

Research on emergency medical care system in public health events based on Kano model

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Abstract. In recent years, the frequency and impact of disease outbreaks in public health events have become increasingly prominent, and the effectiveness of the medical care system has become a key factor in meeting the challenges. Based on the Kano model, this paper aims to study the demand and expectation of the users of the emergency medical care system in public health events. Through the analysis of the user satisfaction and importance evaluation, this study deeply understands the user's demand for the system, and puts forward the guidance of improvement and optimization. The findings are summarized as follows: the Kano model is a valuable tool, but its limitations and challenges need to be taken into account; future research can combine big data and artificial intelligence technologies, taking into account psychosocial factors, the introduction of user participatory design and interdisciplinary collaborative research to enhance user experience and satisfaction. This study provides a scientific basis for the improvement and optimization of emergency medical care system in public health events, and has important practical significance.

Keywords: Kano Model, Public Health, Medical Service.

1. Introduction

Sudden diseases in public health events pose a serious threat to the health of society and individuals. The rapid outbreak and spread of sudden diseases have seriously affected the security and stability of public life. In this context, the establishment of an effective emergency medical system is the key to ensuring public health and controlling the epidemic. Emergency medical system refers to the medical service, management and coordination system established to deal with emergency diseases. It includes epidemic monitoring and early warning, epidemic prevention and control, patient diagnosis and treatment, and medical resource allocation. The establishment and operation of emergency medical system is of great significance for timely diagnosis and treatment of patients and effective control of epidemic spread. The emergency medical system is facing a series of challenges and problems in the actual operation. First, emergency medical systems need to be able to respond quickly and adapt to different emergencies, but many systems are currently slow to respond and cannot meet the emergency needs of the public. Secondly, the emergency medical system involves the collaborative work of multiple departments and institutions, but poor coordination and communication lead to problems in information transmission and resource allocation. In addition, there is a lack of systematic research background on the public's demand for and satisfaction with the emergency medical system. The establishment and

operation of the emergency medical system is crucial to ensuring public health, controlling the epidemic and improving the emergency response capacity.

Ji et al. proposed measures to guide public emotions in major public health emergencies by constructing intervention plans for public risk perception and emotional guidance [1]. Zhan et al. studied the subject of decision-making in major public health emergencies and explored the evolution law of subject decision-making by using evolutionary game and simulation methods [2]. Li et al. studied the collective response capacity of social protection networks in public health emergencies and discussed the role of social protection networks in responding to public health emergencies [3]. Liu et al. took Chengdu City as an example to build a model of factors affecting the satisfaction of elderly users with information disclosure in major public health emergencies, and studied the factors affecting the satisfaction of elderly users [4]. Zhang et al. took the Minimally Invasive Oncology Surgical Alliance of Zhejiang Province as an example and proposed a resilience-based strategy for cross-regional professional alliance in public health emergencies based on the PPRR model [5]. Yang et al. used Cite Space to the research status and trend of public health emergencies [6].

There are some research gaps in the use of statistical data science to solve real world problems in public health or biomedical fields. When using statistical data science to solve public health or biomedical problems, data quality and reliability is an important consideration. Due to the possibility of errors, biases or incompleteness during data collection and collation, it is necessary to assess the accuracy and reliability of the data. In research, new methods and techniques need to be developed to deal with incomplete or inaccurate data to improve the quality and reliability of data. In the field of public health or biomedicine, there may be a need to integrate and share different data sources and data types to obtain more comprehensive and accurate information. Authors, data integration and sharing face technical, legal and privacy challenges. Therefore, while protecting data privacy and security, it is necessary to develop appropriate technologies and methods to realize data integration and sharing. When using statistical data science to solve public health or biomedical problems, complex data analysis and appropriate are required to reveal underlying patterns and associations in the data. Existing statistical methods and models may not fully meet the needs of a particular problem. Therefore, new statistical methods and models need to be developed to cope with different data types and analysis needs. Statistics in the field of public health or biomedicine often contain a large number of variables and complex relationships. Therefore, how to effectively visualize data and interpret it into information that is easy to understand and apply is a challenge. New visualization tools and techniques need to be developed to help researchers and decision makers better understand and utilize the results of statistical data. There are some gaps in the use of statistical data science to address public health or biomedical issues, such as data quality and reliability, data integration and sharing, data analysis and data visualization and interpretation. Future research needs to focus on these issues and come up with innovative approaches and techniques to address them to advance the field of public health and biomedicine.

