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Health system regionalization's infrastructural dimensions: A scoping review

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Abstract:

Regionalized health systems provide a coordinated chain of services for a specific population. The development of regionalized systems not only means the establishment of regionalized centers providing health services, but also consideration of several structural dimensions. The present study aimed to identify the dimensions of developing a regionalized health system. The study employed a scoping review method using Joanna Briggs Institute's (2015) protocol in 2022. A total of 2128 related articles were identified from ISI Web of Science, PubMed, Scopus, and Google Scholar databases from 2002 to 2022. Finally, 26 articles and documents met the study criteria to enter the review process for thematic content analysis, and extracted the structural dimensions for developing health system regionalization. The results of the analysis revealed health system regionalization's structural dimensions categorized into seven main themes including contextual, financial/economic, managerial, organizational, legal and procedural, service provision, capacities and strategies in the health system; as well as 85 subthemes. Development and implementation of health system regionalization require several essential structural dimensions to be taken into consideration to enhance and facilitate system regionalization process.

Keywords:

Health-care system reform, health system reform, health system regionalization, regionalization, regionalization dimensions

Introduction

Regionalization represents the integrated organization of a health-care system, in which regional structures are entrusted with the responsibility of providing and administering health services in a specific region. The adoption of this method by multiple nations serves to enhance the quality of care provided while ensuring efficient allocation of available resources.

Regionalization is the process of transforming power from the central government to the regions, promoting effective application of the subsidiarity principle within the framework of national or federal solidarity, which fosters greater collaboration and

coordination among different levels of health-care system.

However, the development of regionalized systems does not mean only the establishment of regionalized centers providing health services. When developing such systems, several essential aspects need to be taken into consideration. Besides, it is necessary to identify the potential opportunities in order to improve the implementation process. This article provides a systematic review of various dimensions of such systems.

The complexity of health services, the rise in costs, and the public demand for improvement have forced governments to provide extensive health services. Many countries are adopting new models and approaches to enhance service provision, cut

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costs, and boost efficiency. Health-care regionalization is implemented based on this approach.^[1,2]

Improving health-care accessibility and efficiency in a specific area is the objective of the regionalization policy, which considers economic and operational factors, improves clinical outcomes, and enhances coordination of service delivery.^[3-6] While regionalization approaches are touted for their benefits, obstacles and political unacceptability can undermine integration and coordination in health systems.^[2,7] Applying a one-size-fits-all approach to regionalization is not viable for all health systems in different countries.^[8]

Health systems regionalization mandates substantial reforms in their structures and infrastructures. Improper implementation, in contrast, will lead to unforeseen problems. Before the implementation of regionalization, a thorough evaluation of its underlying requirements is critical due to the potential vulnerabilities of this policy. It would be more rational to refrain from implementation unless substantial advantages for the health system are attained.^[9-11]

A lack of integration in health systems necessitates the development of integrated, regionalized, and responsive health systems to improve clinical outcomes and population health. To address challenges in developing such systems, it is advised to transition from a competitive to a cooperative environment for improved health services and intersectoral collaboration.^[12-14] The World Health Organization (WHO) highlights that integrated health services ensure timely, user-friendly, and cost-effective access to necessary health care.^[15] Nevertheless, the introduction of regionalization and parallel structures leads to fragmentation in the health system. The establishment of an integrated health system relies on competent and qualified support mechanisms.^[16]

The development of regionalized systems involves more than simply creating regional health centers. Several factors need to be taken into account, such as the characteristics of existing health centers, coordination between centers, laws and regulations, financing and payment mechanisms, geographic features, communication and information infrastructures, and patient preferences.^[7,14] Also, political considerations and powerful beneficiary influence, social and cultural conditions, and patients' and providers' preferences are critical issues to consider.^[10,13,14,17] Thus, the present study aims to identify structural dimensions in regionalized health systems.

Materials and Methods

This study was conducted as a systematic scoping review in Joanna Briggs Institute's protocol (2015)^[18] in 2022. The

model proposed by Levac *et al.* (2010) was also used as a guide to conduct this review.^[19]

The main research question was specified as follows: What are the structural dimensions in developing health system regionalization? In this study, the population (P) included all the studies that examined the prerequisites, dimensions, and requirements of health-care regionalization in health systems. The concept (C) was the health system regionalization, and the context (C) involved all health organizations, including health-care centers, health and treatment networks, hospitals, and health systems.

In the next step, studies were searched from three main databases, including ISI Web of Science, PubMed, and Scopus, using the specified search strategy. Additional searches were also conducted on Google Scholar. The search period was from 2002 to 2022. Table 1 shows the search strategy used to search for relevant studies in the present scoping review.

The selection criteria included the original studies, review articles, dissertations, and theses that had examined the dimensions, prerequisites, and requirements of service regionalization in health systems. The exclusion criteria were the articles whose full texts were not available or were published in any language other than English. Besides, Google Scholar was also searched to access gray studies or studies that had not been found in the search process based on the reference list of the search articles. After searching for the articles in the databases and removing repeated articles, the identified articles were reviewed by two members of the research team independently in one phase, based on the titles, abstracts, and full texts of the studies. In each phase, both raters decided on the selection of reviewed articles, and any disagreement between them was resolved by a third rater of the research team.

Endnote software (Version 8) was used to manage the systematic search process. Moreover, the PRISMA¹ protocol^[20] was used to manage the process of selecting relevant studies and reporting the results of the scoping review [Figure 1].

After selecting the articles that met the inclusion criteria, the data related to the search question were extracted from the articles and reported in a table [Table 2].

