Original Article

Designing a model for patient relationship management in the general hospitals using the combination of analytic hierarchy process and interpretive structural modeling

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Abstract:

BACKGROUND: Patient relationship management (PRM), in addition to saving costs, increases patient loyalty and creates a satisfactory environment for the patient and the service provider. This study aimed to design a model of PRM in general hospitals using the combination of the analytic hierarchy process and interpretive structural modeling (ISM).

METHODS: This was an applied and cross-sectional study conducted in 2020 at three stages. At the first stage, using a systematic review, factors affecting PRM were identified. In the second stage, these factors were prioritized based on the pair-wise comparisons. In the third stage, the interaction levels of the factors were modeled for the general hospitals using ISM through the use of the MICMAC technique and Excel 2007 software.

RESULTS: The results showed that "integrated information system," "registration of the patient's essential information," and "right data at the correct time" were the first to third priority in implementing PRM in the general hospitals. In the final model of ISM, three levels of effective factors were extracted, and 10, 4, and 6 factors were identified in the first, second, and third levels, respectively.

CONCLUSION: Establishing the PRM strategy in the hospital, in addition to executive and managerial requirements, depends on the existence of an electronic customer relationship management system, and the choice of new technology, as well as the integration of information systems and technology culture, should be given special attention by managers.

Keywords:
Analytic hierarchy process, interpretive structural modeling, patient relationship management

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Introduction

Among the various components of the health-care system, hospital services have been the main cause of cost growth in many countries,[1] and hospitals account for about half of the national health expenditures and about 50% to 80% of government spending on health.[2] In developing countries, about 80% of health-care costs go to hospitals, but unfortunately, their performance is <50% of their capacity.[3] In many countries today, the health-care system faces severe shortages of resources. Therefore, health-care managers and planners should

be able to use the available resources in the most efficient and effective way possible. Patient relationship management (PRM), which is derived from Customer Relationship Management (CRM), can help hospitals maximize their ability to interact with patients. The PRM system has been designed as a software system with the aim of empowering the hospital to increase the effective and interactive communication of care providers with the patients and can not only create a competitive advantage for the hospital but also lead to the achievement of the organization's goals.[4] Such communication both improves the quality of services and increases the speed of meeting customer needs.[5] Using the PRM system, hospitals can meet three groups of needs, including identifying needs, achieving patient satisfaction, and providing patient education.[6]

Patients are key clients in hospitals, and more than 80% of a hospital's business is done by treating its patients.[2,7] Hospital revenues are highly dependent on the insured patients and insurance companies visiting the hospital.[8] Nevertheless, today patients and insurance companies are aware and experienced, doing their research to get information on different treatment options, and identifying centers that provide the best quality services[9] Therefore, one of the most important issues in hospitals is how to manage communication between service providers and patients. Successful implementation of the PRM system by creating a managed relationship between providers and patients can increase patient loyalty and consequently make a profit and reputation for the hospital. On the other hand, successful implementation of the PRM system can improve trust, mutual understanding, patient involvement in decision-making, patient satisfaction, and ultimately community health.

The results of studies show that effective communication with the patient is often necessary for the improvement of the patient's health, more effective management of chronic diseases, and improvement of the patients' quality of life.[10,11] Consequently, in order to increase customer satisfaction, hospitals should not only provide the best services and the most appropriate care environment but also expand close relationships with the patients. The PRM creates a win–win relationship between the hospital and the patient so that the patient who frequently visits a PRM-equipped hospital will have a file in which his or her different specifications, needs, illnesses, and conditions are recorded, and his or her treatment will be given with more confidence using past information. Also, due to the long-term relationship with the physician and nurses, the patient will feel comfortable and relaxed in the hospital environment.[12,13]

On the other hand, in addition to earning credit and reputation, the hospital is advertised free of charge by patients and gain a larger market share.[14] Studies on the health-seeking behavior suggest that the choice of a hospital by patients is generally based on inquiries from their friends, family, and colleagues. Therefore, managing relationships with patients and gaining their satisfaction, in addition to improving the quality of care, will be an important factor in maintaining the profit and share of hospitals in the market.[15,16]

In recent years, patient satisfaction and safety have been at the forefront of the health-care managers' priorities. Therefore, paying attention to the patient and being patient-centered has been placed in the center of the service delivery process.[17] Under these circumstances, the health-care industry has relied on establishing customer-managed relationships and needs the PRM system with higher standards more than other industries.[6] Among health-care organizations, general hospitals play an important role in providing health care and meeting the general health needs of the community by providing a wide range of inpatient and outpatient treatment services. Given the importance of the general hospitals and the wide range of their relationships with patients, paying special attention to the establishment of managed relationships with patients is essential.

