

The Impact of Factors Affecting Policy-Making in the Field of Drug Supply, Production, and Distribution in the Iranian Red Crescent Society

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Date of submission: 03 Aug. 2025

Date of acceptance: 31 Aug. 2025

Original Article

Abstract

INTRODUCTION: Since proper planning for the supply, production, and distribution of medicines, especially in emergencies and humanitarian crises, relies on efficient and responsive management. Therefore, the present study aimed to investigate the factors affecting the policy-making of the supply, production, and distribution of medicines in the RCS.

METHODS: In this descriptive-analytical study, all decision-makers, planners, and specialists of the RCS in the field of supply, production, and distribution of medicines were studied, and 365 people were selected and examined using a simple random sampling method and the Cochran formula. Data were collected using a researcher-made questionnaire whose validity and reliability were confirmed by experts and Cronbach's alpha ($\alpha=0.92$). Data analysis was performed using the Structural Equation Modeling (SEM) method in SmartPLS software.

FINDINGS: Based on the findings, issues such as security and stability in drug supply, creating responsive and flexible structures in distribution, strategic planning and raw material supply chain management, facilitating and improving distribution and logistics processes, ensuring quality and standardizing production, fair and equitable distribution of drugs, developing purchasing infrastructure and new technologies, developing domestic capacities and self-sufficiency in production, continuous monitoring of the distribution process, effective monitoring and evaluation system, extensive coordination and cooperation with stakeholders, strategic and international cooperation, flexibility and accountability in production policies, flexibility in the purchasing process, and continuing research, development, and innovation in production, all have a positive and significant relationship with drug supply, production, and distribution policymaking in the IRCS. Also, all research hypotheses were confirmed ($p<0.05$).

CONCLUSION: The results show that to improve processes, policymakers should pay special attention to infrastructure development, strategic partnerships, flexibility in policymaking, and strengthening domestic capacities.

Keywords: Iranian Red Crescent Society (IRCS); Drug supply; Drug production, Drug distribution.

How to cite this article: Valizadeh T, Soltani H, Roustae A, Ashrafi A. The Impact of Factors Affecting Policy-Making in the Field of Drug Supply, Production, and Distribution in the Iranian Red Crescent Society. *Sci J Rescue Relief* 2025; 17(3): 172-183.

Introduction

The supply, production and distribution of medicines have been considered as one of the strategic areas in the health system of countries in recent years. Medicines, as a vital commodity, play a prominent role in preventing diseases, treating patients and maintaining the general health of the society. However, in times of crisis such as earthquakes, floods and outbreaks of

epidemics, there is a sudden and high demand for medicines and medical equipment, which puts more pressure on the distribution and management systems of medicines (1); therefore, this issue highlights the need to design effective and coherent policies in the pharmaceutical supply chain.

The RCS, as one of the main pillars in the health and humanitarian crisis response system, plays a key role in the supply, production and distribution of medicines in emergencies. In

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addition to providing primary medical and relief services, this Society has an important responsibility in managing pharmaceutical inventories and health equipment in affected and remote areas. However, the lack of an integrated and systematic model of policy-making in this area has caused problems in planning, decision-making, and effective implementation of pharmaceutical activities (2).

One of the main challenges in this area is the dynamics of drug demand during crises and the uncertainty about the amount and type of need. Also, limited financial and human resources, incoordination between relevant organizations, weaknesses in logistical and technological infrastructure, and the lack of accurate tracking and inventory management systems are other obstacles to the efficiency of the drug supply system in this Society. Without a clear and implementable policy model, these challenges will continue and could lead to the failure to meet the drug needs of the affected population (3).

Given the diversity of drug needs, changing environmental conditions, and specific distribution requirements in emergencies, it is essential to develop a systematic, flexible, and resilient model for policymaking in the field of drug supply, production, and distribution in the IRCS. This model should be able to respond to the different needs of the covered areas while making optimal use of limited resources and responding appropriately to unexpected situations. Also, the operational experiences of the IRCS in recent crises have shown that without a strategic framework for drug management, even with individual and local capabilities, it is not possible to respond to drug needs in a systematic and coherent manner. Therefore, providing a practical and evidence-based policymaking model can help strengthen internal capacities, improve coordination between sectors, and increase the effectiveness of relief operations. Finally, given the importance of public health, the direct impact of drugs in reducing mortality and alleviating human suffering, and the vital role of the IRCS in responding to natural disasters and health crises, a comprehensive review of the factors affecting drug supply chain policymaking is a strategic necessity (4).

This study seeks to respond to this need by presenting a model that can be used as a practical model in improving the internal policies of IRCS.

In this area, it can be noted that although studies such as Moghimi et al. (2024) have addressed entrepreneurial policy-making in health financing (2) and Hosseini and Nazifi (2024) have addressed decision-making patterns in the RCS (4), none have specifically addressed modeling integrated policy-making for drug management in crisis situations (including procurement, production, and distribution). This is while drugs as a strategic goods in crises require a special approach. Although studies such as Ebrahimi et al. (2020) have used international models such as the supporting coalition framework, they have not examined the effective factors appropriate to the organizational structure, resources, and specific challenges of the RCS (5).

