Chapter 15
Lean Thinking and Customer Focus: Patient Centered Perspectives on Hospital Quality

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Abstract *Objectives*: In order to be able to make a differentiated choice between healthcare providers, people require information about their quality. An understanding of patient needs and preferences is crucial in providing helpful information regarding hospital quality. This study is the first comprehensive investigation in this field in Germany, focused on patient involvement in, and preferences for, information on hospital quality.

Methods: A patient involvement scale was developed to measure the subjective interest in hospital information. To analyse what particular information on hospital quality patients prefer a relatively new variant of choice experiment a Best–Worst Scaling (BWS) task was integrated into the questionnaire. Goodness of fit tests show good constructs quality. A total of 276 respondents participated including hospital patients and healthy persons (response rate 71 %, representative sample regarding the variables age, gender and social class).

Results: The analysis showed a high involvement in information regarding hospital quality. A second-order confirmative factor analysis revealed three reliable components: general importance of information (0.70), need of certainty (0.85) and need of participation (0.57). In the measurement of information preferences (35 attributes/quality indicators), patients rated indicators of structure quality as the most important attributes. Information about process quality was moderately relevant from the

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patients' point of view. Objective results of outcome quality were more important for patients than subjective quality indicators. We identified two patient clusters (two-step cluster analysis): outcome-orientated and service-orientated patients.

Conclusion: Both the assessment of patient involvement in hospital quality information and the measurement of patient preferences in order to rank patients' perception provide important insights into information needs of patients. The BWS experiment is useful to investigate patient preferences, particularly in research designs with a larger number of items and a focus of the relative ranking of complete attributes (not just levels within attributes).

15.1 Introduction

Ultimately healthcare delivery must provide benefits to the patient else no matter how good it is if the patient is not satisfied to a large extent the process has not realized its goal. Today, there is growing concern globally about the lack of patient centeredness in many healthcare contexts such as inpatient and outpatient care. One way to address this and simultaneously ensure heightened quality of care is to embrace and incorporate various aspects of lean thinking. The following then serves to illustrate how a patient-centric perspective can be combined with lean thinking principles to facilitate the delivery of better quality, patient-centered healthcare delivery.

15.2 Lean Thinking and Hospital Quality

Lean thinking (often called "Lean") is a quality improvement technique that has been implemented with great success in many industries especially in the manufacturing area. Notable examples include Toyota and Boeing Integral to the principles and practices of a lean approach is to enable high quality and effective and efficient process to ensue and eliminate all waste. Globally, healthcare delivery especially in the OECD countries is facing a tremendous cost pressure. Faced with escalating healthcare costs, governments are forced to re-examine how it might be possible to deliver quality healthcare that is also effective and efficient. Such a scenario appears the perfect context for trying to apply Lean thinking principles to facilitate a superior state. And thus we witness the application of lean principles and practices into various healthcare contexts. To do this successfully, it is necessary to understand and at times refine for the nuances of healthcare. Given that at its core Lean thinking is founded on a process management philosophy which has its roots in manufacturing and technology, it is also appropriate in today's healthcare environments as healthcare is currently embracing various forms of IS/IT and e-health solutions.

15.3 Value

A significant component of Lean thinking is the concept of value: the theoretical concept of value, the measurement of value, and the tangible processes behind delivering value (Majdi 2012). In trying to create and/or increase value a key aspect of Lean thinking is concerned with the elimination of seven key wastes (Caldwell 2005; Cross 2009). The seven wastes of Lean thinking translated into healthcare include (Caldwell 2005; Cross 2009) (1) overproduction (e.g. ordering of duplicate tests), (2) wasting time (e.g. patients waiting for treatments), (3) waste of stock on hand (e.g. medications and other items that are stored but not used and then must be disposed of), (4) waste of movement (e.g. time spent walking from one location to another), (5) waste of defective products (e.g. misinformation or recording of wrong information on patient record), (6) waste in transportation (e.g. moving patient unnecessarily) and waste in processing (e.g. duplication of forms and redundant capture of information).

Thus, a core principle of Lean thinking is that the elimination of waste is required in order to achieve both real and potential value. Further, the recovering of this value can present itself in the form of saved costs or other tangibles. Another key concept in Lean thinking is being customer focused which is especially relevant to healthcare and today has even led to the development of consumer health informatics (Manos et al. 2006; Thrall 2008; Toyota Manufacturing Kentucky, Inc 2003; Toyota Motor Corporation 2009; United States Army 2009). However at its simplest level a patient-centric perspective must be considered at all times when applying Lean thinking to healthcare contexts. If this is the case, then patient satisfaction translates easily into high quality, reduction of errors and the realizing of quality healthcare outcomes (Gabow et al. 2008) and hence Lean thinking dictates that processes and methods must be efficiently optimized with the needs of patients in mind in order for organizations to be fully effective.