The main purpose of this study was to determine the factors affecting the PRM model in general hospitals using a systematic review and a combination of Analytic Hierarchy Process (AHP) and interpretive structural modeling (ISM).

Materials and Methods

This was an applied and cross-sectional study conducted in 2020 at the three following stages.

At the first stage, using a systematic review, factors affecting the PRM were identified. The systematic review was performed according to the PRISMA standard guideline. The systematic search of studies and articles was carried out in the valid Persian language databases, including the Scientific Information Database, IranMedex, Iranian Research Institute for Information Science and Technology (IranDoc), and Magiran, as well as in the valid international databases such as PubMed, Ovid, Science Direct, Cochrane Library, Scopus, Web of Science, and Google Scholar. This systematic search lasted for 2 months.

In this search, all original articles published in Persian or English in the field of customer relationship management until the end of 2018 were examined. The inclusion criteria for entering articles into the study included article focus on identifying factors affecting the CRM, providing a specific model or research results for

factors affecting the CRM, having original and authentic research findings, and having access to the full text of the articles. To search for articles in the international and Persian databases, the following search strategy and its Persian equivalent were used: "determinants/factors affecting/effective factors" OR "conceptual framework/ conceptual models/conceptual pattern/framework" AND "Patient Relationship Management/Customer Relationship Management."

The qualitative evaluation of the articles as well as the evaluation of their compliance with the study inclusion criteria were performed by one of the researchers and reviewed by another researcher. Screening of articles was done in three steps based on their title, abstract, and full text of the articles, respectively. The process of reviewing articles related to the factors affecting customer relationship management is presented in Figure 1. Overall, 88 articles were found in the initial search of Persian and international databases. In the next steps, 22 articles were excluded from the study due to duplication, and 41 articles due to noncompliance with the study inclusion criteria. After removing these articles, the selection of articles that had more complete and relevant information related to the aim of this study was done and the full text of all the articles that had met the inclusion criteria was provided to two independent reviewers who were expert in the study field. Finally, 25 articles were reviewed and 3 articles were also identified by manual search in the articles' references and included in the study. Therefore, a total of 28 articles were reviewed and analyzed.

At the second stage, factors affecting the PRM extracted from the systematic review were prioritized based on the pair-wise comparisons by experts using AHP. To do this, 10 experts were purposefully selected from nursing managers and health-care managers working in general hospitals. The inclusion criteria were having at least 5 years of hospital experience, having education related to the patient management, and having the desire to participate in the study and allocating enough time for completing the pair-wise comparison matrix. Expert Choice 11 software was used for analyzing the collected data. The demographic characteristics of the experts participating in the completion of the pair-wise comparison matrix are provided in Table 1.

At the third stage, the interaction levels of factors affecting the PRM in the general hospitals were modeled using ISM. At this stage, the factors that had the highest priority in the AHP were examined, which in the present study was 20 factors. Finally, these factors were analyzed in terms of driving power and dependence power using the MICMAC technique. In this technique, the variables are classified into four groups. The first

