



Identifying and Prioritizing Determinants of Health Workforce Resilience

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Abstract

Background and Objective: Health system resilience, particularly in the face of chronic stress and acute shocks, is a crucial aspect of healthcare management. This study aimed to examine human resource resilience, specifically identifying and ranking the key determinants and indicators essential to a resilient health workforce.

Methods: In this study, trend and pattern analysis of performance measures were used to identify indicators of workforce resilience in the health system. Participants were recruited using purposive and snowball sampling. The factors affecting resilience and their linkage were identified and prioritized using the fuzzy Delphi method and the analytic hierarchy process.

Findings: Our findings can help advance understanding of health system resilience, refine existing models and theories, and provide new conceptual frameworks. Practical implications included recommendations for health system managers, policy implications for health care governance, and strategies for increasing resilience in practice.

Conclusion: This study acknowledged methodological limitations and potential biases and suggests future research directions to address identified gaps and emerging areas in health system resilience management. Moreover, our study can provide valuable insights into the complex dynamics of health system resilience and offer practical recommendations for strengthening healthcare management in the face of adversity.

Keywords: Workforce resilience, Analytical network process, Behavior, Motivation, Empowerment .



Introduction

In today's rapidly changing and uncertain world, organizations are often faced with unexpected events such as natural disasters, pandemics, and terrorist attacks (1). This vulnerability was particularly exemplified during COVID-19, which led to severe global disruptions in supply and demand and significant financial losses (2). During this period, healthcare providers experienced intensified workload, heightened psychological stress, and requirements for performance improvement, all of which led to a decline in their professional resilience (3). This decline highlights the significant role of human resource management (HRM).

In the last three decades, the issue of human resources has been highlighted due to the importance of business strategies and organizational performance, as measured using cost, revenue, and valuation approaches, for the economic benefits of shareholders and owners (4). In the health sector, health workforce resilience costs constitute 65 to 80% of the total health system budget, indicating that human resource management in the health system is important for both its clinical and financial perspectives (5).

Resilience can be defined as "the inherent ability of a health care system (a clinic, department, hospital, etc.) to adjust its performance before, during, or after events (changes, disruptions, and opportunities) and thus maintain the status quo." (5). By fostering a sense of self-efficacy and creating tolerance among employees, resilience will create opportunities for abilities and skills to improve and enhance organizational effectiveness (6). On the one hand, 43% of companies affected by severe crises reportedly never reopened, and around 30% of them failed. This suggests that organizations that have gone bankrupt are less resilient (7). On the other hand, the health system resilience literature emphasizes that efforts should not only focus on absorbing unforeseen shocks resulting from emerging health needs, but also on ensuring the continuity of health improvements, maintaining system achievements, and strengthening the focus on people (8).

The discussion of HRM began in the late 1990s in Germany, Switzerland, and Australia (9). This emerging approach to HRM focuses on designing organizational processes and human resources to align with the principles of sustainable development and to improve working conditions and employee well-being (10). Because the relationship between resilience and HRM promotes organizational sustainability, and the resilience of the HRM process (11). This concept continues to be used as a theoretical expression and political tool; the realities that lie behind the true meaning of resilience, especially in the human resource sector of healthcare organizations, are still unknown and require further research (5).

Several critical factors currently undermine resilience in the healthcare sector: excessive workloads, emotional burnout, feelings of alienation, and the persistent pressure for heightened performance accuracy. When these stressors are coupled with the lack of institutional support and inadequate financial incentives, the collective impact on staff well-being becomes critical. Consequently, a systematic investigation of these determinants is essential to formulating evidence-based policies for workforce resilience. Therefore, this study aimed to identify and prioritize the factors affecting human resource resilience in the healthcare field, enabling effective actions to improve the community's overall health.

Methods

Study design

This study is applied in its purpose and descriptive in its methodology.

In this study, we initially conducted a conceptual review technique to identify and analyze the initial indicators of human resource resilience and its patterns and trends in the health system. Then, the fuzzy Delphi method and the analytical hierarchy process were utilized to screen, prioritize, and model the interdependencies among these factors. Excel and Super Decision software were used for data analysis.