Another important aspect in Lean thinking is the identification of waste through root cause analysis (Majdi 2012). Root cause analysis in Lean involves the 5-Whys approach (Majdi 2012; Toyota Manufacturing Kentucky, Inc 2003; Toyota Motor Corporation 2009; United States Army 2009), i.e. a systematic method that rapidly identifies root causes and aides in determining the relationship between multiple root causes.

The following is an example of a 5-Whys exercise used in a hypothetical hospital setting (Majdi 2012):

(Q1) Why are patients being diverted to neighbouring hospitals?

(A1) Because wait times for our hospital are exceeding industry norms.

(Q2) Why are our wait times exceeding industry norms?

(A2) Because patient volume is exceeding capacity.

(Q3) Why is patient volume exceeding capacity?

(A3) Because not enough hospital beds are available.

(Q4) Why are not enough hospital beds available?

(A4) Because hospital patients are not being discharged efficiently.

(Q5) Why are hospital patients not being discharged efficiently?

(A5) Because ER staff is not following best practices for proper discharge.

> In this example, waste in the throughput process comes from incorrect processing. Once hospital management determines the root cause they can implement further training, ensure compliance with existing standards, or eliminate other barriers. In this case the hospital might consider implementing a training program to ensure that ER staff is following best practices for patient discharge. The hospital might also conduct additional 5-Whys analyses to uncover other problem as. Once root causes of waste are uncovered, the elimination of waste or other related action plans can be executed. (Majdi 2012)

We apply root cause analysis and the ideas of Lean thinking in the following sections to be able to understand patient needs and preferences in order to design a high quality, value adding healthcare setting.

15.4 Study Design

The objective of the study presented here is to understand the current state of information needs on hospital quality, and to provide a descriptive picture of the present situation from the subjective perspective of consumers. Furthermore, the aim of the investigation is to analyse and validate the usability of the implemented measures.

We developed a multidimensional approach (Fig. 15.1). Our comprehensive concept includes the measurement of information involvement, information preferences, various influence factors and consumer clusters. The study results presented and discussed here focus on the information involvement and information preferences on hospital quality. A detailed description of the study protocol and the complete results has been published elsewhere (Simon 2010).

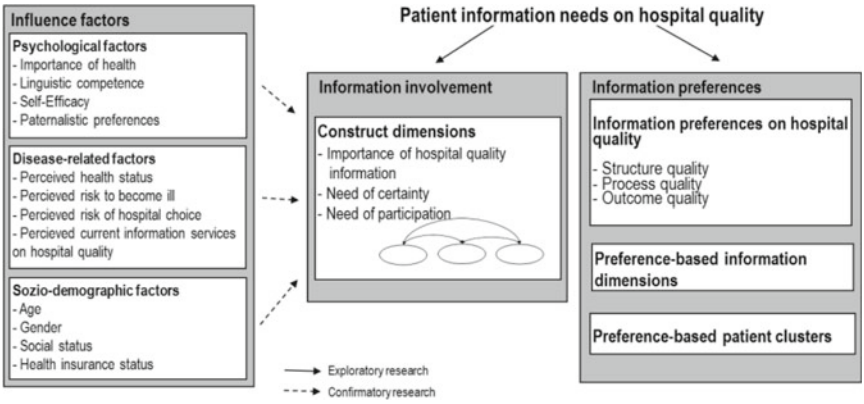

Fig. 15.1 Study design

15.5 Methods

15.5.1 Participants and Data Collection

The exploratory cross-sectional study included current patients of a mayor hospital as well as normal inhabitants of the State of Baden-Wurttemberg (latter named in the presented study as *potential patients*). We selected participants according to the following inclusion criteria: 18 years or older, willing to participate in the study, physically and mentally able to participate.

Regarding the subgroup of hospital patients, we covered all clinical departments but excluded intensive care as well as palliative care wards due to ethical concerns. The recruitment of normal citizens (potential patients) was based on various areas of normal live, i.e. employees of a company, members of a protestant church community, catholic student association and consumers of a fitness studio. The study was conducted in January, February and March 2008.

15.5.2 Questionnaire

We developed a multi-topic questionnaire with an embedded choice-based experiment. The measurement tools were administered as self-reported paper-and-pencil questionnaires.

15.5.2.1 Involvement Scale

A literature search revealed sufficient and often used involvement measurements for consumer goods (exemplarily Zaichkowsky 1994; Laurent and Kampferer 1985; Jain and Srinivasan 1990) but failed to identify a validated instrument specifically addressing the information involvement on hospital quality or other health-related information.

