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Patient-centric quality assessment framework for healthcare services

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ABSTRACT

In this study we propose a quality assessment framework for healthcare services. The proposed assessment framework is patient centric as it is based on patient expectations and perceived quality of service through their personal experience with the healthcare provider, across the various touchpoints during patient care. The framework generates a quality score which is a measure of the degree to which the patient's expectations were met or exceeded. We model the patient's perceived experiential value as a combination of extrinsic and intrinsic values. The extrinsic value includes the functional or utilitarian value, and to some extent, the social value. The intrinsic value includes emotional, epistemic and intrinsic social value. Using this generic framework for healthcare providers, and using a computerized system, appropriate instruments, rubrics or metrics can be designed for specific types of healthcare services. We show how this framework can be utilized for creating an assessment instrument for a specific healthcare facility in Korea – the Childhood Asthma Atopy Center in a general hospital located in Korea.

1. Introduction

It is imperative for all types of service providers, including healthcare providers to provide high-quality service to their customers, and to engage in continuous improvement efforts, to stay competitive. Such efforts require effective quality assessment instruments to help the service providers assess their own service quality and to identify areas for improvement. In developed nations, such as the European Union, services contribute 62% of the GDP whereas the traditional industry and agriculture contribute the remaining 38%. Further, services are being offered across national borders and in order to stay competitive, they must focus on quality (Blind and Hipp, 2003). Traditionally, service quality was evaluated on transaction based attributes such as price and outcome. More recently, quality assessment of services has been based on customer experience. As a result, over the last 25 years or so, there has been a stream of research on customer experience management (CEM) in service delivery systems. The term "quality" is difficult to define precisely and many definitions of "quality" are found in the literature. For the purposes of this paper, we use a customer-centric definition of quality, proposed by Deming (1993) as the degree to which customer's expectations are met or exceeded. The "customer experience" alluded to in the CEM literature goes beyond simply customer satisfaction; it encompasses a holistic experience which includes emotional, social and personal fulfillment during the various touchpoints involved in a service (Gentile et al., 2007). Healthcare services distinguish themselves from other types of services such as insurance, financial, hospitality, entertainment and other services in many ways. For example, (i) they involve a high degree of personalized or individualized interactions with the customer (patient), (ii) there are many touchpoints from start to finish and (iii) in addition to the patient, the patient's loved ones are also involved at an emotional level when receiving the services. Due to these differences, patient experience involves some emotional and social dimensions that may not be so critical in assessing the quality in other types of services. It is therefore critical that the quality assessment framework for healthcare services take into account these unique dimensions in assessing quality. While there is vast amount of literature on CEM in services in general, literature on CEM in healthcare services is somewhat sparse. This paper attempts to fill that gap. In this paper, we propose a patient-centric quality assessment framework especially designed for healthcare providers. Using the framework, a comprehensive quality score is generated which represents the degree to which the patient's expectations are met at all the touchpoints. This generic framework for healthcare providers can be used to build appropriate instruments, rubrics or metrics for assessing specific types of healthcare services, such as dental, surgical, outpatient, emergency care etc.

The patient perceives value on two dimensions, namely, extrinsic and intrinsic. The extrinsic value is derived from (i) utilitarian or functional value, such as how effective the treatment was, how clean

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the facilities were, etc. and (ii) extrinsic social value, such as how pleasant the personnel interactions were. The intrinsic value is derived from (i) emotional value, such as empathy received from health personnel and not being ignored by the personnel, (ii) epistemic value, such as whether the patient's belief systems were honored and (iii) intrinsic social value such as being treated respectfully. It is important for an effective quality assessment framework to include all these value themes.

The contribution of this paper is a proposed generic patient-centric framework for assessing the quality of healthcare services that captures and compares the patient's expected and perceived quality on many dimensions, some of which are unique to health services, across all the touchpoints or stages during the service. It generates a quality score which is a measure of the degree to which the patient's expectations were met or exceeded. To the best of our knowledge, no existing framework provides such a comprehensive quality assessment from the patient's perspective.

