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The importance of the health information systems in value-based healthcare initiatives: a scoping review

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Abstract

The conceptualization of the value-based healthcare (VBHC) model as a way to improve the quality of patient care and control the costs of that care has been widely debated. However, few studies describe how to practically implement VBHC from the perspective of health information systems as technical platforms for data collection, analysis, and sharing. This study presents a scoping review of implementation experiences of this model, specifically focusing on the requirements and barriers of the information system. Out of the initially identified 1866 references, 24 papers were selected, from which the facilitating factors and barriers associated with the information system were extracted. The quality of data, its analysis, and resources (infrastructure and specialized human resources in information and technology communication) emerge as indispensable categories for implementation.

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1. Introduction

The value-based healthcare (VBHC) concept has been launched and promoted as the new approach to address the challenges presented by the costs in the healthcare sector [1]. According to this concept, value is no longer measured by the volume of services, but by the results obtained in healthcare provision [2]. Measuring health outcomes and costs is an essential element in the VBHC process. Measurement of results allows teams to know they are succeeding and provides the data needed to improve care and efficiency [3]. Typically, the desirable and relevant patient level outcomes were measured from both the patient perspective (e.g., patient reported outcome measures-PROMS, patient reported experience measures-PREMS) and clinical outcome perspective [2].

In 2013, Porter and Lee defined a strategy for value-based healthcare transformation based on six points [4]: 1) the organization should operate in integrated practice units; 2) costs and outcomes should be measured for every patient; 3) transition to bundled payment for the care cycle; 4) integration of care delivery across separate facilities; 5) integration of care delivery across separate facilities; 6) building and enabling a suitable information technology platform. According to these authors, for the strategy to be successful, it is important that several of these points advance simultaneously.

This transformation may be regarded as a complex socio-technical intervention that requires organisational readiness for change among healthcare professionals [5]. According to van Staalduinen [6], there is ambiguity in the implementation of VBHC, which hinders the sharing of best practices or comparison between healthcare organizations. In practice, each hospital has its own way and preference for translating the principles of VBHC into practice, based on what is feasible within the specific hospital and healthcare system [5]. This value agenda provides initial guidance on the implementation of VBHC, but it is still insufficient in terms of detailed information on how to practically implement VBHC in a healthcare organization, as highlighted by Daniels [7]. Recently, several authors have described the implementation of value-based initiatives (e.g., [8]). Unfortunately, little is known about the factors that made these implementation efforts successful or not ([7]).

Despite the differences the roadmaps published for VBHC implementation generally comprises 5 stages: preparation, design building, implementation, and improvement (e.g., [5, 8]). In building and implementation stage health informatics and information systems play a decisive role for data gathering and data analysis. Value-based initiatives utilize the Electronic Health Record (EHR) as the primary source of data [9]. An Electronic Health Record (EHR) can be defined as "a repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users" [10]. This digital repository aims to provide continuous, efficient, quality, and integrated medical care with retrospective, concurrent, and prospective information [11]. The EHR is also a requirement for transitioning to Alternative Payment Models (APMs) [12], which have been increasingly important in the adoption of the VBHC concept.

A literature review on common enablers and barriers in health information systems [13] identified five main barriers related to these systems: 1) data fragmentation (fragmentation of sources, access, and utilization); 2) barriers to EHR implementation; 3) lack of governance; 4) legal issues; 5) lack of qualified human resources. Enablers, on the other hand, refer to potential solutions to address these barriers.

Previous reviews have focused on the design (e.g., [14]) drivers of costs [15], cost measurement [16], measuring success [17], economic evaluation [18], and the identification of factors that facilitate or inhibit the design and implementation of VBHC [19]. This scoping review provides an overview of the information and technology issues that influence the success of VBHC models with a focus on EHR. Therefore, we addressed the following research question: What facilitators and barriers related to the healthcare information systems are described in studies related to the implementation of VBHC?