The review of existing involvement theories and literature in health science and information behaviour guided the composition and content of the new measure. We followed the theoretical assumption regarding involvement as a multidimensional construct rather than simple direct measures (Laurent and Kampferer 1985; Simon 2010, p. 103f). After a pre-test the final involvement scale comprised ten items on three a priori defined dimensions: (general) importance, need of certainty and need of participation. The items were to be rated on a five-point Likert-scale. The original version of the involvement questionnaire is available from the author on request.

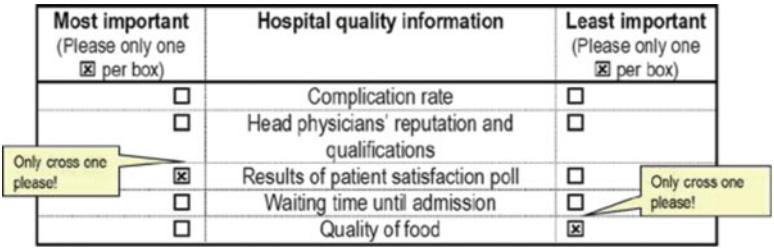

Fig. 15.2 BWS task example: when considering hospital quality information, among the five attributes shown here, which is the most and least important?

15.5.2.2 Best–Worst Scaling

Over the last 2 decades, choice or trade-off experiments already well known in market research have also become a popular method in healthcare research for eliciting patient, consumer and community preferences. A relatively new variant of choice-based experiments the BWS task, grounded in random utility theory (Flynn et al. 2007; Marley and Louviere 2005), has recently gained popularity in health service research. In surveys employing standard rating scales or importance scales usually respondents find it very easy but they do tend to deliver results which indicate that everything is *quite important*. BWS tasks forces participants to make choices between options. One example is shown in Fig. 15.2. The task consists of a list of item sets (boxes). In each task, respondents were simply asked to identify the most and least important item.

The BWS task has been shown to be less cognitively demanding than choosing between complete profiles, an important aspect considering hospital patients. Moreover the BWS experiment can provide information on the relative ranking of complete attributes (second study question) not just levels within attributes which is not available in standard discrete choice experiments.

In the study presented here, our aim was to design and administer a BWS experiment to analyse information preferences on hospital quality from the subjective perspectives of patients.

First of all, we conducted a comprehensive search to identify potential attributes on hospital quality based on the data sources of pubmed and manual search (1997–2007). In total 29 information services on hospital quality, i.e. internet portals, reports and benchmark publication in Germany and other countries could be found. A detailed overview as synopsis is published elsewhere (Simon 2010).

An iterative content analysis (Mayring 2000) was conducted to identify 35 potentially relevant quality indicators (Table 15.1). According to the theory of information economics based on the principles of asymmetric information and quality uncertainty affecting the consumer information search behaviour, we separated all identified attributes on hospital quality in search, experience and credence qualities (Nelson 1970; Darby and Karni 1973; Adler 1996). We included all indicators associated with search qualities (features and characteristics can be evaluated before

Table 15.1 Hospital quality information—35 BWS items

Age of physicians	Professional qualifications of nursing staff/care personnel—qualification, training, competence, expertise
Availability of a patient advocate/patient representative in the hospital, who can be contacted in case of problems and questions	Professional qualifications of the doctors—qualification, training, competence, expertise
Availability of diagnostic technologies—e.g. equipment in the operating theatre, X-ray, laboratory	Quality accreditation of the hospital by independent institutions—quality accreditation as a kind of seal of approval, comparable with the TÜV or Stiftung Warentest
Comfort in patient rooms—e.g. number of beds per room, telephone, TV, toilet	Quality of food—e.g. number of menus available, opportunity of free choice and compilation for the patient
Cooperation between the hospital and other health service partners—e.g. with the treating doctor/family doctor, other hospitals, rehabilitation	Rate of complications—proportion of patients, who had complications during the treatment (e.g. infections after operation, unexpected side effects of medication)
Cooperation with self-supporting groups	Rate of recommendations of practicing doctors—e.g. survey of general physicians, family doctors and specialists once a year, where they would be treated themselves or family members
Costs for additional/optional services—e.g. treatment by head/senior physician, single room or double room, additional room service	Rate of unplanned re-admissions—proportion of patients who had to be hospitalized again
Distance from home/access to the hospital	Reputation and qualification/expertise of the chief/head physician
Efficiency/effectivity—use of cost-effective treatment methods for the same quality of treatment	Research activities—research of new interventions and treatment methods as well as publications of the results in medical journals
Evaluation results of the hospital by/through self-supporting groups—e.g. evaluation of the hospital by/through self-help groups by an annual survey (experienced, active patients)	Results of consumer/patient satisfaction surveys—e.g. anonymous evaluation of the hospital through/by patients after discharge by a satisfaction questionnaire, usually using school grades from 1 to 5
Hospital facilities—e.g. cafeteria, shop, library, prayer room, smoking room, park	Sanitation and hygiene—e.g. hygiene standard
Length of the distances within the hospital—ways to walk in and between the hospital buildings	Size of the hospital—e.g. number of beds, number of special departments
Mortality rate—proportion of patients, who died during the treatment	Specialized treatment options and services—specialization on certain diseases, range of services, outpatient treatment possibilities, alternative therapy offerings, etc.
Number and type of medical malpractice/treatment errors—medical malpractice/errors with serious/severe consequences for the patient	Success rate—proportion of patients with good treatment success (e.g. healing, restoration of performance/physical capacity, pain reduction, improvement of condition)