In the next section, we will describe the relevant literature in customer experience management in service delivery and assessment frameworks. In Section 3, we will describe our framework and the instruments that can be derived from such a framework. Section 4 demonstrates an example of the application of the proposed framework in developing a quality assessment instrument for a specific healthcare service at a particular hospital in Korea. Sections 5 and 6 include discussion and conclusions respectively.

2. Background and literature

Within the broad area of service quality assessment, there is significant amount of literature; not all of it is relevant to healthcare services. The key idea in the literature over the past twenty five years has been that assessment of service quality has transitioned from the traditional transactional approach to a customer experience centric approach, giving rise to the term customer experience management (CEM). Hirschman and Holbrook (1982) in their seminal paper on CEM talked about moving away from a rational consumer perspective to an irrational consumer perspective. The rational consumer was engaged in information processing to evaluate utility whereas the irrational consumer relies on experiential value that relates to multisensory, fantasy and emotive aspects of experience. As mentioned before, Deming (1993) has proposed a customer-centric definition of quality as the degree to which the customer's expectations are met or exceeded. Many more studies, since Hirschman and Holbrook (1982) have underscored this customer centric value theme. For example, LaSalle and Britton (2003) explained that the customer experience is strictly personal and implies customer's involvement at different levels such as rational, emotional, sensorial physical and spiritual. Gentile et al. (2007) claimed that customer experience depends largely upon the relationship developed between the service provider and the customer. Tynan and Mckechnie (2009) reviewed the literature on experience marketing and pointed the wide gap between academia and practice. They also stressed that the customer is the final and only arbiter of value and that the service provider must be flexible and responsive to the customer needs. Torres et al. (2014) said that these new approaches enable development of emotional relationships between customers and service provider, thereby enhancing positive customer experience which reflects positively on the service provider. Won (2015) has classified customer experience attributes based on interaction, responsiveness, and expandability and stressed that the strategies of the future must weigh heavily on overall customer experience of the services received and the responsiveness of the service provider rather than on just the effectiveness of the treatment. Osei-Frimpong et al. (2016) point out that patients these days are much more educated due to access to health related information online which allows patients to co-create value. Yeon et al. (2006) warn that new technologies should be introduced cautiously as new technologies might be viewed favorably by some customers while not so favorably by others.

When assessing the customer's experiential value it is important to identify broad value categories or dimensions and attributes within those broad value categories. For example, Hirschman and Holbrook (1982) talked about hedonic attributes that include emotions and sensory satisfaction. LaSalle and Britton (2003) also included emotional and sensory satisfaction and also added spiritual satisfaction. A popular survey instrument used to assess service quality is called SERVQUAL (Parasuraman et al., 1991) which uses the following five broad dimensions: Reliability, Assurance, Tangibles, Empathy and Responsiveness. The SERVQUAL quality model also goes by the name RATER, based on the first letter of these five dimensions. Reliability includes the competence of the service provider; Assurance includes the trustworthiness of the service provider; Tangibles include the physical facility, equipment and appearance or personnel; Empathy includes the care and individualized attention provided to the customers; Responsiveness includes willingness to help customers and provide timely service. In each category, questions can be designed specific to the service provided and customers are required to express their satisfaction on a seven-point Likert scale. The use of the SERVQUAL survey instrument has received some criticism as a valid tool for the healthcare industry as it was designed primarily for service industry in general.

A popular emerging framework for quality divides customers' experience value into extrinsic and intrinsic values (Holbrook, 1999; Kim et al., 2011; Sheth et al., 1991; Cho et al., 2010). These categories are more suitable for healthcare services as they involve emotional and social dimensions. The extrinsic value is derived from (i) functional value which captures the utilitarian aspect, i.e. how effective was the treatment provided and (ii) extrinsic social value, i.e. how friendly were the encounters with the service provider employees. The intrinsic value is derived from emotional value (active and reactive), epistemic value and intrinsic social value. Emotional value of intrinsic component is defined as utility from mood or emotional states, and such emotional value is classified into active emotion and reactive emotion (Scherer, 2004). The epistemic value is derived from customer's curiosity including knowledge, beliefs and information. Social value captures the utility recognized by one or more social groups, and exists both in both extrinsic and intrinsic components (Sheth et al., 1991; Cho et al., 2010) (See Fig. 1).