Table 1: Demographic characteristics of the experts

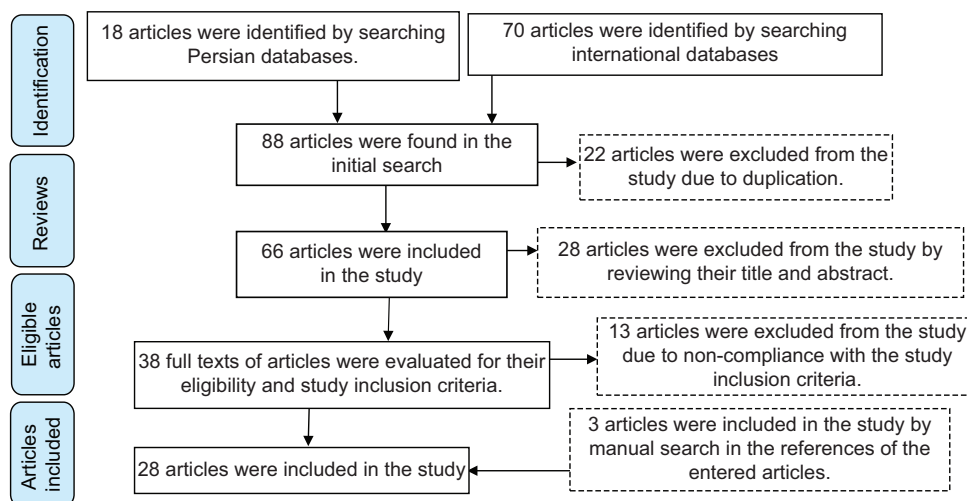| Demographic characteristics	Frequency (%)
Sex	
Male	8 (80)
Female	2 (20)
Age (years)	
30-35	2 (20)
35-40	2 (20)
>40	6 (60)
Management experience in hospitals (years)	
5-10	3 (30)
10-15	2 (20)
>15	5 (50)
Education	
MSc	4 (40)
PhD	6 (60)
Field of study	
Nursing	2 (80)
Health services management	8 (20)

Figure 1: The process of reviewing articles related to factors affecting the Customer Relationship Management

3

group includes autonomous variables (area 1) that have low driving and dependence powers. These variables are somewhat separate from other variables and have little relationship with them. The second group includes dependent variables (area 2) that have low driving power but high dependence power. The third group is linkage variables (area 3). These variables have high driving and dependence powers. In fact, any change in these variables will change other variables. Finally, the fourth group is the driver variables (area 4). These variables have high driving and low dependence powers. Also, the collected data were modeled by ISM using Excel 2007 software.

Research questionnaire

The questionnaire was used for determining the factors affecting the PRM was pairwise comparison questionnaire consisted of six dimensions (electronic customer relationship management, customer knowledge management identification, staff skills required to communicate with the patient, staff capability, patient response, managerial and executive requirements, and marketing).

Results

At the first stage of the study, which was a systematic review, 27 factors affecting the PRM in the general hospitals were identified and classified into 6 dimensions, including electronic management, patient knowledge management, employee capability, responding to patients, management and executive requirements, and marketing [Table 2]. In the dimension of electronic management, "integrated information system" and "new technology" were the most frequent factors. In the dimension of patient knowledge management, "patients' needs assessment" had been emphasized more than other factors. In the dimension of employee capability, "consulting and training to employees" had been focused more frequently in the studies. In the dimension of responding to patients, "clinical relationship with the patient" was more important. "leaders support" and "PRM strategy" were among the most frequent factors in the management and executive requirements dimension. Finally, in the dimension of marketing, all kinds of "advertising (telemarketing, internet, verbal communication)" had been considered more than other factors.

At the second stage of the study, in which the priority of factors was determined using the AHP, the results showed that "integrated information system," "registration of the patient's essential information," and "right data at the correct time" were the first to third priority in implementing PRM in the general hospitals. Prioritization in the dimensions showed that "integrated

information system" and "registration of the patient's essential information" were at the highest priorities in the dimension of electronic management. In the patient knowledge management and employee capability dimensions, "patient participation in the treatment process" and "material and non-material incentives for employees" had the highest priorities. In the dimension of responding to patients, "empathy to patients" and "clinical relationship with the patient" were at the highest priorities. In the dimension of management and executive requirements, "leaders support" and "reorganizing processes" had the highest priorities. Finally, in the marketing dimension, "advertising" was the first priority [Figure 2].

At the third stage, 20 factors with the highest priority in PRM entered the ISM, and the final model was obtained by removing the modification states and also using the segmentation of the levels [Figure 3]. The results of the ISM showed that factors affecting the implementation of PRM were related to each other at three levels. The third level with six factors of new technology (C4), integrated information system (C5), technology culture (C6), alert services (C7), resources (financial and infrastructure) (C17), and leaders support (C19) was the most affecting level, which directly affected the second level factors, namely data warehouse (C2), material and non-material incentives for employees (C11), pay attention to the initial selection indicators (C12), and PRM strategy (C18). Level one with its 10 factors was the most affected level.

