Cost Effectiveness and Resource Allocation

RESEARCH

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Identifying and prioritizing inefficiency causes in Iran's health system

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Abstract

Background Enhancing efficiency is crucial in addressing the escalating scarcity of healthcare resources. It plays a pivotal role in achieving Universal Health Coverage (UHC), with the ultimate goal of ensuring health equity for all. A fundamental strategy to bolster efficiency involves pinpointing the underlying causes of inefficiency within the healthcare system through empirical research. This study aimed to determine and prioritize the causes of inefficiency in Iran's health system.

Methods This mixed-method study comprised three phases. The initial phase involved identifying the causes of inefficiency through a comprehensive literature review of relevant studies published between January 1, 2010, to January 1, 2021. The causes were then aligned and prioritized using criteria derived from the literature and expert opinion. Finally, the identified causes were ranked based on their significance using Multiple-Criteria Decision Analysis (MCDA).

Results From an initial pool of 307 causes of inefficiency, they were reduced to 121 causes in the first round of screening which were categorized into 13 thematic topics. The second screening process further narrowed the list to 48 causes. Among these, the leading causes of inefficiency included the inadequate supply and unequal distribution of hospital beds, the overuse of health services, and the mismanagement of the health workforce. In contrast, the use of traditional treatment methods was determined to be the least significant factor contributing to inefficiency.

Conclusion This study identified key inefficiencies in Iran's health system, such as resource misallocation, overuse of services, and workforce mismanagement. Addressing these issues is essential for optimizing resource utilization, enhancing service delivery, and achieving UHC. The findings suggest that policymakers should prioritize reforms in hospital bed distribution, implement strategies to reduce unnecessary health service use, and strengthen human resource management. Additionally, targeted policies that focus on decentralizing healthcare decision-making and enhancing primary care could significantly improve system-wide efficiency. Future research should evaluate the effectiveness of these interventions and explore the role of digital health solutions in mitigating identified inefficiencies.

Keywords Inefficiency, Efficiency, Performance, Productivity, Health system, Health policy, Iran

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Background

Achieving Universal Health Coverage (UHC) is not possible without allocating the financial resources to implementing interventions that make affordable and accessible health services for everyone. These resources can be provided in several ways, with one of the most well-known being an increase in the share of health budgets [1, 2]. Although this should be done reasonably, given the rapid growth of health costs and economic crises in different countries, improving the efficiency of the health system seems a more appropriate option [3–5]. The 2010 World Health Organization (WHO) report highlighted the value of efficiency and the efforts being made to improve it. One of the primary factors used to rank healthcare systems is their efficiency level [6]. According to the report, 20 to 40% of all health resources are wasted; the reasons for these losses vary among countries, contributing to inefficient health systems [7, 8].

Therefore, the need for efficiency is a primary concern for many health policymakers and administrators. Inefficient healthcare systems and services can result in irrationally poor health outcomes for patients in the short term. This inefficiency can also affect health outcomes through inadequate resource planning and distribution, especially if the system operates with a fixed budget [9]. Furthermore, on a larger scale, budgetary allocations for economic sectors, such as public services (i.e. education), may be reduced as a result of this indirect impact of the healthcare system inefficiency [10].

Moreover, higher efficiency not only leads to improved financial management and efficient budgetary allocations for both the health sector and other industries but also enhances stewardship by reducing waste [11]. This could support and encourage governments and citizens to continue contributing to UHC through taxes and social insurance contributions, resulting in the social benefits that such coverage offers. Conversely, a lack of proof that a provider's service is effective might reduce the public trust in such organizations, threatening the cohesiveness of society, which modern healthcare systems depend on [9]. This is a priority for many countries, including Iran, where ensuring access to affordable and quality healthcare services remains a significant challenge [12]. The need to enhance efficiency is particularly crucial in Iran's health system, given the unique socioeconomic and political circumstances. For over a decade, international sanctions have imposed severe economic constraints, limiting access to financial resources and essential medical supplies [13, 14]. These sanctions have exacerbated existing inefficiencies in the healthcare system, placing additional pressure on policymakers to optimize resource allocation and improve health service delivery despite budgetary limitations [15, 16].