Another construct our proposed framework is built upon is the aggregation of multiple touchpoints throughout the service. A typical healthcare service is comprised of a series of service encounters or touchpoints, such as setting up appointments, reception, waiting, physician interaction, interactions with the nurse and other healthcare personnel, pharmacy, billing and other administrative personnel etc. Customers evaluate the contribution of each service encounter in the service delivery system which is made up of numerous service encounters provided by the entire organization (Zeithaml and Bitner, 2002). Rawson et al. (2013) calls the entire customer experience as an end-to-end journey and concludes that organizations that are able to skillfully manage the entire experience reap enormous rewards. Redelmeier and Kahneman (1996) have shown that the perceived pain by a patient during an exam was not so much related to the total amount of pain and duration of the exam but on the worst level of pain even though of a brief duration. Along the same lines, a negative experience at one of many touchpoints can result in an overall negative evaluation, even if all the other touchpoints resulted in a positive experience. We have incorporated this idea of end-to-end journey in our proposed assessment framework. The idea of series of touchpoints from end-to-end is explained schematically in Fig. 2. Depending on the specific type of healthcare service, the activities may be different.

We will next describe the proposed patient-centric framework.

3. Patient-centric quality assessment framework

Our proposed quality assessment framework is built upon the following key ideas:

1. Quality should be assessed in terms of meeting or exceeding customer expectations; in our case it is patient expectation, i.e., it should be

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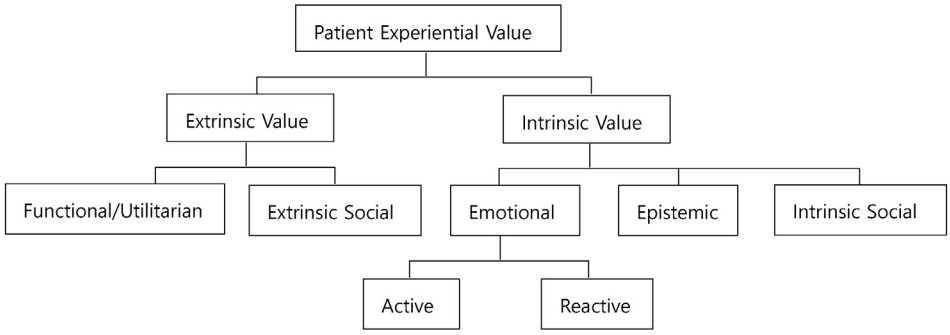

Fig. 1. Patient experiential value.

assessed based on the gap between the patient expectation and the perceived value of service.
2. The patient's value can be divided into extrinsic and intrinsic values.
3. The overall quality experience depends on a series of touchpoints from end-to-end.

3.1. Patient expected and perceived value

A definition of quality that is based on meeting or exceeding customer expectation is often ignored by current quality assessment frameworks. Each customer, (in our case patient) is different and therefore they have different preferences. For example, while to some patients, receiving the right treatment for their illness, i.e. the utilitarian aspect may be the most important criteria for service quality while other dimensions, such as the social and emotional aspects may be quite unimportant, whereas for some other patients, the social aspects may be more important than or as important as the utilitarian aspects. The service provider cannot always assume what is important to the patient. So, it is important that in a patient-centric framework that we capture patient preferences and take those into account in the overall assessment. In our proposed framework, we propose that for each item or criterion on the survey instrument, we capture the patient's preference on a scale of 1 to 10 about how important that item is to them. For each item, we will also capture how the patient rates the service on a scale of 1 to 10. These two values can be used to measure whether the service provider met, exceeded or did not meet the expectations. So, for example, if a patient gives least importance to a criteria and puts down a 1 for that criteria, then even a minimal service provided, say 2 on a scale of 1 to 10 on that criteria will count as exceeding patient expectation. If the patient puts down an importance of 10 on a criteria, then a perceived service of anything below 10 would be considered as not having met the patient expectation. Of course, if a patient puts down a 10 for importance for every criteria then it will be impossible to exceed their expectations; just meeting their expectation would require a service quality of 10 on each criteria. But we hope that customers will rate their preferences realistically.