A panel of experts ($n = 20$) was recruited, using purposive and snowball sampling. This was done by taking into account criteria such as experience, knowledge, and willingness to participate in the study (Table 2).

Table 2. Sociodemographic of participants

Variable	Mode	N
Occupation	Faculty member	7
	Internal director	7
	Head nurse	6
Specialization	Health service management	5
	Economics	4
	Nursing	11
Educational degree	Ph.D.	8
	Master degree	8
	Bachelor degree	4
Field of activity	University	7
	Hospital	13

The stages of implementing the study were structured in three steps:

Step 1: Initial extraction of factors affecting workforce resilience in the health sector (conceptual review method).

Kraus et al. (2020) describe the different stages of the conceptual review method as:

Identifying the research question, identifying relevant studies, selecting studies, charting data, and summarizing and reporting the results.

The following are the steps for conducting a conceptual literature review of the subject.

-Identifying the research question

-The initial question raised in this study was: how was workforce resilience in the health system conceptualized and realized?

- Identifying related studies

To answer the main study question, a literature review of conceptual and empirical articles was conducted using the databases Scopus, Emerald, PubMed, and SED, with a search scope in the fields of health and treatment, social sciences, business, economics, decision sciences, humanities, and psychology. The key terms "resilience," "health system," and "human resources" were identified in the article abstracts.

This study was conducted in the summer of 2024 and was limited to articles published in English and Persian since 2006. This starting point was chosen because 2006 was the year of the first edition of "Resilience Engineering: Concepts and Principles." (12).

Inclusion and exclusion criteria

Studies were excluded if they did not address the human resource dimension of resilience or were conducted in unrelated fields, such as oil and gas.

Three categories of conceptualization were proposed by the researcher: (1) resilience as an outcome, (2) resilience as a process, and (3) resilience capability. The classification of the resilience field was primarily data-driven.

The next step involved identifying recurring themes that emerged from the data and creating categories based on them rather than being guided by any previous theoretical framework.

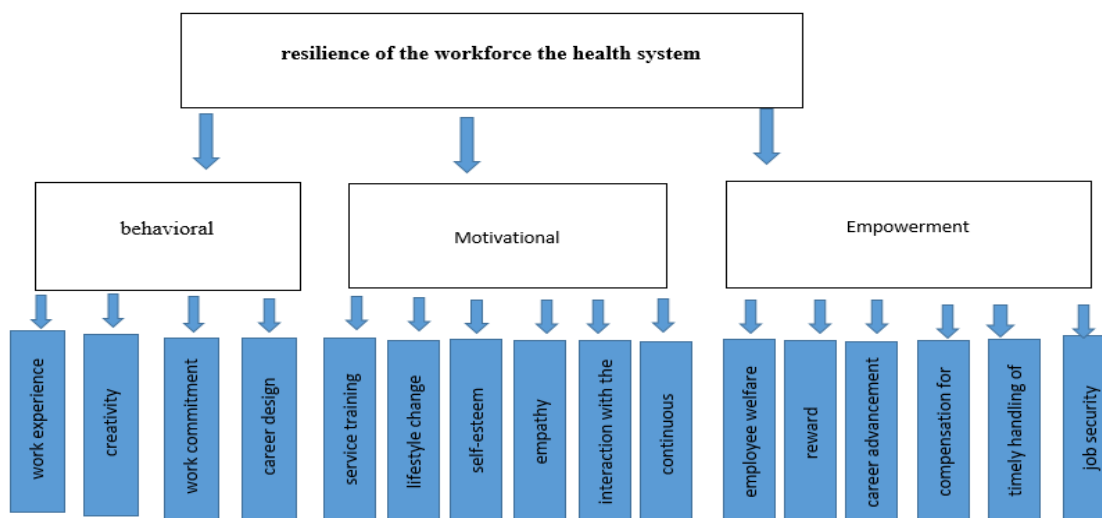
Step 2: Screening factors affecting human resource resilience in the health sector (Fuzzy Delphi method). This step aimed to screen key factors affecting human resource resilience. The findings of this section served as the main inputs to the Analytical Network Process (ANP).