The MICMAC analysis of the factors affecting the implementation of PRM in terms of driving-dependence power [Figure 4] showed that all factors were as the relationship type. These factors had high dependence and high driving powers. In other words, the affecting and affected powers of these factors were very high and every small change in these factors caused fundamental changes in the system. Only C13 had both relationship and dependence characteristics. In other words, this factor had the characteristics of dependent variables, i.e. high dependence and low driving powers.

Discussion

The implementation of a successful PRM system in a hospital enables it to improve patient satisfaction, and in addition to creating financial benefits and reputation for the hospital, promotes the community health.[40]

As mentioned, at the second stage, the factors of integrated information system (0.115), registration of the patient's essential information (0.108), and right data at correct time (0.088) had the highest priorities in establishing customer relationship management

Table 2: Dimensions and factors affecting patient relationship management in the general hospitals

Dimensions	Factors	Frequency	References
Electronic management	Registration of the patient's essential information	2	[18-20]
	Data warehouse	3	[20-22]
	Right data at the correct time	2	[18,20]
	New technology	5	[21,23-26]
	IIS	3	[18,27,28]
	Alert services	3	[18,26,27]
Patient knowledge management	Patients' needs assessment	7	[26,29-34]
	Get feedback from patients	5	[7,20,33,35,36]
	Patient participation in the treatment process	1	[7]
	Patient and family counseling	3	[18,20,21]
Employee capability (employee skills needed to communicate with patients)	Consulting and training to employees	3	[26,30,32]
	Material and nonmaterial incentives (spirit motivation) for employees	3	[19,36,37]
	Pay attention to the initial selection indicators	2	[7,36]
Responding to patients	Empathy to patients	2	[37,38]
	Clinical relationship with the patient	6	[18,23,33,36-38]
	Patient welcome	2	[23,37]
	Accuracy and speed of customer service	4	[20,22,32,39]
	Choice of the health-care provider	2	[32,37]
	Service variety	4	[21,23,32,33]
Management and executive requirements	Leaders support	4	[18,26,28,32]
	Patient identification expert	2	[23,38]
	Resources (financial, infrastructure)	3	[18,23,26]
	PRM strategy	4	[20,23,26,32]
	Reorganizing processes	3	[7,22,37]
Marketing	Relationship-marketing	2	[26,39]
	Advertising (telemarketing, internet, verbal communication)	3	[7,26,30]
	Social CRM	1	[7]

IIS=Integrated information system, PRM=Patient relationship management, CRM=Customer relationship management
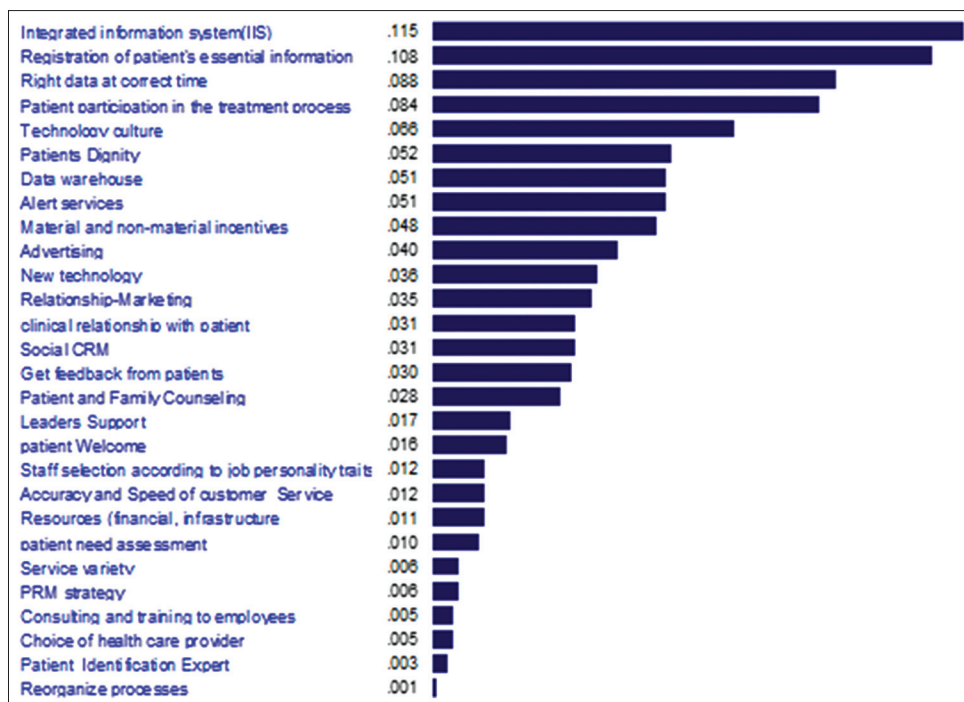