3.2. Value themes

For our proposed model, we use the value themes proposed by Holbrook (1999) and Kim et al. (2011), in which the patient's value can be divided into extrinsic and intrinsic values, where the extrinsic value consists of functional or utilitarian value and some extrinsic social value and the intrinsic value consists of emotional, epistemic and intrinsic social value. The emotional value is derived from obtaining emotional support or sympathy from the personnel. The epistemic value is derived from how well the treatment conformed to their beliefs and the intrinsic social value was derived from deep social connection established in the overall experience.

3.3. The quality score

Using this framework, we develop a quality score on a range of -1 to $+1$ as a measure of the degree to which the patient's expectations were met or exceeded or not met. We assume there are n stages in the service. The value of n may vary from hospital to hospital and within the same hospital, from service to service and even from patient to patient depending on the patient's ailment. There are 6 sub categories of criteria (utilitarian, extrinsic social, emotional active, emotional reactive, epistemic, and intrinsic social). For the i^{th} stage and j^{th} subcategory, we assume there are m_{ij} number of criteria. We define IMP_{ijk} as the "importance" given by the patient to criteria C_{ijk}, on a scale of 1 to 10 where i is the stage, j is the subcategory and k is the criteria number. We define PQ_{ijk} as the "perceived quality" for that criteria. We also assume that the IMP is the same as the expected quality level. So, if the patient rates a criteria as having an importance of 5, their expectations will be met if the perceived quality for that criteria was a 5, exceed at a value greater than 5 and not met at a value below 5. So, the difference ($PQ_{ijk} - IMP_{ijk}$) is a measure of whether patient expectations were met. If the difference is zero, the expectations were met; if it is positive, the expectations were exceeded and if it is negative, the expectations were not met. The quality score is a weighted average of these differences on every touchpoint, weighted by their respective importance, and normalized so that the

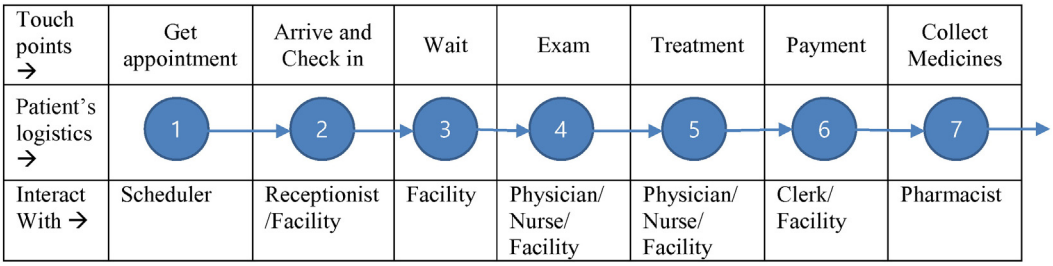

Fig. 2. Series of touchpoints in the end-to-end journey.

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score ranges between −1 and +1 irrespective of the number of questions. The quality score is defined as follows:

$$\text{Quality score} = \sum_{i=1}^{n}\sum_{j=1}^{6}\sum_{k=1}^{m_{ij}} \text{IMP}_{i,j,k} * (\text{PQ}_{ijk} - \text{IMP}_{ijk}) / \times \left(9 * \sum_{i=1}^{n}\sum_{j=1}^{6}\sum_{k=1}^{m_{ij}} \text{IMP}_{ijk}\right)$$

So if the expectations were exceeded on a criterion that is very important to the patient, the overall quality score will be higher than if the expectations were exceeded on a not so important criterion. And vice versa, if the expectations were not met on a very important criteria, the penalty will be higher than if the expectations were not met on a not so important criteria. Again, in this patient-centric framework, the patient gets to decide the importance of each criteria. The maximum difference between PQ and IMP for a criteria is 10 minus 1 or 9. So the maximum overall difference possible if IMP for each criterion was 1 and PQ for each criterion was 10 will be 9 multiplied by the number of questions. That is why, in the quality score, the denominator is $(9 * \sum_{i=1}^{n}\sum_{j=1}^{6}\sum_{k=1}^{m_{ij}} \text{IMP}_{ijk})$ to ensure that the highest quality score does not exceed 1 and the lowest does not go below −1.

A quality score of 0 implies that the expectations were met, a negative score implies the expectations were not met while a positive score implies the expectations were exceeded. The template of a survey instrument based on the proposed framework can be seen in Fig. 3.