This Society, as a major player in crisis management, must be able to cover its operational complexities by examining the effective factors. Also, previous studies have mainly focused on a specific dimension (such as financing or decision-making), but have ignored the systematic relationship between the three areas of drug supply, production, and distribution in crisis situations. Given these gaps, it is necessary to examine the impact of factors affecting policymaking in the areas of drug supply, production, and distribution in the IRCS.

RCS and its role in drug management

The IRCS, as one of the main pillars of the country's crisis management system, plays a vital role in the supply, distribution, and management of medicines in normal and critical situations. This NGO, with its extensive network of volunteers across the country and advanced logistical facilities, is able to respond to the medical needs of affected areas in the shortest possible time. By creating specialized systems such as "mobile pharmacies" and "strategic drug reserves," the RCS is able to provide medical services in the most difficult conditions. The organization's approach to drug management is a combination of humanitarian principles, equitable access, and adherence to the highest quality standards, which has made it a key player in the country's health system (6).

Pharmaceutical policies in Iran: The role of the Ministry of Health and the Food and Drug Administration

The macro-framework for pharmaceutical policymaking in Iran has been formed under the guidance of the Ministry of Health, Treatment and Medical Education as the main custodian of the health system and through the Food and Drug Administration as a specialized executive arm. It is based on upstream documents, including the Five-Year Development Plan Law, the Law Establishing the Ministry of Health, and the regulations of the Food and Drug Administration, and implements the country's macro-pharmaceutical policies in the areas of production, distribution, pricing, and monitoring of drugs (2,4). Therefore, the following hypotheses are examined in this study:

H1: Security and sustainability in drug supply have a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H2: Creating responsive and flexible structures in distribution has a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H3: Strategic planning and supply chain management have a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H4: Facilitating and improving distribution and logistics processes have a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H5: Quality assurance and production standardization have a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H6: Fair and equitable drug distribution has a positive and significant effect on drug supply, production, and distribution policymaking in the RCS.

H7: The development of procurement infrastructure and new technologies has a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H8: The development of domestic capacities and self-sufficiency in production have a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H9: Continuous supervision and monitoring of the distribution process has a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H10: An effective monitoring and evaluation system has a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H11: Extensive coordination and cooperation with stakeholders has a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H12: Strategic and international cooperation has a positive and significant impact on the policy-making of drug supply, production and distribution in the RCS.

H13: Responsiveness and flexibility in production policies have a positive and significant effect on the policy-making of drug supply, production, and distribution in the RCS.

H14: Responsiveness and flexibility in the supply process have a positive and significant effect on the policy-making of drug supply, production, and distribution in the RCS.

H15: Continuity in research and development and innovation in production have a positive and significant effect on the policymaking of drug supply, production, and distribution in the RCS.

Methods

This descriptive-analytical study was conducted with a quantitative and applied approach. The main objective of this study was to investigate the factors affecting the policy-making of drug supply, production and distribution in the IRCS. The statistical population of the study included all decision-makers, planners, managers and specialists of the RCS who are directly involved in the processes related to the drug supply chain. According to the Cochran formula, 365 people were selected and studied using convenience sampling. Also, a researcher-made questionnaire was used to collect data, consisting of 50 questions designed on a five-point Likert scale. The questionnaire was structured in 15 main dimensions, each of which addressed one of the key factors affecting pharmaceutical policymaking, including: security and sustainability of drug supply, responsive and flexible structures in distribution, strategic planning, raw material supply chain management,

facilitation of logistics processes, quality assurance and standardization, equitable distribution, development of procurement infrastructure and new technologies, development of domestic capacities and self-sufficiency, continuous monitoring, effective monitoring and evaluation system, coordination with stakeholders, strategic and international collaborations, flexibility in production and procurement policies, and continuity of research, development and innovation.

To ensure the content validity of the questionnaire, its text was first provided to 10 experts in the fields of pharmaceuticals, crisis management, and health policymaking. After applying the necessary feedback and amendments, content validity was confirmed by obtaining at least 70% agreement among the experts. Also, the construct validity of the questionnaire was assessed through confirmatory factor analysis, which indicated appropriate factor loadings (above 0.5) and good model fit. In terms of reliability, Cronbach's alpha for the entire questionnaire was calculated to be 0.92, indicating very high reliability. Also, the composite reliability for all constructs was above the desired level of 0.7. In the data analysis stage, structural equation modeling with a partial least squares approach was used using SmartPLS-4 software. In this model, the concept of factor loading was used to evaluate the power of each item in explaining the relevant construct, so that factor loadings above 0.5 were accepted. Also, model fit indices (such as R^2 , Q^2 , and GOF) and statistical significance of relationships (with bootstrap test and calculation of t-values and p-values) were analyzed to present the impact of each factor on the dependent variable (pharmaceutical policymaking) in a quantitative and interpretable manner (7).