2. Methodology

We conducted a scoping review in accordance with the methodology of the Joanna Briggs Institute [20], searched the electronic databases: EMBASE and PubMed in the time frame of 2012-2023. The search terminology was set up as follows: (((("VBHC"[Title/Abstract]) OR "value-based health care"[Title/Abstract]) OR "value-based healthcare"[Title/Abstract]) OR "value based"[Title/Abstract]) AND ("initiatives"[Title/Abstract] OR "implementation"[Title/Abstract])) OR "case study"[Title/Abstract]) AND ("EHR"[Title/Abstract]) OR "electronic

health record"[Title/Abstract]) OR "healthcare information system"[Title/Abstract]) OR "health informatics"[Title/Abstract]) OR "information technology platform"[Title/Abstract]))). In respect to study eligibility the inclusion criteria followed were: has full-text available; being in the VBHC domain; information technology domain; implementation domain; in healthcare organizations; be an empirical, original research or reviews; and the English language. Regarding the study selection, both reviewers independently screened all articles included in this study. Eligible studies were selected for full-text reviews. Consensus was reached through discussion between the two reviewers. The included studies were those that utilized EHR to obtain their data and mentioned facilitating or barrier points in relation to its use. Studies that did not mention facilitators or barriers regarding the data used in their study were excluded. The data extraction process began with the collection of information, which was performed independently by the two reviewers. When uncertainties arose, consensus was reached through discussion between the two reviewers. The data extraction process began with recording the general characteristics of the studies, such as the origin country year of publication, the healthcare field and the care setting. The data analysis was conducted in accordance with the study's research question, and three categories: data, data analysis, and resources or infrastructure - emerged from the conventional content analysis performed. Topics related to these categories were categorized as facilitators or barriers to the use of healthcare information systems in VBHC initiatives.

3. Results

The initial database search identified 1866 references. The title/abstract screening resulted in 76 full text articles. After screening these, we selected 24 papers. Some descriptive studies features are shown in table 1.

Table 1. Studies characteristics

		References	<i>n</i>	<i>Total</i>
Origin Country	Belgium	[21]	1	24
	Europe	[8]	1	
	Netherlands	[5, 7, 22]	3	
	Spain	[23]	1	
	United Kingdom	[24, 25]	2	
	USA	[26–41]	16	
Publication Year	2012	[41]	1	24
	2017	[26, 28]	2	
	2018	[32–34]	3	
	2019	[22, 24, 27, 29–31, 35–38]	10	
	2021	[8]	1	
	2022	[5, 7, 23, 25, 39]	5	
	2023	[21, 40]	2	
Healthcare Field	Cardiology	[21, 25, 31, 32, 34, 39]	6	24
	Endocrinology	[41]	1	
	General practice	[37]	1	
	Gynaecology	[35]	1	
	Hospital	[5, 7, 8, 23]	4	
	Integrated Practice Unit	[22, 29, 36]	3	
	Oncology	[40]	1	
	Orthopaedics	[24, 26, 28, 30, 33, 39]	6	
	Urology	[27]	1	
Payment Model	APM	[39, 40]	2	24
	Bundled Payment	[30]	1	
	Not Determined	[5, 7, 8, 21–29, 31–38, 41]	21	
Value Initiative	Experience-based co-design	[5]	1	24
	IT value programs	[23, 31, 34]	3	
	Redesign initiative	[21, 24, 26, 30, 33, 36, 39, 41]	8	
	Traditional value- based program	[7, 8, 22, 25, 27–29, 32, 35, 37, 38, 40]	12	

Resources	- Automated data extraction [7]	- Lack of automated data extraction [38]
	- Quick implementation of EHR [37]	- Data collection done in different ways [23, 31]
	- Performing the necessary intervention on the EHR [37]	- Lack of optimization of computer systems [29]
	- Strong support from IT teams [23, 37]	- Lack of IT infrastructure [29, 36]
	- Specialized human resources (Data-IT expert, consultant VBHC) [5, 23, 34]	- Lack of necessary resources [24]
	- Saving time for healthcare professionals [34]	- Time-consuming and barrier-laden data capture process [24]
	- IT infrastructure [34, 40]	- Deficient organisational workflows [5, 40]
	- Trained healthcare professionals in the HER system to apply it in practice [5]	- Lack communication between hospital network members [8]
	- Adequate tools for data recording that ensure confidentiality and data quality [23, 39]	- Interoperability of different data sets [21]
	- User-friendly communication tool linked to the EHR to collect patient reported outcomes [22, 39]	- Absence of payment of the communication platforms like EHR portals [39]
		- Fragmentation of communities and tools [23]