(continued)

Table 15.1 (continued)

Number and type of patient complaints	Time management during the treatment—morning wake-up times, frequency and duration of contacts with the doctor, number of patients per employee, on-time delivery of diagnostic- and treatment activities
Number of patients (already been) treated with my disease/illness	Waiting time during the treatment—e.g. at the admission, waiting time before the X-ray or ECG, at the discharge
Number or frequency of specific/certain medical interventions or specific treatment methods—e.g. number of bypass operations on the heart per year	Waiting time for admission to the hospital—waiting time in weeks from the statement/finding, that hospitalization is necessary until admission
Personal, individual reports/letters/stories of patients about events and experiences in the hospital (e.g. published on the internet)	

purchase or consumption) and excluded attributes related to experience qualities (quality or features are difficult to observe in advance) or credence qualities (whose utility impact is merely impossible for the consumer to ascertain).

A BWS design was computer-based created with 21 sets, five items per set, three item iterations and three BWS versions, fulfilling well the criteria of frequency balance, orthogonality, connectivity and positional balance (Cohen 2003; Chrzan and Patterson 2006). The BWS tasks were incorporated into a paper-and-pencil questionnaire. An introduction text was provided to present the participants the hypothetical offer of a new information service on hospital quality. A short description as well as an included clear example made them familiar with the experiment. A list with all quality indicators are presented as appendix in case additional explanations were needed (Table 15.1).

The original version of the BWS tasks is available from the authors on request.

15.5.3 Statistical Analysis

Descriptive statistics, reliability analysis, exploratory factor analysis (EFA), *t*-test and two-step cluster analysis were performed with the Statistical Package for the Social Sciences (SPSS), version 16.0. Structure equation model and second-order confirmatory factor analysis (CFA) was computed in AMOS, version 16.0. The software MaxDiff by Sawtooth, version 2.0, was used to create orthogonal BWS designs. A hierarchical Bayes model was estimated to compute the preference structure. Utility (preference) scores were calculated. Significance was set at 5 % level ($p < 0.05$).

15.6 Results

15.6.1 Study Population

433 questionnaires could be distributed. 307 participants answered the questionnaire; a very good response rate of 71 % was achieved (Table 15.2). Not all questionnaires could be included in the analysis mainly because of incomplete answers. The effective sample size consists of 276 cases (64 %). Expectantly the drop out quote in the subgroup of hospital patients was higher (15 %) than the rate of incomplete questionnaires within the subgroup of healthy participants (4 %).

Chi-square tests were conducted to analyse statistically significant differences between study sample and population data. Expected values were derived from the population data for each demographic variable. The study sample was representative regarding the variables age (l^2 8.088, d*f* 4, $p<0.05$), gender (l^2 2.595, d*f* 1, $p<0.05$) and social class (l^2 5.786, d*f* 2, $p<0.05$). Private insured patients were slightly overrepresented.

15.6.2 Information Involvement on Hospital Quality

15.6.2.1 Factor Analysis

First, an EFA (principal components) was performed including the ten items dealing with (general) importance, need of certainty and need of participation. Kaiser's rule was used to extract components with an eigenvalue greater than 1. The a priori defined three involvement dimensions fit very well the components derived from EFA considering item-component loadings of >0.40 as significant. The highly significant Bartlett test and a Kaiser-Meyer-Olkin (KMO) value of 0.820 (as well as very good KMO values regarding each item) showed an excellent goodness of fit. A varimax-rotation revealed three factors with eigenvalues >1 explaining 67.5 % of the total variance. The factor *need of certainty* accounts for 27.41 % of the variances followed by the factors *importance* (21.76 %) and *need of participation* (18.36 %).

Second, a CFA was performed. We employed the aspiration levels by Homburg and colleagues including global and local goodness of fit statistics (Homburg et al. 2008, p. 288).