Step 3: Identifying and prioritizing factors affecting human resource resilience in the health sector (ANP)

In this phase, the initial factors identified in the literature review and the fuzzy Delphi in the previous step were further developed and refined, and structured through the collective judgment of experts. The indicators screened in the second step (Fuzzy Delphi) were analyzed, and, while identifying and prioritizing the final factors, an attempt was made to understand the structure of the relationships among them. Since the questionnaire items and their importance and accuracy were approved by experts, the questionnaires used in the study had sufficient validity. In this study, the consistency rate of the reliability confirmation bias for all paired comparisons was less than 0.1.

Data analysis and graphing

The included studies were coded according to the definitions of resilience.



Results

A total of 4605 articles were retrieved from the search strategy. After removing duplicate articles and screening titles and abstracts, 144 articles remained for full-

text screening. After reviewing the remaining articles, 121 articles were removed. Finally, 23 potentially relevant articles were included for final review (Figure 1 & Table 1).

Table 1. Dimensions/components and indicators

Row	Proposers	Years	Dimensions/components and indicators
1	Salehi and Makara (13)	2021	Key factors affecting the resilience of the health system's human resources during crises include organizational resilience, health-motivational measures, and the development of managers' soft skills that increase staff morale, trust, and adaptability in challenging situations
2	Seyghalani Talab et al. (14)	2024	Key factors affecting the resilience of a health system's human resources include efficient allocation of resources, in-service training, empowerment, and ensuring a proactive organizational framework to enhance preparedness and response during crises and disasters.
3	Khosravizadeh et al. (15)	2022	Key factors affecting the resilience of the health system's human resources during crises include safety, economic and financial stability, staff characteristics, effective crisis management, organizational climate, and favorable working conditions, along with strategies to promote physical, mental, and spiritual health.
4	Padilla (16)	2023	Upgrading job skills, creating job diversity-job identity, and implementing training programs Feedback, job relevance, unlocking capacities, adaptation, and creativity
5	Panda et al. (17)	2024	Key factors include selecting appropriate professional groups, streamlining licensing and accreditation processes, identifying appropriate roles, supporting health and well-being, and effectively utilizing volunteers, including retired physicians and healthcare students, to strengthen the healthcare workforce during crises.
6	Iseron (18)	2020	Key factors influencing the resilience of a health system's human resources during crises include personal commitment, family support, social health, organizational support, adequate protective equipment, financial incentives, and awareness of health risks, as identified in this study during the COVID-19 pandemic.
7	Jaffari et al. (19)	2022	Key factors influencing the resilience of a health system's human resources include effective communication, collaboration, pre-crisis preparedness, adaptability, and the ability to learn from past experiences, which ensures a rapid and efficient response during crises or disasters.
8	Abdolsamad (20)	2023	Key factors contributing to the resilience of the health system's human resources include a sufficient number of skilled professionals, an appropriate mix of competencies and diversity, effective training, motivation, self-management, and attention to preventing burnout during crises such as the COVID-19 pandemic.
9	Martini et al. (10)	2023	Key factors contributing to the resilience of the health system's human resources include improved governance and financing,

