for-Service Vs Value-Based Care: Understanding the Key Differences- Streamline Health. StreamLine Health 2023. <https://streamlinehealth.net/fee-for-service-vs-value-based-care/> (Accessed: 29 October 2024).
- Prognosis CI. What Is Fee For Service In Healthcare? Prognosis HER 2018. <https://prognosis.com/what-is-fee-for-service-in-healthcare/> (Accessed: 3 November 2024).
- Wilson H, Gole J, Mishra B, Mishra J. Value based Healthcare 2016. <https://www.proquest.com/openview/4aafd99c238c24a0cb006cd2372826d6/1> (Accessed: 3 November 2024).
- Catalyst N. What is value-based healthcare? 2017. <https://catalyst.nejm.org/doi/full/10.1056/cat.17.0558> (Accessed: 3 November 2024).
- Reka H, Almaghrabi A, Young S. Introducing patient classification systems in Saudi Health Insurance Market. Council of Health Insurance 2022. <https://chi.gov.sa/MediaCenter/ResearchLibrary/Documents/DRGWhitePaper.pdf> (Accessed: 28 October 2024).
- Hughes C. Workforce Management and Development for Value-Based Care. Association of Talent Development 2020. <https://www.td.org/content/atd-blog/workforce-management-and-development-for-value-based-care> (Accessed: 3 November 2024).
- Vision 2030. Overview. Vision2030.gov.sa. 2016. <https://www.vision2030.gov.sa/en/overview> (Accessed: 15 October 2024).
- CHI. (n.d.). Master document version 1.0 Customer Excellence and Outreach Council of Health Insurance KSA. <https://vbhc.chi.gov.sa/assets/pdf/CHI%20VBHC%20action%20book.pdf>
- HSTP. Health Sector Transformation Program Delivery Plan. 2021. https://www.vision2030.gov.sa/media/0wop2tds/hstp_eng.pdf
- IHACPA. (2022). IHACPA. [online] IHACPA. <https://www.ihacpa.gov.au/> (Accessed: 9 December 2024).
- CHI. (2024). Minimum Data Set (MDS). [https://www.chi.gov.sa/knowledge-center/DocLib/Minimum%20Data%20Set%20\(MDS\).pdf](https://www.chi.gov.sa/knowledge-center/DocLib/Minimum%20Data%20Set%20(MDS).pdf)
- PRISMA. (2020). PRISMA flow diagram. www.prisma-statement.org. <https://www.prisma-statement.org/> (Accessed: 9 December 2024).
- Zingg W, Castro-Sanchez E, Secci FV, Edwards R, Drumright LN, Sevdalis N, *et al.* Innovative tools for quality assessment: integrated quality criteria for review of multiple study designs (ICROMS). *Public Health* 2016;133:19-37. <https://doi.org/10.1016/j.puhe.2015.10.012>
- Keith RE, Crosson JC, O'Malley AS, Cromp D, Taylor EF. Using the Consolidated Framework for Implementation Research

- (CFIR) to produce actionable findings: a rapid-cycle evaluation approach to improving implementation. *Implement Sci* 2017;12(1):15. <https://doi.org/10.1186/s13012-017-0550-7>
24. CFIR Research Team. (n.d.). Constructs – The Consolidated Framework for Implementation Research. <https://cfirguide.org/constructs/> (Accessed: 18 December 2024).
 25. Mehmood A, Ahmed Z, Ghilan K, Damad A, Azeez FK. Inpatient Case-mix Cost Vs Average Cost for Health Care Services in King Fahd Central Hospital, Saudi Arabia: A Comparative Study. *Inquiry* 2021;58:469580211056060. <https://doi.org/10.1177/00469580211056060> PMID:34796754
 26. Mehmood A, Ahmed Z, Ghailan K, Azeez FK, Akhtar S, Rehman W, *et al.* Development of Casemix-based Patient Classification for Patient-Level Costing in a Tertiary Hospital, Saudi Arabia. *Pak J Life Soc Sci* 2022;20:146-152. <https://doi.org/10.57239/PJLSS-2022-20.1.0015>.
 27. Bah S, Almutawa HH, Alassaf NF, Al Hareky MS, Hashishi AS, Alkhater ZJ, *et al.* Pilot Study of Reimbursement Practices in Private Healthcare Centers in the Eastern Province of Saudi Arabia: To What Extent Do They Meet International Best Practices? *Perspect Health Inf Manag* 2015;12(Spring):1b. <https://pubmed.ncbi.nlm.nih.gov/26755896/>
 28. Alshehri A, Balkhi B, Gleeson G, Atassi E. Efficiency and Resource Allocation in Government Hospitals in Saudi Arabi: A Casemix Index Approach. *Healthcare (Basel)* 2023;11:2513. <https://doi.org/10.3390/healthcare11182513>
 29. AL-Gahtani S, Shoukri MM. Analysis of Length of Stay (LOS) Data from the Medical Records of Tertiary Care Hospital in Saudi Arabia for Five Diagnosis Related Groups: Application of Cox Prediction Model. *Open J Stat* 2021;11:99–112. <https://doi.org/10.4236/ojs.2021.111005>.
 30. Aldawsari M, Alrowaily M, Mustafa SH, Albali NH. Awareness and Knowledge of the National Healthcare Transformation Program Among Public Health and Preventive Medicine Physicians in Saudi Arabia. *Cureus* 2024;16:e66782. <https://doi.org/10.7759/cureus.66782>
 31. Al-Nozha OM. Key aspects of the Saudi healthcare system reform and the potential impact on the main stakeholders: A qualitative study. *J Taibah Univ Med Sci* 2024;19(3):598-610. <https://doi.org/10.1016/j.jtumed.2024.04.007>
 32. Albagmi S, Shawaheen M, Asiri EM, Alqadeer TA. Assessment of clinical miscoding errors and potential financial their implications on healthcare management - A case of local hospital in Najran, Saudi Arabia. *Saudi Pharm J* 2024;32(1):101894. <https://doi.org/10.1016/j.jsps.2023.101894>
 33. Barouni M, Ahmadian L, Anari HS, Mohsenbeigi E. Challenges and Adverse Outcomes of Implementing Reimbursement Mechanisms Based on the Diagnosis-Related Group Classification System: A systematic review. *Sultan Qaboos Univ Med J* 2020;20:e260-e270. <https://doi.org/10.18295/squmj.2020.20.03.004>.
 34. Mehmood A, Ahmed Z, Ghailan KY, Dohare S, Varghese J, Azeez FK. *et al.* Implementation of Healthcare Financing Based on Diagnosis-Related Group in Three WHO Regions, Western Pacific, South East Asia and Eastern Mediterranean: A Systematic Review. *J Health Manag* 2023;25:404-413. <https://doi.org/10.1177/09720634231168250>.
 35. Asadi F, Sabahi A, Ramezanghorbani N, Emami H. Challenges of implementing diagnostic-related groups and healthcare promotion in Iran: A strategic applied research. *Health Sci Rep*. 2023;6:e1115. <https://doi.org/10.1002/hsr2.1115>
 36. Chanturidze T, Esau M, Hölzer S, Richardson E. Introducing Diagnosis-Related Groups in Kazakhstan: Evolution, achievements, and challenges. *Health Policy* 2016;120:987–91. <https://doi.org/10.1016/j.healthpol.2016.07.007>