Table 15.2 Participation rate

	Distributed questionnaires	Participated	Completed questionnaires
Hospital patients	193	167	142
Potential patients	240	139	134
Total	433	306	276

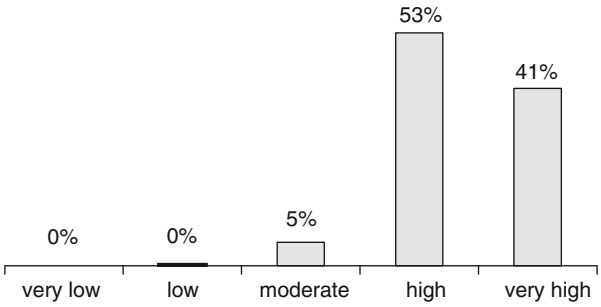

Fig. 15.3 Distribution of information involvement

Fig. 15.4 Second-order CFA

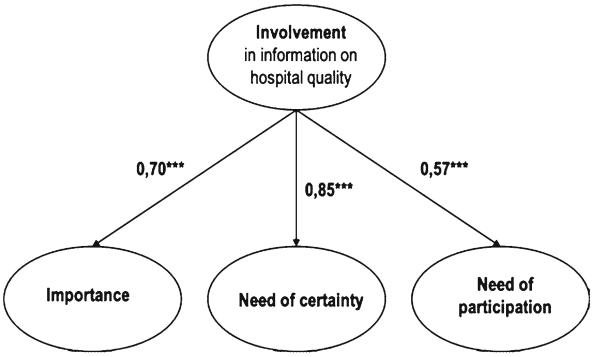

Table 15.3 shows the result of the CFA as well as related psychometric properties. The model fitted the data very well. Furthermore a high discriminant validity of the three involvement scale factors based on the Fornell-Larcker criterion was found. Finally to examine the content validity of the developed involvement scale, we used a direct involvement measurement adapted by Zaichkowsky (Zaichkowsky 1994). We found significantly high correlations between the two scales (® coefficient 0.71, $p < 0.001$).

15.6.2.2 Descriptive Results and Second-Order CFA

Figure 15.3 describes the distribution of information involvement on hospital quality within the participants. The vast majority show a high and very high involvement in information on hospital quality. The mean values of the two subgroups were compared using a *t*-test and a Kolmogorov-Smirnov test. We identified no significant differences between the two subgroups of participants (hospital patients and healthy participants).

We conducted a second-order CFA to find out more about the motivation or reason behind the information involvement (Fig. 15.4). The model fits the empiric date

Table 15.3 CFA and psychometric properties of the involvement scales

Involvement construct with three dimensions							
Goodness of fit							
l^2/df	84.625/32	CFI	0.95				
		GFI	0.95	(0.99)			
RMSEA	0.077	AGFI	0.91	(0.98)			
	Indicator reliability	C.R.	Item-to-total correlation	Cronbach alpha	Variance explained (EFA)	Factor-reliability	DEV
Factor 1: Importance							
Information on hospital quality is very important to me	0.72	9.44	0.71				
I'm really very interested in information on hospital quality	0.67	9.40	0.67	0.79	0.70	0.81	0.74
I couldn't care less about information on hospital quality	0.35	*	0.53				
Factor 2: Need of certainty							
Information on hospital quality provides certainty whether the hospital will meet my needs	0.53	*	0.63				
Information on hospital quality provides help for orientation between different alternative hospitals and treatment options	0.65	12.36	0.72	0.85	0.69	0.85	0.66
Information on hospital quality helps me to better understand my doctor's advice about the right hospital	0.53	11.32	0.65				
Information on hospital quality helps me to make an informed decision about the right hospital	0.67	12.52	0.76				
Factor 3: Need of participation							
The decision about the right hospital should be a shared decision between patient and doctor	0.44	*	0.45				
I would like to have real influence when it comes to choose the right hospital	0.31	6.28	0.45	0.65	0.59	0.65	0.51
I would like to participate in the decision about the right hospital	0.42	6.58	0.48				

ML-estimation/()–ULS-estimation
*Reference indicator

well ($p<0.001$). Besides the general importance of hospital information and the willingness for participation, surprisingly, the need of certainty showed the highest factor loadings. We conclude that the need of certainty—just to know whether the hospital might be good, outstanding or low performing—is highly important. And besides the other factors, a good predictor for the participants' information involvement on hospital quality. Our results reflect common theories of coping. Typically individuals in stressful situations use two types of coping mechanism: problem-orientated and emotion-orientated coping strategies. Literature findings indicate that in stressful events related to health problems individuals seek predominantly information to maintain their intra-psychic balance (Pakenham 1999; Vitaliano et al. 1990; Taylor 2003). Our results related to hospital quality indicate that even in case individuals with less interest in actively shared decision making nonetheless might be very interested in information on hospital quality to improve their certainty as a factor of intra-psychic well-being.