The quality of the articles extracted in the scoping review was examined using different tools for evaluating the quality of articles based on the type of study^[21] [Table 3].

Then, the extracted data were reviewed qualitatively several times. The purpose of this thematic content
¹Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Table 1: The search strategy used in the study

Databases	ISI Web of Science, PubMed, Scopus, Google Scholar
Search limitations	Language (English), in title/abstract (keywords), full text available, document type: article, review, dissertation, and thesis
Search duration	01.01.2002 up to 08.05.2022
Search period	07.05.2022 up to 08.05.2022
Search terms	#1 Regionalization OR region* health plan* #2 referral OR integrate* OR financ* OR regulat * OR payment * OR organiz* OR Model* OR network* OR collaborat* OR decentr * OR behavior* #3 "Health system" OR "Healthcare system" OR "Health care system" OR "Health network" OR "Health care network"
Search strategy	#1 AND #2 AND #3
The search strategy in PubMed	("Regionalization"[Title/Abstract] OR "regional health planning"[MeSH]) AND ("referral "[Title/Abstract] OR " integrate *"[Title/Abstract] OR "financ*"[Title/Abstract] OR "regulat*"[Title/Abstract] OR "payment*"[Title/Abstract] OR "organiz*"[Title/Abstract] OR "Model*"[Title/Abstract] OR "network*"[Title/Abstract] OR "collaborat*"[Title/Abstract] OR "decentr*"[Title/Abstract] OR "behavior*"[Title/Abstract]) AND ("Journal article"[Publication Type] OR "Review"[Publication Type]) AND "English"[Language] AND 2002/01/01:2022/08/05[Date - Publication]
The search strategy in ISI Web of Science	(TI = (Regionalization) OR AB = (Regionalization) OR TI = (region* health plan*) OR AB = (region* health plan*)) AND (TI = (referral) OR AB = (referral) OR TI = (integrate *) OR AB = (integrate *) OR TI = (financ*) OR AB = (financ*) OR TI = (regulat*) OR AB = (regulat*) OR TI = (payment*) OR AB = (payment*) OR TI = (organiz*) OR AB = (organiz*) OR TI = (Model*) OR AB = (Model*) OR TI = (network*) OR AB = (network*) OR TI = (collaborat*) OR AB = (collaborat*) OR TI = (decentr*) OR AB = (decentr*) OR TI = (behavior*) OR AB = (behavior*)) AND (TI = (Health system) OR AB = (Health system) OR TI = (Healthcare system) OR AB = (Healthcare system) OR TI = (Health care system) OR AB = (Health care system) OR TI = (Health network) OR AB = (Health network) OR TI = (Health care network) OR AB = (Health care network)) AND English (Languages) and Article or Review Article (Document Types) and All Open Access or Free to Read (Open Access)
The search strategy in Scopus	(TITLE-ABS-KEY (Regionalization*) OR TITLE-ABS-KEY (region* health plan*)) AND (TITLE-ABS-KEY (referral) OR TITLE-ABS-KEY (integrate *) OR TITLE-ABS-KEY (financ*) OR TITLE-ABS-KEY (Regulat *) OR TITLE-ABS-KEY (Payment *) OR TITLE-ABS-KEY (Organiz*) OR TITLE-ABS-KEY (Network*) OR TITLE-ABS-KEY (Collaborat*) OR TITLE-ABS-KEY (Decentr*) OR TITLE-ABS-KEY (behavior*) OR TITLE-ABS-KEY (model)) AND (TITLE-ABS-KEY (Health system) OR TITLE-ABS-KEY (Healthcare system) OR TITLE-ABS-KEY (Health care system) OR TITLE-ABS-KEY (Health network) OR TITLE-ABS-KEY (Health care network))

analysis was to ensure that all complex topics and concepts related to the context of the present review study were covered in the text of the articles.

In this step, two members of the research team independently merged and summarized the data extracted from the text of the reviewed articles to extract the main and secondary themes related to the search question. Any possible disagreement was resolved by a third rater of the research team. Then, the main and secondary aspects related to the subject were defined, clarified, and categorized as a comprehensive set of prerequisites and requirements of health service regionalization [Table 4].

In the last step, we consulted with two subjects matter experts in the health-care regionalization field from medical universities of Iran to confirm the findings of the study.

Results

Twenty-six articles met the criteria to enter the scoping review for data extraction and analysis [Figure 1]. Most of the studies (4; 0.19%) were conducted in 2021. Moreover, three studies (16%) were conducted in 2019, three studies (11%) in 2017, and three studies (11%) in 2015. The majority of the studies extracted in this scoping

review were conducted in Brazil (7; 27%), USA (5; 19%), and Canada (4; 15%). Moreover, the selected studies were review (9; 37%), qualitative (7; 35%), case-control (4; 15%), and mixed methods (4; 15%) studies. Table 2 summarizes the studies selected in the present systematic review.

Table 3 also shows an assessment of the quality of the reviewed articles based on their type.

The results of content analysis of the data extracted from the text of the selected studies revealed the dimensions of developing a regionalized health-care system. Dimensions were categorized into seven main themes and 85 subthemes [Table 4]. The main themes related to the dimensions were contextual, financial and economic, managerial, organizational, legal and procedural, service provision, and dimension related to capacities and strategies in the health system.