Findings

All decision-makers, planners, and experts and specialists related to the supply, production, and distribution of drugs in the medical system organization were studied, and based on the

Cochran formula, 365 people were selected by simple random method. All decision makers, planners, and experts and specialists related to the supply, production, and distribution of drugs in the medical system organization were studied, and based on the Cochran formula, 365 people were selected by simple random method. Table 1 shows the demographic conditions of the participants.

Table 1. Demographic characteristics of the statistical population

Variable		Frequency	Percentage
Gender	Female	202	55.4%
	Male	163	44.6%
Education	Bachelor's Degree	120	32.8%
	Master's Degree	205	56.1%
	PhD and above	40	11.1%
Age	30 to 40	150	41.1%
	40 to 50	170	46.6%
	50 years and older	45	12.3%

Figure 1 shows the conceptual model of the research in a standardized form of factor loadings and path coefficients.

Cronbach's alpha was used to assess the reliability of the constructs, and since it was higher than 0.7, acceptable reliability was confirmed. Also, the composite reliability (CR) test was used, and the results showed that all constructs were at a desirable level in terms of reliability (3). In addition, the rho-a coefficient was higher than 0.7 in all cases, which confirms the strength and reliability of the research results. In the area of validity, convergent and divergent tests were conducted to examine the validity of the constructs. Since all factor loadings were significant and higher than 0.7, convergent validity was confirmed. In addition, the Average Variance Extracted (AVE) values higher than 0.5 confirm the convergent validity and the construct under study (3). In summary, all indicators related to reliability and validity show the appropriate quality and optimal fit of the measurement models for analyzing the results of this study. (Table 2)

Table 2. Model fit indices

Variables	Questions	Factor Loading	Cronbach's Alpha	Combined reliability	AVE	Q ²
Security & sustainability in drug supply	The supply of essential medicines in the RCS is well managed in crisis situations	0.785	0.836	0.712	0.506	0.312
	Preventive plans are in place to ensure the sustainability of the supply of medicines in the long term.	0.747				
	The current management strategies of the RCS are capable of dealing with potential crises in the medicine supply chain.	0.754				
Creating responsive and flexible structures in distribution	The existing structures in drug distribution are able to respond quickly to urgent needs.	0.759	0.767	0.716	0.557	0.453
	The drug distribution system is flexible to sudden changes in conditions.	0.748				
	Decisions regarding drug distribution are made based on real and up-to-date needs	0.742				
Strategic planning and supply chain management	Strategic planning in the pharmaceutical raw materials supply chain has helped improve production.	0.742	0.736	0.723	0.585	0.395
	Proper management of the pharmaceutical raw materials supply chain has reduced production stoppages.	0.742				
	Existing strategies for sourcing raw materials are resilient to external shocks.	0.728				
Facilitating and improving distribution and logistics processes	The logistics processes of drug distribution have been optimized in a way that reduces delivery time.	0.688	0.867	0.895	0.512	0.217
	The use of advanced logistics systems has increased the accuracy of drug distribution.	0.766				
	The existence of appropriate logistics infrastructure plays a significant role in drug distribution.	0.752				
Ensuring quality and standardization of production	Quality standards are well respected in the production of domestic medicines.	0.748	0.719	0.765	0.556	0.299
	The existence of robust monitoring systems has increased the quality of domestically produced medicines.	0.750				
	The country's drug production processes are in line with international standards.	0.731				
Fair and equitable distribution of drugs	The process of distributing medicines nationwide is such that the needs of all regions are met equally.	0.756	0.724	0.789	0.570	0.372
	In the distribution of essential medicines, deprived and underserved regions are given due consideration.	0.743				
	Existing policies in medicine distribution are designed with the aim of equal access for all groups in society.	0.718				
Developing procurement infrastructure and new technologies	The existing infrastructure in the RCS is sufficient for managing the warehouse and distribution of medicines.	0.729	0.712	0.776	0.567	0.149
	The use of modern technologies has been applied in the process of providing medicines.	0.747				
	The development of logistics infrastructure in the RCS has helped to improve access to medicines.	0.677				
Developing domestic capacities and self-sufficiency in production	The use of advanced technologies in the pharmaceutical procurement sector has increased the accuracy and efficiency of the RCS's processes.	0.711	0.745	0.798	0.546	0.564
	Empowering the country's domestic capacities in drug production has helped reduce dependence on imports.	0.760				
	Investment in domestic drug production infrastructure has helped increase the country's self-sufficiency.	0.696				
Continuous monitoring and supervision of the distribution process	Domestic drug production can serve as a sustainable solution in crisis situations.	0.769	0.854	0.765	0.573	0.482
	Monitoring systems in the drug distribution process work well.	0.706				
	Continuous monitoring of drug distribution has increased transparency and reduced abuse.	0.743				
Effective monitoring and evaluation system	Regular reports on drug distribution performance help improve processes.	0.737	0.891	0.729	0.557	0.476
	The RCS's monitoring system in the pharmaceutical supply chain is efficient.	0.740				
	Regular assessments are conducted for the quality and efficacy of distributed medicines.	0.742				
Extensive coordination and cooperation with stakeholders	The existence of a strong monitoring system has increased transparency in pharmaceutical processes.	0.713	0.735	0.781	0.534	0.312
	Coordination between organizations involved in drug distribution has helped improve processes.	0.695				
	Participation of various stakeholders in the drug distribution process has helped increase the efficiency of the system.	0.738				
Strategic and international	Collaboration with the public and private sectors in the drug distribution chain is well-functioning.	0.660	0.765	0.745	0.516	0.413
	Regular communication with stakeholders in the field of drug distribution helps identify and remove barriers.	0.751				
	Cooperation with international organizations helps improve the provision of medicines in the IRCS.	0.760				
		0.728				