15.6.3 Information Preferences on Hospital Quality

The subjective priority scores for the 35 information items on hospital quality are presented in Table 15.4. First a count analysis is performed on the BWS data. The relationship between the square root of the ratio (most count divided by least count) and the most counts appear to be linear with an R^2 of 84 %. This result confirms the possibility of using the BW ratio as an estimate of the position attributes on the scale of importance. This is consistent with the international literature on the BWS method.

Second the BWS data are analysed with probability model (estimated by hierarchical Bayes method). The percent certainty value of 0.564 and the mean root likelihood of 0.507 showed a sufficient goodness of fit. We found a strong linear relationship between the hierarchical Bayes (HB) estimates and the (most–least) score with an R^2 of 98 %. The HB analysis provided a ranking list as well as utility scores. First we conducted a ranking over all utility scores. The top ten information preferences on hospital quality consist of:

1. Physicians' qualifications
2. Specialized treatment options and services
3. Nurses' qualifications
4. Availability of diagnostic technologies
5. Sanitation and hygiene
6. Treatment success rate
7. Number of treated patients (with a certain disease)
8. Quality accreditations from independent institutions
9. Number and frequency of certain diagnostic and therapeutic treatments
10. Head physicians' reputation and qualifications

Table 15.4 Information preferences on hospital quality—BWS results

		Total counts			Calculated		
Nr.	Item	Most	Least	Most—least	Sqrt (most/least)	HB score	Rang HB score
1	Mortality rate	58	159	−101	0.60	1.663	25
2	Number and type of medical malpractice/treatment errors	177	45	132	1.98	4.034	12
3	Success rate	252	45	207	2.37	4.658	6
4	Rate of complication	153	59	94	1.61	3.812	13
5	Rate of unplanned re-admissions	64	199	−135	0.57	1.947	22
6	Efficiency/effectivity	23	305	−282	0.27	0.830	32
7	Evaluation results of the hospital by/through self-supporting groups	37	262	−225	0.38	1.243	29
8	Results of consumer/patient satisfaction surveys	103	127	−24	0.90	2.550	19
9	Rate of recommendations of practicing doctors	199	93	106	1.46	3.796	14
10	Number and type of patient complaints	91	208	−117	0.66	1.898	23
11	Quality accreditation by independent institutions	310	55	255	2.37	4.455	8
12	Personal, individual reports/letters/stories of patients	79	278	−199	0.53	1.563	26
13	Professional qualifications of the doctors	552	2	550	16.61	5.566	1
14	Reputation and qualification/expertise of the chief/head physician	236	65	171	1.91	4.235	10
15	Professional qualifications of nursing staff	342	10	332	5.85	5.149	3
16	Age of physicians	17	411	−394	0.20	0.398	35
17	Research activities	112	133	−21	0.92	2.739	17
18	Specialized treatment options and services	447	17	430	5.13	5.242	2
19	Availability of medical technologies	291	21	270	3.72	5.005	4
20	Number of patients (already been) treated with my disease/illness	271	70	201	1.97	4.483	7
21	Number or frequency of certain medical interventions or treatment methods	249	36	213	2.63	4.380	9
22	Distance from home/access to the hospital	78	261	−183	0.55	1.743	24
23	Size of the hospital	22	396	−374	0.24	0.516	33
24	Availability of a patient advocate/patient representative	36	298	−262	0.35	1.050	30
25	Cooperation with self-supporting groups	25	264	−239	0.31	0.906	31

(continued)

Table 15.4 (continued)

Nr.	Item	Total counts			Calculated		
		Most	Least	Most—least	Sqrt (most/least)	HB score	Rang HB score
26	Costs (out of pocket) for additional/optional services	57	211	−154	0.52	1.423	28
27	Quality of food	59	225	−166	0.51	1.507	27
28	Hospital facilities	180	28	152	2.54	4.048	11
29	Comfort in patient rooms	73	150	−77	0.70	2.120	21
30	Waiting time until admission	134	111	23	1.10	3.197	16
31	Length of the distances within the hospital	16	420	−404	0.20	0.436	34
32	Cooperation between the hospital and other health service partners	119	133	−14	0.95	2.550	20
33	Time management during the stay	176	122	54	1.20	3.341	15
34	Waiting time during the stay	119	116	3	1.01	2.636	18
35	Sanitation and hygiene	201	10	191	4.48	4.879	5

On the opposite site of the ranking with clearly low priority can be found the attributes *age of physicians, length of the distances within the hospital*, *hospital size* and *efficiency/effectivity* of the hospital.