Discussion

Regionalization aims to integrate and rationalize health-care services, promote evidence-based practice, decentralize resources and decision-making, and prioritize illness prevention and health promotion. To achieve regionalization, several requirements must be fulfilled, including regulating responsibility, matching

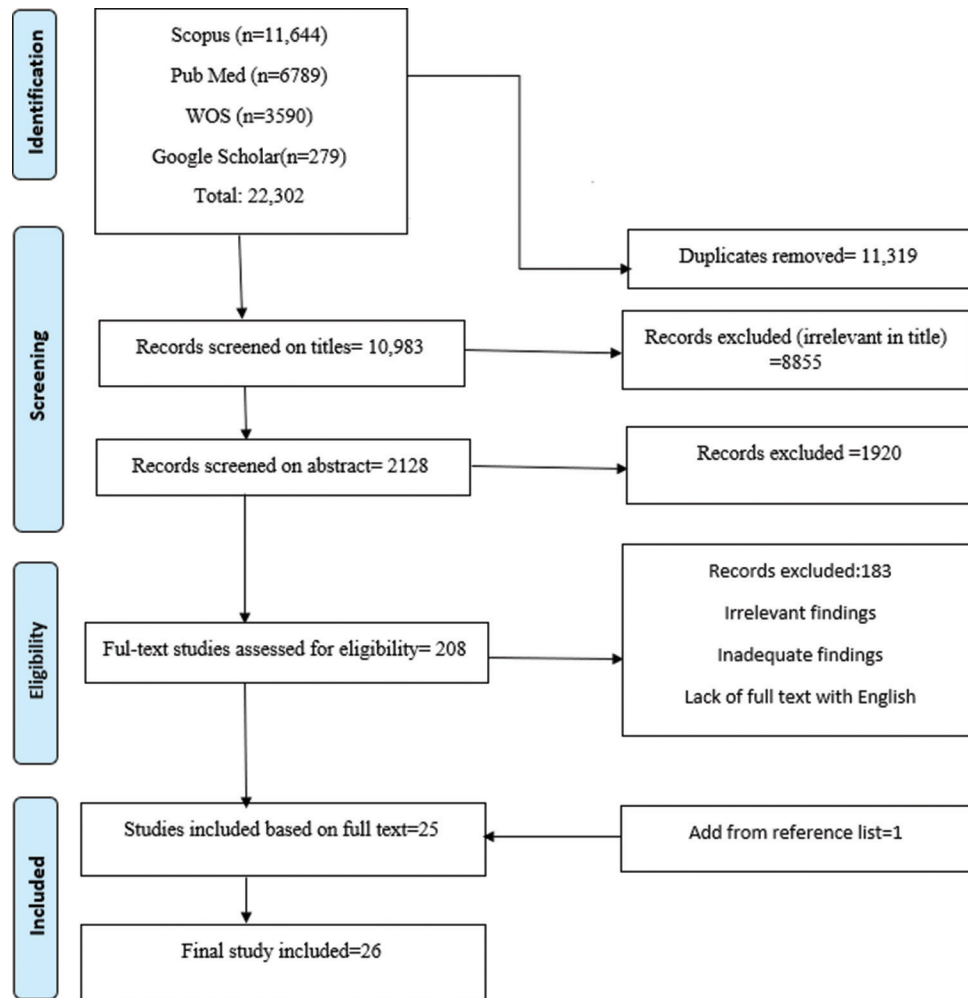


Figure 1: The PRISMA flow diagram for article selection

supply with demand, establishing a gateway and referral system, ensuring continuous information flow, and creating partnerships between health professionals and technicians.^[36]

Success in achieving regionalization goals depends on taking these requirements into account, as emphasized in multiple studies. The study by Tofani *et al.*^[24] classified these requirements into two structural dimensions and explored their significance. They believed that regionalization cannot utilize prescriptive models for development. Investment in the improvement of technical and political dimensions is necessary. The technical dimension involves strategies for providing health-care services based on technological requirements, logistics for guiding the population to service networks, and regulations and protocols for access. The political dimension deals with power conflicts and requires strong regulatory mechanisms. Regionalization is not just about organizing health-care actions and services, but also involves political construction to address specific regional health needs.

In 2016, Bergevin *et al.*^[47] proposed seven structural requirements for improving health-care regionalization. These involve managing integrated regionalized health systems, strengthening wellness promotion and public health, ensuring timely access to primary health care, involving physicians in leadership and accountability, engaging citizens in shaping their own health system, strengthening health information systems, and fostering a culture of excellence and continuous quality improvement. These improvements aim to enhance health-care provision with minimal initial expenses and substantial ongoing cost savings. The key principles behind regionalized systems of care, as proposed by Walton and Mohr (2021), are standard selection, infrastructure design and development, data collection and surveillance, and performance verification.^[45]

The first point that necessitates contemplation is the role of each country's political, economic, and geographic context to propose a practical plan to implement a health system regionalization. However,