collaborations	International agreements and partnerships have been effective in the production and distribution of medicines. Interaction with other countries in the field of medicines has helped increase the country's drug security.	0.711				
Responsibility and flexibility in production policies	Drug production policies are flexible in the face of critical situations and rapid changes. Policy decisions in the field of medicines well reflect the real needs of the market and patients. Organizations responsible for drug production respond to the immediate and long-term health needs of the community.	0.766 0.733 0.757	0.802	0.792	0.529	0.333
Responsibility and flexibility in the supply process	The drug supply process in the RCS is able to respond quickly to urgent needs. The drug supply system is flexible and adaptable to new conditions in times of crisis or widespread diseases. Decisions related to drug supply in the RCS are made based on real needs	0.691 0.773 0.668	0.712	0.712	0.560	0.280
Continuity in research and development and innovation in production	Investment in pharmaceutical research and development has led to the creation of new technologies in drug production. Research activities in the pharmaceutical field are carried out continuously and coherently. Innovation in drug production processes has helped improve quality and reduce costs.	0.725 0.724 0.756	0.793	0.769	0.573	0.245
Policy-making for drug supply, production and distribution in the IRCS	The policies in place at the RCS for the production of medicines are adequate and appropriate in terms of sustainability and pharmaceutical safety. The policies in place at the RCS for the supply of medicines are adequate and appropriate in terms of sustainability and pharmaceutical safety. The policies in place at the RCS for the distribution of medicines are adequate and appropriate in terms of sustainability and pharmaceutical safety.	0.760 0.722 0.714	0.860	0.793	0.544	0.376