Second we identified all information items above average mean utility score (2.709) and categorized them according to the quality dimensions by Donabedian in structure, process and outcome quality (Donabedian 1980).

Over all information on structure quality was highly important for the participants (Fig. 15.5). Within all structural items, qualification of physicians and nurses as well as health service characteristics has the highest priority score. Less relevant were comfort attributes, i.e. patient rooms or food quality.

Information on process quality was moderately relevant. The most important here was information about *sanitation and hygiene* followed by *time management during the stay* and *waiting time until admission* (Fig. 15.6).

We analysed also outcome quality preferences and found clear but highly different opinions (Fig. 15.7). Interestingly the respondents prefer strongly objective information, i.e. success rates, accreditation results, information on medical incidents or complication rates to subjective quality indicators. The preference analysis showed clearly if patients have the chance to get these information they are less interested in subjective indicators like results of consumer satisfaction surveys or narrative patient stories. The most relevant attribute within the information on subjective quality was the recommendation rate of GPs.

As mentioned before, we addressed two subgroups of participants—hospital patients and potential patients (normal citizens). In the third step of our investigation, we analysed significant differences with a *t*-test. The comparison is shown in (Table 15.5). We found only a few significant differences between both subgroups

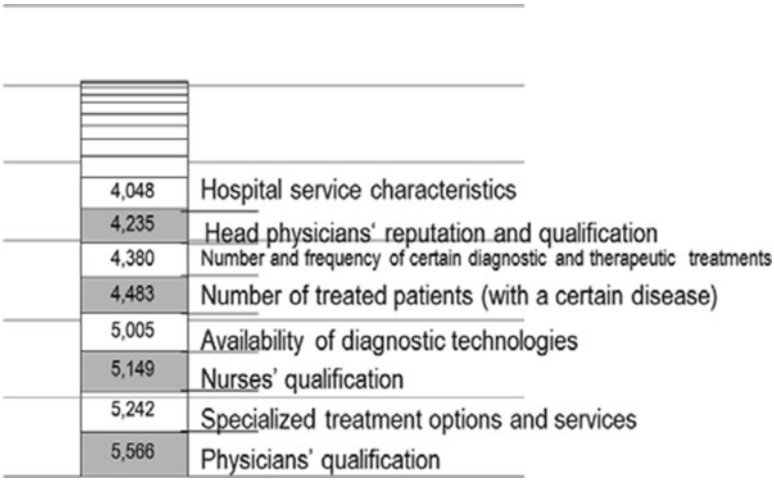

Fig. 15.5 Information preferences on structure quality. HB/utility scores in reverse order

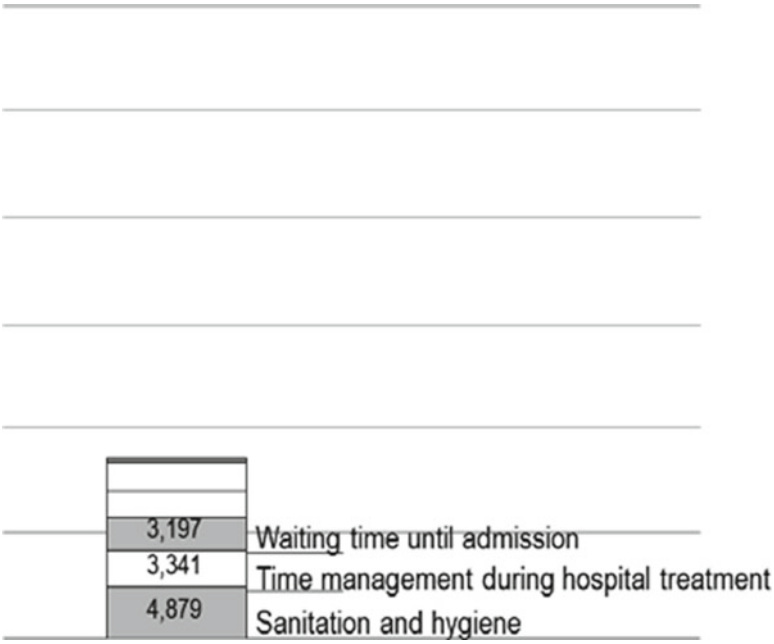

Fig. 15.6 Information preferences on process quality. HB/utility scores in reverse order

(7 of 35 items). Hospital patients prefer significantly more information about the reputation and qualification of the head physician, research activities, time management during the stay, waiting time for admission and the hospital's efficiency and effectivity. Potential patients are more interested in information about patient complaints and the results of quality accreditations.