Iran's healthcare financing system is structured around three primary functions: revenue collection, pooling of funds, and purchasing. Each of these functions faces distinct challenges that impact the efficiency of healthcare system [17]. Revenue collection relies heavily on out-of-pocket payments, leading to financial strain on households and potentially limiting access to necessary services. The pooling of funds is affected by fragmentation across multiple insurance schemes, reducing the ability to redistribute resources effectively. Additionally, purchasing practices often prioritize high-cost treatments over preventive care, further straining the system's capacity to deliver cost-effective services [18]. Given these challenges, Iranian policymakers have focused on implementing efficiency reforms, not only to achieve UHC but also to ensure the sustainability of the health system amid economic adversity. The context of sanctions necessitates a strategic approach to healthcare financing and resource utilization, emphasizing the need for policies that strengthen health system resilience, optimize service delivery, and enhance health equity.

As one of the few countries in the world that have integrated medical education into healthcare services [19], Iran's health system has unique governance and structure, with the The Ministry of Health and Medical Education (MoHME) regulating the health system [19]. The MoHME, through its extensive network of over 60 universities of medical sciences (UMSs) across 32 provinces, is committed to implementing the goal of a healthy community through the designing and implementation of national health policies. The UMSs are responsible for education, research, and healthcare provision for people living in their catchment area through a national healthcare network [20, 21]. During the past decades, several reforms have been conducted in Iran's health system, e.g., the establishment of Primary Health Care (PHC) network for the provision of basic healthcare, expansion of social health insurance, and the implementation of a recent health transformation plan (HTP), all of which have contributed to improving health indicators over the past years in Iran [22]. Iran's national development plans have emphasized the need to increase efficiency. The MoHME has already announced plans to enhance the healthcare system's effectiveness as one of its priorities. However, the challenge of inefficiency remains a crucial problem in the health system [1, 2, 23–25]. Understanding the common type and causes of inefficiency in the national healthcare system and identifying the sources are essential steps toward achieving an efficient health system. This understanding can assist countries in making the necessary modifications to improve their healthcare systems' efficiency.

Due to the importance of this issue, this study aimed to determine and prioritize the causes of inefficiency in

Iran's health system. Health policymakers and managers at various levels can use the list of the main causes and sources of inefficiency obtained from this study as a basis for adopting policies to improve the efficiency of Iran's health system.

Method

This is a mixed-method study that was designed in three phases: Identifying the sources of health system inefficiency, Identification of the criteria for aligning the causes of inefficiency and prioritizing them for the health system in Iran and Prioritization of inefficiency causes in Iran's health system (Fig. 1).

Phase 1. Identifying the sources of health system inefficiency

This phase consists of a Scoping review [26] of the literature on the sources and causes of inefficiencies in the health systems; conducted in national (the studies that were conducted in the scope of Iran and were published in domestic magazines) and international database using specific keywords related to the study's objectives. The search strategy for this review are detailed in Table 1.

To ensure the validity of the article inclusion and exclusion process, two research team members reviewed the studies. After conducting an initial screening to remove duplicates and irrelevant articles, they evaluated the remaining ones for relevance and extractable data. The final selection was made through consensus between the two reviewers. If there was no consensus during the