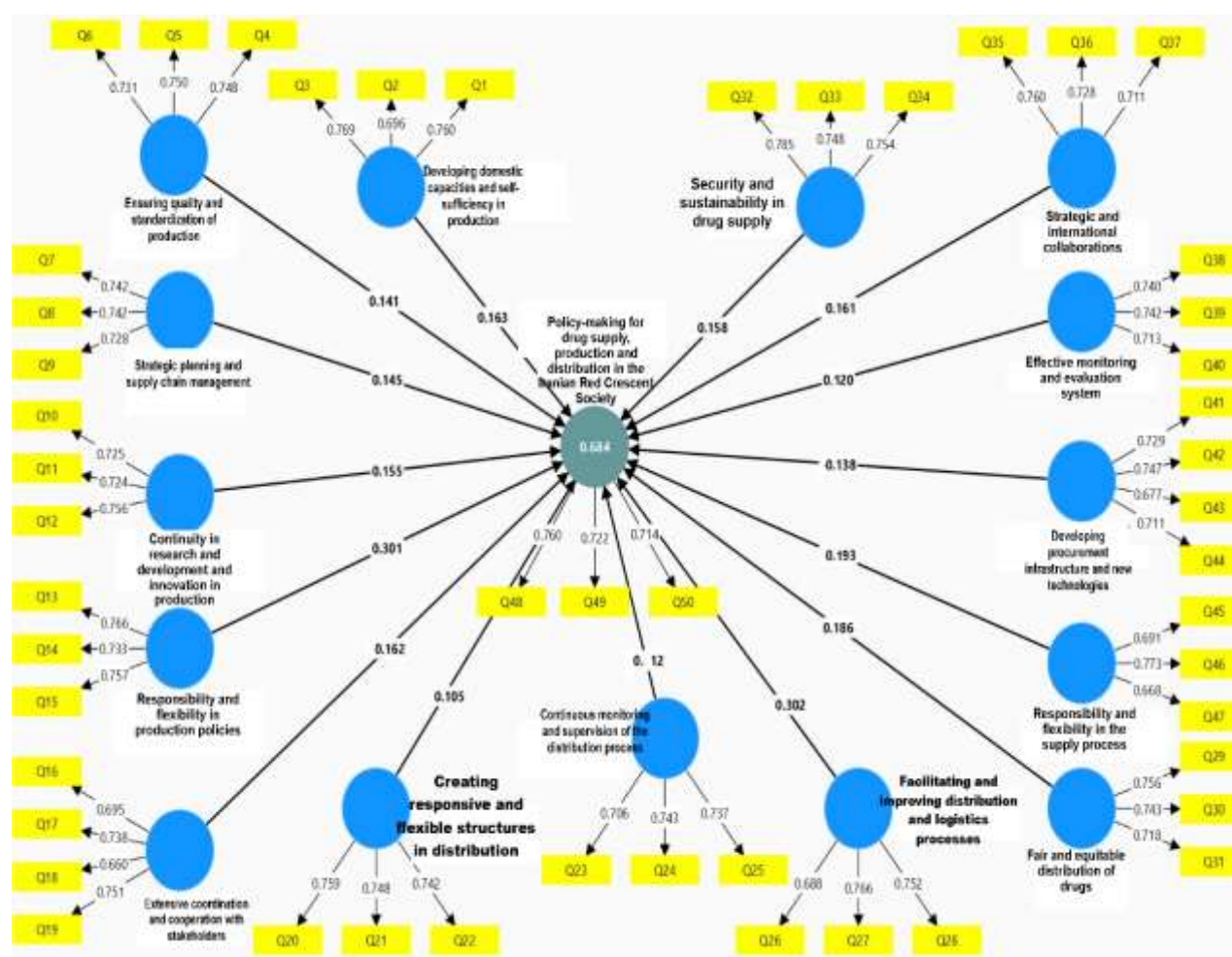


Figure 1. Standardized factor loading coefficients and path coefficients

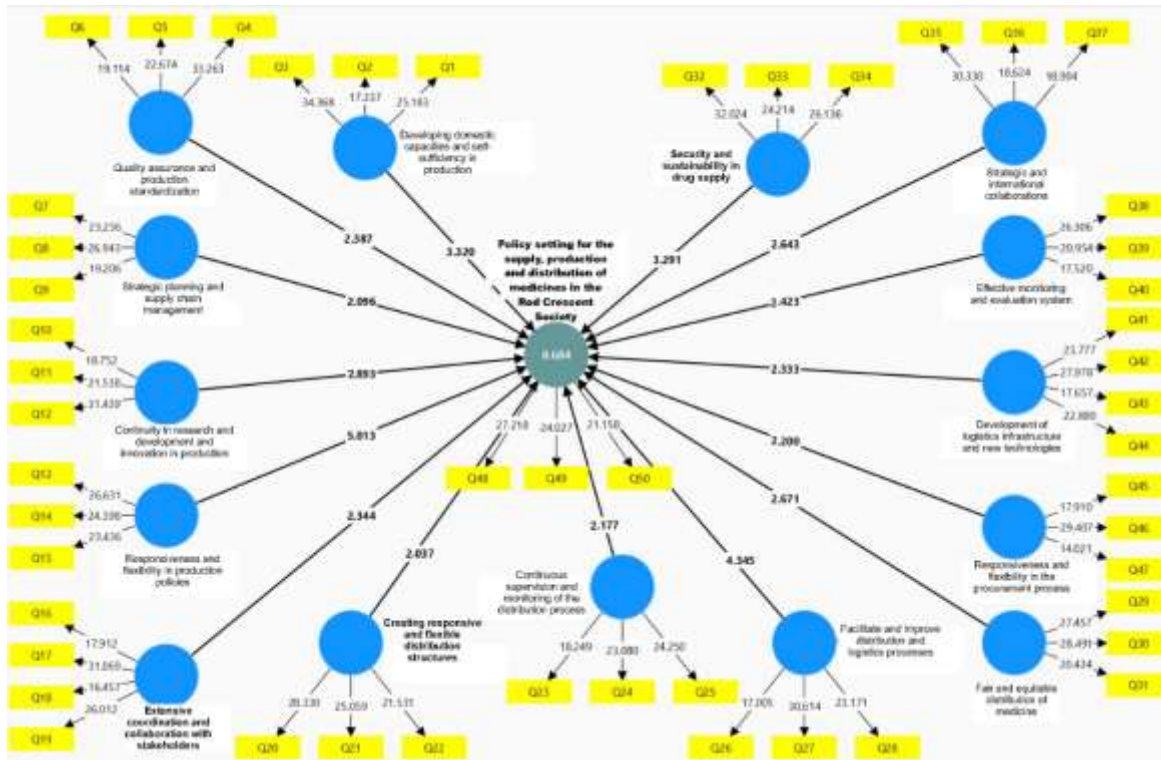


Figure 2. Structural model
Table 3. Hypothesis results

Hypotheses	T	β	α	p	Results
security and stability in drug supply → policy-making for supply, production, and distribution of drugs in the RCS	3.291	0.158	0.05	0.001	Confirmed
establishing responsive and flexible structures in distribution → policy-making for supply, production, and distribution of drugs in the RCS	2.037	0.105	0.05	0.042	Confirmed
strategic planning and supply chain management → policy-making for supply, production, and distribution of drugs in the RCS	2.096	0.145	0.05	0.037	Confirmed
facilitation and improvement of distribution and logistics processes → policy-making for supply, production, and distribution of drugs in the RCS	4.345	0.302	0.05	0.000	Confirmed
ensuring quality and standardization of production → policy-making for supply, production, and distribution of drugs in the RCS	2.387	0.141	0.05	0.017	Confirmed
fair and equitable drug distribution → policy-making for supply, production, and distribution of drugs in the RCS	2.671	0.186	0.05	0.008	Confirmed
developing procurement infrastructure and modern technologies → policy-making for supply, production, and distribution of drugs in the RCS	2.333	0.138	0.05	0.020	Confirmed
developing internal capacities and self-sufficiency in production → policy-making for supply, production, and distribution of drugs in the RCS	3.320	0.163	0.05	0.001	Confirmed
continuous monitoring of the distribution process → policy-making for supply, production, and distribution of drugs in the RCS	2.177	0.112	0.05	0.030	Confirmed
effective oversight and evaluation system → policy-making for supply, production, and distribution of drugs in the RCS	2.423	0.120	0.05	0.019	Confirmed
extensive coordination and collaboration with stakeholders → policy-making for supply, production, and distribution of drugs in the RCS	2.344	0.162	0.05	0.025	Confirmed
strategic and international collaborations → policy-making for supply, production, and distribution of drugs in the RCS	2.643	0.161	0.05	0.009	Confirmed
responsiveness and flexibility in production policies → policy-making for supply, production, and distribution of drugs in the RCS	5.013	0.301	0.05	0.002	Confirmed
responsiveness and flexibility in the procurement process → policy-making for supply, production, and distribution of drugs in the RCS	2.200	0.193	0.05	0.034	Confirmed
continuity in research, development, and innovation in production → policy-making for supply, production, and distribution of drugs in the RCS	2.793	0.155	0.05	0.000	Confirmed

The structural model also has several indicators and criteria that must be evaluated and confirmed in order to rely on the results of the model and the collected data with high confidence. These criteria include examining the path coefficients (beta) and their significance (T-values), examining the coefficient of determination index (R²), endogenous latent variables, and examining the predictive correlation index Q². To evaluate the overall model fit, which encompasses both the measurement and structural models, the Goodness-of-Fit (GOF) index was used as a comprehensive criterion. This index integrates the average communality (as an indicator of measurement model fit) and the average R² values (reflecting the explanatory power of the structural model) to provide an overall assessment of model fit. In this study, the average communality was calculated as 0.549, and the average R² was 0.684, resulting in a GOF value of 0.612. According to established benchmarks where 0.01, 0.25, and 0.36 represent weak, moderate, and strong fit, respectively the obtained GOF value indicates a strong and acceptable overall model fit (7).