Using this framework, a unique instrument can be printed for each patient, since each patient might go through different stages. For each stage, for each type of treatment, a set of questions can be prepared in a database. Using technology, a computerized system can be developed that allows the hospital to input the various stages or touchpoints the patient is going through and print a survey specially designed for each particular patient's experience.

4. Specific case

We will now show how our generic framework can be applied to a specific healthcare situation. The subject of this study is the Childhood Asthma Atopy Center in a general hospital, located in Seoul in Korea.

4.1. Hospital overview

The hospital in question was established by the welfare foundation and has a total of 2715 rooms. In addition, the hospital operates 49 medical offices, 33 professional centers, 6 professional clinics and cancer hospitals, a hospital specializing in heart diseases, and some children's hospitals.

4.2. The touchpoints in the end-to-end journey

To apply our proposed we first analyze the service encounters. Fig. 4 shows the schema for a service delivery system of a young patient, for treatment of digestive disorders due to atopy and food allergy.

The service delivery system for Childhood Asthma Atopy Center can be outlined as follows:

1. The patient arrives at the hospital, submits an application and waits.
2. The patient then goes for a diagnosis of atopy by a specialist (A) of allergic diseases.

Value Category	Value Subcategory	Stage 1			…	Stage n		
		Criteria	How Important (1 to 10)	Perceived Quality (1 to 10) Stage-1	…	Criteria	How Important (1to 10)	Perceived Quality (1 to 10) Stage-n
Extrinsic	Utilitarian	C_{111}	IMP_{111}	PQ_{111}		C_{n11}	IMP_{n11}	PQ_{n11}
		C_{112}	IMP_{112}	PQ_{112}		C_{n12}	IMP_{n12}	PQ_{n12}
		…	…	…		…	…	…
		$C_{11m_{11}}$	$IMP_{11m_{11}}$	$PQ_{11m_{11}}$		$C_{n1m_{n1}}$	$IMP_{n1m_{n1}}$	$PQ_{n1m_{n1}}$
	Ex-Social	C_{121}	IMP_{121}	PQ_{121}		C_{n21}	IMP_{n21}	PQ_{n21}
		C_{122}	IMP_{122}	PQ_{122}		C_{n22}	IMP_{n22}	PQ_{n22}
		…	…	…		…	…	…
		$C_{12m_{12}}$	$IMP_{12m_{12}}$	$PQ_{12m_{12}}$		$C_{n2m_{n2}}$	$IMP_{n2m_{n2}}$	$PQ_{n2m_{n2}}$
Intrinsic	Emotional Active	C_{131}	IMP_{131}	PQ_{131}		C_{n31}	IMP_{n31}	PQ_{n31}
		C_{132}	IMP_{132}	PQ_{132}		C_{n32}	IMP_{n32}	PQ_{n32}
		…	…	…		…	…	…
		$C_{13m_{13}}$	$IMP_{13m_{13}}$	$PQ_{13m_{13}}$		$C_{n3m_{n3}}$	$IMP_{n3m_{n3}}$	$PQ_{n3m_{n3}}$
	Emotional Reactive	C_{141}	IMP_{141}	PQ_{141}		C_{n41}	IMP_{n41}	PQ_{n41}
		C_{142}	IMP_{142}	PQ_{142}		C_{n42}	IMP_{n42}	PQ_{n42}
		…	…	…		…	…	…
		$C_{14m_{14}}$	$IMP_{14m_{14}}$	$PQ_{14m_{14}}$		$C_{n4m_{n4}}$	$IMP_{n4m_{n4}}$	$PQ_{n4m_{n4}}$
	Epistemic	C_{151}	IMP_{151}	PQ_{151}		C_{n51}	IMP_{n51}	PQ_{n51}
		C_{152}	IMP_{152}	PQ_{152}		C_{n52}	IMP_{n52}	PQ_{n52}
		…	…	…		…	…	…
		$C_{15m_{15}}$	$IMP_{15m_{15}}$	$PQ_{15m_{15}}$		$C_{n5m_{n5}}$	$IMP_{n5m_{n5}}$	$PQ_{n5m_{n5}}$
	Intrinsic Social	C_{161}	IMP_{161}	PQ_{161}		C_{n61}	IMP_{n61}	PQ_{n61}
		C_{162}	IMP_{162}	PQ_{162}		C_{n62}	IMP_{n62}	PQ_{n62}
		…	…	…		…	…	…
		$C_{16m_{16}}$	$IMP_{16m_{16}}$	$PQ_{16m_{16}}$		$C_{n6m_{n6}}$	$IMP_{n6m_{n6}}$	$PQ_{n6m_{n6}}$

Fig. 3. Template of patient centric survey instrument based on the framework.