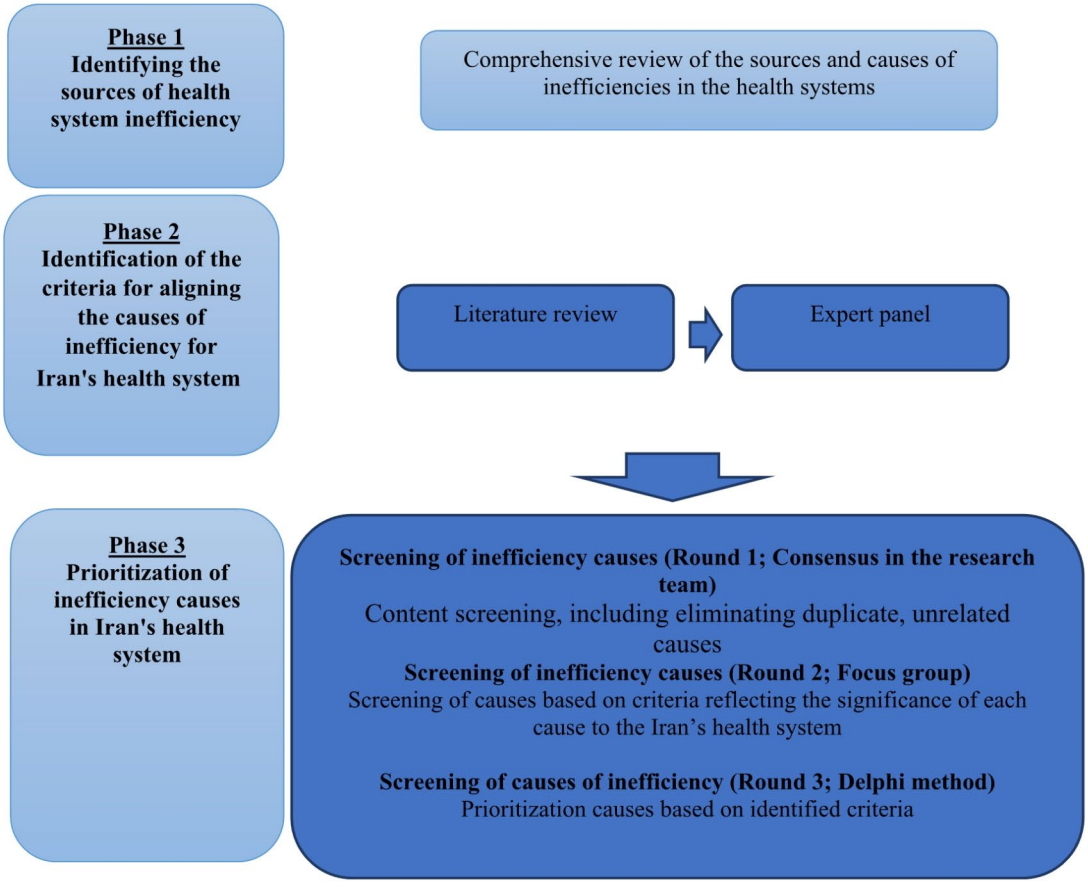

Fig. 1 The process of identifying and prioritizing the inefficiency causes in Iran's health system

Table 1 Methodology details for the comprehensive review

Data sources	- PubMed - Scopus - Cochrane - Scientific Information Database (SID)
Key words and search strategy	- (((inefficiency) OR (efficiency)) AND ((determinant*) OR (source*) OR (cause*))) AND ("health system" OR "healthcare" OR "health care" OR hospital*).
Inclusion criteria	- Subject: Studies included in the analysis focused on sources and causes of inefficiencies in the healthcare system. Additionally, studies providing conceptual tools and models for assessing efficiency of health system were also considered. - Year: Relevant studies published from January 1, 2010, and January 1, 2021. - Language: English and Farsi - Scope: The analysis considered studies conducted at national, regional, and local levels, regardless of their design (longitudinal, cross-sectional, cohort, etc.). - Additional Sources: In addition to articles, reports from specific individuals and organizations, such as those from WHO, were also taken into account.
Exclusion criteria	- Merely addressing the importance of assessing and ranking countries based on their health system efficiency. - Assessed and measured health efficiency in national level. - Provided frameworks for assessing health system efficiency. - General expression about the details of assessment methods - Provided insufficient information to be used in our research; and - Provided solutions to promote health system efficiency.

article selection process, a third reviewer, in our research team, was consulted to make the final decision. This approach ensured that the inclusion and exclusion criteria were consistently applied and helped to minimize bias in the selection of studies.

The included articles were analyzed through narrative or thematic analysis. Each study was carefully reviewed, and general information was documented in a table. The content was then synthesized and relevant data were extracted and recorded according to the study's objectives and inclusion criteria. We employed MAXQDA 13 software for this qualitative analysis of the studies. This software enabled us to systematically code and categorize the data, ensuring a rigorous and consistent analysis process.

Phase 2: identification of the criteria for aligning the causes of inefficiency

This phase aimed to development appropriate criteria for ranking the causes of inefficiency in Iran's health system through a two-step process. First, a literature review was employed to review electronic databases, including PubMed, Cochrane and Scopus, in order to identify relevant criteria for prioritization in health.

Table 2 List of criteria for prioritization of causes of inefficiency in Iran's health system

No.	Criterion	Definition
1	Budget impact	What is the amount of resources wasted due to inefficiency in the country's health system?
2	Equity in access	To what extent can the cause of inefficiency make inequality in access to different socio-economic groups?
3	Impact on health promotion	In the current situation of the country's health system, does this cause of inefficiency have a negative impact on the quality of life and life expectancy?
4	Community acceptability	Will the alleviation of this cause of inefficiency be fully accepted by society in the current situation of the country's health system?

Next, an expert panel was convened to gather expert insights on the identified criteria from the literature review. The panel consisted of seventeen experts; they were selected through purposive sampling. purposive sampling was employed to select experts based on specific criteria: [1] expertise in health system efficiency [2], experience in health policy and priority setting, and [3] familiarity with the healthcare system in Iran. These criteria ensured that the selected experts had the necessary knowledge and experience to provide valuable insights into the prioritization of inefficiency causes. The panel discussion, which lasted approximately two hours, included a briefing on the study's objectives and the results of the review. Feedback from the experts was then solicited. A facilitator for the meeting, guiding discussions to help the experts reach a consensus on the criteria. Through this process, final criteria were identified for prioritization of inefficiency causes (Table 2).