Figure 2: Prioritizing factors affecting the implementation of patient relationship management in the general hospitals

in the hospital. Indeed, the evolution of information technology, especially the World Wide Web and e-commerce, has provided an opportunity for improving the relationship with customers, compared to the

previous facilities, in today's competitive markets. In the first step of customer relationship management, a database should be prepared based on the customer data and information. Then, the data and information collected and recorded in the database should be analyzed using various techniques.[41]

The registration of the patient's essential information (C1) and the right data at the correct time (C3), as the first steps in providing services to the patient, are very important. In the present study, at the ISM stage, most factors had high driving and dependence powers, and "new technology, integrated information system, technology culture, alert services, resources (financial, infrastructure), and leader support" were recognized as

Figure 3: Interpretive structural modeling of factors affecting the implementation of patient relationship management in the general hospitals

the most affecting factors in implementing PRM in the general hospitals.

Although choosing the right technology is necessary to establish PRM, it should be noted that CRM is not just a technological issue but is a matter of work that information technology tools need to be tailored to the needs of the job and coordinated with customer relationship management operations and strategies.[42]

According to the results of the Moghadam *et al*., study,[37] the use of up-to-date technologies and equipment along with amenities, and the existence of appropriate architecture and friendly design of the hospital space can play a significant role in the successful implementation of the PRM system. However, studies show that in addition to the proper technology, appropriate support of organizational processes requires an appropriate IT infrastructure to communicate across the organization.[43,44] In the successful implementation of the PRM project, the information systems integration with other channels and data integration, system adaptation, and operational integration are the basic components. According to the results of Zablah *et al*., study,[45] in the context of customer relationship management, integrating information systems, creating a central data warehouse, mechanizing the decision-making process, and using analytical models to explore customer perspectives should be considered.
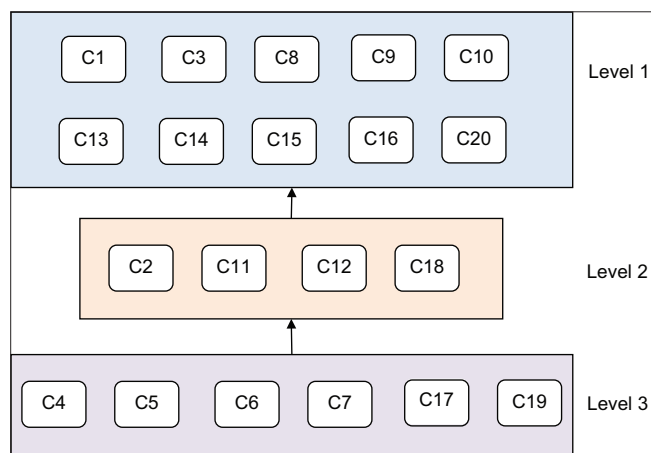
Based on the results of the present study, in addition to the use of modern technologies and having an
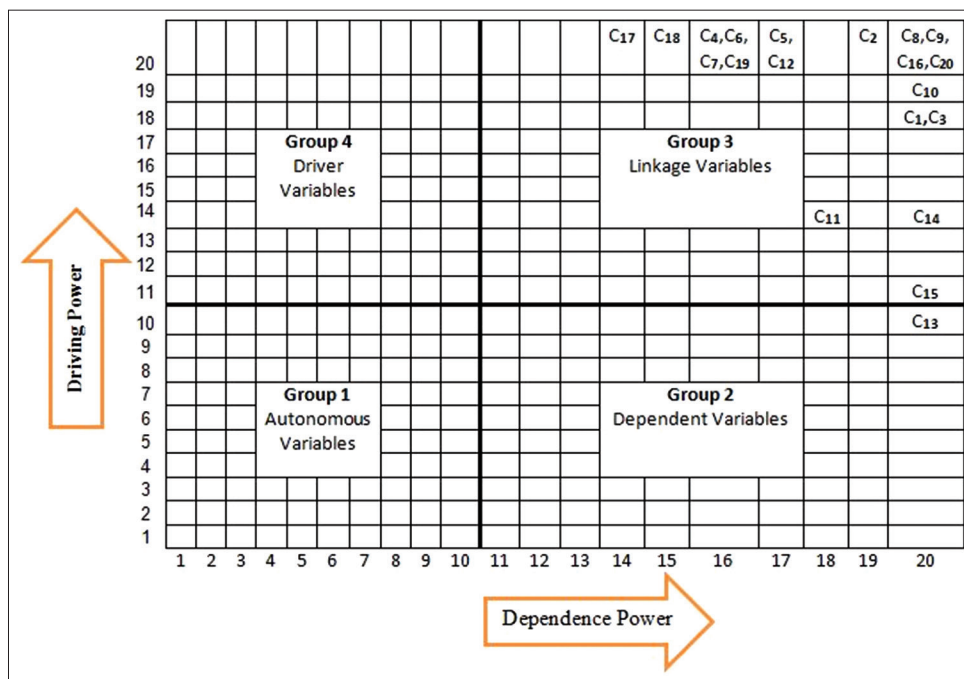