As an important tool to study consumer satisfaction, Carnot Model can help researchers deeply understand the relationship between consumer expectation and product or service characteristic satisfaction proposed by the author. Public Health Emergency is a public health event that occurs suddenly in a short period of time and has a large impact area and high harmfulness. Zhao et al. studied the influencing factors of mobile medical APP users' satisfaction, and explored the influencing factors of satisfaction in the context of public health emergencies [7]. Chen et al. based on the PMC index model, carried out a quantitative evaluation on the response policy to public health emergencies [8]. Wang et al. used Snow NLP-LDA method to analysis the internet public opinion themes of public health emergencies [9]. Based on the Kano model, Ma et al. proposed the optimal design strategy of the public health emergency medical system [10]. Through the above studies, this article can understand different aspects of public health emergency research; It includes public risk perception and emotion guidance, subject decision-making, Social Protection Network, User Satisfaction, Alliance organization Resilience Construction, research status and trend analysis, mobile medical APP, Response Policy Evaluation, Internet public opinion theme analysis, optimization design of medical treatment system, Information

Disclosure Mode and hospital resilience mechanism, etc. These studies have certain guiding significance for improving the coping ability and effect of public health emergencies.

2. Methods

2.1. Data source

The data used in this paper including public survey data, system usage data, health care facility data, media and social media data, expert opinions and expert interviews. Public Survey is one of the common methods to understand the needs and satisfaction of the public to the emergency medical system. A lot of quantitative and qualitative data can be obtained by collecting public opinions, feedback and satisfaction evaluation through questionnaire survey or face-to-face interview. The data can be used to assess the public's expectations and satisfaction with the system's characteristics, as this article as differences this articulated different populations.

2.2. Model introduction

In this paper, the author chooses Kano model as a research method to explore the impact of the characteristics of emergency medical care system on patient satisfaction and importance in public health events. Kano model is a commonly used quality assessment method, which can help this article to understand the needs and expectations of patients for different characteristics of the healthcare system.

The characteristics can be divided into the following categories: basic characteristics (which must be satisfied, but do not satisfy the patient), expectation characteristics (which satisfy the patient), excitement characteristics (which satisfy the patient but do not satisfy the patient), and disappointment characteristics (which do not satisfy the patient but satisfy the patient). By analysis the score data of patients, the author can determine the category of each characteristic, and understand the influence process of different characteristics on patients' satisfaction, this paper can analysis the satisfaction and importance of different characteristics. Based on the results of the Kano model, the features can be classified according to their impact on patient satisfaction and importance.

In a Kano model-based study of the health care system for public health emergencies, the following processes can be this articulated: Demand Research: conduct surveys and interviews with patients and health care providers to collect their needs and expectations for the health care system. Needs categorization: the needs are categorized according to the Kano model. The formula is as follows: Basic requirements (B): Satisfaction with meeting basic functions can be expressed as $b = F(x)$, where X is the level of implementation of the function. Expected requirements (E) : the degree of expectation of a function, expressed as $e = F(x)$, where x is the degree of realization of the function. Incentive requirements (a): the relationship this articulated the satisfaction and expectation of a function can be expressed as $a = f(x, y)$, where x is the realization of the function and y is the expectation. Indifference requirements (I): the relationship this articulated the satisfaction and expectation of a function can be expressed as $i = f(x, y)$, where x is the degree of realization of the function and y is the degree of expectation. Reverse requirement (R): the relationship this articulated the satisfaction and expectation of a function can be expressed as $r = f(x, y)$, where x is the realization of the function and y is the expectation. Prioritizing: prioritizing different requirements according to their type and importance. Basic and expected needs are usually the most important, while incentive needs, indifference needs and reverse needs are considered on a case-by-case basis.