Phase 3. Prioritization of causes of inefficiency in Iran's health system

The causes of inefficiency in the Iran's health system were screened and prioritized in three steps. The first round of causes of inefficiency screening was conducted by two researchers based on specific criteria: redundancy (removing repeated causes), ambiguity (eliminating unclear causes), and relevance to the health system (discarding causes incompatible with Iran's system). The screening also involved consolidating some causes and making editorial revisions. Ultimately, the causes of inefficiency were classified based on thematic similarity, resulting in a structured thematic categorization.

Then, we prioritized the causes of inefficiency in the healthcare system based on criteria reflecting the significance of each cause to the Iran's health system. Experts (the ten experts in the field of health policy and economics) were asked to rate the causes based on their

perceived significance to the healthcare system using a Likert scale in a Focus group meeting. A consensus threshold of 75% agreement among experts was set, ensuring that only those causes deemed highly significant progressed to further stages of the analysis. To assess the relative importance of each cause, we employed a pairwise comparison technique, where experts compared causes two at a time, assessing which was more critical in terms of inefficiency. This technique enabled us to assign weights to each cause, reflecting its relative impact on the system. The comparisons were conducted using a structured questionnaire and analyzed using Analytic Hierarchy Process (AHP) as a decision-making tool. The causes with the highest scores were considered the top priorities for included in the next round of inefficiency causes ranking. Data analysis was conducted using Microsoft Excel.

In the third round of screening, the causes of inefficiency were prioritized using the identified criteria. A structured checklist was distributed to 17 healthcare executives and academic experts. The rows of the checklist included identified causes of inefficiency causes, while the columns contained the criteria identified in the second phase of the study. Based on the definitions provided for each criterion, experts were asked to rate each cause on a scale of 1 to 5, with scores reflecting the relative impact of each cause on the Iran's health system.

Using a simple weighting model and a multiple-criteria decision analysis (MCDA), rankings were calculated. First, the expert scores were averaged, and a final decision matrix was formed. Excel modeling was then done using the weights from the previous step. In this method, the significant factor of each option is calculated using the weighted average, and the option with the highest value is deemed to be the best one after determining the significant factor of the criteria based on the decision makers' perspective by weighting methods, Shannon entropy. Shannon entropy is a measure of uncertainty or randomness in a system. It quantifies the average amount of information produced by a random variable. In the context of weighting methods, Shannon entropy is often used to assign weights to different categories or variables based on their distribution or frequency [27]. Shannon entropy [28] was selected as the weighting method because it provides a way to capture the diversity or spread of data points within a system. By calculating the entropy of each category or variable, we can determine how much information is contained in each one and use this information to assign appropriate weights. This helps in ensuring that the weighting reflects the importance or significance of each category or variable in the overall analysis.

Table 3 The summary of the process for identifying and screening of inefficiency causes of Iran's health system

The process for identifying and screening of inefficiency causes of Iran's health system	The number of inefficiency causes
Inefficiency causes extracted from the comprehensive review	307
Number of inefficiency causes after first round of screening	121
Number of inefficiency causes after second round of screening	48
Final prioritization (third round of screening)	Prioritization of 48 causes, from 1 to 48

Results

A summary of the process at each stage is provided in Table 3. Through a scoping review (Appendix 1; [7, 29–81]), 307 inefficiency causes were initially identified. Following the first screening round, this number was reduced to 121 causes (Appendix 2). These causes were categorized into 13 thematic topics (Fig. 2). Based on this classification, the majority of causes pertained to the topic of "Hospital" (18.181%), while the least were related to "Health service recipients "(2.479%) (Fig. 2). Second screening process further narrowed the list to 48 causes. The leading cause was related to pharmaceuticals and medical equipment (10 occurrences), followed by healthcare financing [9]. Other notable causes include corruption and managerial factors, each accounting for 5 instances, while environmental factors and issues related to hospitals and the quality of health services are the least frequent, with 1 and 2 occurrences respectively. The remaining categories, such as health service delivery and human resources, range from 3 to 4 instances. In the final round, these 48 causes were prioritized, with each ranked from 1 to 48 (Table 4).

