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ANALYZING FACTORS AFFECTING PATIENT SATISFACTION USING THE KANO MODEL

by

TEJASWI MATERLA

A DISSERTATION

Presented to the Faculty of the Graduate School of the

MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

In Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

in

ENGINEERING MANAGEMENT

2018

Approved by
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Dr. Ruwen Qin

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PUBLICATION DISSERTATION OPTION

This dissertation consists of the following articles that have been published, or submitted for publication as follows:

Paper I, Pages 4 – 44 have been published in Total Quality Management and Business Excellence.

Paper II, Pages 45 – 77 have been submitted to Total Quality Management and Business Excellence.

Paper III, Pages 78 – 110 have been submitted to International Journal of Health Care Quality Assurance.

ABSTRACT

Customer needs associated with the healthcare sector are constantly evolving with the technological advancements, rising costs, and shifts in patient demographics. Challenges associated with understanding patient needs impact the quality of care and life, safety, and satisfaction. The objective of this research was to develop a methodology to collect and analyze the needs associated with healthcare units that differ based on the type of care and services and patient perceptions over time. The proposed methodology provides insights into the voice of the customer through visualization of the relationship between the performance of quality attributes and customer satisfaction. Cronbach's alpha is employed in the proposed methodology to ensure internal consistency of the instrument used to gather the voice of the customer. In addition, the chi-square test for goodness of fit is included in the proposed methodology to test the distribution. The Fisher's exact test value (p) from the Chi-square test of independence is used to evaluate patients' responses and effect sizes were analyzed using Cramer's V to determine the magnitude of effect between the variables. These steps enabled patient responses to be compared by demographics. The proposed methodology was validated through a study of the factors affecting patient satisfaction related to health services. The analysis suggests that the patient responses can be evaluated using the demographic factors. The study suggests that the proposed methodology is beneficial in understanding the growing patient complexity, and maintaining ongoing efforts into understanding patient needs by tracking them over time and with shifts in the demographic environments.

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1. INTRODUCTION

In the past, healthcare professionals have provided care to patients using their expertise and the resources available in a manner which they perceived to be most suitable for patients. This approach of treating patients as "objects" but not as "service customers" has created barriers in the process of care. Patients' healthcare needs are continuously changing due to the amplifying influence of factors such as technological advancements, awareness of quality deficits, medical costs, and changes in patient demographics, among others. Medical providers and organizations face ongoing challenges in understanding these complex patient needs, which can directly cause harm to patients while increasing healthcare costs and patient dissatisfaction. In recent years, patients' perception of quality and satisfaction are being considered along with provider's judgments to improve the quality of care, increase the likelihood of desired healthcare outcomes, and reduce the possibility of adverse events. It is imperative that healthcare organizations focus on patient satisfaction and quality perception to maintain high performance in the provision of quality care and achieve sustainability. The objective of this research is to provide a systematic methodology of capturing the patients' needs associated with different types of care and services provided by healthcare systems with a key focus on patient satisfaction and perception of quality.

Several quality improvement methodologies such as quality function deployment (QFD), Servqual, process maps, and root cause analysis, among others, have been used in the healthcare sector to essentially focus on improving healthcare processes. Although these methodologies provided great benefits in terms of reduction in wastes and variation associated with healthcare services, they did not consider patients' quality perception and

satisfaction. An integrated methodology to assess healthcare service quality and obtain diverse patient needs associated with the healthcare services is proposed in this research. The proposed methodology was validated through a study of the factors affecting patient satisfaction related to health services such as walk-in clinics and university health services.

Prior research related to healthcare needs' identification and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) were considered in developing a service quality scale (survey) customized to the healthcare services selected to validate the proposed methodology. Cronbach's alpha was employed in the proposed methodology to ensure the reliability of the scale (instrument) developed to gather the healthcare needs. Data collected from patients regarding healthcare services was analyzed using the Kano model. The Kano model is a quality methodology that aids in capturing the voice of the customer and categorizing the quality attributes of a product or service based on customer satisfaction. The proposed methodology included the Chi-square test for goodness of fit to test the distribution, Fisher's exact test value (p) from the Chi-square test of independence to evaluate patients' responses based on various demographic factors such age, gender, and health status among others, and Cramer's V to determine the magnitude of effect between patient needs and demographic factors.

The significant contribution of this research is an integrated methodology for healthcare needs identification and service quality improvement that can be utilized to understand the complex patient needs related to the complete life cycle of any healthcare service unit. The proposed methodology can be effectively employed to elicit patient needs associated with the entire healthcare system based on patient satisfaction and perception of quality to provide care that is safe, effective, timely, efficient, and equitable. A meaningful

comparison of the differences in the perceptions of customer segments can be achieved using this systematic methodology. This methodology also allows a comprehensive understanding of the quality perception, satisfaction and opinions of all the stakeholders of a healthcare organization.

PAPER

I. THE APPLICATION OF KANO MODEL IN THE HEALTHCARE INDUSTRY: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

The critical determinant of success in any industry is the customers' perception of the products and services offered. Hence, organizations focus on customer satisfaction for service quality improvement, business growth, and sustainability. Although the Kano model has been used widely to elicit customers' service quality requirements and improve customer satisfaction, the implementation of the Kano model in healthcare remains in its infancy and there is ambiguity in customer needs related to healthcare services. This paper provides a review of the literature on implementing the Kano model in healthcare through a systematic search of databases related to service quality improvement in the healthcare sector. The objective of this paper is to detail how the Kano model can be employed and integrated with other quality methodologies to obtain customer requirements and improve healthcare service quality. It is evident from this systematic review that customer needs and preferences vary with the type of care acquired and services offered by healthcare providers. The findings allow healthcare providers to comprehend customer needs related

to service quality and develop sustainable improvement strategies. This article intends to propel further research in service quality improvement of the healthcare industry.

Keywords: Customer satisfaction; healthcare; Kano model; patient satisfaction; service quality; systematic literature review

1. INTRODUCTION

While the healthcare industry is one of the largest and fastest growing industries in the world, healthcare continues to be a grave socio-economic problem facing many nations today. Healthcare providers and medical professionals constantly face numerous challenges in understanding and meeting the needs, requirements, and expectations of customers, which lead to poor quality of care, lower patient satisfaction, and excessive medical costs (Kizer, 2002). According to the United States (US) Department of Health and Human Services, the total national health expenditure was $2.9 trillion in 2013 with a growth rate of 3.6% compared to the previous year. Data collected by the Organization for Economic Cooperation and Development show that the US spent 17.1% of its gross domestic product (GDP) on healthcare in 2013, which is 50% more than the second highest spender France (11.6% of GDP) and almost double the UK spending of 8.8% of GDP; while still being the only country in the high-income countries without a publicly financed universal healthcare system. The Commonwealth Fund report in October 2015 stated that while the rate of healthcare spending in the US is in excess of most countries, the US had the worst outcomes in terms of chronic conditions, obesity, and infant mortality compared

to 12 other high-income nations including Australia, Canada, Denmark, France, Germany, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, and the United Kingdom (National Center for Health Statistics, 2015; Squires & Anderson, 2015). Although the healthcare expenditure in the US exceeds most of the other developed nations, the healthcare quality lags far behind (McDermott, Stock, & Shah, 2011) and Americans experience poor health outcomes, which include shorter life expectancy and greater prevalence of chronic conditions (Squires & Anderson, 2015).

Customers' perception of quality is a significant determinant of success of a healthcare organization, considerably impacting customer satisfaction, service consumption, and customer loyalty. With the rising costs of providing healthcare and intensified competition in the industry, healthcare providers are focusing on the improvement of patient satisfaction as a method of managing costs and enhancing service quality (Parasuraman, Berry, & Zeithaml, 1991; Bond & Thomas, 1992; Kuo, Wu, Hsu, & Chen, 2011; Materla & Cudney, 2017). Patient satisfaction is an intricate combination of perceived needs, expectations, and the overall experience of healthcare; and its measurement has often been challenging for healthcare providers due to its complexity (Smith, 1992; Gosavi, Cudney, Murray, & Masek, 2016).

Traditionally, most studies assumed a linear relationship between product or service quality and customer satisfaction, suggesting that the more the quality level increases, the more customer satisfaction is attained (Huiskonen & Pirttila, 1998). However, the researchers observed that the linear relationship may be inaccurate for understanding customer satisfaction and different aspects of quality. Herzberg's two-factor theory was initially developed to identify the factors influencing motivation levels of

employees in the workplace (Bloemer & Kasper, 1995). Kano, Seraku, Takahaski, and Tsuji (1984) extrapolated Herzberg's two-factor theory and developed a model to identify the quality attributes that influence customer satisfaction, and suggested a non-linear relationship between them. The Kano model can be used to identify and classify the quality attributes based on their impact on customer satisfaction into must-be, attractive, one-dimensional, reverse, and indifferent categories. Must-be attributes correspond to the basic requirements of the product or service quality, and absence of these attributes leads to extreme customer dissatisfaction. Customer satisfaction is directly proportional to the level of performance for one-dimensional attributes. The presence of attractive attributes leads to extreme customer satisfaction, but the absence leads to no customer dissatisfaction. The absence of reverse attributes leads to customer satisfaction. The indifferent attributes have no effect on the customer satisfaction or dissatisfaction. Implementing the Kano model will enable healthcare providers to understand the complex behaviour of patients and their needs related to the service quality, which can be utilized to improve customer satisfaction. A representation of the Kano model as suggested by Hogstrom, Rosner, and Gustafsson (2010) is provided in Figure 1.

Over the past few years, research has been conducted employing the Kano model to understand service quality and patient satisfaction in the healthcare industry. Although the implementation of the Kano model has gained momentum in the healthcare industry, there is a lack of research that provides insights into patient satisfaction by integrating all service units of the healthcare system. A healthcare system has many subsystems such as hospitals with specialty units, clinical laboratories, clinics, and day-care centers, among many others, which differ based on the type of care, service type, and a variety of other

characteristics (Baru, Cudney, Guardiola, Warner, & Phillips, 2015). Most of the existing studies focus on presenting the isolated results from specific service units. The literature on the Kano model implementation in the international healthcare sector has been considered in this article, as it can provide insights into how the Kano model can be utilized in diverse conditions to drastically improve healthcare systems.

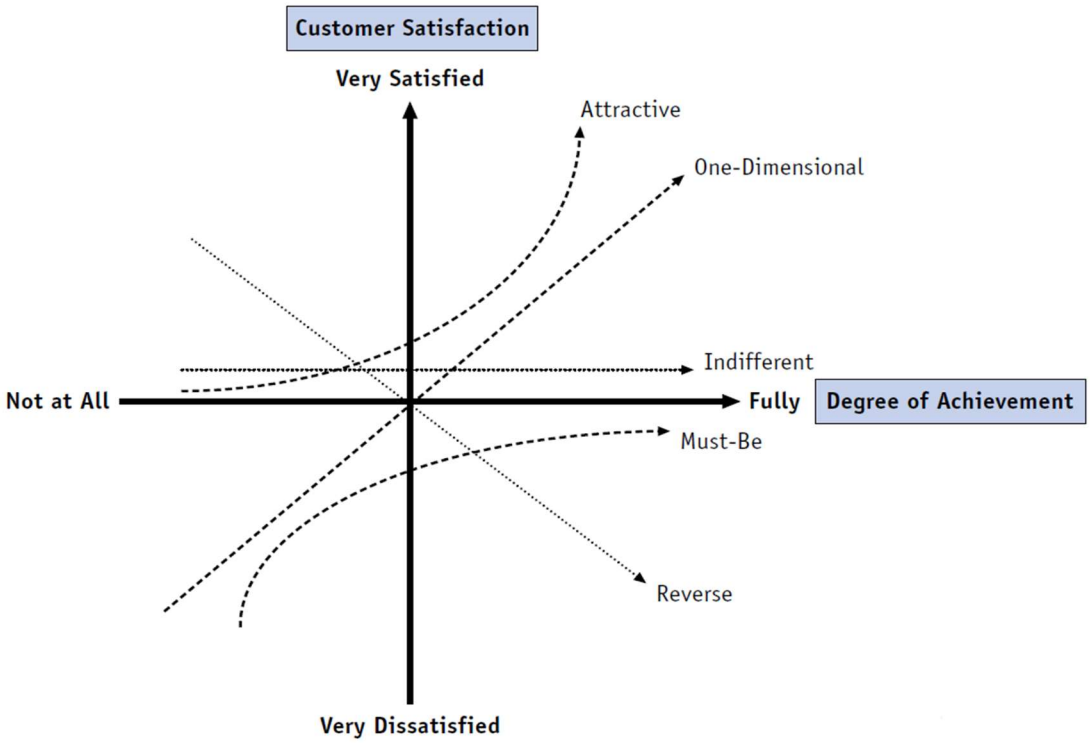

Figure 1. Kano model.

This article aims to identify and organize the existing literature regarding the use of the Kano model in the entire healthcare sector, provide a better understanding of the model, identify differences in the various implementations, recognize the challenges in the implementation of the model, and provide principal findings.

2. SYSTEMATIC LITERATURE REVIEW METHODOLOGY

This study employed a systematic review methodology because of its transparency and repeatability to investigate the key aspects in the implementation of the Kano model in the healthcare industry from 2002 to 2016. The systematic literature review has been carried out in a structured manner as suggested by Tranfield, Denyer, and Smart (2003) and Brereton, Kitchenham, Budgen, Turner, and Khalil (2007). Systematic reviews help avoid the potential effects of research bias and ensure a traceable research path (McLean, Antony, & Dahlgaard, 2015). A systematic review of the implementation of the Kano model in the healthcare sector provides a complete picture of how the model is currently being employed and integrated with other quality models, challenges with its implementation, and equips healthcare providers with valuable customer information for sound decision-making.

2.1. SYSTEMATIC REVIEW PROCESS

This systematic review followed the guidelines and outline advocated by Tranfield et al. (2003) and Brereton et al. (2007). It contains three stages: planning the review, conducting the review, and reporting and dissemination. Each review stage was performed in a series of steps, keeping the review and research objectives in mind. The steps in each review stage are presented in Figure 2.

2.1.1. Planning the Review. The main objective of the systematic review was to identify and organize the available literature on the implementation of the Kano model in the healthcare sector to determine the essential elements of the model and recognize the disparities in the Kano model deployments in diverse service units of the healthcare sector

and challenges associated with them. Articles published since 2002 to the last issue available on 1 August 2016 that utilized the Kano model in any or all service units of a healthcare system were used for this systematic review. This timeframe was chosen carefully to ensure that the findings were relevant and up-to-date. Searches to ensure inclusion of all relevant literature were conducted using databases such as Academic Search Complete, SCOPUS, MEDLINE, Web of Science, Biomed Central Open Access, Dissertations and Theses A&I, HealthSTAR, IEEE Xplore, Journals@OVID, Premedline, Science Direct, Inderscience, and Google Scholar. The databases were selected based on the research domains and types of publication included in them. The authors are confident that the findings from these databases are representative of the literature available within the search parameters utilized. The search words 'Kano model', 'Healthcare', 'Service quality', 'Patient satisfaction', and 'Customer satisfaction' were selected based on the main objective of the systematic review.

Initially, high-quality journals related to service quality and healthcare, such as Managing Service Quality, Total Quality Management & Business Excellence, Academic Emergency Medicine, Quality Assurance in Healthcare, and International Journal of Health Services, were searched for relevant literature. The searches were later extended to other journals obtained from the previously mentioned databases. The review was largely focused on empirical studies found in journal articles and conference papers; and books as well as other non-referred publications were excluded. The research papers that did not have the correct implementation of the Kano model as suggested by Kano et al. (1984) were also excluded. The organization of the relevant literature concentrated on the common

themes between the studies that focused on the Kano model or its integration with other quality models.

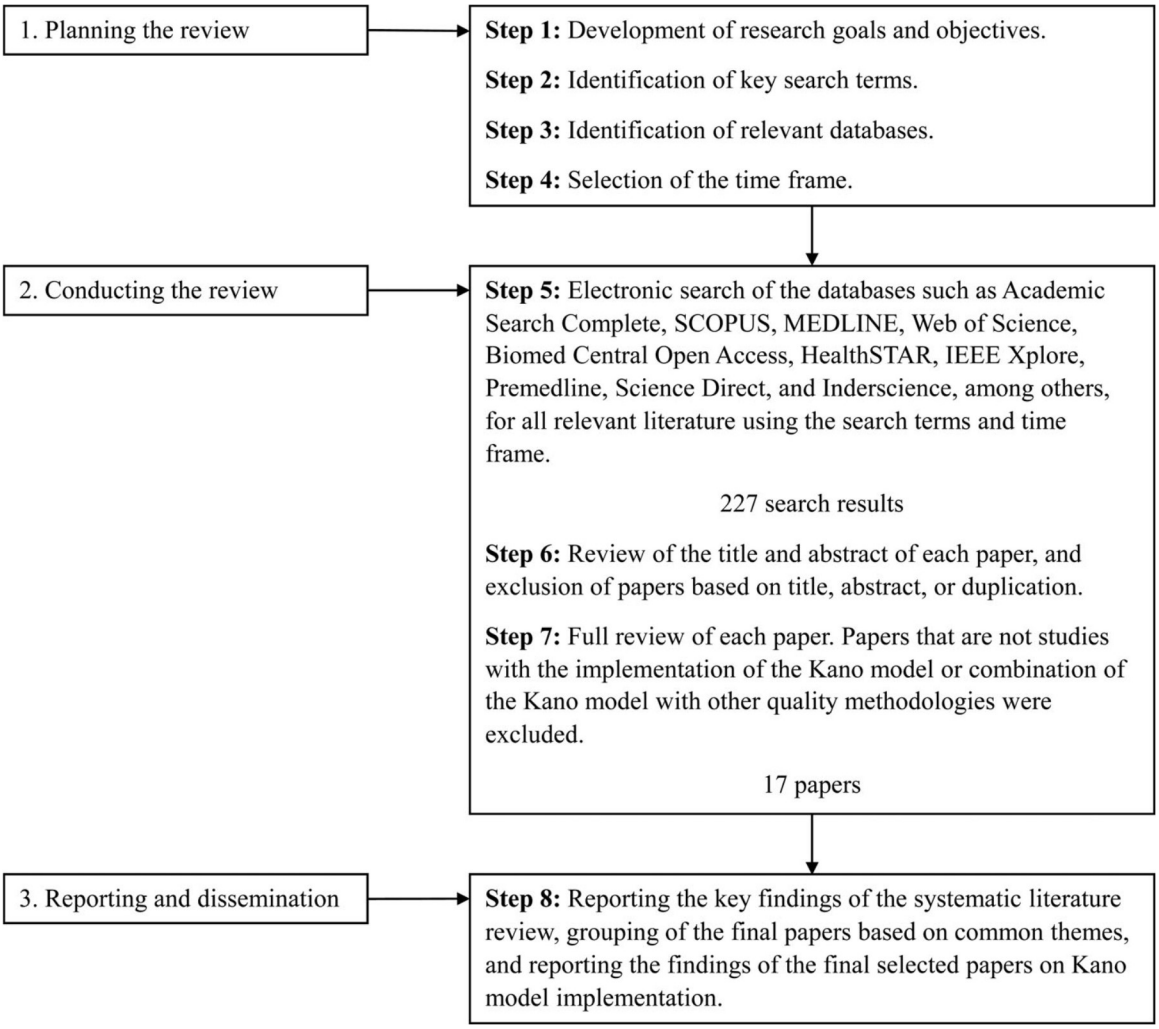

Figure 2. Steps of the three stages of the systematic review process.

2.1.2. Conducting the Review. The searches were performed using the keywords and selecting 'All text' in the field section, and the time frame criteria of 2002 – 2016. Keeping the 'Kano model' and 'Healthcare' search terms constant, every possible combination of the other search terms was used. The connectors such as 'AND' and 'OR'

were employed to combine the search terms. The time frame criteria for the search are limited, as the implementation of the Kano model in the healthcare industry has gained momentum only in recent years. The terms chosen were appropriate to identify the studies that employed the Kano model in the healthcare sector. The search process returned a total of 227 search results.