Figure 4: The MICMAC analysis of factors affecting the implementation of patient relationship management in terms of driving-dependence power

appropriate infrastructure, the culture of technology establishment is also very effective. The technology culture had the fourth priority among other factors and had a score of 0.66. Each organization has its own culture, and intra-organizational and extra-organizational cultural infrastructures should be considered in the implementation of technologies and therefore, it can be said that culture is a very important and effective factor in the successful implementation of electronic management of the relationship with patients, especially when the electronic management of the relationship with patients is considered between the two departments of information technology and marketing, because each of these two departments has its own organizational subcultures.

Thus, it can be said that the successful implementation of electronic management of the relationship with patients requires changes in the organizational culture. This is more important in the health-care environment because patients with different cultures are clients of the hospital and PRM experts should also be well-educated in understanding the culture and behavioral issues. Moreover, studies show that customers have different perceptions of each other, hence the type and value of the relationship established with them should also be different, and this should be considered in the relationships.[41] Some researchers believe that the quality of the physician-patient relationship is important due to its role in increased patient satisfaction, positive effects on patient care outcomes, patient compliance with the physician's advice, reduction of time required to justify patients, reduction of patient complaints from physicians, and positive evaluation of physician performance.[47] In the hospital, as a service organization, there is a direct relationship between the patient and the service provider, and having skilled staff in dealing with the patient can lead to patient loyalty and improved health.[48]

Also, when an organization implements the customer relationship management project, it is involved in the organization's resources. Manpower, as one of the most important resources, plays a mediating role between the quality of internal services and the expression of service quality outside any organization.

Paying attention to the motivational factors of employees and improving their skills by giving various material and spiritual rewards will encourage them and finally, it causes them to pay considerable attention and effort to attract and retain customers. The factor of material and nonmaterial incentives for employees (C11) refers to this issue. In the present study, this factor with a score of 0.66 was in the ninth priority and was one of the most important factors in the optimal deployment of PRM.