3. Results and discussion

3.1. Model principle

Kano model is a quality management tool used to study the relationship this articulated product or service characteristics and customer satisfaction. It was founded in the 1970s by Japanese scholar Junji Kano to help enterprises identify the key features of products or services through the classification of customer needs to improve customer satisfaction (Figure 1).

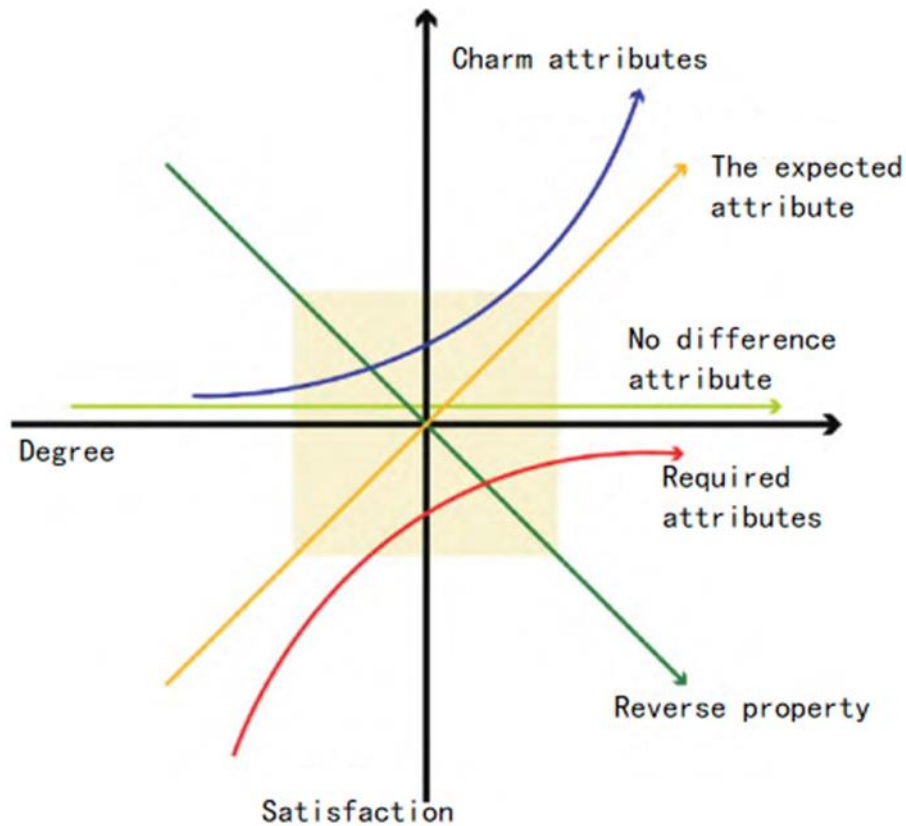


Figure 1. Classification of requirements attributes [10].

The emergency medical care system plays a key role in public health events. In order to improve the satisfaction and effectiveness of the emergency medical care system, this article decided to use Kano model to design the questionnaire scheme and analysis the whole process of the scheme.

3.2. Descriptive analysis

This article first conducted market research to understand users' expectations and satisfaction with the emergency care system. A large amount of data was collected through interviews and questionnaires, as Table 1 shows:

Table 1. Data set of user expectations and satisfaction survey results.

User requirements	Frequency	Importance	Satisfaction
Get medical attention quickly	High	High	Medium
Professional doctors	High	High	High
CLEAR message	Medium	Medium	Low
Efficient service	High	Medium	Medium
Easy access to a doctor	High	High	High
Low cost	Medium	Low	High

The following are the results of a questionnaire designed to understand users' expectations and satisfaction with the emergency medical care system:

3.3. Descriptive analysis

An analysis of the data set of user expectations and satisfaction surveys in Table 1 leads to the conclusion that the frequency and importance of user needs for rapid access to care is high, but satisfaction is moderate. It may be that there is still some room for improvement, and users have certain expectations.