Table 2: The characteristics of the selected studies through a systematic search

Row	First author's name (year)	Study title	Place	Study design	Setting/participants	Findings	Quality appraisal status
1	Feazel <i>et al.</i> ^[22] (2015)	Achieving regionalization through rural inter-hospital transfer	USA	Review	-----	❖ Interhospital transfer	Moderate
2	Ezisi (2017) ^[23]	Challenges in horizontal integration of eye care services into the pre-existing rural primary care structure: An operations research perspective from Nigeria	Nigeria	Operation research study	481 patients	❖ Some operations challenges	Moderate
3	Tofani <i>et al.</i> (2021) ^[24]	Chaos, organization, and creativity: Integrative review on health care networks	Brazil	Literature review	Scientific articles	❖ Regional governance ❖ Regional planning ❖ Health-care networks	Good
4	Zhu <i>et al.</i> (2019) ^[25]	Combining resource, structure and institutional environment: A configurational approach to the mode selection of the integrated healthcare in county	China	Qualitative comparative analysis	15 IHCs in 10 counties	❖ Governance	Good
5	Viana <i>et al.</i> (2019) ^[26]	Confronting health inequalities: Impasses and dilemmas in the regionalization process in Brazil	Brazil	Brief review	----	❖ Contextual factors	Weak
6	Hamadi <i>et al.</i> (2017) ^[27]	Does hospital ownership influence hospital referral region health rankings in the United States	USA	Quantitative analysis	6000 hospitals	❖ Referral efficiency indicators	Moderate
7	Farrag <i>et al.</i> (2021) ^[28]	Does implementation of the universal health insurance affect the quality of referrals in the healthcare system? A cross-sectional comparative study in Egypt	Egypt	Cross-sectional study	12 PHC centers, 21 PHC units, seven general hospitals, and four specialized hospitals/1200 physicians and nurses	❖ Referral system	Good
8	Spagnolo <i>et al.</i> (2021) ^[29]	Exploring the implementation and underlying mechanisms of centralized referral systems to access specialized health services in Quebec	Canada	Qualitative study	Nine semi-structured interviews	❖ Contextual factors	Good
9	Tuot <i>et al.</i> (2015) ^[30]	Facilitators and barriers to implementing electronic referral and/or consultation systems: A qualitative study of 16 health organizations	USA	Qualitative study	16 interviews with leaders of health-care delivery organizations	❖ Referral systems ❖ Electronic consultation systems	Moderate
10	Seyed-Nezhad <i>et al.</i> (2021) ^[31]	Factors affecting the successful implementation of the referral system: A scoping review	Iran	Scoping review	63 studies	❖ Referral system	Good
11	Javanparast (2022) ^[32]	A framework to determine the extent to which regional primary healthcare organisations are comprehensive or selective in their approach	Australia	Narrative review/ qualitative	---	❖ Comprehensive regional primary health-care organizations	Good
12	Sancho <i>et al.</i> (2017) ^[33]	The health regionalization process from the perspective of the transaction cost theory	Brazil	Conceptual theoretical essay	---	❖ Health regionalization requirements	Weak
13	Santos (2014) ^[34]	Regional governance: Strategies and disputes in health region management	Brazil	Qualitative study	17 semi-structured interviews of health policymakers and managers	❖ Regional governance	Good

Contd...

Table 2: Contd...

Row	First author's name (year)	Study title	Place	Study design	Setting/participants	Findings	Quality appraisal status
14	Fleury <i>et al</i> (2002) ^[39]	Regional planning implementation and its impact on the integration of a mental health care network	Canada	Case study	143 interviews	❖ Regional planning	Good
15	Vargas <i>et al</i> (2015) ^[35]	Regional-based integrated healthcare network policy in Brazil: From formulation to practice	Brazil	Qualitative study	Policy documents/ semi-structured interviews	❖ Regional-based IHNs	Moderate
16	Ramos <i>et al</i> (2020) ^[36]	Regionalization for health improvement: A systematic review	Brazil	Systematic review	39 studies	❖ Organizational arrangements	Good
17	Neville <i>et al</i> (2005) ^[37]	Regionalization of health services in Newfoundland and Labrador: Perceptions of the planning, implementation, and consequences of regional governance	Canada	Mixed methods	12 senior health ministry officials and 23 CEOs and senior administrators	❖ Health system reform	Moderate
18	Give <i>et al</i> (2019) ^[38]	Strengthening referral systems in community health programs: A qualitative study in two rural districts of Maputo Province, Mozambique	Mozambique	Qualitative study	22 interviews and eight focus group discussions	❖ Referral systems	Good
19	Rasoulynejad (2004) ^[39]	Study of self-referral factors in the three-level healthcare delivery system, Kashan, Iran, 2000	Iran	Quantitative study	1036 individuals	❖ Referral systems	Good
20	Mohr <i>et al</i> (2017) ^[40]	Against the current: Back-transfer as a mechanism for rural regionalization	USA	Case-control	Five large hospitals	❖ Back-transfer systems ❖ Hub-and-spoke systems	Good
21	Mello <i>et al</i> (2016) ^[41]	A systematic review of the process of regionalization of Brazil's Unified Health System, SUS	Brazil	A systematic review	26 studies	❖ Contextual factors ❖ Regional governance ❖ Decentralization ❖ Regulation ❖ Access and equity in a system	Good
22	Umney <i>et al</i> (2022) ^[42]	Marketisation and regional planning in neoliberal public services: Evidence from French hospitals	France	Case study	French hospital sector	❖ Decentralization ❖ Regional planning ❖ Payment and financing ❖ Public and private sector actors conflicts	Good
23	Farinella <i>et al</i> (2011) ^[43]	The regionalization of the public health system and new governance models for healthcare: The stroke network case in Italy	Italy	Qualitative research methods	Stroke networks	❖ Contextual factors ❖ Networks ❖ Financial arrangements ❖ Regulation ❖ Public and private sectors competition	Good
24	Wiktorowicz <i>et al</i> (2010) ^[44]	Mental health network governance: Comparative analysis across Canadian regions	Canada	Qualitative study	Ten networks	❖ Network governance	Good

Contd...

Table 2: Contd...