Table 3 presents the analysis of factors influencing policy-making for the supply, production, and distribution of drugs within the RCS, based on standardized regression coefficients (β), significance levels (p-value), and a 95% confidence level ($\alpha = 0.05$). The factors "Responsiveness and Flexibility in Production Policies" ($\beta=5.013$) and "Facilitation and Improvement of Distribution and Logistics Processes" ($\beta=4.345$) exhibit the strongest positive impact on drug policy-making and are both statistically significant. Other notable factors such as "Security and Stability in Drug Supply" and "Developing Internal Capacities and Self-Sufficiency in Production" also demonstrate considerable influence, highlighting the strategic importance of supply chain resilience and domestic production autonomy. All hypotheses are confirmed, as the t-values for all variables exceed the critical threshold of 1.96 at the 95% confidence level, and all p-values are below 0.05, indicating statistical significance. These findings underscore the necessity of an integrated, adaptive, and well-monitored policy framework in drug supply management, particularly for humanitarian organizations operating in crisis-prone and resource-constrained environments. (Figure 2)

Discussion & Conclusion

Hypothesis 1: Security and sustainability in drug supply, with a t-statistic of 3.291 and a path coefficient of 0.158, has a positive and significant impact on drug supply, production, and distribution policymaking in RCS. This finding is consistent with the studies of Khajeh et al. (2024) and Bahrami et al. (2024) (8, 9), as their research showed that adopting preventive policies, such as creating strategic reserves and diversifying supply sources, can ensure the sustainability of the drug system in crisis situations. The findings of this study also confirm that a systematic and long-term approach to drug security not only reduces supply gaps, but also serves as a fundamental basis for formulating efficient policies in the field of drug production and distribution. In other words, establishing drug supply security as a key variable can provide a sustainable framework for strategic decision-making in humanitarian organizations such as RCS. This agreement of the findings with reputable domestic research strengthens the validity of the present results and highlights the need for more serious attention to sustainability components in pharmaceutical policymaking.

Hypothesis 2: Creating responsive and flexible structures in distribution with a t-statistic of 2.037 and a path coefficient of 0.105 has a positive and significant effect on drug supply, production, and distribution policymaking. This finding is consistent with the studies of Ciceri et al. (2025) and Tucker and Duskin (2022) (10, 11) because their research showed that designing agile and adaptable distribution structures to changing conditions can significantly increase the efficiency of the pharmaceutical system in the face of unexpected crises. The findings of this study confirm that flexible approaches to drug distribution, especially in humanitarian organizations such as RCS, can serve as a key strategy to improve responsiveness in emergency situations. In fact, responsive and flexible structures enable the drug distribution system to quickly adapt to environmental changes and distribute pharmaceutical services in an optimal and equitable manner. This is consistent with the findings of reputable international research and emphasizes the need for greater attention to developing resilient infrastructure in the country's pharmaceutical system.