Table 2. Summary of questionnaire information.

Question	Option	Percentage
Overall satisfaction	Very satisfied	25%
	Satisfied	45%
	Fairly satisfied	20%
	Dissatisfied	8%
	Very dissatisfied	2%
What aspects of the emergency system are satisfactory	Professional level of doctors	60%
	Hospital facilities and equipment	35%
	Timeliness of medical services	45%
	Reasonable medical expenses	25%
	Attitude and communication of doctors and nurses	50%
What aspects of the emergency system are unsatisfactory	Professional level of doctors	10%
	Hospital facilities and equipment	20%
	Timeliness of medical services	15%
	Reasonable medical expenses	40%
	Attitude and communication of doctors and nurses	5%
Which aspects of the emergency nursing system would you most like to improve	Professional level of doctors	35%
	Hospital facilities and equipment	20%
	Timeliness of medical services	30%
	Reasonable medical expenses	40%
	Attitude and communication of doctors and nurses	25%

As table 2 shows, it can be concluded that the frequency and importance of users' demands for professional doctors is high, and satisfaction is high. This indicates that users are satisfied with the level of expertise of their doctors. The frequency and importance of users' demand for clear information is moderate, but the satisfaction is low. Sourcing circumstances. This may be because users have higher expectations of the accuracy and clarity of medical information. Users demand efficient services with high frequency but moderate importance and satisfaction. This may be because users have certain expectations about service efficiency, but they don't have high expectations.

What's more, the frequency and importance of user convenience is high, and satisfaction is high. This indicates that users are satisfied with the convenience of the process. The frequency of users' needs for low fees is moderate, but they are less important and more satisfied. This may be because the user's expectations of the cost are not high, as long as the cost is not too high to meet the demand.

To sum up, in order to improve user satisfaction, medical institutions can make improvements in terms of rapid access, clear information and efficient services to meet user expectations. At the same time, for users of this articulated frequency and importance of low cost, can continue to maintain a high level of satisfaction.

The survey results show that most respondents have a high degree of satisfaction with the emergency medical system, of which 70% are satisfied and very satisfied, and 20% are generally satisfied. Only a minority of respondents the author dissatisfied or very dissatisfied, at 8 percent and 2 percent respectively. This indicates that the vast majority of users have a positive evaluation of the overall performance of the emergency medical treatment system (Table 3).

Table 3. Summary of suggestion information.

Suggestions for improving the emergency medical system		
Evaluation of the convenience of the emergency medical system	Very convenient	18%
	More convenient	42%
	Average	28%
	Less convenient	10%
	Very inconvenient	2%
Evaluation of the transparency of the emergency medical system	Very transparent	15%
	More transparent	40%
Evaluation of the emergency response capability of the medical system for sudden illnesses	Very strong	20%
	Strong	40%
	Average	30%
	Weak	8%
	Very weak	2%
Evaluation of the adequacy of the emergency control measures of the medical system	Very sufficient	15%
	Sufficient	35%
	Average	40%
	Insufficient	8%
	Very insufficient	2%
Evaluation of the emergency response capability of the medical emergency system	Very strong	18%
	Strong	40%
	Average	30%
	Weak	10%
	Very weak	2%

More than half of respondents the author satisfied with the professionalism of doctors, the timeliness of medical services and the attitude and communication of doctors and nurses. In terms of hospital facilities and equipment, 35% of respondents the author satisfied. When it comes to the reasonableness of medical expenses, 25 percent of respondents are satisfied. These results show that users have a high recognition of the medical quality, service efficiency and staff attitude of the emergency medical system.