			strong middle-level leadership, transparency, decentralized decision-making, and the capacity to reflect and adapt during crises, accountability, and operational flexibility.
10	Forsgren et al. (21)	2022	Key factors contributing to the resilience of the health system's human resources include effective preparation through training and guidelines, adaptive strategies such as remote spiritual health-based prevention, and participatory governance, including collaboration with local councils and organized populations.
11	Bourau et al.	2022	Key factors influencing the resilience of health system human resources include effective preparation through training and guidelines, adaptive strategies such as telehealth-based prevention, and participatory governance including collaboration with local councils and organized populations.
12	Mancini et al. (22)	2022	Transparency - Justice and Equality - Employee Welfare - Profitability - Trustworthiness
13	Chasma et al.	2019	Supportive culture - Flexible working style - Transparency - Voluntary behavior - Acquired skills - Altruism - Empathy - Social reward - Accountability - Social participation Sustainable management of allocated resources
14	Macke and Genari (9)	2018	Talent acquisition and retraining - Employee skills development - Maintaining a healthy and productive workforce - Attracting professionals - Training and development - Compensation - Diversity management - Organizational monitoring and support - Career management - Occupational health and safety management - Promoting volunteer work - Internal communications
15	Haldane (8)	2021	Financing - Health manpower - Health service delivery - Community participation
16	Anlesinia et al. (23)	2020	Values and attitudes - Managerial competencies - Resource availability - Perceived benefits - Social values and cultures - Stakeholder demands
18	Machi-Silva and Ribeiro	2021	Accountability - Individual Competencies - Risk Management - Response Readiness - Human Resource Risk Management
18	Mossadegh-Rad et al. (24)	2020	Governance and leadership - financing - human resources - equipment and supplies - information - adaptation - learning - responsiveness - change - planning - recruitment - forecasting and communication
19	Pidaei	1400	Joining support networks (insurance) - Sustainable investing - Self-esteem - Emotion management - Flexibility - Optimism and hope - Realism - Empathy - Maintaining religious beliefs - Nutrition - Personal hygiene - Exercise - Lifestyle changes - Controlled communication
20	Hassan et al. (25)	2023	Employee motivation, creativity, and innovation are important in maintaining continuity and quality of service.
21	Hillman et al. (26)	2020	Rebuilding the old framework, expertise - creative thinking
22	Etemadi et al (27)	2020	Awareness-Job Diversity-Self-Regulation-Integration-Adaptation-Duty Theory
23	Soud et al.	2011	Personal Competence-Trust Your Instincts-Stress Strengthening-Positive Acceptance of Change-Control-Spiritual Influences

Expert Panel Results

An expert panel of 20 specialists in the health system was recruited. Participants were included using the purposeful snowball sampling method (Table 2).

Results of the Fuzzy Delphi Method

Table 3 presents the final results of the Fuzzy Delphi method used for the initial screening of human resource resilience indicators in the health sector in two rounds.

The difference between the definite averages of the second and first rounds is presented in this stage. According to Cheng Lin et al., if the difference between

the two rounds of the survey is less than a commonly used threshold (0.1), the survey process stops, indicating that we have reached consensus (28). Across all indicators extracted from the literature review, the average difference was estimated at less than 0.1, indicating consensus and completing the Fuzzy Delphi process.

Table 3. Final results of fuzzy Delphi

Row	Index	Fuzzy average			Definite average of the first round	Definite average of the second round	Difference
1	Responsibility	0.852	0.082	0.829	0.911	0.946	0.935
2	Transparency	0.852	0.063	0.881	0.945	1	0.982
3	Accountability	0.852	0.129	0.681	0.810	0.786	0.792
4	Behavior	0.852	0.087	0.816	0.903	0.929	0.929
5	Motivation	0.852	0.01	1.044	1.054	1.179	1.131
6	Empowerment	0.852	0.051	0.925	0.977	1.054	1.024
7	Self-confidence	0.852	0.057	0.905	0.963	1.036	1
8	Creativity	0.852	0.022	1.008	1.030	1.143	1.095
9	Job diversity	0.852	0.004	1.057	1.062	1.196	1.137
10	Effectiveness	0.852	0.051	0.927	0.979	1.054	1.03
11	The right to choose	0.852	0.069	0.863	0.933	0.982	0.964
12	Feedback	0.852	0.034	0.97	1.004	1.107	1.054
13	Job importance	0.852	0.04	0.964	1.004	1.089	1.071
14	Occupational identity	0.852	0.016	1.026	1.042	1.161	1.113

Results of the network analysis process

Paired comparisons and weighting of criteria

In this section, three criteria—behavior, motivation, and empowerment — were evaluated by experts. The results are presented in Table 4.

Table 4. Pairwise comparisons of criteria

Dimensions	Behavior	Motivation	Empowerment	Priority weight
Behavior	1	0.9	1	0.32
Motivation	0.9	1	1	0.32
Empowerment	1	1	1	0.36

Pairwise comparisons and sub-criteria weighting

In this section, the sub-criteria of the dimensions identified by the experts were evaluated and prioritized (Tables 5, 6, and 7).