Each paper was subjected to a thorough evaluation of the title and abstract using the inclusion and exclusion criteria specified in the planning stage of the systematic review process. At the end of this stage, only 17 papers remained for the full review. The full text of the remaining papers was reviewed in the final stage. The final papers were required to have the Kano model implementation or a combination of the Kano model with other quality methodologies such as quality function deployment (QFD), Servqual, analytic hierarchy process (AHP), customer satisfaction matrix, and service blueprint. The final papers were reviewed and categorized according to their integration with the other quality methodologies. The papers were grouped under four categories based on their common themes such as ‘Implementation of the Kano model’, ‘Implementation of the Kano model and QFD’, ‘Implementation of the Kano model and Servqual’, and ‘Implementation of the Kano model and other quality methodologies’.

3. LITERATURE REVIEW ON THE IMPLEMENTATION OF KANO MODEL

Understanding the complex behavior of patients and service quality needs that impact patient satisfaction has been an ongoing challenge for healthcare providers. Although the Kano model has been widely used in many industries to understand service

quality and customer satisfaction, there is minimal research that employs the Kano model in the healthcare sector. However, these limited studies warrant a discussion to motivate further research in the field. While some researchers employed the Kano model to comprehend the customers' perception of the quality and service quality requirements in most service sectors, others have integrated it with various quality methodologies in the healthcare sector and developed sustainable quality improvement strategies as well (Paraschivescu & Cotirlet, 2012). This section provides a discussion of the studies that employed the Kano model and integrated it with other quality methodologies in the healthcare industry, and their significant findings and practices.

3.1. IMPLEMENTATION OF KANO MODEL

Al-Sayyari et al. (2009) compared the service expectations of hemodialysis treatment between Arab (Saudi, Syrian, and UAE) and Austrian patients using the Kano Model. The information on 20 service quality attributes of the dialysis treatment was gathered by analyzing survey responses from 530 Saudi, 172 Austrian, 60 Syrian, and 68 UAE patients. This study was conducted at 10 different hospital-based dialysis centers in Saudi, two dialysis centers in Austria, one specialized kidney hospital in Syria, and one dialysis center in the UAE. The differences related to sex, age, literacy rate, and duration of dialysis were investigated among the Arab and Austrian patients. While higher satisfaction coefficients and one-dimensional responses were observed in Arab patients, must-be and attractive responses were observed in Austrian patients, where literacy rate significantly impacted these differences among the patients. It was speculated that monopoly on services/product provisions in Arab countries that existed until recently and

a culture of not being seen as demanding resulted in higher satisfaction coefficients on the responses when compared to their counterparts in Austria. The research suggests that literacy rate and cultural needs should be considered when serving countries with underdeveloped sophistication in market segments of the healthcare sector.

Cordero-Ampuero, Darder, Santillana, Caloto, and Nocea (2012) evaluated expectations of both patients and physicians regarding osteoarthritis (OA) treatment using the Kano methodology. The patients were selected on the basis of having at least one year of disease progression and with at least one prescription of anti-inflammatory drugs within the last year. The treatment attributes' data were obtained by gathering responses from 965 adult patients with OA, one of the major sources of disability in elderly people, and 383 physicians who treat these patients at university hospitals and tertiary hospitals throughout Spain. None of the treatment attributes was considered as must-be by both patients and physicians. Out of the 13 treatment attributes, 9 were identified as attractive, 1 as reverse, 2 as indifferent, and 1 as one-dimensional attribute by the patients. The physicians identified 7 treatment attributes as attractive, 3 as indifferent, and 3 as one-dimensional attributes. While achievement of both total disappearance of the symptoms and lasting symptom relief were ranked higher by the patients, physicians gave utmost importance to short- and long-term safety. The findings suggest that there is a clear significant difference in the expectations of the OA treatment between the patients and physicians; therefore, when choosing an appropriate treatment for the patient, he/she should be included in the decision-making.

Matı´as-Guiu, Caloto, and Nocea (2012) examined the usefulness of the Kano methodology in assessing the expectations of patients receiving symptomatic migraine

treatment and the neurologists treating them. The research explored 16 treatment attributes by obtaining responses from 204 migraine patients and 68 neurologists from university hospitals and tertiary hospitals throughout Spain. The attributes such as treatment safety, efficacy, and quality of life were considered to be most important by both patients and neurologists. However, the most important attribute for patients was an achievement of total pain disappearance and absence of long-term adverse effects for neurologists. The neurologists considered 11 attributes as attractive, 3 as must-be, and 2 as indifferent, whereas, the patients identified 8 attributes as attractive, 5 as one-dimensional, and 3 as indifferent. The patients did not consider any attribute as a must-be attribute. The authors recommend that patients be involved in the decision-making for their treatment to provide customized care that positively impacts their satisfaction.

Gustavsson, Gremyr, and Sarenmalm (2016) explored multiple patient roles such as supplier, product, participant, recipient, and co-designer, which can be considered in the Kano model deployment for healthcare improvement and to identify diverse patient needs. This study was conducted in the children's and women's healthcare department of the Skaraborg hospital in Sweden, where 113 responses from patients, relatives, and healthcare professionals were collected with an aim of designing a new perinatal center. The findings suggest that input from various groups (e.g. patients, relatives, and healthcare professionals) and various stakeholders eliminate the challenges in identification of complex patient needs. The most important attributes obtained from various groups, such as communication between aftercare wards and neo wards and being near the child, were incorporated into the design of the new perinatal center. The authors recommend considering various patient roles in order to comprehend diverse and dynamic patient

needs, rather than relying solely on patients or healthcare professionals. A comparison of the studies that only employed the Kano model is provided in Table 1.

Table 1. Comparison of the studies that employed the Kano model.

Author (s)	Year	Service unit of the healthcare system	Location	Principal findings
Al-Sayyari et al.	2009	Hemodialysis unit	Arab (Saudi, Syria and UAE) and Austria	• On 20 service quality attributes, Arab patients had higher satisfaction coefficients and one- dimensional responses whereas Austrian patients had must-be and attractive responses. • Literacy rate had a significant impact on the differences in Arab and Austrian patients.
Cordero-Ampuero et al.	2012	Orthopedic department	Spain	• Out of the 13 treatment attributes, none of them were considered as must-be by both patients and physicians. • While patients gave utmost important to efficacy of the treatment, physicians considered safety to be more crucial.
Matías-Guiu et al.	2012	Neurology unit	Spain	• Out of the 16 treatment attributes, the attributes related to treatment safety, efficacy and quality of life were considered to be most important by both patients and neurologists. • While an achievement of total pain disappearance is considered a crucial attribute by patients, absence of long term adverse effects is identified as most important by neurologists.

Table 1. Comparison of the studies that employed the Kano model (cont.).

Gustavsson et al.	2016	Children's and women's healthcare department	Sweden	• The input from various groups (patients, relatives, healthcare professionals) and stakeholders eliminate the challenges in identifying complex patient needs. • The communication between aftercare ward and neo ward and to be near the child were considered the most important attributes, which were incorporated into the design of a new perinatal center at the hospital.

3.2. IMPLEMENTATION OF KANO MODEL AND QFD

Since the late 1960s, QFD has been practiced by several companies around the world for product development (Matzler & Hinterhuber, 1998), and has made its way into service planning and development over recent years (Akao & Mazur, 2003; Ezzell, Cudney, Phelps, & Mazur, 2016; Gillis & Cudney, 2015). QFD is a planning and development support tool that provides a systematic way for product/service providers to ensure quality and customer satisfaction while simultaneously maintaining a competitive advantage (Nordin & Razak, 2011; Paryani, Masoudi, & Cudney, 2010; Singh, Elrod, & Cudney, 2012). The studies of Chiou and Cheng (2008), Nordin and Razak (2014), and Shamshirsaz and Dong (2014) utilized the Kano model and QFD to determine the key quality attributes impacting patient satisfaction.

Chiou and Cheng (2008) provided a framework for identifying and prioritizing patients' needs, and translating them into requirements for regular service planning using an integrated Kano – QFD approach to assist healthcare providers in decision-making as

well as developing sustainable quality improvement strategies. They explored the service quality attributes of dimensions such as convenience, cleanliness, nursing care, and physician care, focusing mainly on impressive (attractive) qualities based on the informative survey data obtained from various healthcare facilities in Taiwan. Upon investigating the Kano – QFD approach, they deduced that this approach would allow medical providers to classify the quality attributes, prioritize them with impressive qualities having the highest importance, recognize trade-offs, and translate them into functional requirements for regular service planning. Chiou and Cheng suggested that the functional requirements can also be categorized into structure, process, and outcome requirements.

Nordin and Razak (2014) also presented a framework to comprehend the nonlinear relationship between customer needs and product or service quality using an integrated Kano – QFD approach. Due to the complexity of both patient needs and service delivery processes, the healthcare industry was considered for this study. Data were collected at a doctor care facility in Malaysia on service dimensions such as the code of practice, standardization of diagnosis, staff knowledge and experience, medical apparatus used, and degree of attentiveness. They analyzed the data using the critical incident technique and analysis of complaints and compliments (ACC), which use the frequencies of positive and negative responses to assist in the classification of quality attributes using the Kano model. The Kano quality attributes were divided into service attributes and patient attributes. While the service attributes included all the elements of the service required to provide the necessary treatments to patients such as laboratory testing, infrastructure, code of practice, and training of the professionals among others; the patient attributes consisted of all the features of the care provided such as pain management, interaction with the professionals,

and comfort of the facilities. Out of the 10 service attributes, the researchers observed that 8 were must-be and 2 were one-dimensional attributes. All of the 10 patient attributes were must-be attributes. By calculating Berger's coefficient for the Kano quality attributes, they noticed that the dissatisfaction level was higher than the satisfaction level. Upon implementation of QFD, the Kano quality attributes were converted into requirements for service design and development and prioritized. Patient attribute and service attribute indices were calculated using the ACC method. A similar finding was obtained that suggests that the satisfaction level for the Kano quality attributes was lower than the dissatisfaction level. The researchers observed that the patient expectations are different from the healthcare providers and concluded that patients give utmost importance to ethical healthcare providers.

Shamshirsaz and Dong (2014) deployed an integrated Kano – QFD approach to examine the residents' needs and establish priorities to improve their satisfaction in the care homes. They explored 12 essential needs of the care homes by gathering information from 102 residents in 35 independent care homes in London, United Kingdom. The residents for this study were selected based on their interest in participating in the research, good understanding of the English language, having no Alzheimer's or other known cognitive impairment, having enough energy to participate, and having a care home residency of at least four weeks. Out of the 12 quality attributes, 3 attributes such as accessible equipment, home-like environment, and suitable design were identified as attractive. In addition, five attributes such as empathic staff, social interaction, autonomy, daily living activities, and family support were recognized as one-dimensional.

Table 2. Comparison of the studies that employed the Kano-QFD approach.

Author (s)	Year	Service unit of the healthcare system	Location	Principal findings
Chiou and Cheng	2008	All service units	Taiwan	• This approach will allow healthcare providers to classify, prioritize, and recognize trade-off attributes, and translate them into functional requirements for service planning. • The functional requirements can be categorized into structure, process, and outcome requirements.
Nordin and Razak	2014	Doctor care facility	Malaysia	• Out of 10 service attributes, eight were must-be and two one-dimensional attributes. • All 10 patient attributes are must-be attributes. • Dissatisfaction level for Kano quality attributes is higher than the satisfaction level. • Patients give utmost importance to ethical healthcare providers.
Shamshirsaz and Dong	2014	Independent care homes	London, United Kingdom	• Three quality attributes were identified as attractive, five as one-dimensional, one as indifferent, and three as must- be from the 12 essential needs of the care home residents. • Improvement to any of the three factors such as accessible equipment, home-like environment and suitable design will significantly increase residents' satisfaction.

The only indifferent attribute was involvement. The three must-be requirements included meals, safety, and accurate medical care. Based on the ratio of improvement, benchmarks, and available resources, these classified Kano quality attributes were prioritized and translated into technical requirements using QFD. The researchers suggest that an integrated Kano – QFD approach can also be applied to different care homes to understand the residents' needs, as they are essential for quality improvement in the UK, where more than half of the healthcare beds belong to elder care homes. A comparison of these studies that employed an integrated Kano – QFD approach is provided in Table 2.

3.3. IMPLEMENTATION OF KANO MODEL AND SERVQUAL

Servqual has been one of the most widely used quality models in the service industry (Pawitra & Tan, 2003). It is a methodology that allows service providers to define service quality in terms of the gap between the customers' perceptions and the expectations about the service quality performance of an organization (Parasuraman, Zeithaml, & Berry, 1988; Fotiadis & Vassiliadis, 2013). However, this model assumes a linear relationship between the service quality and customer satisfaction, and has been challenged as not being adequate (Chang & Chang, 2013). Incorporating this model with the Kano model eliminates this drawback, and allows service providers to elevate the quality of their services and customer relationship management strategies.

Christoglou, Vassiliadis, and Sigalas (2006) studied the public healthcare service quality in Greece using an integrated Kano – Servqual model. Information regarding the key service quality attributes and patient satisfaction was gathered from 75 patients of the General Hospital of Katerini in Greece using a 22-item Servqual instrument. The key

service quality elements were classified and prioritized using the Kano model. It was observed that the importance of personal knowledge, courtesy of hospital employees, and their ability to convey trust and confidence were most valued by the patients. This integrated approach allowed medical providers to understand patient preferences and improve the service quality.

In a further study, Vassiliadis, Fotiadis, and Tavlaridou (2014) employed the integrated Kano – Servqual model to explore the effects of new facilities on patients' quality perceptions of the public healthcare services offered in Greece. A 22-item Servqual instrument was utilized to gather patient satisfaction and service quality information from 100 patients of the outpatient care unit of Katerini General Hospital in Greece. The Kano model was employed to identify and categorize the critical service quality attributes. It was observed that, out of 22 attributes, 12 were considered as one-dimensional and 10 as must-be attributes. The study found no attractive or indifferent attributes. The two attributes 'healthcare facility employees give patients personal attention' and 'healthcare facility employees tell patients exactly when services will be performed' were found to have significant impact on patient satisfaction and dissatisfaction.

Medical tourism has become a prosperous emerging industry, as patients have increasingly opted to seek treatments in other countries because of affordability, better access to care, or a higher level of quality of care (Arellano, 2007; Connell, 2006, 2013). Healthcare providers are seeking ways to differentiate their services and establish strategies to be part of this profitable medical tourism sector. Studies have confirmed that the perceived service quality and patient satisfaction are heavily influenced by patient nationalities and languages (Sofaer & Firminger, 2005). Wongrukmit and

Thawesaengskulthai (2014) investigated the hospital service quality of the Thailand medical tourism industry using an integrated Kano – Servqual approach. A 36-attribute Servqual scale was used to gather 824 responses from the patients and their families in the outpatient services unit of a private international hospital located in Bangkok, Thailand. A comparative analysis was conducted to understand the differences in perceived service quality among patients from different nationalities such as Japan, Myanmar, Arab nations, and Thailand. The Kano model was utilized to categorize and prioritize the hospital's service quality attributes. It was observed that the quality attributes showed a significantly different level among different nationalities. The study showed that, for patients of Myanmar and Arab nations, all attributes were one-dimensional. For the Japanese patients, 35 service quality attributes were perceived as one-dimensional and one as must-be. Thai patients perceived 32 as one-dimensional, 2 as indifferent, and 2 as attractive quality attributes. A customer satisfaction coefficient matrix was proposed to prioritize the classified Kano service quality attributes. This integrated approach can be used to improve perceived service quality by offering different improvement strategies to meet different nationalities' needs.

Yeboah, Ansong, Appau-Yeboah, Antwi, and Yiranbon (2014) identified and prioritized the service quality elements using an integrated Kano – Servqual approach, which can be used to increase patient satisfaction and hospital competitiveness. The service quality and patient information was gathered from the outpatient wards of four selected public hospitals in Ghana using the Servqual model on service dimensions such as tangibles, reliability, responsiveness, assurance, and empathy. The critical service quality attributes were then classified and prioritized using the Kano model. This study found that,

out of the 26 service quality attributes of the public hospitals, 3 were considered as attractive, 4 as must-be, 3 as indifferent, and 16 as one-dimensional service quality attributes. There were no reverse service quality elements. This integrated approach allows healthcare service providers to understand patient priorities and improve them to increase their satisfaction.

Similarly, Sulisworo (2015) investigated the relationship between service quality attributes and customer behavior using the Kano model and Servqual to help service providers develop better customer relationship management strategies. The information regarding the key service attributes and customer satisfaction was gathered using the Servqual perspective on parameters such as tangibles, reliability, responsiveness, assurance, and empathy. The key service quality attributes were categorized using the Kano model. This integrated Kano – Servqual approach was applied to a private hospital in Indonesia. It was observed that 3 of the 26 attributes belonged to the attractive quality category, 4 to the must-be category, 3 to the indifferent category, and 16 to the one-dimensional category. There were no reverse service quality attributes. It was also noticed that the importance of a service attribute is a function of the performance of that attribute. Sulisworo (2015) suggests that service providers should focus on the attractive qualities instead of must-be or one-dimensional attributes to differentiate themselves because of the intense competition in the industry. A comparison of these Kano – Servqual studies is presented in Table 3.

Table 3. Comparison of the Kano–Servqual studies.

Author(s)	Year	Service unit of the healthcare system	Location	Principal Findings
Christoglou et al.	2006	All units of a public hospital	Greece	• Importance of personal knowledge, the courtesy of hospital employees, and their ability to convey trust and confidence were most valued by the patients.
Vassiliadis et al.	2014	Outpatient care unit of a public hospital	Greece	• Out of the 22 service quality attributes, 12 were considered as one-dimensional and 10 as must-be attributes. • The service elements 'healthcare facility employees give patients' personal attention' and 'healthcare facility employees tell patients exactly when services will be performed' were found to have significant impact on patient satisfaction and dissatisfaction.
Wongrukmit and Thawesaengskulthai	2014	Outpatient services unit of a private international hospital of the medical tourism industry	Thailand	• Quality attributes showed a significantly different level among different nationalities. • All 36 attributes were perceived as one-dimensional by Myanmar and Arab patients. • The 35 service quality attributes were perceived as one-dimensional and one as must-be by Japanese patients. • Thai patients perceived 32 as one-dimensional, 2 as indifferent, and 2 as attractive quality attributes
Yeboah et al.	2014	Outpatient wards of four selected public hospitals	Ghana	• Out of the 26 service quality attributes of the public hospitals, 3 were considered as attractive, 4 as must-be, 3 as indifferent, and 16 as one-dimensional attributes.

Table 3. Comparison of the Kano–Servqual studies (cont.).

				• There were no reverse service quality elements.
Sulisworo	2015	All units of a private hospital	Indonesia	• Similar findings in terms of the Kano quality attributes. • The importance of a service attribute is a function of the performance of that attribute.

3.4. IMPLEMENTATION OF KANO MODEL AND OTHER QUALITY METHODOLOGIES

Few researchers utilized the Kano model to understand the patients' needs and classify service quality attributes of various subsystems of the healthcare system. An ageing population across the world has increased the demand for long-term care and, as a result, the elderly care industry has transformed into an emerging service industry. Chang and Yang (2010) investigated the feasibility of exploring elderly service requirements and preventing the service failure points by implementing the Kano model and service blueprint. A service blueprint is a flow chart that depicts all the steps, their interactions with the customers and potential failure points of a service delivery process, and assists in managing service as well as operational processes simultaneously (Shostack, 1984). This study was conducted at an adult day-care facility of a charitable foundation in Taiwan that provides support services to elderly people and primary caregivers. They collected data on 21 service elements related to 6 service quality dimensions such as ease of care, class design, group activities, lunch and snack, break time, and other support services. The data were analyzed using Cronbach's alpha method and the service elements were categorized using the Kano model. They found that, out of 21 service quality elements, 17 were considered attractive, 2 were indifferent, and 2 were one-dimensional attributes.