According to the ranking of the inefficiency causes of Iran's health system, the range of scores was between 0.76 and 0.91 (the expected range: 0–1). The score of 6.2% of the causes was above 0.9 and the score of 85% of the causes was above 0.8. Based on findings, the top inefficiency causes include "Inefficiency in the number and distribution of hospital beds" (Mean: 0.913), while the lowest score was for the "Using traditional treatments" (Mean: 0.755). Pharmaceuticals and medical equipment, such as overuse of services and improper medical guidelines, also rank high. Health service delivery inefficiencies, particularly the lack of a functional referral system, are significant contributors. Managerial factors, including administrative inefficiency and instability due to government changes, are also noteworthy (Table 4).

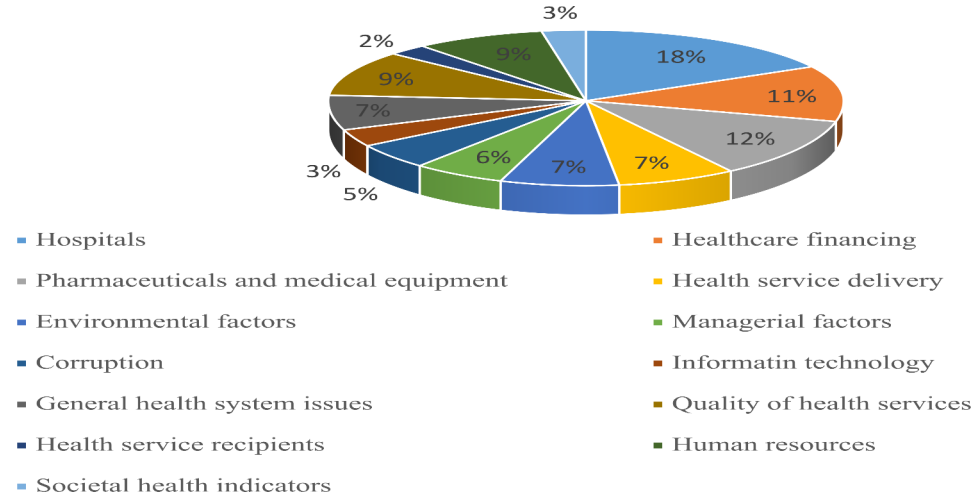

Fig. 2 Thematic classification of inefficiency causes and the their frequency after first round of screening

Discussion

The following are the top seven reasons why Iran's healthcare system is inefficient: Inefficient number and distribution of hospital beds, Overuse of medicines and healthcare services, Mismanagement of health human resources, Inefficiencies in service delivery and underutilization of the referral system, Lack of strategic purchasing of health services by health insurance organizations, Inefficient payment and tariff methods, Inefficiencies in e-health implementation within the country's health system. These factors lead to inefficiencies that hinder Iran's healthcare system's ability to operate as efficiently and effectively as possible. Addressing these problems is essential to raising the standard and facilitating access to healthcare in the nation.

Improving the utilization of trained healthcare managers is a critical aspect that can significantly enhance hospital efficiency in Iran. Governmental hospitals, in particular, grapple with persistent financial constraints, leading to delayed or inadequate payment practices. This financial strain not only impacts the operational capacity of these hospitals but also contributes to a decline in employee morale and job satisfaction. Similarly, according to the literature, the main cause of high percentages of bed occupancy in hospitals is weakness in bed management [38].

The issue of hospital bed distribution identified in this study reflects current international trends, where many countries are actively reducing bed capacity and seeking innovative alternatives to traditional hospital-based care. Lack of a model for providing alternative services in hospitals, unequal distribution of beds across provinces, mismanagement of hospital inputs, and lack of proper education of hospital management students are among the main causes of inefficiency in Iran's hospitals [34, 36, 41]. "Hospital at home" models, which provide acute care services in a patient's home, and the use of telemedicine are examples of strategies that can reduce reliance on hospital infrastructure while maintaining quality of care [82, 83]. Digitalization, including the adoption of electronic health records (EHRs) and telehealth services, can also play a significant role in enhancing efficiency by facilitating better data management, supporting clinical decision-making, and reducing administrative workloads [84].

Strengthening care coordination, also is crucial to improving the quality and continuity of care, particularly for patients with chronic conditions who frequently navigate multiple levels of the health system [85]. Enhancing communication between primary, secondary, and tertiary care services could reduce unnecessary hospital admissions and streamline patient pathways [86]. In addition, implementing techniques to reduce resource duplication, such as shared diagnostic services and centralized procurement, could optimize the use of limited resources and minimize costs [87].