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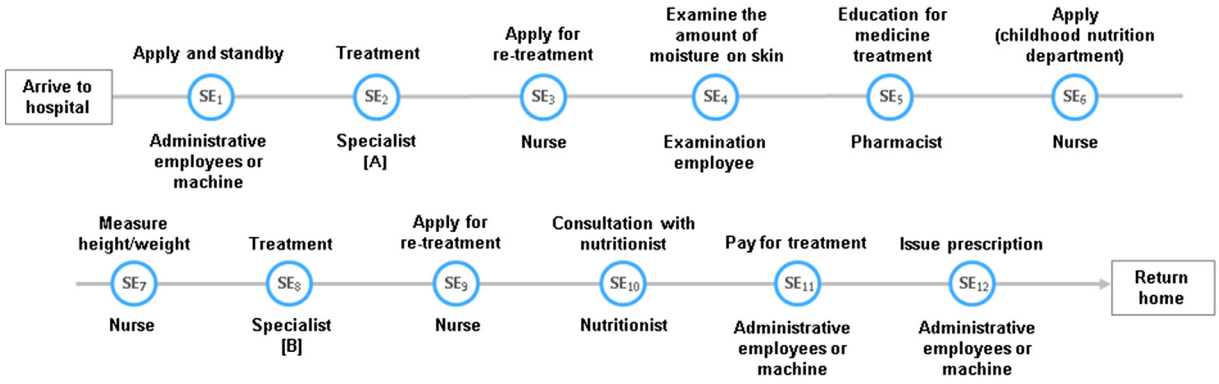

Fig. 4. Service delivery system for Childhood Asthma Atopy Center.

Value Category	Value Subcategory	Stage 1: Apply and Standby		
		Criteria	How Important (1 to 10)	Perceived Quality (1 to 10)
Extrinsic	Utilitarian	Ease of application	IMP_{111}	PQ_{111}
		Comfortable waiting area	IMP_{112}	PQ_{112}
		Clean waiting area	IMP_{113}	PQ_{113}
	Ex-Social	Quiet waiting area	IMP_{121}	PQ_{121}
		Safe waiting area	IMP_{122}	PQ_{122}
Intrinsic	Emotional Active	Fun activities to do for the child	IMP_{131}	PQ_{131}
		Fun children TV programs	IMP_{132}	PQ_{132}
	Emotional Reactive	Pleasant personnel	IMP_{141}	PQ_{141}
	Epistemic	Staying Informed about the amount of wait	IMP_{151}	PQ_{151}
	Intrinsic Social	Respectful personnel	IMP_{161}	PQ_{161}

a) Criteria for Stage 1 –Apply and Wait

Value Category	Value Subcategory	Stage 2: Treatment		
		Criteria	How Important (1 to 10)	Perceived Quality (1 to 10)
Extrinsic	Utilitarian	Accuracy of Diagnosis	IMP_{211}	PQ_{211}
		Pain management during diagnosis	IMP_{212}	PQ_{212}
		Safety during diagnosis	IMP_{213}	PQ_{212}
		Appropriate treatment advise	IMP_{214}	PQ_{212}
	Ex-Social	Warm greeting by the specialist	IMP_{221}	PQ_{221}
		Warm greeting by the nurse	IMP_{222}	PQ_{222}
Intrinsic	Emotional Active	Specialist sympathetic towards patient	IMP_{231}	PQ_{131}
		Nurse sympathetic towards patient	IMP_{232}	PQ_{232}
	Emotional Reactive	Attention given to patient (Not indifferent)	IMP_{241}	PQ_{241}
		The loved ones also treated well		
	Epistemic	Full information disclosed	IMP_{251}	PQ_{251}
	Intrinsic Social	Trustworthy specialist	IMP_{261}	PQ_{261}
		Specialist followed ethical practices	IMP_{262}	PQ_{262}

b) Criteria for Stage 2 –Treatment

Fig. 5. a: Criteria for Stage 1 – Apply and wait. b: Criteria for Stage 2 – treatment.