Transportation services, a service element of the other support services dimension, had the highest degree of importance associated with it and was considered as a one-dimensional attribute. The other elements of the support services dimension included the services provided in conjunction with the care provided at the adult day-care facility. It was observed that the aspects of the transportation services such as the availability, staff, and bus drivers' attitude significantly impacted the customers' overall perception of service quality. After the classification of the service quality elements, the service blue-print of the existing system was redesigned by incorporating the key quality attributes. This approach can be utilized by managers to understand, constantly monitor, evaluate, and enhance the service quality of any healthcare center.

Krassadaki and Grigoroudis (2010) categorized the services provided by a public hospital in Greece using the Kano model, focusing mainly on the services provided by the hospital personnel such as medical, nursing, and support personnel. They carried out a survey that targeted the perceptions of inpatients, outpatients, and visitors on various criteria such as hospital location, infrastructure and facilities, hygiene, personnel, service, and additional services. They analyzed the survey data using the multi-criteria satisfaction analysis method as well as dual importance diagram, and classified the quality attributes into must-be, one-dimensional, and attractive quality attributes using the Kano model. This study concluded that the hospital personnel, as a satisfaction measurement criterion, holds high importance for dissatisfied patients and low importance for satisfied patients. However, for both satisfied and dissatisfied patients, nursing care personnel was considered as a must-be, medical personnel as an attractive, and support personnel as a one-dimensional quality characteristic. They deduced that nursing care personnel have a high

impact on patient dissatisfaction and recommend that hospitals should eliminate any shortcomings or inadequacies related to personnel.

As the healthcare industry is extremely complicated with various service units and complex patient needs, providers are not only focusing efforts on understanding patient needs and enhancing the service quality, but also managing the service requirements in order to develop effective healthcare services. Lee, Sugumaran, and Park (2011) developed a framework for service system requirements management for value co-creation among stakeholders for the medical tourism system using the Kano model and AHP, which will be helpful in designing efficient service delivery systems. They suggested that, in order to understand the customer requirements, healthcare providers need to also analyze business requirements and change factors that affect the service. They collected information from several service providers and customers in Korea. The data were analyzed using the Kano model and AHP. AHP is a multi-criteria decision-making method used to solve a complex problem with multiple conflicting and subjective criteria (Ishizaka & Labib, 2011). The service quality elements related to the dimensions such as business, service, and interaction were classified into Kano quality attributes and prioritized based on the hierarchy determined using AHP. They specifically focused on the attractive, must-be, and one-dimensional attributes, as they have the highest impact on customer satisfaction. The researchers applied the developed framework to the interactive Korean medical tourism system, a system that provides customized healthcare information to medical travelers and medical professionals, by considering the requirements of all stakeholders involved, namely the Ministry of Health and Welfare, Korean tourism organization, service providers, and patients. A goal and scenario approach was employed to elicit the

requirements of business, service, and interaction dimensions. After implementing the integrated Kano – AHP approach, they noticed that value co-creation by all the stake-holders is feasible and it allows the development of effective service delivery systems.

Similarly, Basu and Chhillar (2013) investigated the possibility of identifying critical determinants of quality perception by deploying both the Kano model and Herzberg two-factor theory, and presented a third quality factor affecting patient satisfaction. The study was conducted at the Health Center of the Institute of Nuclear Medicine and Allied Sciences, a multi-specialty outdoor and emergency services unit in New Delhi, India. They analyzed the survey data using the Cochran method and categorized the service quality attributes using the Kano model into must-be, attractive, indifferent, and one-dimensional attributes. Basu and Chhillar (2013) found that, out of 26 service attributes, 21 were one-dimensional and 5 were must-be quality attributes. The existing system had no attractive quality attributes that could positively impact patient satisfaction. Using the Herzberg two-factor theory, the researchers grouped the Kano attributes into hygiene and motivating factors, and deduced that there exists a third category of factors that exhibit both hygiene and motivating characteristics.

Clinical laboratories are emerging as vital units of the healthcare system due to rapid advancements in clinical technologies and their role in the patient's treatment cycle. El-Hashmi and Gnieber (2013) deployed the Kano model in the outpatient clinical laboratory of the Benghazi Medical Center in Libya and categorized its service quality attributes related to service dimensions such as tangibles, reliability, responsiveness, assurance, and empathy into must-be, one-dimensional, attractive, and indifferent attributes. They also implemented the customer satisfaction matrix to verify the efficiency

of the clinical laboratory in customer satisfaction and identify the implementation priority of service quality attributes according to their significance. They concluded that there were 6 attractive, 6 one-dimensional, 13 indifferent, and only 1 must-be service quality attributes associated with the existing clinical laboratory. A comparison of these studies is presented in Table 4.

Table 4. Comparison of the studies that employed the Kano model and other quality methodologies.

Author(s)	**Year**	**Service unit of the healthcare system**	**Location**	**Principal Findings**
Chang and Yang	2010	Adult day care center	Taiwan	• Out of 21 service quality elements, 17 were considered attractive, two were indifferent, and two were one-dimensional attributes. • Transportation services had the highest degree of importance associated with it and was considered as a one-dimensional attribute.
Krassadaki and Grigoroudis	2010	All units of a public hospital	Greece	• Hospital personnel, as a satisfaction measurement criterion, holds high importance for dissatisfied patients and low importance for satisfied patients. • Nursing care personnel were considered as a must-be, medical personnel as an attractive, and support personnel as a one-dimensional quality characteristic. • Nursing care personnel have the highest impact on patient satisfaction.

Table 4. Comparison of the studies that employed the Kano model and other quality methodologies (cont.).

Lee et al.	2011	All units of the medical tourism	Korea	• It is important to involve all stakeholders in developing efficient service delivery systems. • Value co-creation by all the stakeholders is feasible using an integrated Kano – AHP approach.
El-Hashmi and Gnieber	2013	Clinical laboratory	Libya	• It is possible to classify the quality attributes of a clinical laboratory using the Kano model and prioritize them using the customer satisfaction matrix. • The existing system at the Benghazi Medical center had 6 attractive, 6 one-dimensional, 13 indifferent, and only 1 must-be service quality attributes related to service dimensions such as tangibles, reliability, responsiveness, assurance, and empathy.
Basu and Chhillar	2013	Multi-specialty outdoor and emergency services unit	India	• The Kano quality attributes can be categorized as hygiene and motivating factors. • There exists a third category of quality factors that exhibit both hygiene and motivating characteristics.

4. PRINCIPAL FINDINGS OF THE SYSTEMATIC LITERATURE REVIEW

The systematic literature review conducted resulted in several key findings that suggest that there is an immediate need for increased implementation of the Kano model in the healthcare sector to not only understand changing customer needs, but also to revolutionize the industry to adapt to the medical innovations while providing better and more affordable care. Although the search process returned 227 research papers, the

authors only considered empirical studies based on the inclusion and exclusion criteria previously discussed and 17 papers remained for the full review. As indicated by the literature trends, the implementation of the Kano model in the healthcare sector gained momentum only in the recent years. Figure 3 presents the number of studies published per year from 2002 to 2016.

Various factors such as medical tourism, population ageing, emergence of corporate care home sector, and economic recession, among others, have contributed to the implementation of the Kano model by healthcare providers in various countries to comprehensively understand patient needs and provide improved care while reducing unnecessary costs. The adoption of the Kano model in the healthcare sector has been influenced by the change in the patient's role as a recipient of care to a contributor in care delivery. The Kano model varies by the industry type as customer needs associated with the individual products/services differ, and is extremely valuable to explore quality attributes that change with the offered products/services in any industry. The Kano model has been implemented mainly in Asian countries followed by European countries. Although there have been several quality improvement studies conducted in the US healthcare sector, an empirical Kano model study has not been conducted yet. Figure 4 presents the number of Kano model empirical studies conducted in different countries.

Although the Kano model has been implemented in several countries to understand patient needs and improve healthcare service quality, it has either been implemented in an individual service unit or generically in all service units of the healthcare system. The Kano model has not been comprehensively implemented by exploring all of the service units within a healthcare system. However, these studies have introduced several strategies for

healthcare improvement that can be used in similar situations such as prioritizing attributes based on achievability within the time constraints of daily service planning, redesigning the facilities by incorporating key quality attributes with available resources, focusing on key attributes that are prioritized based on the ratio of improvement, benchmarks and available resources, focusing on must-be attributes that have higher impact of customer dissatisfaction during recessions, considering cultural and national needs when developing improvement plans, and focusing on attractive needs in an intense competitive market, among others. The number of publications according to the type of healthcare service unit is displayed in Figure 5.

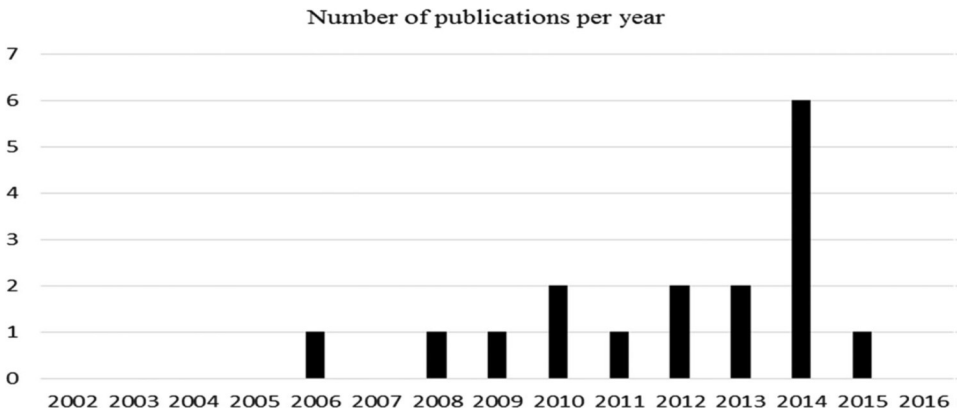

Figure 3. Number of publications per year.

The common themes in this systematic review of the Kano model implementation can be noticed as ‘Implementation of the Kano model’, ‘Implementation of the Kano model and QFD’, ‘Implementation of the Kano model and Servqual’, and ‘Implementation of the Kano model and other quality methodologies’. Figure 6 presents the number of studies included in this systematic literature review that implemented the Kano model along with other quality methodologies. The varying feature here is the quality methodology that was

integrated with the Kano model. Servqual is one of the quality methodologies that has frequently been integrated with the Kano model to understand patients' needs. The analysis of the literature indicates that there is minimal research conducted using the Kano model and other integrated approaches in the healthcare sector.

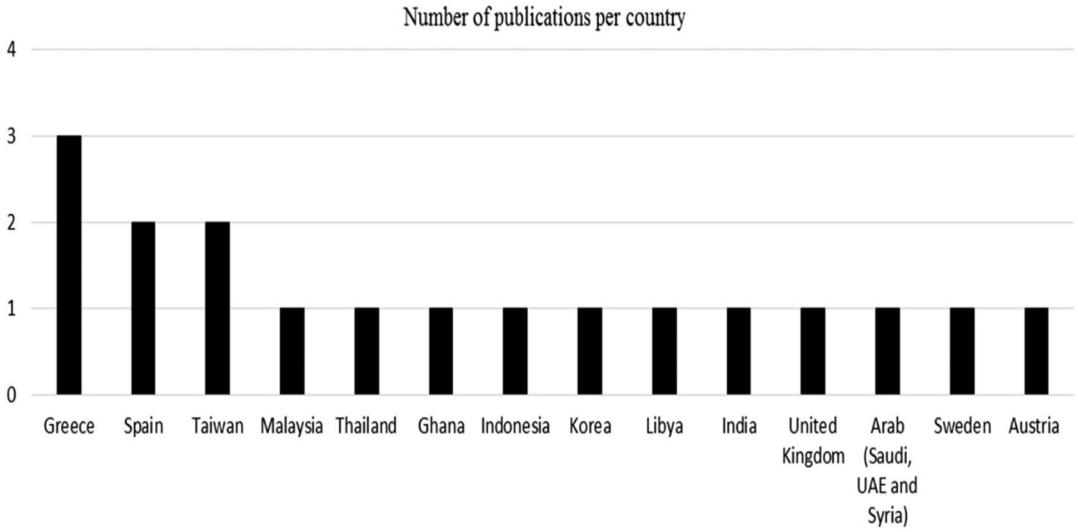

Figure 4. Number of publications per country.

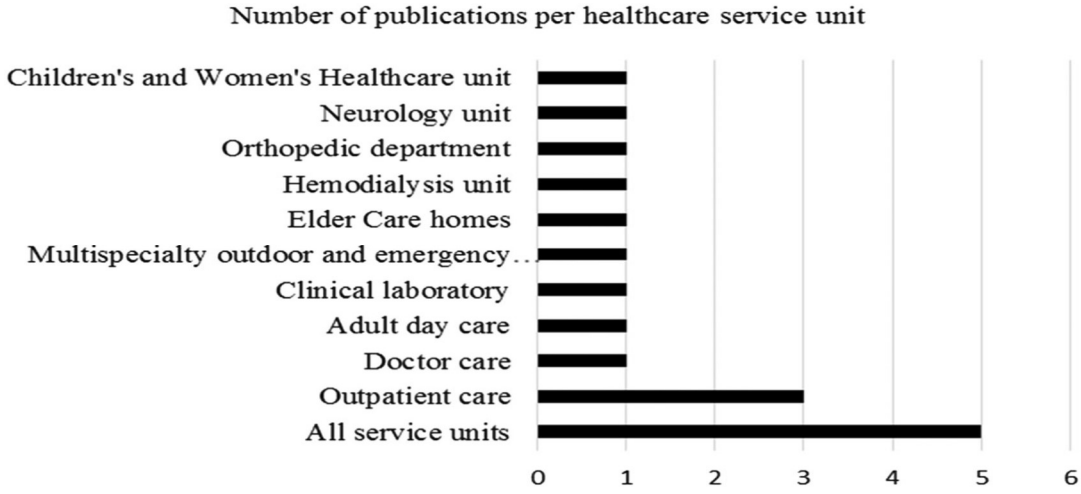

Figure 5. Number of publications per healthcare service unit.

There are many advantages of utilizing the Kano model in service development and improvement. The Kano model enables a healthcare organization to identify priorities in service development and improvement, extensively understand the customer needs by recognizing the factors that have the greatest influence on satisfaction, recognize the trade-off attributes of the service, provide customized services to the customers, and distinguish quality attributes of the service (Kano et al., 1984; Matzler, Hinterhuber, Bailom, & Sauerwein, 1996; Matzler & Hinterhuber, 1998). Over the years, as the Kano model was adopted in various industries, it has been misunderstood or incorrectly implemented. There exist several different versions of the model that create great confusion during the implementation. This systematic review of the literature on the Kano model implementation aims to provide a better understanding of the model, identify differences in the various implementations, and recognize the challenges in the implementation of the model.

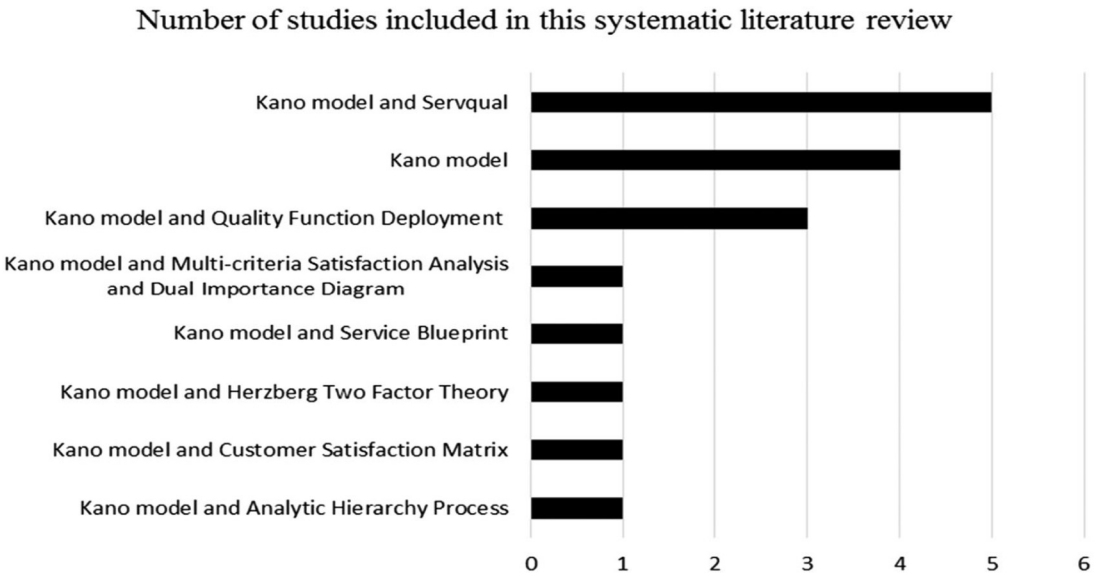

Figure 6. Number of studies that implemented the Kano model and integrated it with other quality methodologies in the healthcare sector.

5. CONCLUSIONS AND FUTURE WORK

As competition continues to grow in the healthcare industry, a standardization of service processes and tools used by the healthcare providers to understand patient needs can be observed. However, healthcare providers have not been able to completely comprehend the diverse patient needs that differ with the type of care and service acquired. The Kano model can be used in the healthcare industry to understand the customer needs, identify customer preferences, recognize the trade-off quality attributes, and provide tailored healthcare services. The authors suggest that there is an immediate need for research employing the Kano model that can help healthcare providers to understand complex patient needs, improve existing service quality attributes, and innovate new attributes that can drastically improve patient satisfaction, while minimizing excessive costs associated with healthcare. The combination of Kano model with other quality methodologies, such as QFD, Servqual, and service blueprint, among others, must be tested to see if the integration of the models can positively impact the identification of the voice of the customer in the healthcare industry. This will involve the establishment of a framework using the original model developed by Kano et al. (1984) through empirical research. This framework can be used as a guideline to improve healthcare service quality and focus on evolving customer needs, and integrated with other quality methodologies such as QFD, customer satisfaction matrix, and Servqual, among others.

There are several frameworks that are recognized in the field of healthcare quality research for quality of care and services evaluation such as the Andersen Behavior Framework, Donabedian Quality Framework, Organizational Design Framework, and Relational Coordination Framework that can be utilized to improve the healthcare quality

by focusing on care coordination, use of healthcare services, structures and processes of care, health outcomes, factors affecting different systems in a healthcare organization, organizational effectiveness, and dynamics of relationships between the participants involved in providing and receiving care among others (McDonald et al., 2007; Mosadeghrad, 2012). While these frameworks are intended for healthcare service quality improvement with a focus on essential elements of the healthcare system, they do not provide sufficient insights on the gap between patients' perception of quality and their actual healthcare experiences. In the existing literature, the Kano model has been implemented either in an individual service unit or generically in all the service units of the healthcare system. In order to develop an overall framework, the focus of future research will be to exhaustively explore all service units in the healthcare system individually to understand the different types of care and services provided, identify different types of payment delivery systems and healthcare insurance, and recognize the environmental as well as social factors that vary across countries. This framework will be developed to explore the gap between the customers' perception of healthcare quality and their healthcare experiences. The framework will be constructed after an initial validation of the themes by academic researchers, healthcare practitioners, and medical providers. This will be achieved by gathering information and experiences using a survey method. A conceptual framework will be developed based on the information gathered and the original Kano model. The framework will be tested and tailored to the needs of the healthcare system through case study research. The suitability of the existing quality methodologies with the Kano model will also be tested through the case study research.

The authors are confident that this will address the current gap in the literature on the implementation of the Kano model in the healthcare industry.