There is abundant evidence about the overuse of medical services and medicines in various countries [88, 89], which shows that overuse is common all over the world and that all health systems are somehow dealing with this problem [90]. In Iran, overutilization poses a significant barrier to achieving UHC [91]. Addressing this issue requires a comprehensive approach that prioritizes education for healthcare professionals, patients, and the wider community. By raising awareness about appropriate healthcare utilization practices, stakeholders can work towards curbing unnecessary treatments and services. Reforming laws and regulations in the healthcare sector, along with revamping payment systems, are crucial steps in combating overuse. These changes can serve as catalysts for promoting more judicious and efficient healthcare practices. By aligning policies to reduce

Table 4 Priority inefficiency causes in Iran's health system

Topics	Inefficiency causes in in Iran's Health System	Budget impact	Equity in access	Impact on health promotion	Community acceptability	Weighted score	Prioritized
Hospitals	Inefficiency in the number and distribution of hospital beds	0/861	1/000	0/886	0/943	**0/913**	1
Pharmaceuticals and medical equipment	Overuse of medicines and health care services	0/854	1/000	0/865	0/916	**0/903**	2
Human resources	Health human resources mismanagement	0/889	0/886	0/829	0/771	**0/900**	3
Health service delivery	Inefficiency in delivering services, not using the referral system	0/944	0/914	0/914	0/914	**0/891**	4
Healthcare financing	Lack of using strategic purchasing of health services in health insurance organizations	0/917	0/943	0/886	0/914	**0/890**	5
Healthcare financing	The inefficiency of payment and tariff methods	0/833	0/914	1/000	0/886	**0/884**	6
Information technology	Inefficiency of e-health in the country's health system	0/750	0/971	0/857	0/743	**0/884**	7
Healthcare financing	Illness and treatment-centered health insurance system instead of Preventive approaches	0/806	0/943	0/943	0/943	**0/884**	8
Corruption	Induced demand	0/861	0/943	0/914	0/829	**0/882**	9
Quality of health services	Multiple medical errors	0/944	0/886	0/857	0/829	**0/881**	10
Pharmaceuticals and medical equipment	Lack of a suitable model for medical guideline	0/917	0/943	0/771	0/800	**0/876**	11
Hospitals	Inappropriate hospital sizes	0/750	0/857	0/714	0/771	**0/876**	12
Managerial factors	Administrative inefficiency	0/806	0/914	0/943	1/000	**0/873**	13
Pharmaceuticals and medical equipment	Not using Health Technology Assessment (HTA) methods	0/833	0/829	0/829	0/743	**0/872**	14
Corruption	Informal payments	0/833	0/914	0/829	0/771	**0/868**	15
Healthcare financing	Not using economic analyses to achieve efficient intervention in distribution of resources	0/917	0/857	0/743	0/800	**0/864**	16
Pharmaceuticals and medical equipment	A growing number of usable but inoperative medical equipment	0/917	0/829	0/829	0/943	**0/864**	17
Pharmaceuticals and medical equipment	Using ineffective or wrong medicine or using medicine at the wrong time	0/861	0/914	0/686	0/857	**0/862**	18
Healthcare financing	The inefficiency of payment methods	0/944	0/886	0/743	0/743	**0/860**	19
Healthcare financing	Dependence of health insurance funds on governmental resources	0/917	0/829	0/914	0/771	**0/856**	20
Healthcare financing	Non-evidence-based decision-making in the utilization and coverage of health technologies and services	0/806	0/886	0/829	0/857	**0/853**	21
Pharmaceuticals and medical equipment	Low generic medicine usage or paying high prices for certain and rare medicine	0/861	0/857	0/743	0/829	**0/847**	22
Human resources	Lack of a comprehensive health human resource database	0/806	0/857	0/629	0/771	**0/843**	23
Pharmaceuticals and medical equipment	Coverage of costly imported medicine which have a local and cheaper alternative	0/861	0/914	0/743	0/714	**0/843**	24
Human resources	Ineffectiveness of human resource performance evaluation;	0/861	0/857	0/829	0/857	**0/838**	25
Managerial factors	Consecutive government changes, unstable long-term policy implementations and management periods	0/861	0/914	0/714	0/743	**0/833**	26
General health system issues	Prioritizing treatment services over prevention	0/750	0/943	0/886	0/857	**0/832**	27
Information technology	Not using a universal information system for the proper gathering and reporting of data	1/000	0/857	0/829	0/829	**0/831**	28
Healthcare financing	High cost of health services in public and private hospitals	0/833	0/886	0/886	0/829	**0/829**	29

Table 4 (continued)