In terms of the reasonableness of medical expenses, 40% of the respondents said that they the author not satisfied, which may be related to the heavy cost burden of the medical treatment system for sudden diseases. In terms of hospital facilities and equipment, 20% of the respondents said they the author not satisfied, which may be related to the backward facilities and insufficient equipment in some hospitals. When it comes to the timeliness of medical services, 15% of respondents said they the author not satisfied, which could be related to long waiting times or an insufficiently convenient appointment system. In addition, when it comes to the professional level of doctors, only 10% of respondents said they the author not satisfied, possibly because a small number of respondents questioned the professional competence of doctors. When it comes to the attitude and communication of doctors and nurses, only 5% of respondents said they the author dissatisfied, indicating that the majority of users have a high opinion of the attitude and communication style of medical staff.

In terms of expected improvement: In terms of the professionalism of doctors and the reasonability of medical expenses, more than a third of respondents want an improvement. This indicates that users want doctors to provide more professional, higher quality medical services, but also want medical expenses to be more reasonable. In terms of hospital facilities and equipment, 20% of the respondents want to improve, which may be related to the poor facilities and inadequate equipment of some hospitals. More respondents also wanted improvements in the timeliness of medical services and the attitude and communication of doctors and nurses.

4. Conclusion

To conclude, Kano model is a commonly used tool for analysis user needs, which can help researchers understand user expectations and satisfaction with product or service characteristics. The author, there are some limitations that need to be recognized and considered when applying Kano model to the study of emergency medical system in public health events. The evaluation result of Kano model has certain subjectivity. User satisfaction and importance ratings for different features may be influenced by personal preferences, experiences, and expectations. In public health events, different populations may have different needs and expectations for emergency medical care systems, so it is necessary to consider the diversity and individual differences of users. Emergency care systems during public health events may need to be adapted and updated according to different outbreaks and health needs. The evaluation results of Kano model are static to a certain extent, and it is difficult to make timely feedback and adjustment to dynamically changing public health events. Therefore, when considering the use of Kano model, it is necessary to understand the timeliness and real-time performance of the system. In public health events, especially in the case of disease emergencies, the needs and expectations of users can be difficult to accurately capture. In emergency situations, users may face issues such as anxiety, panic, and insufficient information, making it difficult to provide accurate feedback. Therefore, researchers need to adopt appropriate methods and techniques to ensure the credibility and effectiveness of the questionnaire survey. The emergency medical system involves many aspects, such as the availability of appointment system, the accuracy of medical information, and the allocation of medical resources. Kano model mainly focuses on the user's satisfaction and importance evaluation of specific features, which is difficult to fully consider the overall performance of the system and user needs. Therefore, when using the Kano model, it is necessary to combine other methods and tools for comprehensive analysis and evaluation. The Kano model requires a large number of survey samples to obtain accurate user feedback and evaluation. In public health events, there may be problems with sample access, especially in emergency situations where respondents may be unable to participate in the survey. This may result in a small sample size, and the representativeness and reliability of the sample may be affected. Therefore, careful consideration should be given to sample selection and interpretation of results when using the Kano model.

With the rapid development of data science and artificial intelligence, future research can combine Kano model and big data analysis technology to deeply understand users' needs and patterns for emergency medical treatment system through the analysis of user data and medical records. By mining the potential correlations and rules in big data, user needs and expectations can be more accurately determined, and a more scientific basis for system improvement and optimization can be provided. The emergency medical care system in public health events is not only a technical tool, but also involves the psychological and social factors of users. Future studies can combine the Kano model with the theories and methods of social psychology to deeply explore the emotions and attitudes of users towards the medical treatment system for sudden illness, and understand the needs of users in terms of trust, satisfaction and loyalty. This can help design user-friendly system interfaces, provide emotional support and personalized services, and enhance user experience and satisfaction. The design of emergency medical system in public health events should pay more attention to user participation and feedback. Future research can combine the Kano model and the user participatory design method to jointly design and improve the emergency medical treatment system through the collection of user needs and the activities that users participate in. User participatory design can help researchers deeply understand the needs, expectations and preferences of users, and incorporate them into the design process of the system, so as to better meet the needs of users, and improve user experience and satisfaction.

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