This review, however, has certain limitations that should be considered. The common themes identified were based on the varying quality methodology used along with the Kano model. Therefore, the number of studies under each category is low and does not provide a complete picture of the integration of the quality methodologies with the Kano model. Also, because of the methodology used, some relevant studies and grey literature might not have been captured. As the Kano model continues to be frequently implemented and gains popularity in the healthcare industry, a comprehensive review should be conducted to eliminate these limitations. This systematic review on the implementation of the Kano model in the healthcare industry is intended to propel further research in this field to improve the quality of healthcare services around the world and, thereby, the quality of healthcare.

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II. AN INTEGRATED METHODOLOGY FOR EVALUATING PATIENT SERVICE QUALITY

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ABSTRACT

Customer satisfaction and perception of quality are important for the profitability and sustainability of any organization. In healthcare, patients' needs and perception of quality are dynamic considering the rapid changes in healthcare costs, technological advancements, and patient demographics. The purpose of this research is to explore the diverse range of patient needs based on the level of satisfaction and quality perception. A methodology is proposed to provide insights into the voice of the customer through visualization of the relationship between the performance of quality attributes and customer satisfaction. Cronbach's alpha is employed to ensure internal consistency in the instrument used to gather the voice of the customer. In addition, the chi-square test for goodness of fit is included in the proposed methodology to test the distribution. Fisher's exact test value from the Chi-square test of independence is used to evaluate patients' responses. The effect sizes were analyzed using Cramer's V to determine the magnitude of effect between the variables. The proposed methodology enabled comparisons of patient responses by demographics. A cross-sectional study was conducted to explore the needs associated with the walk-in clinics in the United States and validate the proposed methodology.

Keywords: Healthcare; Kano model; patient satisfaction; service quality; walk-in clinics

1. INTRODUCTION

Walk-in clinics, most commonly referred to as a "doc in a box" or "retail clinic", emerged in the United States in 1973 to provide accessible primary care that is urgent but non-life threatening (Miller and Nantes, 1989; Jones, 2000). These are facilities that are physically and administratively separate from hospitals, provide extended hours, and accept patients on a first come first served basis (Rizos, Anglin, Grava-Gubins, and Lazar, 1990). These medical clinics can be found at pharmacy chains (such as Walgreens, CVS, RiteAid), supermarkets (such as Walmart, Target), and even in airports. These walk-in medical clinics offer care and services for conditions such as cough, cold, flu, sore throat, sprain, allergy injection, strain, screening, and diagnostic services, among others, at an affordable cost compared to a primary care physician. They are staffed with licensed "physician extenders" such as nurse practitioners and physician assistants (Gertz, Frank, and Blixen, 2011; Lipman, 2012). Walk-in clinics are common in both higher and lower-income urban and rural communities, and accept commercial, Medicare, and Medicaid coverage. Frequently used by patients for acute conditions, walk-in clinics receive about 10.5 million visits annually at more than 1,800 retail clinics in the U.S. (Bachrach, Frohlich, Garcimonde, and Nevitt, 2015). An individual walk-in clinic generates an approximate revenue of $500,000 per year and serves about 10 to 30 patients per day at a cost of $40 to $75 for a visit (Thygeson, Vorst, Maciosek, and Solberg, 2008).

Patients use walk-in clinics mainly because of the convenience of cash payment irrespective of their insurance status, accessible location, and hours of operation (Lipman, 2012). Regardless of the demographic setting or patient income status, patients that utilize walk-in clinics for acute healthcare needs are less likely to have insurance or a primary care provider (Tu and Cohen, 2008). In 2016, approximately 28.2 million individuals under the age of 65 did not have insurance in the U.S. (Clarke, Norris, and Schiller, 2017). Families with children are more likely to use a walk-in clinic than childless couples, single adults, and senior citizens (Rudavsky and Mehrotra, 2010). Although walk-in clinics offer acute healthcare services at affordable prices, the biggest challenges are the lack of coordination between walk-in clinics and the rest of the healthcare system, and the ability to improve the health of individuals and community rather than simply treating an acute problem (Bachrach, Frohlich, Garcimonde, and Nevitt, 2015).

As walk-in clinics serve a majority of the U.S. population in both urban and rural areas, improving patient satisfaction and service quality of these retail clinics will positively impact individuals and communities. The objective of this study is to propose a methodology to identify patient needs associated with healthcare services using the Kano model that focuses on customer satisfaction and quality perception, develop and validate the quality scale that is customized to a selected healthcare service unit, detect the differences in patient responses due to demographic factors, and analyze association of quality attributes with demographics.

The remainder of the paper is organized as follows. First, a review of the literature on the Kano model in healthcare is discussed. Next, the proposed methodology which combines the Kano model with an analysis of the reliability of the Kano survey, distribution

using the Chi-square goodness of fit model, differences in patient responses due to demographics using Fisher's exact test, and association of service quality attributes with demographics using the effect sizes is presented. Finally, a case study is presented using the proposed methodology to elicit healthcare needs associated with the walk-in medical clinics in the U.S. to identify the factors associated with customer satisfaction and quality perception.

2. KANO MODEL

The relationship between the performances of quality attributes of a product or service and customer satisfaction achieved was assumed to be linear (Matzler and Hinterhuber, 1998; Hogstrom, Rosner, Gustafsson, 2010; Materla, Cudney, and Antony, 2017). However, high performance of a product or service quality attribute does not always result in higher customer satisfaction. Kano, Seraku, Takahaski, and Tsuji (1984) suggested a non-linear relationship between the performance of a quality attribute and customer satisfaction and developed a model that allows for a categorization of quality attributes based on the customer satisfaction achieved. The Kano model categorizes the quality attributes into one of the five categories of perceived quality including attractive (A), one-dimensional (O), must-be (M), indifferent (I), and reverse (R). Attractive attributes create great satisfaction when present and no dissatisfaction when absent. One-dimensional attributes are customer needs in which the level of performance is linearly related to the satisfaction it can create. Must-be attributes are the basic needs that create great dissatisfaction when absent and no satisfaction when present. The needs that have no effect

on customer satisfaction or dissatisfaction are called indifferent attributes. Reverse attributes create great dissatisfaction when present and satisfaction when absent. The Kano model as suggested by Hopen (2016) is presented in Figure 1. The Kano model is being increasingly adopted in the healthcare sector to not only identify improvement opportunities but also to prioritize them (Gustavsson, Gremyr, and Sarenmalm, 2016). The Kano model has been implemented on its own to identify patient needs and improve healthcare service quality (Al-Sayyari et al., 2009; Cordero-Ampuero, Darder, Santillana, Caloto, and Nocea, 2012; Matı´as-Guiu, Caloto, and Nocea, 2012).

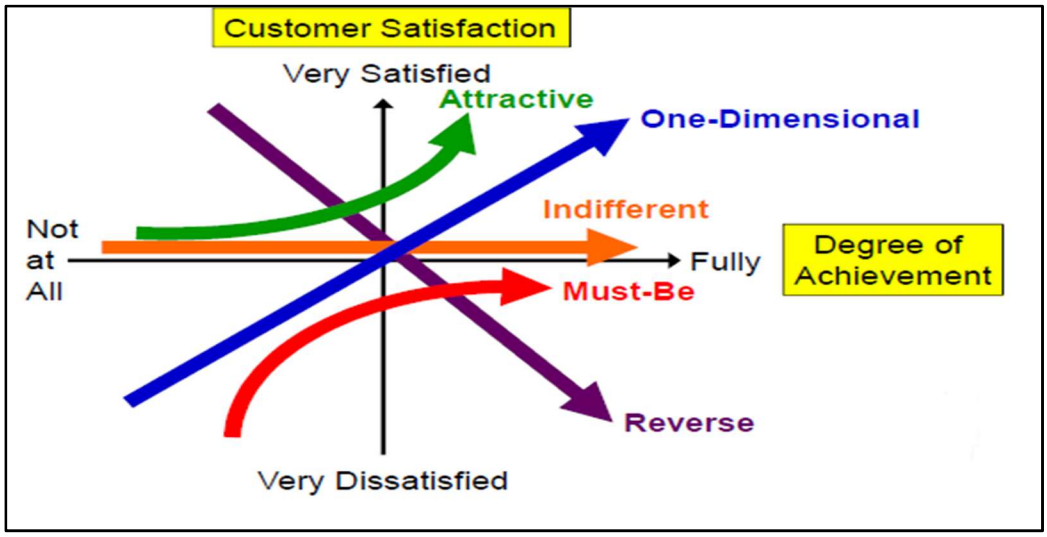

Figure 1. The Kano model.

Moreover, the Kano model has been implemented with other methodologies such as quality function deployment (Chiou and Cheng, 2008; Nordin and Razak, 2014; Shamshirsaz and Dong, 2014), Servqual (Christoglou, Vassiliadis, and Sigalas 2006; Sulisworo, 2015), analytical hierarchy process (Lee, Sugumaran, and Park, 2011), and customer satisfaction matrix (El-Hashmi and Gnieber, 2013).

3. RESEARCH METHODOLOGY

The systematic approach proposed in this study involves an analysis of a healthcare service unit to obtain quality attributes that need to be investigated, implementation of the Kano model to categorize patient needs based on quality perception and satisfaction, analysis of the reliability of the Kano instrument and goodness of the fit of the model, and evaluation of the differences in patients' responses based on demographic factors using Fisher's exact test and effect sizes. The proposed approach is presented in Figure 2.

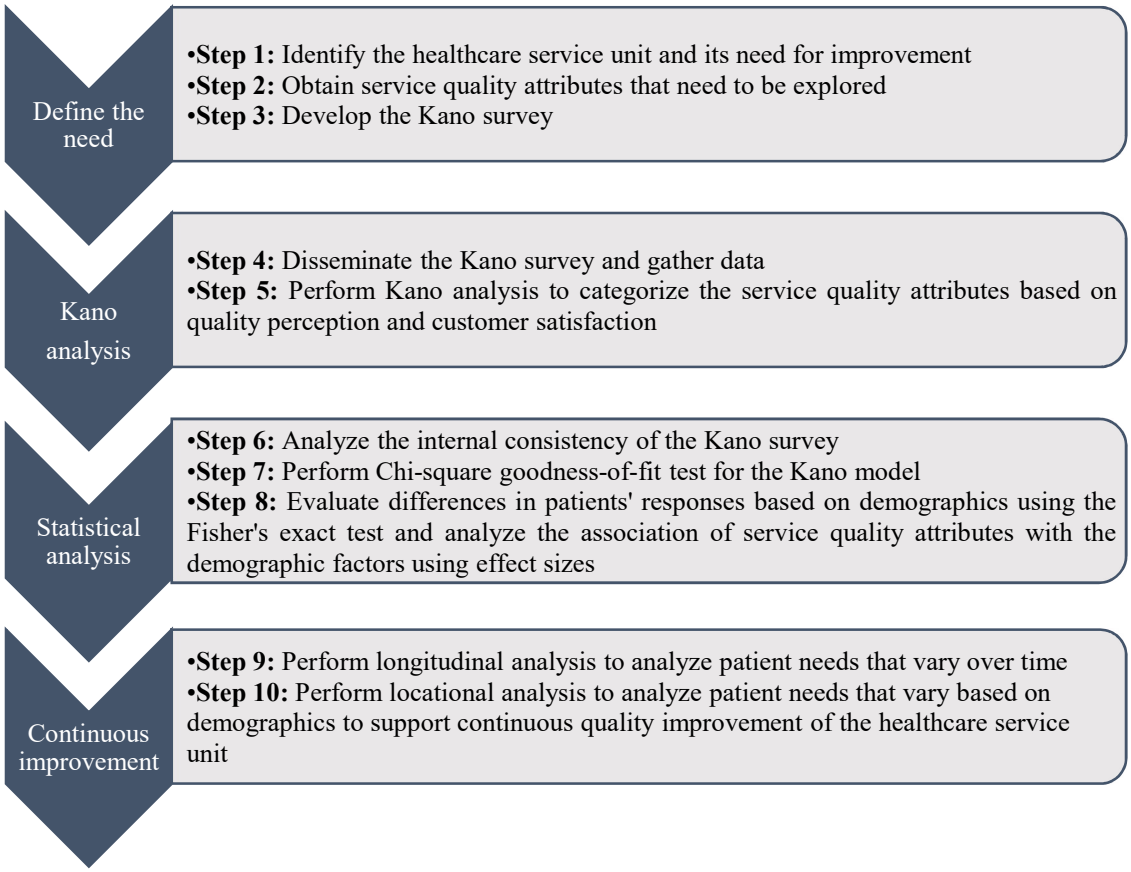

Figure 2. Proposed systematic approach for patient needs identification.

It is suggested that, regardless of whether an existing healthcare service unit is improved or a new one is being developed, this systematic approach can be utilized to identify and categorize complex patient needs associated with any healthcare service unit.

Step 1: Identify healthcare service unit and its need for improvement

It is essential to identify whether a healthcare service unit is being developed or improved. Further, it is necessary to communicate with the customers to understand how and why they use the services offered. A preliminary satisfaction survey and/or focus groups combined with patient complaints and grievances assist in identifying the current level of performance of a healthcare unit and improvement opportunities.

Step 2: Determine service quality attributes

The service quality attributes that need to be investigated can be obtained by identifying the services offered by the healthcare unit and its associated market segment. Existing patient satisfaction studies and satisfaction surveys such as the national and publically reported Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) offer guidance on the types of service quality attributes and survey questions related to different healthcare units.

Step 3: Develop the Kano survey

The customer trends, patient satisfaction surveys, and existing studies should be investigated for the type of questions that can be asked. Stakeholders and subject matter experts must be consulted while developing the Kano survey. The Kano survey must be precise and comprehensible to ensure consistent interpretation by the patients. Each attribute must contain a functional and dysfunctional form of the question and must be randomized to avoid biased results. Each question in both functional and dysfunctional

form must investigate only a single attribute to avoid incorrect categorization of the attribute using the Kano model. Along with the functional and dysfunctional questions related to the service quality attributes, the Kano survey must include questions regarding the demographics of the patients utilizing the healthcare services.

Step 4: Disseminate Kano survey

Stakeholders must be notified regarding the Kano survey before its launch to ensure proper dissemination of the Kano survey. The survey can be disseminated via email, social media, website, and customer experience management platforms.

Step 5: Perform Kano analysis

The patient responses must be processed for the Kano analysis and incomplete responses must be eliminated as both responses to functional and dysfunctional forms of the attribute are required for classification of the attributes. The Kano model should be utilized to categorize the service quality attributes based on quality perception and customer satisfaction.

The Kano categories for the attributes are then obtained by relating the responses provided by customers to the functional and dysfunctional forms of the attributes using the Kano evaluation table (Berger et al., 1993; Robinson, 2009) as shown in Table 1. Frequency analysis of the responses in each Kano category for an individual attribute is performed to determine the final Kano category of perceived quality. The Kano model also allows calculation of the estimated value of a quality attribute as a percent difference between the highest category and next highest category, which is known as category strength (CS). The estimated value of a quality attribute based on the total percentage of responses in attractive, one-dimensional, and must-be categories is the total strength (TS)

of that attribute. The coefficient of satisfaction, also known as the better value, is the estimated ability of a quality attribute to create satisfaction (Equation 1).

$$Better = (A + O)\ /(A + O + M + I) \quad (1)$$

where A, O, M, and I are the number of responses in the attractive, one-dimensional, must-be, and indifferent categories, respectively. The coefficient of dissatisfaction or the worse value is the estimated value of a quality attribute to create dissatisfaction if not present (Equation 2).

$$Worse = (O + M)/(A + O + M + I) \quad (2)$$

Table 1. Kano evaluation table.

Customer Requirements →	**Dysfunctional form**					
↓		**1. I like it that way**	**2. It must be that way**	**3. I am neutral**	**4. I can live with it that way**	**5. I dislike it that way**
Functional Form	**1. I like it that way**	Q	A	A	A	O
	2. It must be that way	R	I	I	I	M
	3. I am neutral	R	I	I	I	M
	4. I can live with it that way	R	I	I	I	M
	5. I dislike it that way	R	R	R	R	Q

A better value closer to 1 indicates that customer satisfaction can be improved by providing the attribute. A large absolute value for worse closer to 1 indicates that providing such attribute will only prevent dissatisfaction. The better and worse values for an attribute closer to zero suggests it has little effect on satisfaction or dissatisfaction.

Step 6: Analyze the internal consistency of the Kano survey

Cronbach's alpha must be calculated to ensure the reliability/internal consistency of the Kano survey. Cronbach's alpha can be calculated as shown in Equation 3.

$$\alpha = \frac{k * \bar{c}}{\bar{v} + (k-1)\bar{c}} \tag{3}$$

where k is the number of scale/survey items, $\bar{c}$ is the average of all co-variances between items, and $\bar{v}$ the average variance of each item (George and Mallery, 2003). A Cronbach's alpha value of 0.7 or higher is preferred.

Step 7: Perform Chi-square goodness-of-fit test for the Kano model

The Chi-square goodness-of-fit test model must be used to compare the observed frequency of the responses to the expected frequency (Fisher, Marshall, and Mitchell, 2011). The Chi-square test statistic can be calculated as shown in Equation 4.

$$X^2 = \Sigma \left[(O_i - E_i)^2 / E_i\right] \tag{4}$$

where O_i is the observed frequency count and E_i is the expected frequency in the ith level of the categorical variable. The degree of freedom (df) is the number of levels (n) of the categorical variable minus one.

Step 8: Evaluate differences in patients' responses

Using the demographic data collected in the Kano survey, the difference in patients' responses must be evaluated using the Fisher's exact test. Fisher's exact test p-value can be calculated as shown in Equation 5.

$$p = \frac{(R_1!\ R_2!\ldots.R_m!)(C_1!\,C_2!\ldots C_n!)}{N!\ \prod_{ij} a_{ij}!} \quad (5)$$

The categorical variables are *X* and *Y* with *m* and *n* levels, respectively, which form an $m \times n$ matrix. The entries a_{ij} represent the number of observations in which $x=i$ and $y=j$. The row and column sums are R_i and C_j respectively, and the total sum is $N = \sum R_i = \sum C_j$ (Weisstein, 2018). The association between the service quality attributes and demographic factors must be analyzed using the effect sizes to understand the healthcare needs associated with specific market segments. Cramer's V is frequently used to explain the strength of association between the variables from chi-square analyses and is suitable for larger contingency tables (Lee, 2016) as shown in Equation 6.

$$\text{Cramer's V} = \sqrt{\frac{X^2}{n*(k-1)}} \quad (6)$$

where X^2 is the chi-square test statistic, *n* is the total number of observations, and *k* is the smaller number of rows or columns.

Step 9: Perform longitudinal analysis to evaluate healthcare needs that vary with time

The patient needs associated with the healthcare service units must be gathered using longitudinal analysis to effectively serve the dynamic market segments and support continuous quality improvement.

Step 10: Perform locational analysis to assess healthcare needs that vary with changes in demographic environment

Conducting locational analysis aids in understanding the changes in patient needs associated with different healthcare service units that serve populations of varying patient demographics.

4. CASE STUDY

In order to illustrate the proposed methodology, a case study was performed using walk-in clinics within the U.S. The following provides a detailed explanation of the proposed methodology using the case study along with the calculations.

Step 1: Identify healthcare service unit and its need for improvement

Walk-in clinics in the U.S. such as CVS Minute Clinic, Walgreens Healthcare Clinic, Target Clinic, NextCare, FastMed, Patient First, FastCare, and Express Care at Walmart, among others were selected for this case study due to the rise in the number of walk-in clinics in recent years and increase in their utilization by patients for primary care. Due to the fast pace of service in the walk-in clinics, extended hours, limited services, and low associated costs, patient satisfaction and needs associated with them have not been fully explored. The main objective was to identify healthcare needs associated with the walk-in clinics that impact patient satisfaction, which could be utilized by healthcare providers for continuous service quality improvement.

Step 2: Determine Service Quality Attributes

The HCAHPS survey, existing Kano studies in the healthcare sector, and prior satisfaction surveys were explored to identify the types of questions asked regarding service quality features. The Kano survey was customized to the care and services offered by walk-in clinics to obtain the patient's healthcare needs associated with them.