Topics	Inefficiency causes in in Iran's Health System	Budget impact	Equity in access	Impact on health promotion	Community acceptability	Weighted score	Prioritized
General health system issues	Health system management is physicians -oriented	0/917	0/886	0/771	0/800	**0/826**	30
Information technology	Difference in sharing information among stakeholders	0/889	0/886	0/800	0/829	**0/824**	31
Managerial factors	Centralized hospital management	0/917	0/857	0/829	0/714	**0/821**	32
Human resources	The high ratio of administrative human resources to clinical human resource	0/778	0/686	0/743	0/657	**0/821**	33
Pharmaceuticals and medical equipment	Irrational medicine prescriptions	0/833	0/857	0/657	0/714	**0/819**	34
Corruption	Fee splitting	0/833	0/800	0/943	0/857	**0/818**	35
Healthcare financing	Lack of -based payment for performance system	0/750	0/800	0/829	0/743	**0/816**	36
Managerial factors	Inefficient hospital management	0/778	0/829	0/857	0/829	**0/811**	37
Corruption	Income differences among various professions and majors of the health system	0/806	0/829	0/886	0/829	**0/803**	38
Health service delivery	Lack of alternative health care provision models for distance or low-populated areas	0/694	0/886	0/886	0/829	**0/801**	39
Environmental factors	Government budgeting style	0/889	0/800	0/800	0/743	**0/800**	40
Information technology	Lack of an efficient information system in the healthcare system	0/972	0/800	0/629	0/657	**0/796**	41
Corruption	Excising conflict of interests in the policy-making	0/833	0/943	0/914	0/800	**0/792**	42
General health system issues	Separation of policy-making from implementation; vague, unclear, and unstable policies	0/722	0/771	0/800	0/771	**0/790**	43
Managerial factors	Not using modern management methods	0/750	0/829	0/829	0/771	**0/780**	44
Pharmaceuticals and medical equipment	Insufficient control of medicine supply, distribution, and prescription chain agents	0/861	0/857	0/743	0/771	**0/779**	45
Pharmaceuticals and medical equipment	Freedom of choice in using commercial and costly medicine	0/667	0/771	0/829	0/800	**0/775**	46
Quality of health services	Not using appropriate quality indicators	0/750	0/714	0/829	0/886	**0/770**	47
Health service delivery	Using traditional treatments	0/806	0/686	0/800	0/743	**0/755**	48

overutilization, Iran can pave the way for a more sustainable and equitable healthcare system [8].

Human resources are one of the key resources of health systems, accounting for a significant amount of the health system's resources. As a result, human resource planning in the health sector should be considered an essential element of planning [92–94]. In Iran, the inefficiency in human resource management within the health sector can be attributed to several key factors. These include the inadequate implementation of a comprehensive human resource information system, disparities in the distribution of certain job groups across provinces, ineffective evaluation of human resource performance, lack of staff motivation, and imbalances in the availability of human resources within specific groups. Planning and managing the workforce effectively suffers from the lack of an appropriate human resource information system.

Additionally, the unequal distribution of human resources within provinces may result in personnel surpluses or shortages in some areas, which may affect the delivery of services. Insufficient performance assessment systems impede organizational efficacy and lead to insufficient worker output. Addressing these challenges requires a holistic approach that emphasizes the implementation of a comprehensive human resource information system, equitable distribution of job groups, and the establishment of robust performance evaluation processes. Furthermore, efforts to enhance staff motivation and address imbalances in human resource availability are essential for improving the overall efficiency of human resource management in the health sector in Iran. By addressing these issues, Iran can strengthen its healthcare workforce and optimize the delivery of services to meet the needs of its population [95, 96].

Referral systems and healthcare-delivering services will improve the health community, reduce healthcare costs, increase access to healthcare services, and generally promote health equity. Running the referral system in Iran, still faces various challenges including management, supervision, insurance, payment mechanisms, and supply

and demand chain. Addressing these challenges requires committed efforts, comprehensive planning, and timely action [97]. The literature demonstrates that the lack of a comprehensive electronic health record, the treatment-focused health system, the individuals' ignorance of health care, and the weak communication between different levels of referral systems are some of the factors contributing to the referral system's inefficiency [98, 99]. The General Practitioner (GP) strategy is a critical component in the implementation of the referral system and the classification of health services because it can address the majority of the referral system's challenges. In addition to the identified inefficiencies in referral systems and healthcare-delivering services, the efficiency of health PHC in Iran warrants further consideration. PHC plays a crucial role in ensuring equitable access to health services, especially in underserved areas. However, studies have highlighted various challenges impacting the efficiency of PHC in Iran, including inadequate resource allocation, suboptimal management practices, and inconsistent quality across districts. For example, the 'Performance evaluation of the districts' primary health care system in Iran; A case study' provides valuable insights into the disparities in PHC efficiency and underscores the need for targeted improvements to optimize resource use and service delivery at the community level. Addressing these issues is essential for strengthening the overall health system efficiency and achieving the goals of UHC [100].