Row	First author's name (year)	Study title	Place	Study design	Setting/participants	Findings	Quality appraisal status
25	Walton <i>et al.</i> 2021 ^[45]	Concept review of regionalized systems of acute care: Is regionalization the next frontier in sepsis care?	USA	A concept review	Acute care	❖ Key components of regionalized systems	Good
26	Agarwal <i>et al.</i> (2014) ^[46]	Thrombolysis delivery by a regional telestroke network--experience from the U.K. National Health Service	UK	Mixed methods	A regional telestroke network	❖ Horizontal networking approach ❖ Telemedicine service	Good

IHN=Integrated health-care network

the potential effectiveness of regionalization relies upon the consortium comprising decision-makers, organized civil society, and academic circles, which must assess the requisite modifications and viability for implementing an evidence-based policy, such as regionalization. Moreover, it is imperative to acknowledge the uncertainties inherent in the evidence and strike a balance among diverse results.^[37,41,43]

The analysis of implementing a regional program was conducted by Spagnolo *et al.*^[29] in terms of the impact of five significant groups of contextual factors. The contextual factors were classified into five levels as follows: structural factors as in socio-political context, such as broader social, historical, and cultural factors; organizational factors like inter-regional collaborations and regional and/or local leadership; provider factors like attributes that might affect physicians' behavior; innovation factors like environmental readiness and program adaptability and acceptability; and patient factors such as patient attributes, benefits of the program's adaptation and use, patient-physician agreement, and patients' perceptions. In summary, decision-makers interested in implementing regional and centralized programs should consider context in both the design and implementation.

The organization of health regionalization involves distributing health resources throughout the health-care system. It aims to provide easy access to care at all levels and in a cost-effective manner. Regionalization goals achieved by some organizational arrangements include coordinating, decentralizing, rationalizing, and governing the health-care network. Coordination involves making decisions and sharing norms in forums and political mechanisms. Decentralization delegates responsibilities to local entities. Rationalization aims to increase service efficiency. Governance organizes society to protect and promote population health. It distributes authority, regulates power, and empowers cooperative relationships.^[9,22,35,36] In their systematic review, Ramos *et al.*^[36] classified 16 interventions into four domains:

coordination, decentralization, regionalization, and governance.

Integrated health-care networks (IHNs) aim to overcome care fragmentation by coordinating care levels and increasing target population size. They construct a health-care organizational model with primary care as the gateway and emergency care as critical entry points.^[24,32,35]

Some decentralization led to more effective regionalization. However, lack of clarity and ambiguity were criticized in two main areas: insufficient transfer of power in health-care organizations and lack of clarity in transfer of authority to regional boards. The central problem in decentralized models is the responsibility for ensuring accountability. Accountability mechanisms should identify the actors accountable, their actions, and the means of reward or punishment.^[38]

The concept of regionalization has been reformed to implement "system rationalization." Regionalization is renewed as a fundamental point for organizing health actions and services and consolidating regional planning and organization.^[34] The main mechanisms for developing rationalized, regionalized, and integrated networks include concentrating procedures in high-volume hospitals, transferring patients from low-volume hospitals to high-volume ones, providing transport services between hospitals, and concentrating procedures in specialized hospitals.^[27]

The process of regionalization, regional governance, and production of networks are interconnected. Therefore, it is crucial to establish effective governance entities that provide incentives for autonomy, cooperation, and competition. In addition, management should be focused on achieving common objectives through intergovernmental and cooperative arrangements at the national, state, and regional levels.^[25,34]

While it is assumed that regionalizing the health system is advantageous, its intricate implementation

Table 3: The checklist of quality appraisal of the selected studies through a systematic scoping review

Study title	CASP for assessing the quality of qualitative studies (yes/no/cannot tell)									
	Was there a clear statement of the aims of the research?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research? (Appropriate research design)	Was the recruitment strategy appropriate to the aims of the research? (Sampling)	Were the data collected in a way that addressed the research issue? (Data collection)	Has the relationship between the researcher and participants been adequately considered? (Reflexivity)	Have ethical issues been taken into consideration? (Ethical Issues)	Was the data analysis sufficiently rigorous? (Data analysis)	Is there a clear statement of findings? (Findings)	How valuable is the research? (Value of the research)
Combining resource, structure and institutional environment: A configurational approach to the mode selection of the integrated healthcare in county	Yes	Yes	Yes	Yes	Yes	Cannot tell	No	Yes	Yes	7/9
Exploring the implementation and underlying mechanisms of centralized referral systems to access specialized health services in Quebec	Yes	Yes	Yes	Yes	Yes	No	Cannot tell	Yes	Yes	7/9
Facilitators and barriers to implementing electronic referral and/or consultation systems: A qualitative study of 16 health organizations	No	Yes	Cannot tell	Yes	Yes	Cannot tell	Cannot tell	Yes	Yes	5/9
Regional governance: Strategies and disputes in health region management	Yes	Yes	Yes	Cannot tell	Yes	Cannot tell	Yes	Yes	Yes	7/9
Regional-based integrated healthcare network policy in Brazil: From formulation to practice	Yes	Yes	Yes	Yes	Yes	Cannot tell	Yes	Yes	Yes	8/9
Strengthening referral systems in community health programs: A qualitative study in two rural districts of Maputo Province, Mozambique	Yes	Yes	Yes	Cannot tell	Yes	Yes	Yes	Yes	Yes	8/9
Against the current: Back-transfer as a mechanism for rural regionalization	Yes	Yes	Yes	Yes	Yes	No	Cannot tell	Yes	Yes	7/9
Marketisation and regional planning in neoliberal public services: Evidence from French hospitals	Yes	Yes	Yes	Cannot tell	Yes	Yes	Yes	Yes	Yes	8/9

Contd...

Table 3: Contd...