Step 3: Develop the Kano Survey

The walk-in clinic Kano survey included four parts: 1) instructions on how to correctly answer the Kano survey and consent form, 2) demographic questions to gather distinctive information about the market segment, 3) paired (functional and dysfunctional)

questions about the quality features of the walk-in clinics, and 4) an additional comments section. Each set of paired questions was constructed in such a way that it investigated a single service quality attribute. The Kano questions were randomized to avoid biased results. Healthcare legal requirements were considered regarding the type of questions that can be asked. The survey explicitly stated that the participation in this study was voluntary. In addition, institutional review board approval was acquired prior to distributing the survey.

The Kano survey included 42 randomized questions on 21 service quality attributes of walk-in clinics, eight demographic questions, and an additional comments section. The survey participants had to meet the following requirements to participate in this study: 1) must be 18 years of age or older, and 2) must have utilized the services offered by the walk-in clinics in the U.S. Various attributes of the walk-in clinics such as the provision of correct care the first time, design of the walk-in clinic facility, provision of written communication of the treatment, clear instructions on the follow-up care, and communication between staff among others were explored. The response categories for the Kano survey were chosen as 1) I like it that way, 2) It must be that way, 3) I am neutral, 4) I can live with it that way, and 5) I dislike it that way, to ensure consistency with the original Kano model. Tables 2 and 3 present the demographic questions and paired Kano questions that were created to gather patient needs associated with the walk-in clinics.

Step 4: Disseminate Kano survey

The survey was constructed on the Qualtrics platform and emailed to all enrolled students at Missouri S&T and general public on social media websites such as LinkedIn

and Facebook. Data was collected over a period of three months from November 2017 to February 2018.

Table 2. Demographic questions.

Number	Demographic Question	Response
1	What is your age? *If the response (a) is selected, the survey is complete.	a) Under 18 years b) 18 – 20 years c) 21 – 23 years d) 24 – 26 years e) 27 – 29 years f) 30 years or older
2	Have you ever used care and services provided a walk-in clinic? *If the response (a) is selected, the survey is complete.	a) Yes b) No
3	How many times have you visited a walk-in clinic in the past 12 months?	a) 0 b) 1 c) 2 d) 3 e) 4 or more
4	What is your gender?	a) Male b) Female c) Prefer not to answer
5	What is your marital status?	a) Single, never married b) Married or domestic partnership c) Separated d) Divorced e) Widowed
6	Do you have kids?	a) Yes b) No
7	Are you a United States (U.S.) citizen?	a) Yes b) No c) Prefer not to answer
8	How would you rate your health status?	a) Poor b) Fair c) Good d) Very good e) Excellent

Table 3. Kano survey.

Number	Paired questions for quality attributes
1	**Functional:** If the appropriately qualified medical staff were available within ten minutes of the time you checked into a walk-in clinic, how would you feel? **Dysfunctional:** If the appropriately qualified medical staff were not available within ten minutes of the time you checked into a walk-in clinic, how would you feel?
2	**Functional:** If the medical staff includes you in the decision-making process of your healthcare delivery, how would you feel? **Dysfunctional:** If you are not included in the decision-making process of your healthcare delivery by the medical staff, what would your reaction be?
3	**Functional:** If after-hours care is provided by a walk-in clinic, how do you feel? **Dysfunctional:** If a walk-in clinic does not provide after-hours care, how do you feel?
4	**Functional:** If the design of a walk-in clinic facility is patient friendly, how do you feel? **Dysfunctional:** If the design of a walk-in clinic facility is not patient friendly, what is your response?
5	**Functional:** If the rooms (consultation, examination rooms, etc.) allow for personal privacy, how do you feel? **Dysfunctional:** If the rooms (consultation, examination rooms, etc.) do not allow for personal privacy, how do you feel?
6	**Functional:** If the medical staff provides written communication of how your treatment will be delivered, how do you feel? **Dysfunctional:** If written communication of how your treatment will be delivered is not provided by the medical staff, how do you feel?
7	**Functional:** If the patient check-in process is easy, how do you feel? **Dysfunctional:** If the patient check-in process is difficult, what is your response?
8	**Functional:** If the staff keeps you informed about the delays, if any, during your visit, how would you feel? **Dysfunctional:** If the staff does not keep you informed about the delays, if any, during your visit, what is your response?
9	**Functional:** If the medical staff provides correct care on the first time, what is your response? **Dysfunctional:** If correct care on the first time is not provided by the medical staff, what would your reaction be?
10	**Functional:** If the walk-in clinic personnel have good communication among them to assure effective treatment, how would you feel? **Dysfunctional:** If the walk-in clinic personnel do not have good communication among them to assure effective treatment, how do you feel?

Table 3. Kano survey (cont.).

11	**Functional:** If the walk-in clinic personnel provide clear instructions about follow up care, how would you feel? **Dysfunctional:** If the walk-in clinic personnel do not provide clear instructions about follow up care, what is your response?
12	**Functional:** If the medical staff are sympathetic and reassuring, how would you feel? **Dysfunctional:** If the medical staff are not sympathetic and reassuring, how do you feel?
13	**Functional:** If the walk-in clinic personnel accommodate your religious restrictions when conducting your medical care, how would you feel? **Dysfunctional:** If your religious restrictions are not accommodated by the walk-in clinic personnel when conducting your medical care, what is your response?
14	**Functional:** If the walk-in clinic personnel accommodate your cultural restrictions when conducting your medical care, how would you feel? **Dysfunctional:** If the walk-in clinic personnel did not accommodate your cultural restrictions when conducting your medical care, how would you feel?
15	**Functional:** If the medical staff provide adequate information about your illness and treatments, how would you feel? **Dysfunctional:** If the medical staff do not provide adequate information about your illness and treatments, how do you feel?
16	**Functional:** If the walk-in clinic personnel provide complete information of the prescribed medications, how do you feel? **Dysfunctional:** If complete information of the prescribed medications is not provided by the walk-in clinic personnel, what is your response?
17	**Functional:** If the walk-in clinic personnel are friendly, how do you feel? **Dysfunctional:** If the walk-in clinic personnel are not friendly, how do you feel?
18	**Functional:** If the medical staff is appropriately qualified to provide care, how do you feel? **Dysfunctional:** If the medical staff is not appropriately qualified to provide care, what would your reaction be?
19	**Functional:** If the walk-in clinic personnel asked about your satisfaction with the care provided, how would you feel? **Dysfunctional:** If the walk-in clinic personnel do not ask about your satisfaction with the care provided, how would you feel?
20	**Functional:** If the medical staff understands your needs and requirements, how would you feel? **Dysfunctional:** If the medical staff does not fully understand your needs and requirements, how do you feel?
21	**Functional:** If you feel confident about the care provided by the medical staff, what is your response? **Dysfunctional:** If you do not feel confident about the care provided by the medical staff, what is your response?

Step 5: Perform Kano analysis

A total of 127 patients that have utilized at least one of the walk-in clinics in the U.S. responded to the Kano survey, out of which 50 patient responses were excluded due to incomplete data regarding demographics or service quality attributes of the walk-in clinics. The remaining 77 complete responses were used for Kano model and statistical analysis. The differences in patient responses were also evaluated based on the demographic factors. The percentage of respondents based on demographic information such as age, gender, citizenship, self-reported health status, marital status, and parental status is presented in Table 4. The responses to the functional and dysfunctional questions for each of the 21 service quality attributes provided by the 77 survey participants were considered for the Kano categorization for the attributes using the Kano evaluation table (Table 1). Frequency analysis was performed for each attribute to select the final Kano category from the categories of perceived quality such as attractive, must-be, one-dimensional, reverse, and indifferent. An attribute falling into a questionable category suggests that the respondents misunderstood the questions or more information is needed regarding the attribute. The category strength, total strength, better (coefficient of satisfaction), and worse (coefficient of dissatisfaction) values were calculated. The patients categorized 15 service quality attributes as one-dimensional, three as indifferent, two as attractive, and one as a must-be attribute. The availability of appropriately qualified medical staff within ten minutes of the check-in process and provision of after-hours care were considered as attractive attributes by the patients.

Table 4. Percentage of respondents based on demographic factors.

Age	18-20	3.89
	21-23	62.34
	24-26	14.29
	27-29	10.39
	30 & older	9.09
Health Status	Poor	1.29
	Fair	3.90
	Good	36.37
	Very good	41.56
	Excellent	16.88
Marital Status	Single, never married	81.82
	Married or domestic partnership	18.18
	Separated	0.00
	Divorced	0.00
	Widowed	0.00
Gender	Female	44.16
	Male	55.84
	Prefer not to answer	0.00
U.S. Citizen	Yes	89.61
	No	10.39
Parental Status	Yes	7.79
	No	92.21

The Kano model analysis for the 21 service quality attributes of the walk-in clinics in the U.S. is presented in Table 5. The worse and better values of the 21 service quality attributes are plotted graphically on the x- and y-axis to display where the attributes lie on the degree of achievement/performance and level of customer satisfaction. These service quality attributes must be studied over time, with shifts in the demographic environment and changes in patient's quality perception, which will make the actual Kano model apparent.

Figure 3 presents the attributes on the Better – Worse plot. Some of the suggestions offered by patients regarding the improvement of the quality of the walk-in clinics were the convenience of flexible and affordable payment plans, an adequate capacity of qualified

medical staff, and entertainment options (such as televisions and magazines) during longer waiting hours.

Table 5. Evaluation of the attributes using the Kano model.

Attribute	Category Totals						Category	CS (%)	TS (%)	Better (%)	Worse (%)
	Q	M	O	A	I	R					
1	2	5	20	42	8	0	A	28.60	87.00	82.70	33.30
2	0	16	27	20	14	0	O	9.10	81.80	61.00	55.80
3	0	0	18	43	16	0	A	32.50	79.20	79.20	23.40
4	0	6	33	23	15	0	O	13.00	80.50	72.70	50.60
5	0	19	34	15	9	0	O	19.50	88.30	63.60	68.80
6	1	10	27	20	18	1	O	9.10	74.00	62.70	49.00
7	0	9	43	18	7	0	O	32.50	90.90	79.20	67.50
8	0	11	33	13	20	0	O	16.90	74.00	59.70	57.10
9	0	17	45	10	5	0	O	36.40	93.50	71.40	80.50
10	2	23	41	5	6	0	O	23.40	89.60	61.30	85.30
11	0	25	38	4	10	0	O	16.90	87.00	54.50	81.80
12	0	5	38	20	14	0	O	23.40	81.80	75.30	55.80
13	0	8	15	9	43	2	I	36.40	42.00	32.00	30.70
14	0	9	20	7	39	2	I	25.00	46.80	36.00	38.70
15	0	22	48	1	6	0	O	33.80	92.00	64.00	90.90
16	1	19	32	6	19	0	O	16.90	74.00	50.00	67.10
17	0	7	42	21	7	0	O	27.30	90.90	81.80	63.60
18	1	38	32	1	5	0	M	8.00	92.20	43.40	92.00
19	0	3	10	22	41	1	I	24.70	45.50	42.10	17.00
20	1	25	32	13	6	0	O	9.10	90.90	59.20	75.00
21	1	18	45	6	7	0	O	35.10	89.60	67.10	82.90

Step 6: Analyze the internal consistency of the Kano survey

Cronbach's alpha, which is used to measure the internal consistency of a test, scale, or survey, was calculated for the Kano survey. It is expressed as a number between 0 and 1. Generally, an alpha value of 0.7 is an acceptable reliability coefficient (Nunnaly, 1978;

George and Mallery, 2003). The Kano survey developed to obtain healthcare needs associated with the walk-in clinics exhibited a reliability coefficient of 0.92.

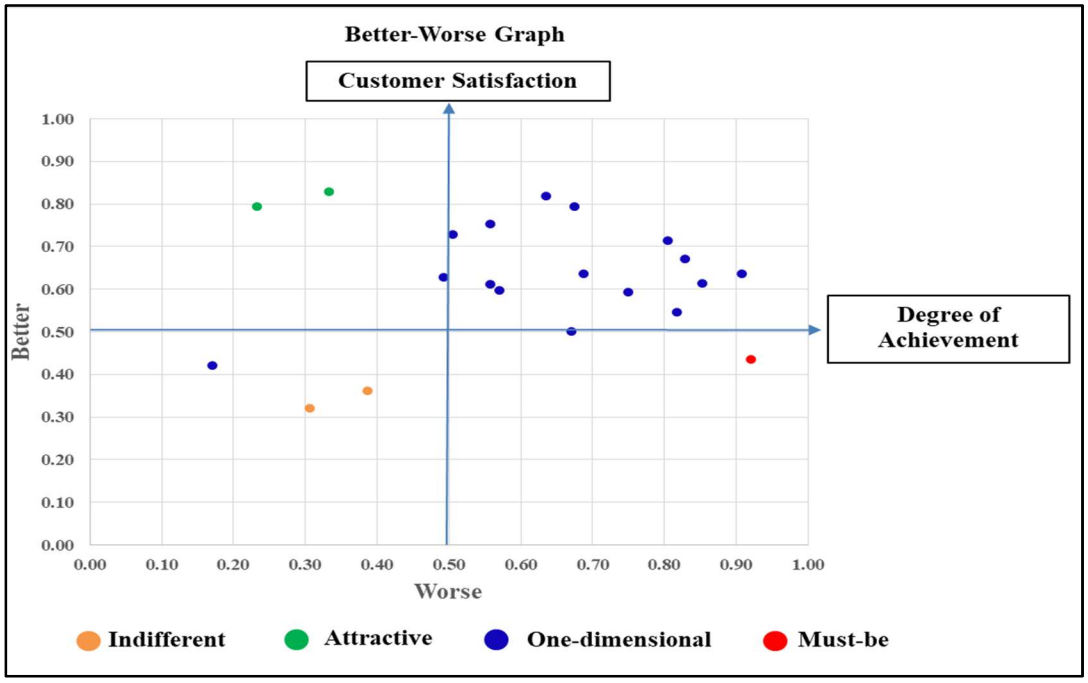

Figure 3. Attributes on the Better – Worse plot.

Step 7: Perform Chi-square test for goodness-of-fit test for the Kano model

The chi-square test for goodness of fit was conducted to determine whether the sample data from the population is consistent with the claimed uniform distribution, which suggests that walk-in clinic patients have no preference of a single Kano category for each service quality attribute. The null hypothesis in this study for all service quality attributes is that the values in Kano categories occur with equal frequency. The chi-square test compares the observed frequency distribution for each category with the expected frequency distribution of the null hypothesis (Fisher, Marshall, and Mitchell, 2011).

As the service quality attributes under investigation were categorical and each level of the categorical variable had an expected frequency of at least five, the chi-square test was appropriate for analysis. A critical chi-square value for every service quality attribute of 11.07 was obtained at a level of significance of 0.05 for 5 degrees of freedom for the Kano categories. As shown in Table 6, the *p*-values are less than the significance level of 0.05 for every service quality attribute; therefore, the null hypothesis was rejected. We can conclude that the Kano categorization for all service quality attributes is statistically significant. An expected value of 12.83 was calculated for the Kano categories for the 21 quality attributes. The expected value in each Kano category is calculated as number of survey responses by number of categories. In this study, the number of patient responses were 77 and Kano categories are 6.

Step 8: Evaluation of the Patients' Responses based on Demographic Factors

The Fishers exact value (*p*) from the Chi-square test of independence was used to analyze the differences in patients' response patterns. Contingency tables of the Kano category responses based on the demographic factors such as gender, age, self-reported health status, citizenship, parental status, and marital status were created for the 21 service quality attributes and analyzed using Fisher's exact test. Fisher's exact test is appropriate to use in situations where the cells have an expected frequency of less than five in contingency tables and the sample size is small (Daya, 2002; Connelly, 2016). The probability (*p*), which ranges between 0.0 and 1.0, was calculated for the service quality attributes based on the demographic factors. The null hypothesis indicates that all cells would be close to equal, suggesting that the differences in demographics have no effect on the patients' response patterns. A *p*-value closer to 1 suggests that the patients responded

similarly regardless of the differences in demographics. A *p*-value closer to 0 indicates that there is a difference in the patients' response patterns regarding the Kano categorization of a particular service quality attribute. The significance level of 0.05 was used for comparison based on demographic factors.

Table 6. Analysis of the Kano survey data using the chi-square test.

	Category Totals						Chi-square	
Attribute	Q	M	O	A	I	R	**calculated**	***p*-value**
1	2	5	20	42	8	0	98.87	0.00
2	0	16	27	20	14	0	46.20	0.00
3	0	0	18	43	16	0	112.27	0.00
4	0	6	33	23	15	0	69.42	0.00
5	0	19	34	15	9	0	65.05	0.00
6	1	10	27	20	18	1	44.17	0.00
7	0	9	43	18	7	0	102.46	0.00
8	0	11	33	13	20	0	61.62	0.00
9	0	17	45	10	5	0	113.05	0.00
10	2	23	41	5	6	0	100.27	0.00
11	0	25	38	4	10	0	93.26	0.00
12	0	5	38	20	14	0	83.91	0.00
13	0	8	15	9	43	2	96.22	0.00
14	0	9	20	7	39	2	83.13	0.00
15	0	22	48	1	6	0	143.13	0.00
16	1	19	32	6	19	0	61.94	0.00
17	0	7	42	21	7	0	102.45	0.00
18	1	38	32	1	5	0	117.42	0.00
19	0	3	10	22	41	1	100.27	0.00
20	1	25	32	13	6	0	67.55	0.00
21	1	18	45	6	7	0	112.74	0.00

Effect sizes, which are quantitative indexes of relationships among variables, show the magnitude of effect between the variables (Emerson, 2016; Kim, 2017; Sullivan and Feinn, 2012; Hedges, 2008). Cramer's V was used for analysis as it is suitable for larger

contingency tables. The strength of association between the demographics and attributes can be interpreted using the guidelines provided by Lee (2016) as shown in Table 7. The analysis for the Fisher's exact test and Cramer's V effect sizes was performed using the IBM SPSS Statistics Version 25 software (Tables 8 and 9). The effect sizes of attributes with demographic factors are visually presented in Figure 4.

Table 7. Interpretation of Cramer's V.

Estimated Values	Interpretation of Association
0.00-0.10	Negligible
0.10-0.20	Weak
0.20-0.40	Moderate
0.40-0.60	Relatively Strong
0.60-0.80	Strong
0.80-1.00	Very Strong

Analysis of Patient Responses by Gender

The survey respondents included 34 female and 43 male patients. The female and male patients responded differently to attributes such as availability of qualified medical staff within ten minutes of the check-in process (*p*-value 0.001), provision of information about the delays during the visit (*p*-value 0.005), and provision of complete information of the prescribed medication (*p*-value 0.035). There was a similarity between the responses of female and male patients regarding medical staff inquiring about satisfaction with the care provided (*p*-value 0.894).

When the attributes were analyzed based on gender, none of the attributes had a Cramer's V value of more than 0.6. Attributes such as availability of appropriately qualified medical staff within ten minutes of the check-in process (0.457) and provision of

information about the delays during the visit (0.403) had a relatively strong association with gender.

Analysis of Patient Responses by Age Group

Patients responded differently on attributes such as the design of the walk-in facility being patient friendly (*p*-value 0.032), provision of adequate information about illness and treatment (*p*-value 0.015), and provision of complete information of the prescribed medication (*p*-value 0.014) based on the age groups. Patients' responses based on age groups showed a similarity regarding the provision of written communication of treatment delivery by the medical staff (*p*-value 0.836).