Hypothesis 3: Strategic planning and supply chain management have a significant impact on drug supply and distribution policymaking with a

t-statistic of 2.096 and a path coefficient of 0.145. This finding is consistent with the studies of Ciceri et al. (2025) and Tucker and Daskin (2022) (10,11). Because, their research showed that adopting strategic approaches in supply chain management can reduce operational challenges and ensure timely delivery of drugs in different conditions. This research confirms that effective strategic planning, especially in the critical medicines sector, can serve as a comprehensive framework for anticipating needs, optimally allocating resources, and reducing disruptions in the supply chain. In fact, integrating strategic supply chain management into pharmaceutical policies enables evidence-based decision-making and the creation of dynamic monitoring systems. This is consistent with the findings of reputable international research, emphasizing the need to develop long-term planning frameworks in the country's pharmaceutical management.

Hypothesis 4: Facilitating distribution and logistics processes with a t-statistic of 4.345 and a path coefficient of 0.302 has a strong and significant effect on policymaking. This finding is consistent with the studies of Methuku (2025) and Ogbuagu et al. (2023) (12,13). The findings of the present study also confirm that investing in modernizing logistics infrastructure and using new technologies in the drug supply chain can have the greatest impact on improving drug policies. In fact, optimizing logistics processes acts not only as a facilitating factor, but also as a strategic driver in the transformation of the drug supply and distribution system. This is consistent with the findings of advanced international studies, emphasizing the need for special attention to the digitalization and smartization of drug distribution systems in the country.

Hypothesis 5: Ensuring quality and standardizing production with a t-statistic of 2.387 and a path coefficient of 0.141 has a positive and significant effect on policymaking. This finding is consistent with the studies of Azar et al. (2021) and Bahrami et al. (2024) (9,14). These results emphasize the need for more serious attention to quality control and standardization systems as a basic prerequisite for effective policymaking, because the implementation of these standards, on the one hand, increases the transparency and observability of processes, and on the other hand, by reducing risks and increasing technical capabilities, it provides the necessary basis for making strategic decisions.

Hypothesis 6: Fair and equitable distribution of drugs has a significant effect on policymaking with a t-statistic of 2.671 and a path coefficient of 0.186. The finding is consistent with the results of the studies of Dieleman et al. (2018) and Chiumia et al. (2024) (15,16). This finding suggests that the more equitable the drug distribution system, the more effective and efficient the macro-policies in this area will be. In other words, equitable distribution of drugs not only leads to improved access to essential drugs, but also provides a suitable platform for the formulation and implementation of effective policies by creating public trust and transparency in the health system. These results emphasize the need to pay attention to indicators of justice in distribution and the formulation of justice-based policies in the health sector.

Hypothesis 7: The development of logistics infrastructure and new technologies has a significant impact on policymaking with a t-statistic of 2.333 and a path coefficient of 0.138. These findings are consistent with the studies of Bahrami et al. (2024) and Kangarlou Haghighi et al. (2024) (9,17). These results indicate that the use of advanced technologies and strengthening logistics infrastructures, by improving supply chain efficiency, increasing transparency, and reducing operating costs, provides a suitable platform for formulating effective policies in the health sector. In particular, this infrastructure development facilitates the optimal distribution of medicines and medical equipment, more accurate monitoring of needs, and ultimately improves the quality of policymaking in the health system. This finding emphasizes the need for greater investment in the modernization of logistics systems as a key factor in health policymaking.

Hypothesis 8: Developing domestic capacities and self-sufficiency in production have a strong and significant impact on policymaking with a t-statistic of 3.320 and a path coefficient of 0.163. This finding is consistent with the studies of Azar et al. (2021) and Khajeh et al. (2024). (8,14) These findings indicate that strengthening domestic production and reducing dependence on imports of medicines and medical equipment, by increasing decision-making independence, reducing supply chain vulnerability, and improving product quality, plays a decisive role in formulating macro health policies. In particular, production self-sufficiency increases flexibility in responding to crises, reduces costs, and ultimately

improves the effectiveness and efficiency of the policymaking system in the health sector. These results emphasize the need for special attention to strategic planning for developing domestic production capacities as a fundamental axis in health policymaking.

Hypothesis 9: Continuous monitoring and supervision of the distribution process with a t-statistic of 2.177 and a path coefficient of 0.112 has a positive and significant effect on policymaking. This finding is consistent with the studies of Bahrami et al. (2024) and Godman et al. (2021) (9,18). Thus, the implementation of efficient monitoring systems in the drug distribution cycle by increasing transparency, reducing waste, and improving resource allocation provides the necessary basis for formulating more accurate and evidence-based health policies. This finding emphasizes the importance of developing intelligent and continuous monitoring mechanisms as a key factor in improving the effectiveness of the health policymaking system.

Hypothesis 10: An effective monitoring and evaluation system with a t-statistic of 2.423 and a path coefficient of 0.120 has a significant effect on policymaking. This finding is consistent with the studies of Bahrami et al. (2024) and Khajeh et al. (2024) (8,9). These results indicate that the establishment of efficient and systematic monitoring mechanisms plays a significant role in improving the quality and effectiveness of health policymaking by creating transparency, improving accountability, and enabling continuous performance evaluation. In particular, this monitoring system provides accurate and timely feedback to policymakers, enabling them to modify and optimize policies towards achieving the health system's overall goals. This finding emphasizes the need to strengthen monitoring institutions and develop performance evaluation indicators as a fundamental component of the policymaking process.