Study title	CASP for assessing the quality of qualitative studies (yes/no/cannot tell)									
	Was there a clear statement of the aims of the research?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research? (Appropriate research design)	Was the recruitment strategy appropriate to the aims of the research? (Sampling)	Were the data collected in a way that addressed the research issue? (Data collection)	Has the relationship between the researcher and participants been adequately considered? (Reflexivity)	Have ethical issues been taken into consideration? (Ethical Issues)	Was the data analysis sufficiently rigorous? (Data analysis)	Is there a clear statement of findings? (Findings)	How valuable is the research? (Value of the research)
The regionalization of the public health system and new governance models for healthcare: The stroke network case in Italy	Yes	Yes	Yes	Yes	Yes	Cannot tell	Yes	Yes	Yes	8/9
	Yes	Yes	Yes	Cannot tell	Yes	Yes	Yes	Yes	Yes	8/9
Study title	AXIS tool (yes/no/do not know)									
Introduction	Methods									
	Were the aims/objectives of the study clear?	Was the study design appropriate for the stated aim (s)?	Was the sample size justified?	Was the target/reference population clearly defined? (Is it clear who the research was about?)	Was the sample taken from an appropriate population base, so that it closely represented the target/reference population under investigation?	Was the selection process likely to select subjects/participants who were representative of the target/reference population under investigation?	Were measures undertaken to address and categorize nonresponders?	Were the risk factor and outcome variables measured correctly using instruments/measurements that had been piloted or published previously?	Is it clear what was used to determine statistical significance and/or precision estimates? (e.g., <i>P</i> values, CIs)	Were the methods (including statistical methods) sufficiently described to enable them to be repeated?
Does implementation of the universal health insurance affect the quality of referrals in the healthcare system? A cross-sectional comparative study in Egypt	Yes	Yes	Yes	Yes	Do not know	Yes	No	Yes	Yes	Do not know
Study of self-referral factors in the three-level healthcare delivery system, Kashan, Iran, 2000	Yes	Yes	Yes	Yes	Yes	Yes	Do not know	Do not know	Do not know	Yes

Contd...

Table 3: Contd...

	Results			Discussion			Other	
	Were the basic data adequately described?	Does the response rate raise concerns about nonresponse bias?	If appropriate, was information about nonresponders described?	Were the results internally consistent?	Were the results of the analyses described in the methods presented?	Were the authors' discussions and conclusions justified by the results?	Were there any funding sources or conflicts of interest that may affect the authors' interpretation of the results?	Was ethical approval or consent of participants attained?
Does implementation of the universal health insurance affect the quality of referrals in the healthcare system? A cross-sectional comparative study in Egypt (cont.)	Yes	No	Do not know	Yes	Yes	Yes	No	Yes
Study of self-referral factors in the three-level healthcare delivery system, Kashan, Iran, 2000 (cont.)	Yes	No	Do not know	Yes	Yes	Yes	No	Yes
The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for systematic reviews and research syntheses (yes/no/unclear/not applicable)								
Study title	Is the review question clearly and explicitly stated?	Were the inclusion criteria appropriate for the review question?	Were the search strategy appropriate?	Were the resources used to search for studies adequate?	Were the criteria for appraising studies appropriate?	Was critical appraisal conducted by two or more reviewers independently?	Were the methods used to combine studies appropriate?	Were the likelihood of publication bias assessed?
Factors affecting the successful implementation of the referral system: A scoping review	Yes	Yes	Unclear	Yes	Yes	No	Yes	Unclear
Regionalization for health improvement: A systematic review	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A systematic review of the process of regionalization of Brazil's Unified Health System, SUS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SANRA (score from 0 to 2)								
Study title	Justification of the article's importance for the readership	Statement of the concrete aims or formulation of questions	Description of the literature search	Referencing	Scientific reasoning	Appropriate presentation of data		
Achieving regionalization through rural interhospital transfer	2	1	0	2	1	1		

Contd...

Table 3: Contd...

Study title		SANRA (score from 0 to 2)				
		Justification of the article's importance for the readership	Statement of the concrete aims or formulation of questions	Description of the literature search	Referencing	Scientific reasoning
						Appropriate presentation of data
Chaos, organization, and creativity: Integrative review on health care networks	2	1	0	1	2	2
	1	1	0	2	1	1
	2	2	1	2	2	1
	2	2	1	2	2	1
Concept review of regionalized systems of acute care: Is regionalization the next frontier in sepsis care?		2	2	1	2	2
						1
Study title		MMAT version 2018 for information professionals and researchers (yes/no/cannot tell)				
		Screening questions		Questions for mixed methods studies		
		Are there clear research questions?	Do the collected data allow us to address the research questions?	Is there an adequate rationale for using a mixed methods design to address the research question?	Are the different components of the study effectively integrated to answer the research question?	Are the outputs of the integration and of qualitative components adequately interpreted?
					Do the divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Challenges in horizontal integration of eye care services into the pre-existing rural primary care structure: An operations research perspective from Nigeria	Yes	Yes	Yes	Cannot tell	Yes	No
						Yes
Does hospital ownership influence hospital referral region health rankings in the United States	Yes	Yes	Yes	Cannot tell	Cannot tell	Cannot tell
Regionalization of health services in Newfoundland and Labrador: Perceptions of the planning, implementation, and consequences of regional governance	Yes	Yes	Yes	Yes	Cannot tell	Cannot tell

Contd...

Table 3: Contd...