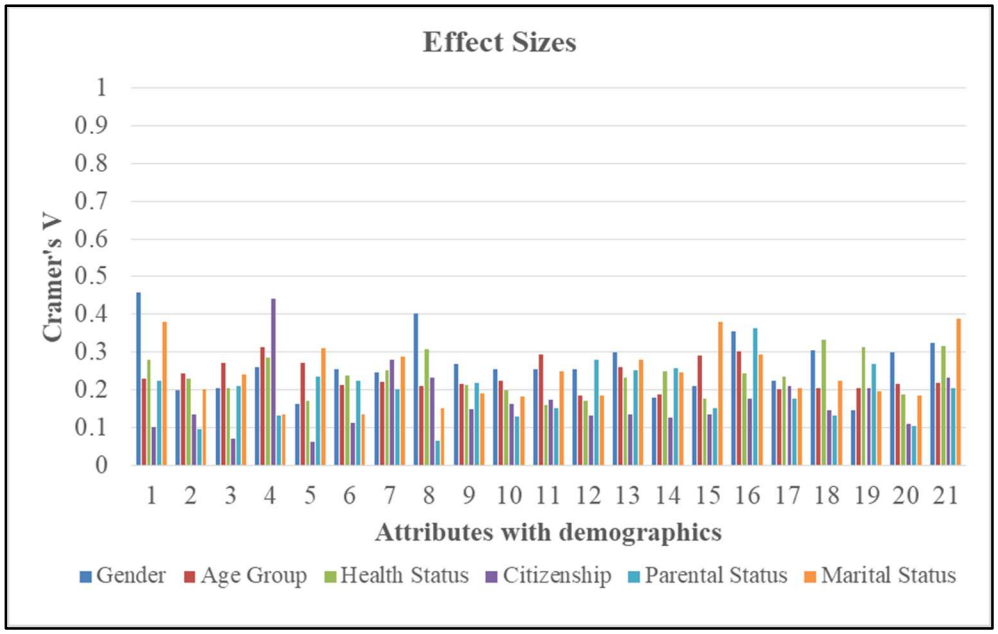

Figure 4. Effect sizes of attributes with the demographics.

None of the attributes, when analyzed with age groups, had a Cramer's V value of more than 0.4. Design of the walk-in facility being patient friendly (0.312), provision of

clear instructions of follow up care (0.294), and provision of complete information of the prescribed medication (0.303) had a moderate association with age groups.

Analysis of Patient Responses by Health Status

The data suggested that none of the attributes had dissimilar patient responses based on self-reported health status. The patients responded similarly to attributes such as the provision of clear instructions about follow-up care (*p*-value 0.88) and medical staff being sympathetic and reassuring (*p*-value 0.89) based on self-reported health status.

Table 8. Analysis of attributes based on demographics using Fisher's exact test.

	Gender	**Age Group**	**Health Status**	**Citizenship**	**Parental Status**	**Marital Status**
Attribute	***p*-value**	***p*-value**	***p*-value**	***p*-value**	***p*-value**	***p*-value**
1	0.001	0.373	0.363	0.797	0.364	0.035
2	0.397	0.419	0.227	0.749	0.937	0.407
3	0.194	0.216	0.650	1.000	0.210	0.090
4	0.186	0.032	0.436	0.003	0.853	0.744
5	0.625	0.303	0.855	1.000	0.225	0.07
6	0.408	0.836	0.637	0.960	0.384	0.875
7	0.218	0.474	0.541	0.067	0.432	0.130
8	0.005	0.452	0.072	0.292	1.000	0.663
9	0.139	0.616	0.579	0.569	0.437	0.478
10	0.342	0.437	0.386	0.528	0.740	0.820
11	0.175	0.072	0.880	0.370	0.800	0.244
12	0.171	0.649	0.891	0.551	0.181	0.426
13	0.148	0.285	0.377	0.906	0.368	0.136
14	0.759	0.632	0.468	0.830	0.232	0.374
15	0.347	0.015	0.834	0.542	0.652	0.012
16	0.035	0.014	0.166	0.518	0.022	0.152
17	0.303	0.780	0.775	0.250	0.544	0.418
18	0.075	0.435	0.108	0.451	0.562	0.377
19	0.894	0.489	0.483	0.371	0.111	0.450
20	0.112	0.429	0.835	0.708	0.807	0.572
21	0.054	0.374	0.502	0.301	0.545	0.020

When evaluated based on self-reported health status, none of the attributes had a Cramer's V of more than 0.4. Attributes such as availability of medical staff appropriately qualified to provide care (0.334), medical staff inquiring about satisfaction with the care provided (0.312), and confidence with the care provided by the medical staff (0.317) had a moderate association with self-reported health status.

Analysis of Patient Responses by Citizenship

The survey respondents consisted of 69 U.S. citizens and 8 non-U.S. citizens. The patients' responses based on citizenship status exhibited no similarity regarding the design of the walk-in facility being patient friendly (*p*-value 0.003). However, there was a similarity in the patients' responses regarding the provision of after-hours care (*p*-value 1.00) and privacy of the rooms (consultation and examination rooms) (*p*-value 1.00).

None of the attributes, when evaluated with citizenship status, had a Cramer's V value of more than 0.6. However, the design of the walk-in clinic facility being patient friendly (0.440) had a relatively strong association with citizenship status.

Analysis of Patient Responses by Marital Status

The survey respondents included 14 married (or in a domestic partnership) patients and 63 single patients. When compared based on marital status, the patients responded differently to attributes such as availability of qualified medical staff within ten minutes of the check-in process (*p*-value 0.035), provision of adequate information about illness and treatment (*p*-value 0.012), and confidence with the care provided by the medical staff (*p*-value 0.02). However, patients responded similarly to the provision of written communication of the treatment delivery by medical staff (*p*-value 0.875).

When analyzed with marital status, none of the attributes had a Cramer's V of more than 0.4. Attributes such as availability of appropriately qualified medical staff within the ten minutes of the check-in process (0.380), provision of adequate information about illness and treatment (0.380), and confidence with the care provided by the medical staff (0.389) had a moderate association with marital status.

Table 9. Effect sizes of the walk-in clinic attributes based on demographics.

	Gender	**Age Group**	**Health Status**	**Citizenship**	**Parental Status**	**Marital Status**
Attribute	**V**	**V**	**V**	**V**	**V**	**V**
1	0.457	0.231	0.281	0.102	0.224	0.380
2	0.200	0.244	0.229	0.136	0.095	0.201
3	0.205	0.271	0.204	0.070	0.209	0.242
4	0.260	0.312	0.284	0.440	0.131	0.136
5	0.162	0.271	0.170	0.062	0.234	0.310
6	0.255	0.214	0.237	0.112	0.225	0.135
7	0.247	0.220	0.253	0.279	0.202	0.287
8	0.403	0.211	0.308	0.232	0.065	0.152
9	0.269	0.216	0.214	0.149	0.218	0.190
10	0.255	0.223	0.198	0.162	0.129	0.183
11	0.256	0.294	0.161	0.174	0.153	0.248
12	0.255	0.186	0.171	0.132	0.281	0.186
13	0.298	0.261	0.233	0.134	0.251	0.281
14	0.180	0.188	0.248	0.126	0.258	0.246
15	0.210	0.290	0.178	0.135	0.153	0.380
16	0.354	0.303	0.243	0.176	0.362	0.293
17	0.225	0.201	0.235	0.209	0.178	0.204
18	0.305	0.205	0.334	0.145	0.131	0.223
19	0.146	0.206	0.312	0.205	0.269	0.195
20	0.299	0.215	0.189	0.109	0.105	0.184
21	0.325	0.218	0.317	0.233	0.205	0.389

Analysis of Patient Responses by Parental Status

There were 6 survey respondents that had parental status (had kids) and 71 patients did not. When analyzed based on parental status, the patients' responses differed on the

provision of complete information of the prescribed medication (*p*-value 0.022). The patients responded similarly regarding inclusion in the decision-making process of the healthcare delivery (*p*-value 0.937) and provision of information about the delays during the visit (*p*-value 1.00).

None of the attributes, when analyzed with parental status, had a Cramer's V value of more than 0.4. Medical staff being sympathetic and reassuring (0.281) and provision of complete information of the prescribed medication (0.362) had a moderate association with parental status.

5. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

The consideration of patient's perception of quality and satisfaction using the Kano model makes the identification of complex patient needs easier and more reliable. The proposed systematic methodology provides clear instructions on how to gather the voice of the patients and differences in their responses based on various demographic factors which can be transformed into functional requirements. This systematic approach can also be used to prioritize quality attributes when faced with factors such as limited budget, economic recession, and intense competition among others, and translated throughout the healthcare industry.

In the existing literature, the Kano model was deployed using a predetermined scale and throughout healthcare systems without focusing on specific attributes of healthcare service units that vary by the care and services provided. The proposed methodology eliminates these inadequacies and provides guidance on understanding the patient needs that vary with time, changes in the patient demographics, and quality perceptions. Further,

it provides a means for validating the reliability of the Kano survey using the Cronbach's alpha, detecting the differences in patient responses using the Fisher's exact test, and understanding the impact of demographics on the service quality attributes using effect sizes. Effect sizes are particularly useful for practical considerations as they are not sensitive to the sample sizes and can be translated into actionable results by looking at the attributes that have a moderate or higher (all levels of strong) association with the demographic factors. Such quality attributes must be carefully considered for quality improvement. The proposed systematic methodology provides guidance on understanding the growing patient complexity.

Based on the data collected from patients that have utilized care and services offered by the walk-in clinics in the U.S. on 21 service quality attributes, 15 were identified as one-dimensional, three as indifferent, two as attractive, and one as a must-be attribute by the patients. The patients considered the availability of appropriately qualified medical staff within ten minutes of the check-in process and provision of after-hours care as attractive attributes, which can be provided at walk-in clinics to significantly increase patient satisfaction.

Although only walk-in clinics in the U.S. were considered in this study, the proposed systematic methodology can be utilized to improve the quality of a healthcare unit in any country. The longitudinal and locational analysis of walk-in clinics and the healthcare needs associated with other healthcare units such as clinical laboratories, orthopedic clinics, pediatric care units, and emergency care services, among others, will be evaluated as a part of future research. Further, it would also be valuable to compare patients' quality perceptions with those of healthcare providers associated with such units.

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III. ANALYZING FACTORS AFFECTING PATIENT SATISFACTION WITH HEALTH SERVICES

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ABSTRACT

Purpose

Healthcare providers are increasing their focus on patient satisfaction and patient-oriented services as they play a significant role in managing rising costs, elevating service quality, and establishing sustainable quality improvement strategies. In recent years, the Kano model has gained popularity in the healthcare industry and has been employed to improve patient satisfaction. The objective of this research is to illustrate how the Kano model can be deployed to identify a wide range of complex patient needs and convey its potential usefulness in the continuous improvement of the healthcare sector.

Design/Methodology/Approach

This paper provides a case study of implementing the Kano model to identify diverse patient needs and aims to eliminate the gaps identified in prior research, which include generically applying the Kano model to all service units of the healthcare system and using a predetermined service quality scale. This study emphasizes the importance of scale development and individual attention to each healthcare service unit in determining intricate patient needs. A cross-sectional study was conducted at the Student Health Services of Missouri University of Science and Technology where the data was collected

using the Kano survey. The respondents included undergraduate and graduate students that have utilized the healthcare services offered. A total of 138 patients were surveyed using a Kano model based questionnaire that included demographics and treatment as well as service expectations.

Findings

Of the 21 quality attributes evaluated by the patients, 16 were categorized as one-dimensional, three as indifferent, and two as attractive attributes using the Kano model. None of the quality attributes showed a dominant must-be feature. The students considered the availability of appropriately qualified medical staff within ten minutes of the check-in process and provision of after-hours care as attractive attributes that create greater satisfaction.

Research Limitations/Implications

The research was conducted at a university student health services center. Therefore, respondents in the survey are in a younger age group, which may affect patient expectations. In addition, expectations of a student health services center may be different than expectations of visiting a primary care physician and other healthcare units.

Originality/Value

This study contributes to a better understanding of the identification of healthcare needs using the Kano model and advocates focusing on shifts in the categories over time and changes in the demographic environment.

Keywords: Customer satisfaction, healthcare, Kano model, patient satisfaction, service quality, student health services

1. INTRODUCTION

Poor quality of care severely impacts patients' quality of life and safety while increasing healthcare costs and patient dissatisfaction. An improved focus on patient needs and satisfaction enables healthcare providers to not only improve the quality, but also empowers them to provide medical care that is safe, effective, patient-centered, timely, efficient, and equitable (Corrigan, Donaldson, and Kohn, 2000 and 2001; Morris, Otto, and Golemboski, 2013; Siverbo, Eriksson, Raharjo, and Moonen, 2014). In recent years, the application of quality methodologies and tools to improve healthcare processes began expanding at an exponential rate. Prior research suggests that healthcare providers could greatly benefit from quality improvement activities focused on patient satisfaction as they reduce waste as well as costs while enhancing patient safety and healthcare quality (Mazur, 2003; Birnbaum and Ratcliffe, 2008; Gremyr and Raharjo, 2013; Padma, Lokachari, and Chandrasekharan, 2014; Materla and Cudney, 2017).

The Kano model is a quality methodology that enables comprehensive insight into the needs through data visualization by identifying the features/attributes of a service that have a high impact on patient satisfaction. Predominantly used in tourism, internet, and education services, the Kano model has gained popularity in the healthcare sector due to its effectiveness and its use is presumed to have a positive influence on the relationship between patients and the healthcare system. It allows healthcare providers to identify, classify, and prioritize complex patient needs; and establish sustainable quality improvements (Gustavsson, Gremyr, and Sarenmalm, 2016). The purpose of this paper is to illustrate how the Kano model can be deployed to identify a diverse range of patient

needs and convey the benefits of using it for the continuous improvement of the healthcare sector. A case study conducted at the Student Health Services (SHS) department of Missouri University of Science and Technology (S&T) is presented to assist healthcare providers in identifying intricate patient needs, categorizing the needs based on their impact on satisfaction, and prioritizing them based on their strength values that indicate an important patient perspective.

1.1. THE KANO MODEL

Nowadays, organizations maintain ongoing efforts to understand changing customers' perceptions of quality and their satisfaction. Traditionally, a one-dimensional model for quality was assumed suggesting that the degree of customer satisfaction was proportional to the functional performance of a product or service; that is, the less (more) functional the product or service, the less (more) satisfied the customer (Huiskonen and Pirttila, 1998; Jane and Dominguez, 2003). However, researchers later observed that the linearity between customer satisfaction and product or service quality to be inaccurate. Developed to understand employees' motivation at the workplace, Herzberg's two-factor theory states that the factors (motivators) that cause job satisfaction are different from those (hygiene factors) that cause job dissatisfaction (Bloemer and Kasper, 1995). Inspired by the Herzberg's two-factor theory, Professor Noriaki Kano and his colleagues at the Tokyo Rika University in Japan presented Kano's theory of attractive quality to understand how customers' perceive and evaluate product or service quality.

The Kano model offers a theoretical and operative methodology for understanding customer needs and perceptions by providing a visual representation of the relationship

between the functional performance of quality attributes and degree of satisfaction achieved (Kano, Seraku, Takahaski, and Tsuji, 1984; Berger et al., 1993; Robinson, 2009). The Kano model classifies product or service quality attributes into one of the five categories of perceived quality, which include must-be (M), attractive (A), one-dimensional (O), reverse (R), and indifferent (I) categories. The must-be category consists of attributes that lead to customer dissatisfaction when the product or service is less functional but lead to no satisfaction when fully functional. The attractive attributes lead to extreme satisfaction when present, but are unnoticed when absent and lead to no dissatisfaction. Customer satisfaction is directly proportional to the functional performance of the one-dimensional attributes. Reverse quality attributes are those that create customer satisfaction when absent and dissatisfaction when present. Indifferent quality attributes do not create either customer satisfaction or dissatisfaction when present. The Kano model as suggested by Robinson (2009) is presented in Figure 1. Due to the increased traceability and clear visualization of the voice of the customer, the Kano model is being increasingly adopted in the healthcare industry and recognized as a valuable tool in understanding a product or service lifecycle (Mikulic and Prebezac, 2011).

1.2. OBSERVATIONS ON THE USE OF KANO MODEL IN HEALTHCARE

While some healthcare quality studies have implemented the Kano model alone to understand the voice of the patients, others have integrated it with other methodologies such as quality function deployment (QFD), Servqual, service blueprint, and analytic hierarchy process (AHP) among others, to enhance the quality of care and develop sustainable improvement strategies (Materla, Cudney, and Antony, 2017).

As argued by Al-Sayyari et al. (2009), the Kano model has been effective not only in eliciting patients' service quality expectations but also in understanding the differences in expectations of patients from different nationalities and cultures. It is important for healthcare providers to consciously include patients in their treatment decisions and explore multiple patient roles such as supplier, product, participant, recipient, and co-designer as it can give insights into varying patient expectations due to increased patient awareness (Cordero-Ampuero, Darder, Santillana, Caloto, and Nocea, 2012; Matías-Guiu, Caloto, and Nocea, 2012; Gustavsson, Gremyr, and Sarenmalm, 2016).

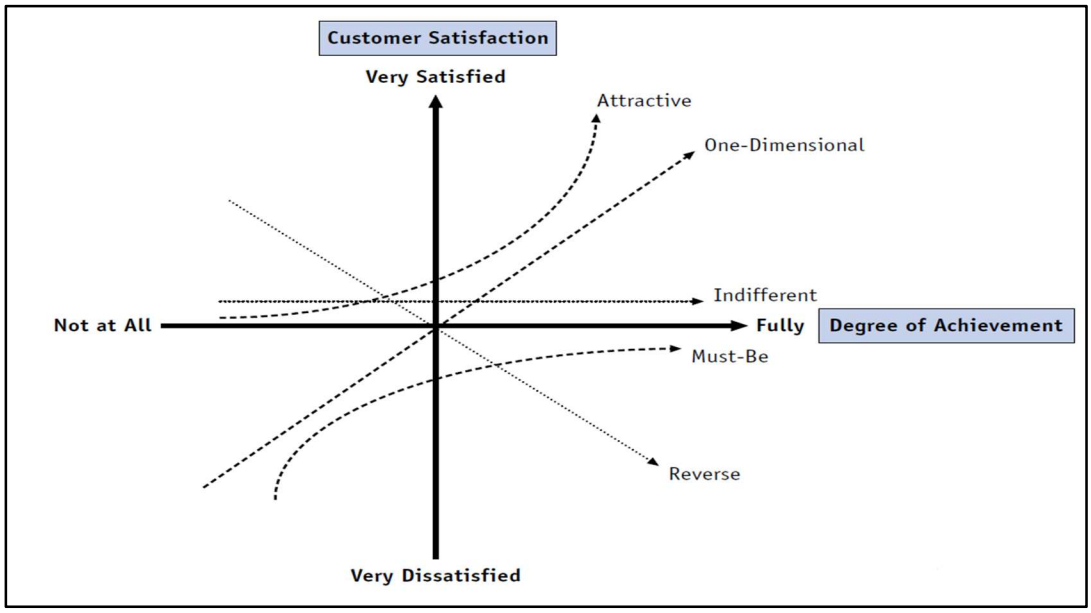

Figure 1. The Kano Model.

While the application of the Kano model allows healthcare providers to understand patient needs, integrating it with QFD aids in recognizing trade-offs and translating them into functional service requirements (Chiou and Cheng, 2008; Aghlmand, Lameei, and Small, 2010; Nordin and Razak, 2014; Shamshirsaz and Dong, 2014).

The integration of the Kano model with Servqual and AHP employed at healthcare organizations proved beneficial in understanding and improving the patient-provider relations (Christoglou, Vassiliadis, and Sigalas, 2006; Lee, Sugumaran, and Park, 2011; Sulisworo, 2015). The Kano model assists providers in eliciting patient preferences in both healthcare service development and improvement stages (Vassiliadis, Fotiadis, and Tavlaridou, 2014). The Kano model can be used as a potential tool to not only understand patients' behaviors, but also to differentiate healthcare services from competitors (Wongrukmit and Thawesaengskulthai, 2014; Yeboah, Ansong, Appau-Yeboah, Antwi, and Yiranbon, 2014). A clear identification of failure points in regular healthcare service planning and patient needs can be attained using an integrated Kano – service blueprint approach (Chang and Yang, 2010). The Kano model can be utilized to efficiently use the available resources by focusing only on the attributes that have a high impact on satisfaction in events such as economic recession and rise of the corporate care sector, among others (Krassadaki and Grigoroudis, 2010).