Table 5. Pairwise comparisons of Behavioral Sub-criteria

Sub-criteria	Responsibility	Creativity	Transparency	Priority weight
Responsibility	1	1.66	1.50	0.44
Creativity	0.59	1	0.90	0.26
Transparency	0.66	1.11	1	0.29

Table 6. Pairwise comparisons of Motivational Sub-criteria

Sub-criteria	Job importance	Job diversity	Feedback	Job identity	Priority weight
Job importance	1	4	2	1.6	0.42
Job diversity	0.25	1	0.5	0.40	0.10
Feedback	0.5	2.0	1	0.80	0.21
Job identity	0.6	2.5	1.25	1	0.26

Table 7. Pairwise comparisons of Empowerment Sub- criteria

Sub-criterion	Lifestyle	Effectiveness	Meaningfulness	Right to choose	Self-confidence	Priority weight
Lifestyle	1	1.5	3	3	1.5	0.33
Effectiveness	0.66	1	2	20	1	0.22
Meaningfulness	0.33	0.5	1	1	0.5	0.11
Right to choose	0.33	0.5	1	1	0.5	0.11
Self-confidence	0.66	1	2	2	1	0.22

Table (8). Ranking of sub-criteria based on the three clusters of the model

Dimensions	sub-criteria	Local weight	Local rank	Total weight	Overall rank	Total weight
Behavior	Responsibility	0.026	1	0.054	9	0.236
	Creativity	0.016	3	0.032	11	
	Transparency	0.017	2	0.036	10	
Motivation	Job Importance	0.031	2	0.063	7	0.289
	Job Diversity	0.007	4	0.015	12	
	Feedback	0.029	3	0.060	8	
	Job Identity	0.036	1	0.075	6	
Empowerment	Lifestyle	0.107	1	0.219	1	0.473
	Effectiveness	0.066	2	0.135	2	
	Meaningfulness	0.047	4	0.0972	4	
	Right to Choice	0.047	4	0.097	5	
	Self-Confidence	0.053	3	0.110	3	

Ranking of indicators

To perform network analysis, first, based on the relationships obtained from the correlation matrix, the criteria of the cluster sub-criteria were compared in pairs with the internal sub-criteria of the same cluster and with those of other clusters. The inconsistency

rate was less than 0.1, indicating the comparison can be trusted. Based on the results, the rank of each criterion, along with its relevant sub-criteria, is shown in Table 8.

Discussion

Organizational resources are among the most important parts of any organization, on which its success or failure depends. Today, the existence of resilient human resources and the identification of the factors that create them are of great importance for their

continued activities and for serving society, especially in hospital environments that offer special working conditions, including stress and unconventional work environments. This study aimed to examine the con-

cept of human resource resilience in the health system and identify effective factors and key indicators in this field.

Our findings identify workplace behavior—comprising responsibility, creativity, and transparency—as a critical dimension for fostering human resource resilience. While this aligns with existing literature (17, 21, 22), these previous studies have examined these components in isolation. By identifying them as an integrated cluster, our study offers a more nuanced and comprehensive perspective, suggesting that the synergy between these three factors significantly amplifies their collective impact on workforce resilience.

The second most important dimension in creating and measuring the level of human resource resilience was the criterion of perception (including four components of importance, diversity, feedback, and occupation), which is consistent with previous studies (13, 17, 25). However, the main difference in these studies is that the capacity of those factors together was neglected to create a community perspective on resilience.

The empowerment dimension (including five components of lifestyle, effectiveness, meaning, right to choose, and self-belief), was another important dimension that was identified in our study. This finding is also in accordance with previous studies (14, 18, 19, 29).

Conclusion

Practical implications of the present study include recommendations for health system managers, policy implications for healthcare governance, and strategies for enhancing resilience in practice. Furthermore, by rigorously addressing methodological limitations, this study identifies critical gaps and promising avenues for future research. Ultimately, this work offers a nuanced understanding of the complex dynamics of health system resilience, providing a roadmap for strengthening management strategies in the face of systemic adversity.

Footnotes

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