Study title	MMAT version 2018 for information professionals and researchers (yes/no/cannot tell)									
	Screening questions			Questions for mixed methods studies						
	Are there clear research questions?	Do the collected data allow us to address the research questions?	Is there an adequate rationale for using a mixed methods design to address the research question?	Are the different components of the study effectively integrated to answer the research question?	Are the outputs of integration of qualitative and quantitative components adequately interpreted?	Are the divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?			
Thrombolysis delivery by a regional telestroke network--experience from the U.K. National Health Service	Yes	Yes	Yes	Cannot tell	Yes	Cannot tell	Cannot tell			
AXIS=appraisal tool for cross-sectional studies, CASP=Critical Appraisal Skills Program, CI=confidence interval, MMAT=Mixed Methods Appraisal Tool, SANRA=Scale for the Assessment of Narrative Review Articles										

hinders efficiency. Regional management plays a crucial role in promoting regionalization and connecting local administrators. These bodies should coordinate the distribution of health services and workers to ensure equal access to care. The vital role of regional committees is to enable comprehensive care through constant negotiation and decision-making with the state. Their ultimate effect is to reinforce regional governance.^[34,35] From an integrated system perspective, managing a regionalized network is crucial for a social policy as health system regionalization. Health issues require a coordinated, interdependent, and cooperative system with multiple dimensions of integration among various clinical and governmental subsystems that encompass collective representations and values.^[35]

During regionalization, governments have periodically implemented regulations to create management tools. However, each new tool proposed by the governments has faced difficulties in adherence by regional and state managers. In addition, frequent changes in management and governance can lead to institutional insecurity, which may increase information asymmetries and opportunistic activities, fostering greater competition among the involved agents.^[34] The organizational and operational rules of health-care networks, as well as the responsible institutions and levels to fulfill them, need to be specified. Governance, planning, and coordination processes should also be outlined at each level. Regional, state, and governmental capacity to fulfill their responsibilities should be periodically accredited. Some governments examine tools such as regional plans, referral centers, regional committees, and patient referral tools like referring guidelines, standardized forms, and waiting lists.^[9,29,36]

A more efficient and coordinated and less-expensive health-care system will be achieved through reducing separate entities and institutions and increasing economies of scale in larger organizations. The main reasons for regionalization are the reduction in government funding transfers to the states for health and social services and the internal provincial fiscal pressures caused by declining federal financial support. These factors led to the introduction of regionalization.^[38] Regional entities can function without funding, administrative structure, or determining states' and regional institutions' competences. Policies should establish a funding mechanism to prevent duplication and discoordination among regional levels.^[36]

More precisely delineated accountability relationships, provision of sufficient resources, commitment on the part of the provincial government to address

Table 4: Structural dimensions of developing a regionalized health system identified in the systematic scoping review

Regionalization dimensions	
Themes	Subthemes
Contextual dimension ^[22,29,35,37,41,43,45]	✓ Epidemiological context ^[26]
	✓ Regional asymmetries ^[26]
	✓ Political base ^[26]
	✓ Capacity of direction and consensus among local actors ^[24,45]
	✓ The existence of roadways ^[22]
	✓ Transportation services between areas ^[28,36]
Financial and economic dimension ^[22,43]	✓ Level of flexibility in funding for locally tailored programs ^[32]
	✓ Regional funding ^[34]
	✓ State strategies for funding and encouraging regionalization ^[34]
	✓ Existence and type of regional investment (origin, types, and purposes) ^[34]
	✓ Existence and type of solidary allocations of financial resources aimed at offsetting inequalities in the region ^[34]
	✓ Insurance and payment factors ^[22]
	✓ Hospital revenue (cost-related) factors ^[22]
	✓ Redistribution of funds ^[9]
	✓ Financial cooperation ^[35,42]
	✓ Reimbursement systems considering regional characteristics of population and structure of health system ^[36,38,39,42]
Managerial dimension	✓ Fiscal decentralization ^[36]
	✓ Identifying inefficiency within the existing system ^[37]
	✓ Desire for more local control and innovation in the public sector ^[37]
	✓ Management of human resources ^[22,29,31]
	✓ Investment of administrators ^[24]
	✓ Management of providers ^[29]
	✓ Providing participatory care ^[22]
	✓ Referral conformity evaluation ^[29]
	✓ Clinical review of referrals ^[29]
	✓ Performance indicators ^[29,45]
	✓ Monitoring ^[29] and evaluation ^[35,45]
	✓ Communication ^[29] and interorganizational relationship ^[33,35]
	✓ Management commitment ^[29,33] and support
	✓ Regional planning ^[9,24,41,42]
	✓ Regional governance ^[24,34-36,41,44]
	✓ Public-private relationships ^[34,39,41,43,45]
	✓ Innovation ^[29]
	✓ Service contracts between funders and public and private service providers ^[26,34,35,42]
	✓ Assessment of the population needs ^[9]
	✓ Policy formulation ^[9]
	✓ Organization and coordination ^[9]
	✓ Informing the public about referral system and level of services ^[36]
	✓ Allocate enough resources and equitable distribution of them ^[9,25]
	✓ Providing technical resources ^[29,35]
Organizational dimension ^[9,24-26,29,33,42]	✓ Balance between governmental and internal control ^[9]
	✓ Balance between centralization and decentralization ^[9]
	✓ Structural/functional vertical integration with the broader health system ^[32]
	✓ The vertical integration of services of different care levels ^[35]
Legal and procedural dimension ^[28,29,41,43]	Rules
	✓ Registration and rules about the organization and operation of the regional health-care organization ^[22,29,34,35]
	✓ Degree of normality of policy documents (normative effectiveness) ^[9]
	✓ Clinical decision rules, protocols, and practice guidelines ^[22,31,35,45]
	✓ Guideline from ministry ^[29]
	Process
	✓ Back transfer ^[22,28,31,39,40]
	✓ Health information exchanges ^[22,31,39]
	✓ Existence of mechanisms for coordination of care ^[9,35]

Contd...