It is imperative that healthcare providers understand various quality aspects of the patients' treatment cycle as well as service lifecycle to elevate service quality and enhance patient satisfaction, which can be accomplished by the implementation of the Kano model alone or combined with other quality methodologies. Although the Kano model has been frequently used in recent years along with other quality methodologies, it was either generically applied to all service units of the healthcare system or used with a predetermined service quality scale. However, patient expectations differ by the type of care or service acquired; therefore, individual attention must be given to each service unit to understand those patient needs. The following sections present a case study conducted

at the Student Health Services (SHS) of Missouri University of Science and Technology (S&T) utilizing the Kano model and emphasize the importance of scale development and individual attention to each service unit of a healthcare system.

2. METHOD

2.1. DATA COLLECTION

The Student Health Services at the Missouri University of Science and Technology was selected for the Kano model deployment to identify the students' healthcare needs in order to improve the quality of services offered and maintain the health of the campus community. SHS provides a variety of health and wellness services to students such as regular medical care (acute problems), allergy injections, tobacco cessation, orthopedic care, travel medicine, STD testing, and well-woman exams, among others, for a health service fee of approximately $110 per semester. All graduate and undergraduate students enrolled at the university can utilize the services provided by the SHS department.

The main objectives for this project included identification of patient needs that impact their satisfaction and dissemination of that information to healthcare providers and management of the SHS department to improve the quality of services and care offered by them. Preliminary information on the healthcare statistics associated with the SHS department from the 2015–2016 school year was obtained, which served as a baseline for this project. The details on the types of care appointment, total number of patients treated in that year, and total number of appointments were acquired as shown in Table 1. It was observed that a total of 6,114 distinct patients had utilized the SHS department and 10,718

appointments were made in the 2015–2016 school year. The three main reasons for utilizing the SHS department included acute problems followed by orthopedic services and injections, respectively.

Table 1. SHS healthcare statistics for the 2015–2016 school year.

Type of care appointment	**Distinct patient total**	**Number of appointments**
Acute problem (e.g., cold, flu)	2849	5521
Administrative	40	44
Allergy injection	51	629
Consult	186	214
Follow up	280	337
Injection	381	439
Orthopedic	899	1772
Paperwork	45	48
Physical – general	84	87
Physical – sports	167	193
Physical – Tuberculosis (TB)	34	36
Psych – 20	6	6
Psych – 60	1	1
Self-check-in	3	3
Sexually Transmitted Infection	169	188
TB	8	8
TB signs/symptoms	111	144
TB test	364	442
Travel	93	102
Wart	42	111
Wound	177	260
Well woman exam	124	133
Total	6,114	10,718

A preliminary satisfaction survey regarding the performance of the SHS department was conducted with 260 of the 6,114 patients responding, resulting in a response rate of 4.25%. The students ranked wait time in the waiting and exam rooms, staff's friendliness, knowledge of the doctor or provider, provider's communication skills, types of services available, and overall satisfaction with the SHS on a 5-point Likert scale. The scale

consisted of the following categories: excellent – 5, very good – 4, good – 3, fair – 2, and poor – 1. The results are shown in Table 2. The results suggest that the students considered the knowledge of the doctor/providers and staff's friendliness to be good with scores of 99.62% and 99.61%, respectively, followed by provider's communication skills (98.85%), types of services available (98.85%), and overall satisfaction (98.84%). The students ranked wait time in the exam room and waiting room the lowest of the options with scores of 95.77% and 93.46%, respectively.

Table 2. SHS preliminary satisfaction survey.

	Percent							
Please rate the following	**Excellent**	**Very Good**	**Good**	**Fair**	**Poor**	**Std. deviation**	**Variance**	**Mean**
Wait time in the waiting room	57.31	17.69	18.46	5.38	1.15	1.01	1.02	4.25
Wait time in the exam room	66.92	20.38	8.46	3.85	0.38	0.83	0.70	4.50
Staff's friendliness	81.15	15.38	3.08	0.38	0.00	0.51	0.26	4.77
Knowledge of the doctor or provider	75.00	20.00	4.62	0.00	0.38	0.59	0.35	4.69
Provider's communication skills	79.23	16.92	2.69	1.15	0.00	0.56	0.31	4.74
Type of services available	65.77	21.92	11.15	0.77	0.38	0.75	0.57	4.52
Overall satisfaction	71.15	23.08	4.62	0.38	0.77	0.66	0.44	4.63

The high standard deviation in some aspects of the satisfaction survey indicates that the data is spread out over a wide range of values, whereas a lower value indicates that the data is clustered around the mean. Although none of the aspects of the preliminary satisfaction survey scored below 90%, the SHS department was interested in supporting continuous improvement of the services offered. Figure 2 provides a visual representation of the responses to the preliminary satisfaction survey. As the majority of the students utilized the SHS department for acute problems, orthopedic care and injections, the services related to these areas were further explored. An analysis of the preliminary satisfaction survey suggested that an emphasis for improvement should be on the wait times in both exam and waiting rooms.

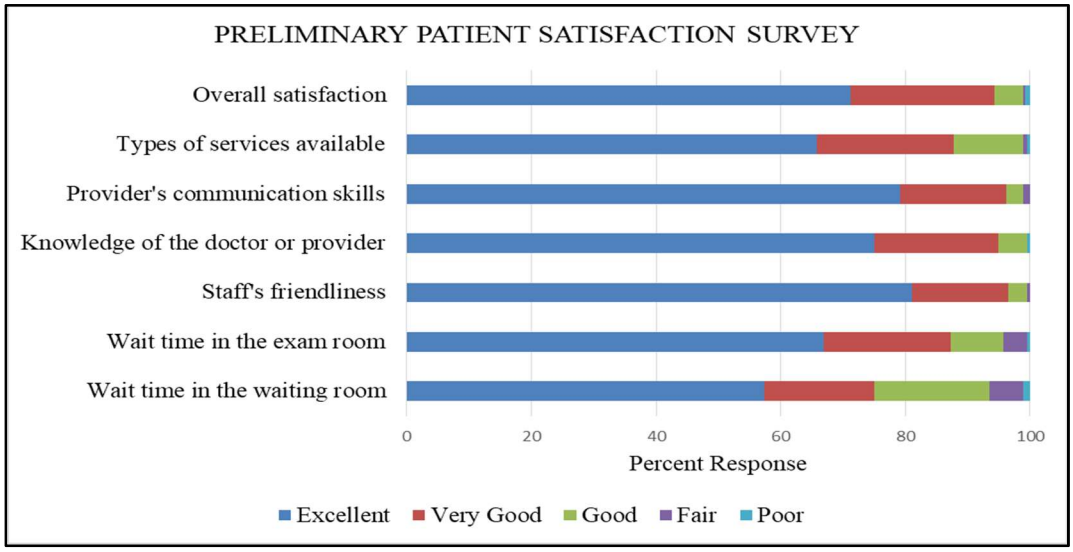

Figure 2. Preliminary satisfaction survey of the SHS department.

The market segment utilizing the SHS department consisted of both undergraduate and graduate students who are either U.S. citizens or international students from various countries such as China, Germany, Japan, India, and Saudi Arabia, among others. This

information was used to develop a detailed Kano survey that focuses on the service quality aspects of the SHS department.

2.2. KANO QUESTIONNAIRE

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, existing Kano studies in the healthcare sector, and prior satisfaction surveys were explored to identify the types of questions asked regarding service quality features. Using this accumulated information and preliminary satisfaction survey results, the Kano survey was customized to elicit the patient needs associated with the SHS department. The Kano survey included demographic questions to gather distinctive information about the market segment and paired (functional and dysfunctional) questions about the quality features. The Kano survey included a set of paired questions investigated only a single service quality attribute. Randomization of the question order was introduced to avoid biased results. The healthcare providers and subject matter experts were consulted, and suggestions provided by Berger et al. (1993) and Robinson (2009) were followed while developing the questionnaire to ensure wording consistency. A consent form was also composed that provided information to the patients on how their confidentiality and privacy will be maintained. The healthcare providers of the SHS department were consulted to ensure that the health, safety, and legal requirements were met.

The Kano survey was deployed on the Qualtrics platform to all enrolled students at Missouri S&T. The survey consisted of 42 randomized questions on 21 service quality attributes of the SHS, six demographic questions, and an additional comments section. The students were only allowed to participate in the Kano survey based on the following

criteria: 1) must be 18 years of age or older, 2) must be currently enrolled at the university, and 3) must have utilized the services offered by the SHS during his/her enrollment. The participation in the Kano survey was voluntary and the responses were collected during a two month period (April and May 2017). The Kano survey deployed had four parts: Part 1: consent form and survey instructions, Part 2: general demographic questions, Part 3: Kano questionnaire (functional and dysfunctional pair of questions), and Part 4: additional comments. The Kano survey examined various attributes such as availability of qualified medical staff, inclusion in the decision-making process, staff's friendliness, the privacy of the rooms, and provision of adequate information on illness and required treatment, among others. The response categories for the Kano questionnaire used were: 1) I like it that way, 2) It must be that way, 3) I am neutral, 4) I can live with it that way, and 5) I dislike it that way. The demographic questions and Kano questionnaire are presented in Tables 3 and 4, respectively.

3. RESULTS AND STATISTICAL APPROACH

In total, 138 responses were received, of which 68 responses were excluded due to incomplete responses to either demographic or Kano quality attribute questions. A total of 70 complete and anonymous responses was processed for analysis. After the Kano analysis, the responses to the demographic questions were used to analyze the differences in response patterns across the diverse demographics and needs associated with the SHS department. The students' information on age, gender, international/U.S. citizen status, health status, and the number of visits to the SHS in the past 12 months are presented in

Table 5. Analysis of the 70 completed surveys was performed by looking up each pair of responses (functional and dysfunctional) in the evaluation table and results were tabulated for each attribute. The Kano evaluation table as suggested by Berger et al. (2009) is presented in Table 6. The attributes fall into one of the following categories of perceived quality: attractive, must-be, one-dimensional, reverse, and indifferent. The responses to the attribute questions that may not have been clearly understood by the patients fall into the questionable response category.

Table 3. General demographic questions.

Number	Question	Response category
1.	What is your age? *If the response (a) is selected, the survey is complete.	a) Under 17 years b) 18 – 20 years c) 21 – 23 years d) 24 – 26 years e) 27 - 29 years f) 30 years or older
2.	Have you ever used the Student Health Services? *If the response (a) is selected, the survey is complete.	a) Yes b) No
3.	How many times have you visited the Student Health Services in the past 12 months?	a) 0 b) 1 c) 2 d) 3 e) 4 or more
4.	What is your gender?	a) Male b) Female c) Prefer not to answer
5.	Are you an international student?	a) Yes b) No
6.	How would you rate your health status?	a) Poor b) Fair c) Good d) Very good e) Excellent

Table 4. Kano questionnaire.

Number	Functional form of the feature	Dysfunctional form of the feature
1.	If the appropriately qualified medical staff were available within ten minutes of the time you checked into the Student Health Services, how would you feel?	If the appropriately qualified medical staff were not available within ten minutes of the time you checked into the Student Health Services, how would you feel?
2.	If the medical staff includes you in the decision making process of your healthcare delivery, how would you feel?	If you are not included in the decision making process of your healthcare delivery by the medical staff, what would your reaction be?
3.	If after-hours care is provided by the Student Health Services, how do you feel?	If the Student Health Services does not provide after-hours care, how do you feel?
4.	If the design of the Student Health Services facility is patient friendly, how do you feel?	If the design of the Student Health Services facility is not patient friendly, what is your response?
5.	If the rooms (consultation, examination rooms, etc.) allow for personal privacy, how do you feel?	If the rooms (consultation, examination rooms, etc.) do not allow for personal privacy, how do you feel?
6.	If the medical staff provide written communication of how your treatment will be delivered, how do you feel?	If written communication of how your treatment will be delivered is not provided by the medical staff, how do you feel?
7.	If the patient check-in process is easy, how do you feel?	If the patient check-in process is difficult, what is your response?
8.	If the staff keeps you informed about the delays, if any, during your visit, how would you feel?	If the staff does not keep you informed about the delays, if any, during your visit, what is your response?
9.	If the medical staff provide correct care on the first time, what is your response?	If correct care on the first time is not provided by the medical staff, what would your reaction be?
10.	If the Student Health Services personnel have good communication among them to assure effective treatment, how would you feel?	If the Student Health Services personnel do not have good communication among them to assure effective treatment, how do you feel?
11.	If the Student Health Services personnel provide clear instructions about follow up care, how would you feel?	If the Student Health Services personnel do not provide clear instructions about follow up care, what is your response?
12.	If the medical staff are sympathetic and reassuring, how would you feel?	If the medical staff are not sympathetic and reassuring, how do you feel?

Table 4. Kano questionnaire (cont.).

13.	If the Student Health Services personnel accommodate your religious restrictions when conducting your medical care, how would you feel?	If your religious restrictions are not accommodated by the Student Health Services personnel when conducting your medical care, what is your response?
14.	If the Student Health Services personnel accommodate your cultural restrictions when conducting your medical care, how would you feel?	If the Student Health Services personnel did not accommodate your cultural restrictions when conducting your medical care, how would you feel?
15.	If the medical staff provide adequate information about your illness and treatments, how would you feel?	If the medical staff do not provide adequate information about your illness and treatments, how do you feel?
16.	If the Student Health Services personnel provide complete information of the prescribed medications, how do you feel?	If complete information of the prescribed medications is not provided by the Student Health Services personnel, what is your response?
17.	If the Student Health Services personnel are friendly, how do you feel?	If the Student Health Services personnel are not friendly, how do you feel?
18.	If the medical staff is appropriately qualified to provide care, how do you feel?	If the medical staff is not appropriately qualified to provide care, what would your reaction be?
19.	If the Student Health Services personnel asked about your satisfaction with the care provided, how would you feel?	If the Student Health Services personnel do not ask about your satisfaction with the care provided, how would you feel?
20.	If the medical staff understands your needs and requirements, how would you feel?	If the medical staff does not fully understand your needs and requirements, how do you feel?
21.	If you feel confident about the care provided by the medical staff, what is your response?	If you do not feel confident about the care provided by the medical staff, what is your response?

The number of responses falling into each category for every service quality attribute is tallied to determine the final category for that attribute. The category strength, total strength, better (co-efficient of satisfaction), and worse (co-efficient of dissatisfaction) values were calculated. The category strength is the estimated value of a particular feature

and calculated as the percent difference between the highest category and next highest category. The total strength is the estimated value of a particular feature based on the total percentage of responses in attractive, must-be, and one-dimensional categories. The better value is the estimated ability of the feature to create satisfaction and calculated as:

$$Better = (A + O)\ /(A + O + M + I) \quad (1)$$

where A, O, M, and I are the number of responses in the attractive, one-dimensional, must-be, and indifferent categories. The worse value is the estimated value of the feature to create dissatisfaction if it is not included and calculated as:

$$Worse = (O + M)/(A + O + M + I) \quad (2)$$

Table 5. Student Demographics.

Age	**%**	**Gender**	**%**	**Student**	**%**	**Health Status**	**%**	**Number of visits in past 12 months**	**%**
18-20	6	Female	39	U.S. citizen	64	Poor	1	0	11
21-23	46	Male	60	International	36	Fair	11	1	21
24-26	24	Prefer not to answer	1			Good	33	2	31
27-29	13					Very good	36	3	16
30 & older	11					Excellent	19	4 or more	20

It was observed that out of the 21 service quality attributes, the patients categorized 16 service quality attributes as one-dimensional, three attributes as indifferent, and two as attractive. None of the service quality attributes showed a dominant must-be characteristic. The students considered the availability of appropriately qualified medical staff within ten

minutes of the check-in process and provision of after-hours care as attractive attributes. The classification of quality attributes using the Kano model is presented in Table 7.

The service quality attributes are presented graphically using the worse and better values on the x and y-axis, respectively. The attributes are represented as points on the graphs. The better and worse values lie between zero and one, with a better value for an attribute closer to 1 indicating that satisfaction can be improved by providing such attribute, and a large absolute value for worse closer to 1 indicating that providing such attribute will only prevent dissatisfaction.

Table 6. Kano evaluation table.

Customer Requirements →	**Dysfunctional form**					
↓ Functional Form		**1. I like it that way**	**2. It must be that way**	**3. I am neutral**	**4. I can live with it that way**	**5. I dislike it that way**
	1. I like it that way	Q	A	A	A	O
	2. It must be that way	R	I	I	I	M
	3. I am neutral	R	I	I	I	M
	4. I can live with it that way	R	I	I	I	M
	5. I dislike it that way	R	R	R	R	Q

The values closer to zero suggests that the attribute has a very little effect on satisfaction or dissatisfaction. The longitudinal and location-oriented analyses will transform these attribute points into lines that make the Kano model clear. Such analyses also demonstrate how the values change over time and how locality affects customers' perceptions of quality. Figure 3 presents the attributes on the Better – Worse plot. The students offered suggestions in the additional comments section to improve the quality of the SHS department and attract more students to utilize their offered services. Such suggestions are provided in Table 8.

Table 7. Evaluation of the attributes using the Kano model.

Attribute	**Category Totals**							**CS**	**TS**	**Better**	**Worse**
	Q	**M**	**O**	**A**	**I**	**R**	**Category**	**(%)**	**(%)**	**(%)**	**(%)**
1	0	5	18	37	10	0	A	27.10	85.70	78.60	32.90
2	1	14	23	13	17	2	O	8.60	71.40	53.70	55.20
3	1	5	23	27	12	2	A	5.70	78.60	74.60	41.80
4	1	12	35	12	10	0	O	32.90	84.30	68.10	68.10
5	0	12	27	7	24	0	O	4.30	65.70	48.60	55.70
6	1	14	19	18	15	3	O	1.40	72.90	56.10	50.00
7	0	10	35	16	8	1	O	27.10	87.10	73.90	65.20
8	0	12	26	16	15	1	O	14.30	77.10	60.90	55.10
9	1	19	29	12	8	1	O	14.30	85.70	60.30	70.60
10	1	22	35	2	8	2	O	18.60	84.30	55.20	85.10
11	0	21	33	6	10	0	O	17.10	85.70	55.70	77.10
12	2	9	28	15	15	1	O	18.60	74.30	64.20	55.20
13	1	7	13	8	38	3	I	35.70	40.00	31.80	30.30
14	1	9	10	13	34	3	I	30.00	45.70	34.80	28.80
15	1	23	38	2	6	0	O	21.40	90.00	58.00	88.40
16	0	15	28	10	16	1	O	17.10	75.70	55.10	62.30
17	1	10	40	11	8	0	O	41.40	87.10	73.90	72.50
18	0	28	35	1	6	0	O	10.00	91.40	51.40	90.00
19	1	4	13	19	32	1	I	18.60	51.40	47.10	25.00
20	0	13	46	5	6	0	O	47.10	91.40	72.90	84.30
21	1	20	40	4	4	1	O	28.60	91.40	64.70	88.20

3.1. KANO QUESTIONNAIRE RELIABILITY

The item analysis was performed to study the internal reliability of the Kano questionnaire. Cronbach's alpha is a measure of the internal consistency of an instrument (test, scale, or questionnaire) and expressed as a number between 0 and 1. A Cronbach's alpha value of 0.7 or higher is generally considered to be an acceptable reliability coefficient (Nunnaly, 1978; George and Mallery, 2003; Tavakol and Dennick, 2011). The Kano questionnaire showed strong internal consistency with a Cronbach's alpha value of 0.91.