Regarding data category, the described implementation experiences emphasize the need to have quality data that is structured but allows some customization by organizations, rigorous, reliable, detailed, collected over time to enable longitudinal studies, in real-time, easily accessible, and shareable (suggesting the creation of a central repository to be shared by the group of institutions involved in the VBHC initiative). On the barriers side, these experiences emphasize organizational problems such as lack of data, data collection protocols, insensitivity to the need for data collection tools, lack of awareness of routine information collection practices, and issues with access. They also highlight failures of healthcare professionals who do not collect complete information (clinical, cost-related, etc.) or fail to accurately transcribe information, raising concerns about potential data reliability. In this regard, it is suggested that primary sources (patients, physicians, and other healthcare professionals directly involved in patient care) be responsible for recording the data.

Regarding data analysis, the main reported difficulties are related to the lack of data or access to them (due to belonging to different organizations), the lack of standardized data that requires conversions and limits confidence in their quality and accuracy. As a result, there is an awareness of the need for automated data collection that instills confidence in the results of the analysis. Facilitating factors reported in data analysis include awareness of the importance of data-driven decision-making, the speed it enables in decision-making, and therefore the recognition of the need for personalized dashboards that facilitate information interpretation by professionals without requiring an expert. However, the presence of an expert analyst to assist healthcare professionals in using indicators is still welcome. It was also reported that the creation of care pathways built in the electronic information system will enable easy extraction of systematically noted data and provide real-time outcomes and process indicators specific to a particular patient group.

Regarding resources, infrastructure and human resources dominate the reports. In terms of infrastructure, barriers arise from the lack or inadequacy of technological platforms, fragmentation of data collection and communication tools. In terms of human resources, barriers stem from the scarcity of experts in optimization, e-dashboard, and EHR portals. Other barriers arise from the diversity of organizations involved and organizational weaknesses in terms of organization and protocol creation. The most reported facilitating factors are the perception of the need for such resources to adhere to VBHC initiatives, the presence of IT platforms, IT workflows, and adequate tools, IT competencies, and human resources to support implementation (consulting, support in technology usage, and data entry/analysis), training and engagement of professionals and patients as the source of data. Leadership and the existence of a specific budget for this type of project are also reported as crucial for success.

4. Conclusion

This study has demonstrated that health information systems are crucial for VBHC implementation initiatives. EHRs emerge as a means of data collection and a source for analysis, playing a fundamental role in ensuring the

trust and ease of use of information. The engagement of healthcare professionals and patients in utilizing EHRs is indispensable to meet the reporting requirements imposed by these programs, without excessively burdening professionals with administrative tasks. The conventional content analysis approach allowed for the categorization of findings into data, data analysis, and resources, enabling the identification of facilitators and barriers within each category during the implementation of these models. It is worth noting that, among the selected studies, the follow-up and continuous improvement, seen as the final stage of implementing these models (e.g., [5, 8]), did not emerge as a category in our analysis. This may indicate that we are still in an early stage of introducing these types of models into healthcare systems due to deficient organizational readiness among stakeholders.

The primary limitation experienced in this study relates to the article selection process, as many articles use the designation of VBHC without being directly related to the adoption of VBHC models. Furthermore, not all studies describing the implementation of this model explicitly mention their association with VBHC, which may have led to the exclusion of some studies reporting experiences in adopting these types of models. Lastly, it is important to note that the majority of reported experiences originate from the United States, driven by their healthcare system and the increased motivation of payers (e.g., Medicare) to apply VBHC principles.

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