Table 4: Contd...

Themes	Regionalization dimensions	
	Subthemes	
Service provision dimension ^[35]	✓	Pharmacy services ^[22]
	✓	Emergency medical treatment ^[22]
	✓	Telemedicine and tele pharmacy ^[22,46]
	✓	Allocation of services ^[29]
	✓	Incorporate a continuum of curative, rehabilitative, preventive, and health promotion services (integration width) ^[32,35]
	✓	Model for organization of services ^[35,40,46]
	✓	Resolution of services available ^[35]
	✓	A health-care organizational model by which primary care is the gateway ^[28,35]
	✓	Having complementary services ^[9]
	✓	Description of the gamut of services available ^[9]
	✓	Increase the scope of services covered ^[9]
	✓	Tools for purchase of services ^[35]
	✓	Outreach service in remote areas ^[36]
	✓	Effective referral system ^[28,31,38,39]
Dimension related to capacities and strategies ^[29]	✓	Capabilities of the presenting hospital ^[22]
	✓	Capacity at the receiving hospital ^[22]
	✓	Hospitals' ownership ^[27]
	✓	Geographic health coverage ^[35]
	✓	Focus on whole population health ^[27,32]
	✓	Focus on equity of access ^[32,35,41]
	✓	Collaboration with local/regional, secondary, and tertiary health organizations ^[27,32]
	✓	Intersectoral collaboration with non-health sectors in PHC planning ^[32]
	✓	Organizational authority in responding to local needs (local responsiveness) ^[32]
	✓	Government strategies to improve health-care networks ^[34]
	✓	Institutional strategy to develop and implement the Regional Action Plan for the health region ^[34]
	✓	Existence, implementation, and monitoring of the Regional Action Plan for the health region ^[34]
	✓	Type of participation of private service providers ^[34,35]
	✓	Community participation and control ^[27,32,38,39]
	✓	Decentralization of care ^[36,37]
	✓	Allow patient mobility between regions ^[36,39]
	✓	Freedom of user choice between public and private providers ^[36]
	✓	Concentration of procedures in hospitals with high volume of production ^[36]
	✓	Concentration of procedures in specialized hospitals ^[36]
	✓	Transfer of patients arriving from low-volume hospitals to high-volume hospitals ^[36]

population health and allocate funding based on needs, encompassing physician and pharmaceutical services within the regional authority's funding framework, and access to comprehensive information for the purposes of planning and administration are the crucial strategies and tools that determine the degree to which regional structures can attain the objectives of regionalization.^[38]

To prevent fragmentation in health care, it is suggested to integrate care through different approaches, including vertical programs into mainstream health services, coordination between public and private health-related services, and integrating health with other sectors. These reforms, like regionalization, aim to provide fair, comprehensive, integrated, and continuous health services to a specific population. They are responsible for clinical and economic outcomes and population health by introducing IHNs.^[36]

Stronger Primary Health Care (PHC) systems lead to improved population health and equitable outcomes and prepare for integrated care. WHO recommends decentralized PHC structures for localized planning and decision-making. These structures implement PHC, address community needs, and coordinate services. Criteria are proposed to assess network comprehensiveness.^[33,38] Other entry points like emergency care are important in coordinating and continuing care in a regional health system. Regional trauma care systems reduce delays in medical care, prevent inappropriate treatment, and decrease preventable deaths. Successful trauma care is time-sensitive.^[36,37]

An effective referral system is crucial in an integrated health-care system. It ensures transfer from one level of the health system to a higher one with better resources. This promotes a close relationship among all health-care

levels and enables governments to manage the referral process. Several factors are needed for a productive referral system.^[28,31,38,39]

An effective regionalized system requires interhospital transfer and is influenced by various factors such as hospital capabilities, services, financial requirements, patient insurance, and telemedicine. Back transfer to the initial hospital after tertiary care is also important.^[23]

It is required to define distinct health-care network development criteria. The network delimitation criteria related to geographic boundaries such as the proximity among regions, network interoperability and resolution capacity of services available should be clearly defined. Moreover, other criteria related to balancing of equity in geographic access and economies of scale, width of services, depth of the services (number of establishments by level of care) and financial resources allocation should be addressed.^[37]

Conclusion

Following the findings of the current study, it can be argued that each country will be able to develop an effective model for the planning and implementation of health-care regionalization in accordance with the contexts, conditions, and existing structures related to its health system, the population needs of each region, the requirements and challenges of health-care regionalization, and the obstacles to implementing this strategy.

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Data and materials

The datasets supporting the conclusions of this article are included within the article.

Ethical considerations

The protocol of this research was reviewed and approved by the ethical committee of Isfahan University of Medical Sciences, Iran (IR.MUI.RESEARCH.REC.1399.353). Intellectual property rights were considered for all the authors.

Consent for publication

We, all authors of the article, give our consent for the publication of identifiable details within the text in Health Research Policy and Systems Journal.

Consent to participate

There are no participants.

Authors' contributions

All authors contributed to the design and implementation of the research, analysis of the results, and writing of the manuscript (study concept and design: Dr. Raeisi and Mr. Eskandarian, acquisition of data: Dr. Raeisi and Mr. Eskandarian, analysis and interpretation of data: all authors, drafting of the manuscript: Dr. Raeisi and Mr. Eskandarian, critical revision of the manuscript for important intellectual content: Dr. Ferdosi and Dr. Golzari, study supervision: Dr. Raeisi).

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Conflicts of interest

There are no conflicts of interest.

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