3.2. CHI-SQUARE TEST FOR GOODNESS OF FIT

With a sample size of 70, the chi-square test for goodness of fit was used to determine whether the sample data from the population are consistent with a claimed distribution. The test was performed using the MS Excel software. The claim or null hypothesis in this study for each individual attribute is that the values in Kano categories occur with equal frequency. In other words, the sample data is a uniform distribution suggesting that the patients have no preference of a particular Kano category for each individual attribute and Kano categorization based on satisfaction has no importance. The chi-square test compares the observed frequency distribution for each category with the expected frequency distribution of the null hypothesis (Fisher, Marshall, and Mitchell, 2011).

The Chi-square goodness of fit test was appropriate for analysis as the variables (attributes) under study were categorical from a single population, and each level of the

categorical variable had an expected frequency count of at least five. The critical chi-square values can be obtained using the degrees of freedom (5) and level of significance (0.05).

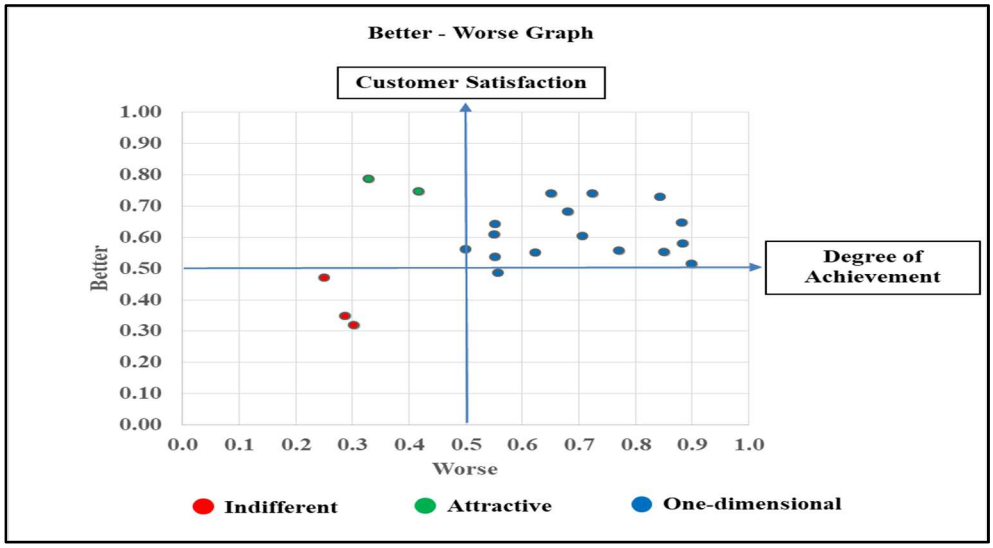

Figure 3. Attributes on the Better – Worse plot.

Table 8. Additional comments/suggestions to improve the SHS department.

	Student Response				
Question	**Highest response**	**Second highest response**	**Third highest response**	**Fourth highest response**	**Fifth highest response**
Please provide any comments or suggestions to improve the SHS	After hours care	Other types of care such as eye care, dental care among others	Training to doctors/providers to provide better diagnosis	Hire more doctors/providers	Promote a healthy lifestyle on campus

It can be observed that the computed chi-square values for every quality attribute are higher than the critical chi-square values obtained (p-values are less than the

significance level of 0.05); therefore, the null hypothesis suggesting that the data are consistent with the claimed uniform distribution was rejected for all 21 quality attributes. We can conclude that the difference between the actual Kano ratings is statistically significantly different, suggesting that the category and total strength values for the quality attributes provides an important customer perspective. The chi-square test analysis of the Kano survey data is presented in Table 9.

Table 9. Analysis of the Kano survey data using chi-square test.

	Category Totals						**Chi-square**	
Attribute	Q	M	O	A	I	R	**calculated**	***p*-value**
1	0	5	18	37	10	0	85.83	0.0000
2	1	14	23	13	17	2	31.83	0.0000
3	1	5	23	27	12	2	52.74	0.0000
4	1	12	35	12	10	0	68.34	0.0000
5	0	12	27	7	24	0	58.40	0.0000
6	1	14	19	18	15	3	25.66	0.0001
7	0	10	35	16	8	1	71.09	0.0000
8	0	12	26	16	15	1	41.60	0.0000
9	1	19	29	12	8	1	51.03	0.0000
10	1	22	35	2	8	2	82.74	0.0000
11	0	21	33	6	10	0	72.80	0.0000
12	2	9	28	15	15	1	43.14	0.0000
13	1	7	13	8	38	3	78.80	0.0000
14	1	9	10	13	34	3	59.94	0.0000
15	1	23	38	2	6	0	102.63	0.0000
16	0	15	28	10	16	1	47.09	0.0000
17	1	10	40	11	8	0	91.66	0.0000
18	0	28	35	1	6	0	105.37	0.0000
19	1	4	13	19	32	1	64.74	0.0000
20	0	13	46	5	6	0	131.09	0.0000
21	1	20	40	4	4	1	104.34	0.0000

An expected value for the Kano categories of 11.67 and a critical chi-square value of 11.07 at a significance level of 0.05 is considered for the data related to the 21 quality attributes. The degrees of freedom (df) is 5 as we have six Kano categories such as questionable, must-be, one-dimensional, attractive, indifferent, and reverse.

3.3. ANALYSIS OF PATIENT RESPONSES

The patients' responses were evaluated using the Fishers exact value (p) from the Chi-square test of independence. This test was used to analyze contingency tables with the demographics and Kano category responses. Fisher's exact test is a statistical significance test used in cases where there are cells with an expected frequency of less than five and with small sample sizes (Daya, 2002; Connelly, 2016). The probability (p), which ranges between 0.0 and 1.0, is calculated by determining the probability of getting observed frequency distribution by establishing and comparing to all other possible distributions where the row and column totals remain the same as the observed distribution. The null hypothesis indicates that all the cells would be close to equal. When the p value is closer to 1, there is a similarity between the response patterns and when closer to 0, there is a difference in the response patterns of patients regarding the Kano attribute categories. Fisher's exact test was utilized to compare the Kano category responses of all the attributes with demographics such as gender, age, health status, and student's residency status.

Effect sizes are being increasingly reported by researchers in all fields to show the magnitude of effect between the variables, as the significance test by itself fails to show us the degree of effect for practical considerations (Emerson, 2016; Kim, 2017). Effect sizes are quantitative indexes of relationships/associations among variables and not sensitive to

the sample sizes (Sullivan and Feinn, 2012). In other words, they describe the degree to which the null hypothesis of no relation between variables is false (Hedges, 2008). Three different measures of effect size for chi-squared test and Fisher's exact test predominantly used are Phi, Cramer's V, and Odds Ratio. However, Phi and Odds Ratio are only suitable for a 2x2 contingency table and Cramer's V is suitable for larger contingency tables (Kim, 2017). Using the Cramer's V interpretation guidelines provided by Lee (2016) as shown in Table 10, the strength of association between the different demographics and attributes is discussed. Fisher's exact test *p*-values and Cramer's V effect sizes were calculated using the IBM SPSS Statistics Version 25 software and presented in Table 11. The effect sizes of attributes, when analyzed with different demographics, are presented in Figure 4.

3.3.1. Comparison of Patient Responses by Gender. The Kano category responses were analyzed based on gender. A significance level of 0.05 is considered for interpretation of the attributes. Only one of the 70 respondents chose not to provide the gender. The data indicate that there was no similarity between the Kano category responses of the male and female patients about the design of the SHS facility being patient friendly (*p*-value 0.04). However, both male and female patients had a similar response pattern regarding their confidence about the care provided by the medical staff (*p*-value 1.00), medical staff providing complete information of the prescribed medications (*p*-value 0.99), and medical staff being appropriately qualified to provide care (*p*-value 0.96).

None of the attributes, when compared with gender, had a Cramer's V value of more than 0.4. The attributes such as the patient-friendly design of the facility, good communication among the medical staff, and accommodating religious restrictions when providing medical care had the highest Cramer's V values of 0.364, 0.332, and 0.374,

respectively; suggesting only a moderate strength of association among these attributes and gender.

Table 10. Interpretation of Cramer's V.

Estimated Values	Interpretation of Association
0.00-0.10	Negligible
0.10-0.20	Weak
0.20-0.40	Moderate
0.40-0.60	Relatively Strong
0.60-0.80	Strong
0.80-1.00	Very Strong

3.3.2. Comparison of Patient Responses by Age Group. When analyzed with the age groups, the results indicated that there was no similarity in the Kano category responses regarding the friendliness of the SHS personnel (*p*-value 0.05). The Kano category responses based on the age groups had similarities on the availability of an easy patient check-in process (*p*-value 0.98).

When analyzed with the age groups, none of the attributes had a Cramer's V value of more than 0.4. However, the attributes such as inclusion in the decision making process of the healthcare delivery, friendliness of the medical staff, and appropriately qualified medical staff to provide the care had the highest Cramer's V values of 0.322, 0.323, and 0.323, respectively; which suggest only a moderate strength of association among these attributes and age groups.

3.3.3. Comparison of Patient Responses by Health Status. The patient response data was analyzed using the health status. The data suggested that the Kano category responses, based on the respondents' self-reported health status, exhibited no similarity

with respect to the SHS personnel accommodating cultural restrictions when providing medical care (*p*-value 0) and staff keeping patients informed about the delays during their visit (*p*-value 0.05). However, there was a similarity in the Kano category responses based on the respondents' self-reported health status regarding the provision of complete information for medication prescribed by the SHS personnel (*p*-value 1.00).

None of the attributes, when analyzed with patients' self-reported health status, had a Cramer's V value of more than 0.6. The only attribute that showed a relatively strong association with the health status is friendliness of medical staff with a Cramer's V value of 0.514. When analyzed with the health status, attributes such as privacy of the rooms, provision of written communication of the treatment delivery, and accommodating cultural restrictions when providing medical care also had the highest Cramer's V values of 0.296, 0.367, and 0.349, respectively; with a moderate strength of association with health status.

3.3.4. Comparison of Patient Responses by Residency Status. The Kano category responses based on the students' residency status displayed no similarity on the staff keeping patients informed about the delays during their visit (*p*-value 0.02), the design of the SHS facility being patient friendly (*p*-value 0.04), and provision of the after-hours care by the SHS (*p*-value 0.05).

The Kano category responses based on the students' status for all other attributes exhibited similarity. None of the attributes, when analyzed with the residency status, had a Cramer's V value of more than 0.4. The attributes such as the provision of after-hours care, patient-friendly design of the facility, and provision of information about the delays during the visit had the highest Cramer's V values of 0.37, 0.345, and 0.396, respectively; suggesting only a moderate strength of association with student's residency status.

Table 11. Analysis using Fisher's exact value and effect sizes.

	Gender		Age		Health Status		Residency Status	
Attribute	***p***	**V**	***p***	**V**	***p***	**V**	***p***	**V**
1	0.683	0.143	0.754	0.201	0.409	0.234	0.225	0.257
2	0.341	0.281	0.117	0.322	0.542	0.238	0.934	0.153
3	0.605	0.236	0.208	0.275	0.270	0.265	0.049	0.370
4	0.041	0.364	0.569	0.229	0.713	0.201	0.042	0.345
5	0.588	0.171	0.069	0.303	0.107	0.296	0.608	0.165
6	0.656	0.224	0.138	0.315	0.068	0.367	0.621	0.232
7	0.122	0.316	0.982	0.156	0.800	0.187	0.484	0.221
8	0.936	0.135	0.551	0.225	0.050	0.270	0.020	0.396
9	0.856	0.202	0.913	0.218	0.230	0.263	0.503	0.255
10	0.186	0.332	0.196	0.286	0.326	0.273	0.199	0.298
11	0.864	0.100	0.593	0.228	0.300	0.236	0.135	0.285
12	0.277	0.309	0.692	0.219	0.938	0.195	0.254	0.297
13	0.061	0.374	0.058	0.307	0.521	0.250	0.136	0.340
14	0.710	0.216	0.609	0.245	0.004	0.349	0.507	0.265
15	0.839	0.162	0.228	0.279	0.670	0.226	0.181	0.282
16	0.990	0.122	0.751	0.220	0.997	0.148	0.943	0.126
17	0.668	0.200	0.049	0.323	0.490	0.514	0.360	0.257
18	0.960	0.114	0.341	0.323	0.651	0.232	0.297	0.228
19	0.313	0.291	0.773	0.207	0.578	0.242	0.323	0.289
20	0.117	0.294	0.919	0.199	0.806	0.188	0.122	0.280
21	1.000	0.165	0.920	0.234	0.813	0.246	0.867	0.201

The effect sizes provide information on the attributes to consider regardless of the sample size and distribution. Therefore, quality attributes with strong (all levels) and moderate level of association with respect to demographic factors must be considered for quality improvement. This statistical approach to the Kano survey provides insights into the reliability of the instrument being used, the goodness of fit of the model, and responses of the patients based on various demographics. It allows a comparison of the differences in patient responses related to healthcare needs that can be translated into actionable requirements for the healthcare service units.

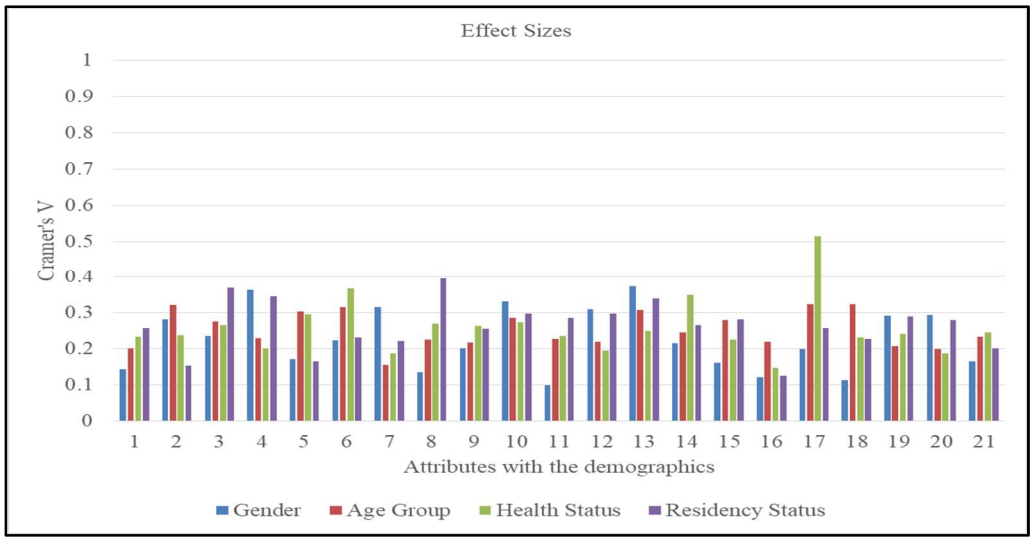

Figure 4. Effect sizes of attributes with the demographics.

4. CONCLUSIONS AND FUTURE RESEARCH

Depending on the availability of the resources and support of all stakeholders, the Kano survey data will be used by the healthcare providers to improve the service quality of the Student Health Services. There were no must-be quality attributes associated with the SHS; therefore, the focus must be placed on one-dimensional and attractive attributes to enhance patient satisfaction, attract new customers, and gain patient loyalty. In order to continuously improve the healthcare service quality, the healthcare providers at SHS must capture changing patient needs over time and with advancements in healthcare technologies using longitudinal and locational analyses.

The main contribution of this study is the clear implementation of the Kano model to elicit diverse patient needs associated with any healthcare service unit and drive the continuous quality improvement of the healthcare system. This study provides information on how to eliminate the gaps identified in earlier research, of generically applying the Kano

model to the entire healthcare system, and using a predetermined service quality scale. It is important to provide individual attention to each healthcare unit to effectively identify associated patient needs. This study suggests focusing on shifts in the categories of perceived quality over time and changes in the demographic environment. It is essential for healthcare providers to systematically apply the Kano model to understand complex patient needs in order to provide quality patient-oriented services.

As part of the future research, analyzing the differences in the perceptions of quality among the healthcare providers and patients would provide additional information for improvement. Further, it would be valuable to identify patient needs associated with a healthcare unit that resembles the structure of the Student Health Services and evaluate the differences between those units.

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SECTION

2. CONCLUSION

Healthcare needs identification and service quality improvement can be effectively performed using the integrated methodology proposed in this research. The voice of the patient (service customer) related to the different healthcare services based on the perception of quality and satisfaction was reliably captured using the proposed systematic methodology. This systematic approach assisted in developing a service quality scale that focuses on capturing the customer needs that are specific to the type of care and services provided by each individual service unit in the healthcare system. The customized service quality scale developed using the systematic approach enabled the classification of diverse patient needs into one of the perceived categories of quality based on patient satisfaction using the Kano model. The results of this research suggest that patient needs can also be prioritized depending on whether a healthcare organization is improving an existing service or developing a new one. The integration of Cronbach's alpha and chi-squared goodness of fit test into the proposed methodology allowed measurement of the internal consistency of the service quality scale and test of the distribution. The evaluation of differences in the patient responses based on demographic factors such as age, gender, health status, and marital status, among others, can be successfully accomplished using the Fisher's exact *p*-value from the chi-square test of independence integrated into the systematic methodology. It also allowed the determination of the magnitude of effect between the patient needs and demographic factors using the effect sizes.

The integrated approach enables healthcare providers to maintain quality efforts into understanding the growing complexity of patient needs and provide patient-centered services, which enhance patient satisfaction. It allows healthcare organizations to improve the process of care with a critical emphasis on service customer (patient) satisfaction and maintain performance for the long-term survival of the business. Different types of care and services can be evaluated using the proposed methodology to understand patient satisfaction and quality perception. This research provides a methodology to gather the quality attributes associated with healthcare services that must be investigated and to construct a scale that features functional and dysfunctional aspects of the service quality attributes. This integrated approach provides guidance on longitudinal and locational analyses required to understand the patient needs that change over time and with changes in perception and demographic environments.

This systematic methodology is extremely beneficial to healthcare organizations and providers to eliminate the gaps between patients' perception of quality and their actual experiences with the healthcare system. The serious drawbacks in the existing literature related to the healthcare needs identification such as the use of predetermined service quality scale and its generic application in the entire healthcare system to identify patient needs have been addressed by this research. Additionally, this systematic approach can be utilized to understand the perceptions and opinions of all stakeholders of the healthcare organization.

Future work will expand this systematic methodology of healthcare needs identification and service quality improvement for individual deployment to understand patients' quality perception towards all service units of the healthcare system. The impact

of various patient demographic factors on healthcare needs associated with these service units will also be evaluated. A comparison of the perceptions of patients and medical providers would also be valuable in creating a unified vision of the standard of healthcare services.

VITA

Tejaswi Materla was born in Hyderabad, India. Tejaswi graduated in June 2010 from Osmania University in India with a Bachelor of Engineering in Electrical and Electronics Engineering. After graduation, she worked as a Software Engineer in India before enrolling in the Master of Science program as an Engineering Management student at Missouri University of Science and Technology in 2012. In May 2014, she graduated from Missouri S&T with a Master of Science in Engineering Management and Graduate Certificate in Lean Six Sigma. After graduation, Tejaswi worked as a Quality Engineering Trainee in the United States before enrolling in the Doctor of Philosophy (Ph.D.) program in Engineering Management at Missouri S&T. In August 2015, she began conducting research to identify patient needs associated with different healthcare services based on patient satisfaction and perception of quality using the Kano model. This research involved the development of a systematic methodology for identifying patient needs and evaluating service quality using the Kano model which can be translated throughout the healthcare industry. During her doctoral studies, Tejaswi received the Herbert McMahon Educational Grant by St. Louis Section (1304) of American Society for Quality and Graduate Leadership Award from the Office of Professional Leadership and Campus Engagement (PLACE) at Missouri S&T. Tejaswi maintained active membership in the American Society for Quality (ASQ), Institute of Industrial and Systems Engineers (IISE), and American Society for Engineering Management (ASEM). Tejaswi was an ASEM certified Associate Engineering Manager and a Certified Lean Six Sigma Yellow Belt. In May 2018, she received her Doctor of Philosophy (Ph.D.) in Engineering Management from Missouri S&T.