Hypothesis 11: Extensive coordination and collaboration with stakeholders has a positive effect on policymaking with a t-statistic of 2.344 and a path coefficient of 0.162. This finding is consistent with the studies of Boström et al. (2021) and Hussain et al. (2024) (19,20). These results indicate that establishing effective mechanisms for the active participation of all stakeholders in the health system - including drug manufacturers, distribution centers, healthcare providers, and end consumers- by facilitating

information exchange, more accurate identification of needs and priorities, and increasing the level of mutual trust provides a suitable platform for formulating comprehensive, operational, and accepted policies. In particular, this extensive collaboration increases the accuracy of needs assessment, reduces resistance to policy changes, and improves the quality of implementation of approved policies. This finding emphasizes the need to design and establish institutional structures for systematic interaction with various stakeholders as a key factor in improving the effectiveness of the health policymaking system.

Hypothesis 12: Strategic and international cooperation has a significant effect on policymaking with a t-statistic of 2.643 and a path coefficient of 0.161. These findings are consistent with the results of the research of Khajeh et al. (2024) and Azar et al. (2021) (8,14). These findings indicate that constructive interactions with international institutions and regional cooperation in the field of health significantly enhance the capacities of the policymaking system through the transfer of technical knowledge, achieving global standards, and facilitating the exchange of successful experiences. These cooperations play a decisive role in formulating effective and evidence-based policies, especially in areas such as access to new pharmaceutical technologies, managing global health crises, and coordinating regulatory policies. The present study emphasizes the necessity of developing and institutionalizing such cross-border cooperation as a key factor in improving the quality and efficiency of the health policymaking system.

Hypothesis 13: Responsiveness and flexibility in manufacturing policymaking have a strong and significant effect on policymaking with a t-statistic of 5.013 and a path coefficient of 0.301. These findings are consistent with the studies of Ciceri et al. (2025) and Godman et al. (2021) (10,18). These results indicate that responsive and flexible mechanisms in manufacturing policymaking of drugs and medical devices lead to improving the quality of policy decisions through three key mechanisms: first, responsive systems pave the way for evidence-based decision-making by creating transparency and the ability to monitor performance. second, policy flexibility enables rapid adaptation to environmental changes and unexpected crises.

third, the combination of these two features strengthens organizational learning and the capacity to reform policies in the health system.

Hypothesis 14: Responsiveness and flexibility in the supply process have a positive and significant effect on policymaking with a t-statistic of 2.200 and a path coefficient of 0.193. This finding is consistent with the study by Ciceri et al. (2025) and Tucker and Daskin (2022) (10,11) on flexibility in the drug supply chain. This finding indicates that the establishment of responsive and flexible mechanisms in the management of the drug and medical equipment supply chain provides a suitable platform for the formulation and implementation of effective policies in the health sector by increasing transparency, improving monitoring capabilities, and promoting operational flexibility. In particular, these features enable the health system to respond quickly and appropriately in the face of unforeseen challenges such as epidemics or drug shortages and to maintain its efficiency by timely reviewing policies. These results emphasize the need for special attention to designing smart and responsive pharmaceutical supply systems as a key factor in improving the quality of health policymaking.

Hypothesis 15: Research and development and innovation in manufacturing have a significant impact on policymaking with a t-statistic of 2.793 and a path coefficient of 0.155. This is consistent with the studies of Bahrami et al. (2024) and Godman et al. (2021). (9,18) These results indicate that investing in research and development activities and applying new technologies in the production process of drugs and medical equipment provides a suitable platform for developing advanced and effective policies in the health sector by improving product quality, reducing production costs, and increasing competitiveness. In particular, manufacturing innovations enable the health system to deal more effectively with emerging challenges such as new diseases or drug resistance. This finding emphasizes the need for special attention to developing research infrastructure and encouraging innovation in the pharmaceutical industry as a key factor in improving the quality of health policymaking.

Compliance with Ethical Guidelines

All ethical principles have been considered in this article, and participants were informed of the

purpose of the research and its implementation steps.

Funding/Support

This article is extracted from Teymour Valizadeh thesis entitled "The Impact of Factors Affecting Policy-Making in the Field of Drug Supply, Production and Distribution in the IRCS" without any financial support.

Author's Contributions

This article is based on Teymour Valizadeh PhD thesis at Islamic Azad University of Kish, who was responsible for conducting the research, collecting, and analyzing the data; and the second author, Hassan Soltani, was responsible for the design and supervision, and Alireza Rousti and Azadeh Ashrafi were responsible for the methodology. However, Hassan Soltani was responsible for correspondence and Teymour Valizadeh was responsible for editing the final manuscript submitted to the journal.

Conflict of Interests

The authors declare no conflict of interest.

Acknowledgments

The authors hereby acknowledge all those who contributed to this research.

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