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3. If the exam results suggest food allergy as a possible cause of the disease, the specialist might recommend a cooperative treatment with the nutrition department. They make an appointment with a nutrition specialist (B) with the help of a nurse.
4. Proceed with the test for moisture level in the skin.
5. They receive education on medicine treatment from a pharmacist (education for taking a dose of antihistaminic medicine and the usage of steroid ointment).
6. They then submit an application at the nutrition department.
7. A nurse measures the height and weight of the patient.
8. They consult with the nutrition specialist (B) in the childhood nutrition department.
9. They apply for the re-treatment in the childhood nutrition department.
10. Consult with professional nutritionist for food and snack the patient can eat. In addition, they are provided with a food diary for filling the foods a patient can eat until the next appointment a week later. In addition, they are provided with information of food a patient is able to eat based on the result of diagnosis from a specialist (A) for allergic disease and a specialist in the childhood nutrition department.
11. They pay for the treatment.
12. They get the prescription medicines.

4.3. Applying the patient-centric quality assessment framework

Based on the analysis of the series of touchpoints, a questionnaire can be designed for each stage in which appropriate criteria for that stage can be included in the survey. For each criteria in each subcategory, the importance or expectation by the patient and the perceived quality can be captured. See Fig. 5a and b for the survey instrument for the first two stages. Similar instruments can be designed for other stages.

Using data from such questionnaires for each stage, the quality score given by

$$\text{Quality score} = \sum_{i=1}^{n}\sum_{j=1}^{6}\sum_{k=1}^{m_{ij}} \text{IMP}_{i,j,k} * \left(\text{PQ}_{ijk} - \text{IMP}_{ijk}\right) / \times \left(9 * \sum_{i=1}^{n}\sum_{j=1}^{6}\sum_{k=1}^{m_{ij}} \text{IMP}_{ijk}\right)$$

can be easily computed using a computer software or a spreadsheet. A score of 0 implies that the expectations were met, overall. A positive score implies that the expectations were exceeded whereas a negative score implies the expectations were not met.

5. Discussion

The quality score as generated by the proposed framework which provides a measure of the degree to which patient's expectations of quality are met is the first of its kind in the literature. It supports a customer centric definition of quality given by Deming, who is regarded as one of the foremost pioneers in the field of quality management. While the aggregate quality score is useful to evaluate the overall service quality, an analysis of stage-wise score can provide useful information about the level of service at each touchpoint. Some pivot table analysis can also be performed to assess quality gaps on each of the six sub categories individually, across all the touchpoints. Further, in addition to looking at the quality score which is a weighted average across all the stages, the lowest (most negative) criteria and stages can be identified because often the patient's overall experience is guided by their worst touchpoint and is not balanced by the positive experience at other touchpoints. The framework provides the data to perform that type of analysis as well. Further, the preferences of each patient can be stored in the database, so that when the same patient returns, the service provider will know which areas to focus better for this particular patient. A database based system can be designed to print a unique survey instrument for each patient depending on the touchpoints each patient goes through.

6. Conclusion and future research

In this paper, we proposed a patient-centric quality assessment framework for healthcare providers. The framework incorporates patient's preferences, expectations and perceived quality of service at every touchpoint during the service. The generic framework can be used to develop a survey instrument specific to each individual patient depending on the patient's touchpoints, which depends on the patient's condition. The instrument generates a quality score between −1 and +1 indicating whether the patient's expectations were met (score of 0), exceeded (a positive score) or not met (a negative score). The instrument can also be used to identify areas of improvement for the service provider for touchpoint and also for each criteria. The framework is based on customer's experience divided into extrinsic and intrinsic values. We also showed how the generic framework can be used to design a survey instrument for a specific case for a hospital in Korea. In future studies, the effectiveness of the survey instruments using the proposed framework can be evaluated by collecting and monitoring data over a period of time.

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