Proper communication and relationship with patients is one of their important needs, which in addition to informing them about the disease and its treatment, leads to understanding the patients' concerns by the medical staff as well as better understanding and empathy, psychological support, improvement of physical, psychological and behavioral consequences, and providing patient comfort, and on the contrary, lack of proper communication is one of the most important reasons for not recognizing patients' psychological and social needs.[48-50] Therefore, creating effective communication and interaction of clinical staff with the patients is one of the essential factors in establishing the CRM programs. Creating this capability is possible with effective training. This has been defined in other studies as the training of medical staff on how to interact with customers.[48]

Lack of attention to patients' feelings and perceptions causes disruption in the staff-patient communication. Patients dignity (C15) is one of the important factors in managing the relationship with the patients. According to the results of the study by Abbaszadeh *et al*.,[23] Communication skills and public relations training, psychology, social work, marketing, and knowledge management are among the necessities of implementing the PRM system. Lindgreen[51] also in their study concluded that organizational knowledge management and personal learning were as the skills needed for customer relationship management. Based on the results of the Hung *et al*., study,[28] knowledge management capabilities have a significant effect on the PRM acceptance. These capabilities include information technology infrastructure, which is used to gain the advantages of technology and shared knowledge about customers, products, and services.

Also, the results of the current study showed that the presence of alert services was one of the most effective factors in the successful implementation of the PRM. Informing patients via SMS and sending text messages on sites and strengthening portals and ports of communication with the patients are among the mandatory measures for the successful implementation of electronic management of communication with the patients.[27,33,52]

One of the dimensions of PRM is the social dimension, which can include virtual interactions among patients as well as between patients and the hospital. Social media is important not only for making patients available but also for accessing valuable information about their satisfaction and dissatisfaction with the hospital's various health-care services. In addition, one of the services that can be provided in the PRM system to improve communication with the patients is the E-mail

address of service providers to answer questions related to health. This also facilitates the follow-up of treatment by the nurses or physicians.[27]

As mentioned above, one dimension of customer relationship management is the social dimension, which can include virtual interactions among patients as well as between patients and the hospital.[53] The concept of this issue can be found in social CRM. The experience of emotions, which includes satisfaction, commitment, satisfaction with the services received, etc., can be achieved through social CRM.[54] Another important factor affecting the successful implementation of the PRM is the existence of appropriate infrastructure. Developing a comprehensive plan and strategic management to start and end the establishment of customer relationship management is one of the most important infrastructures necessary.[55] Timely development of this plan and formulating appropriate strategies can coordinate the subsystems and prevent the imposition of additional costs in the future. Also, the existence of resources and infrastructure such as organizational structure, CRM strategy, employees with the right capabilities, and culture can affect the success of CRM implementation. The type of employees and strategies as well as the employees' motivations can improve the skills needed to support sustainable competitive advantages.

According to the results of the present study, one of the most important and effective factors in the successful implementation of PRM was the leader support. In order for the successful implementation of projects related to the relationship and communication with the patient, the hospital senior managers should be patient-centered. They should also commit to changing the context of electronic customer relationship plans as well as to the implementation of CRM in the hospital. Organizational innovations have always been a complex and difficult task for the Admissions department. The results of a study on the acceptance rate of PRM system strategy in hospitals in Mashhad, Iran, showed that only 12 (23.5%) hospitals accepted this strategy.[56] In a study, Mendoza Morales *et al*.[57] examined a model of key factors affecting the successful implementation of the CRM strategy. Based on the results of this study, the support of senior managers had major effects on all three dimensions of the CRM strategy, including human factors, processes, and technologies.[57] The results of the Moghaddam *et al*. study[37] on the factors affecting the successful implementation of the PRM strategy also showed that the lack of sufficient knowledge about PRM in hospital managers and the staff was one of the main limitations for the organizational development and support necessary for the successful implementation of the PRM.[37] Therefore, it seems that providing organizational training in the nature and advantages of the PRM can

provide the necessary platform for acceptance, conflict reduction, and support for PRM development at the management and staff level.

Conclusion

One of the strategies that helps health-care organizations stay in the competitive market is the PRM strategy, the establishment of which depends on the availability of the necessary resources, facilities, and infrastructure. The results of the present study showed that "new technology, integrated information system, technology culture, alert services, resources (financial, infrastructure), and leader support" were the most affecting factors in implementing the PRM in the general hospitals, and the necessary planning should be done in order to align these factors. In this regard, hospitals should consider attracting sufficient funds before planning and implementing the CRM plan, and identify and employ specific individuals with specific tasks for the CRM program.

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Conflicts of interest
There are no conflicts of interest.

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