Reforms in various aspects and functions of health insurance organizations, such as payment methods and health service tariffs, are required to improve the efficiency of Iran's health system. Given the interdependence of many of these challenging factors, developing a comprehensive plan for financing reforms to create strategic purchasing of health services and improve the efficiency of these functions is more desirable [45]. Some of the most significant causes of inefficiency in health insurance organizations include retrospective payment systems, unclear and wide health services benefit packages, and the absence of comprehensive health technology assessment in financing the provision of services [54].

To encourage the development of e-health, it is essential to note that the majority of countries have established incentives for patients, healthcare providers, hospitals, and insurance companies. To protect electronic health records (EHR) and make their implementation quicker, some countries have enacted rules and regulations. Over the past 20 years, the European Union has also provided funding for research into health information technology. The use of local health networks, electronic health records, and the establishment of health cards have all advanced considerably in Europe as the outcome of these supports [101]. Since 2001, e-health and EHR have been addressed in Iran, and significant progress has been made recently in this field. MoHME is primarily responsible for these achievements, which actually overlap in a few cases and are still far from being at their best. Achieving the objectives of this sector in the future is also difficult because of the uncertainty surrounding the supervisory and policy-making bodies as the country's custodians of e-health and EHR.

According to a report entitled "Greater Efficiency for Better Health and Financial Protection" issued by the Second Annual UHC Forum, the causes of inefficiency in the health systems of different countries include high-cost, low-impact health services instead of low-cost high-impact services; doing things in the wrong place that are inefficient; under-utilization of generic medicines or paying too much for specific medicines; overuse or unnecessary use of required medicines and health services; the improper size of health facilities especially hospitals; equipment that has been purchased and cannot be repaired or used optimally; low productivity workers; medical errors; corruption, and health system fraud; mismanagement practices; and high administrative costs [75, 102]. A review of these causes shows that they are very similar to the causes of inefficiency identified in this study.

Conclusion

In conclusion, this study provided a comprehensive analysis of the causes of inefficiency in Iran's health system and ranked them using a structured, multi-criteria approach. By identifying key areas of inefficiency, the study offers valuable insights for policymakers to formulate targeted strategies aimed at improving health system efficiency. As the health landscape continues to evolve, ongoing assessment and adaptation of these strategies will be crucial in sustaining the efficiency and effectiveness of Iran's health system. To address these challenges and drive substantial improvements in efficiency, specific measures and strategies need to be implemented to transform the healthcare landscape. It is evident that enhancing efficiency in the health system does not solely rely on increasing inputs or financial resources but rather on the adoption of effective management practices and the dedication of healthcare personnel. By focusing on optimizing managerial practices and leveraging the commitment of employees, Iran can make significant strides towards improving the efficiency of its health system. Policymakers and health managers play a crucial role in implementing targeted interventions based on the identified inefficiency drivers outlined in this analysis. By addressing these root causes and implementing tailored solutions, Iran can work towards achieving enhanced efficiency and ensuring the equitable distribution of resources within the healthcare sector.

Future research should focus on evaluating the implementation of the identified strategies and their effects on health system efficiency, as well as exploring innovative approaches that could further enhance resource allocation and patient outcomes. This research should explore the implementation of these complementary strategies and assess their impact on health system efficiency in Iran. Evaluating the effectiveness of integrated care models, care coordination techniques, and digital health innovations can provide valuable insights for policymakers, helping to fill existing gaps and guide targeted reforms.

Abbreviations

UHC	Universal Health Coverage
MCDA	Multiple-Criteria Decision Analysis
MoHME	Ministry of Health and Medical Education
EHR	Electronic Health Records
PHC	Primary Health Care
WHO	World Health Organization
AHP	Analytic Hierarchy Process
HTP	Health Transformation Plan

Supplementary Information

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Supplementary Material 1

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Author contributions
AO and MT generated the research idea, and designed the work. MT and EM revised the research article for submission. MM, FH and EM carried out data analysis and interpretation, and drafted the research article. EM, MM and BK collected the data. AB, FH, BK, JJ and EM revised the manuscript for submission. All authors have read and approved the manuscript.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
This study was approved by the ethical committee of Tehran University of Medical science, under the license no: IR.TUMS.VCR.REC.1396.4018.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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