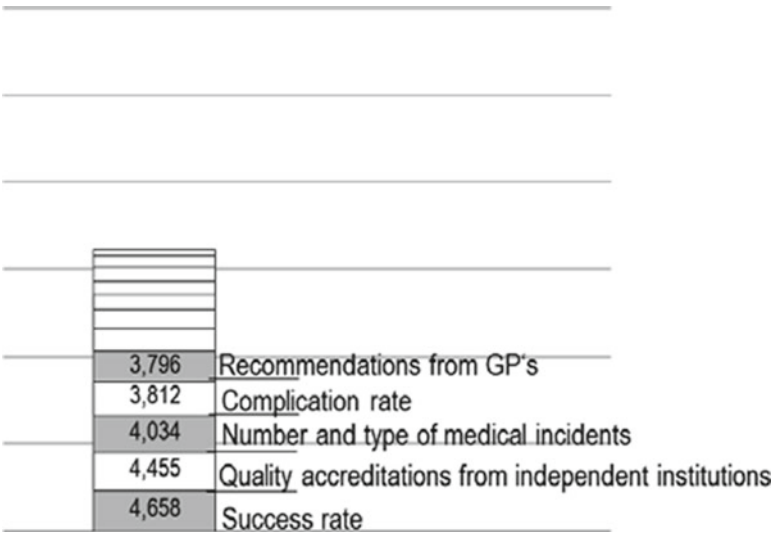

Fig. 15.7 Information preferences on outcome quality. HB/utility scores in reverse order

Table 15.5 Significant differences between the two subgroups of participants

Item nr.	Quality indicator	HB score hospital patients	HB score potential patients	*t*
6	Efficiency/effectivity	1.006	0.658	3.271
10	Number and type of patient complaints	1.653	2.138	−2.600
11	Quality accreditation by independent institutions	4.177	4.726	−3.613
14	Reputation and qualification of the head physician	4.529	3.949	3.242
17	Research activities	3.074	2.412	3.728
33	Time management during the treatment	3.653	3.037	2.913
34	Waiting time for admission to the hospital	3.013	2.267	3.550

In the fourth step of our BWS study, we summarized all most preferred quality information (mean utility score above average 2.709) and ended up with a total of 70 % information preferences on hospital quality:

- Structure quality 38 %
- Process quality 11 %
- Outcome quality 21 %

That means 70 % of patient information preferences could already be meet if the most relevant information for patients would be provided sufficiently.

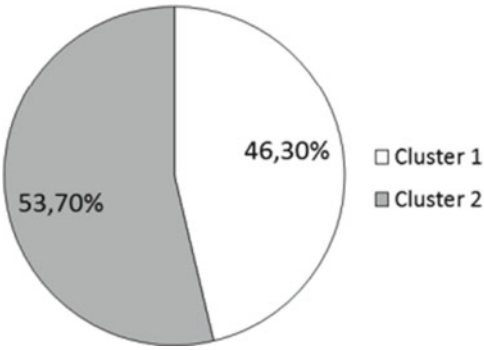

Fig. 15.8 Cluster size

15.6.3.1 Preference-Based Patient Clusters

Data clustering is a method that can group classes of objects with similar characteristics. Clustering is often confused with classification, but there is a major difference between them, namely, when classifying, the objects are assigned to pre-defined classes, whereas in the case of clustering, those classes must be empirically defined too.

The algorithm of the two-step analysis groups the observations in clusters, using the approach criterion. The procedure uses an agglomerative hierarchical clustering method. Compared to classical methods of cluster analysis, the two-step method employed here offers several advantages, i.e. the optimal number of clusters can be determined automatically (based on empirical evidence). Therefore the common practice of a priori defined clusters often related to merely hypothetically content-based grouping can be avoided (Jensen 2008, p. 349ff).

All 35 utility scores (HB estimates) regarding patients' information preferences were included. First, we choose Akaike information criterion (AIC) to determine the number of clusters. The results obtained using Bayesian information criterion (BIC) are not different from those obtained with AIC. No outliners were to handle with.

The lowest AIC coefficient indicated a maximum of six clusters, according to the two-step algorithm, the optimal number of clusters is two, because the largest ratio of distances showed clearly two clusters.

As shown in Fig. 15.8 nearly half of the study population belongs to each of both clusters. Moreover we found significant differences in various information preferences (Fig. 15.9). In cluster one (named by *outcome-orientated patients*) respondents preferred clearly more objective as well as subjective outcome quality indicators, i.e. incident rates, complication rates, unplanned re-admission, patient complaints or results of consumer satisfaction surveys. In contrary participants with higher priority for hospital service and performance attributes, i.e. waiting time until admission, comfort in patient rooms, waiting time during the stay and distance to the hospital were grouped in cluster two (named therefore by *performance-orientated patient type*).

Additionally we used other variables of the questionnaire to describe the two patient clusters further. Outcome-orientated respondents showed significantly less

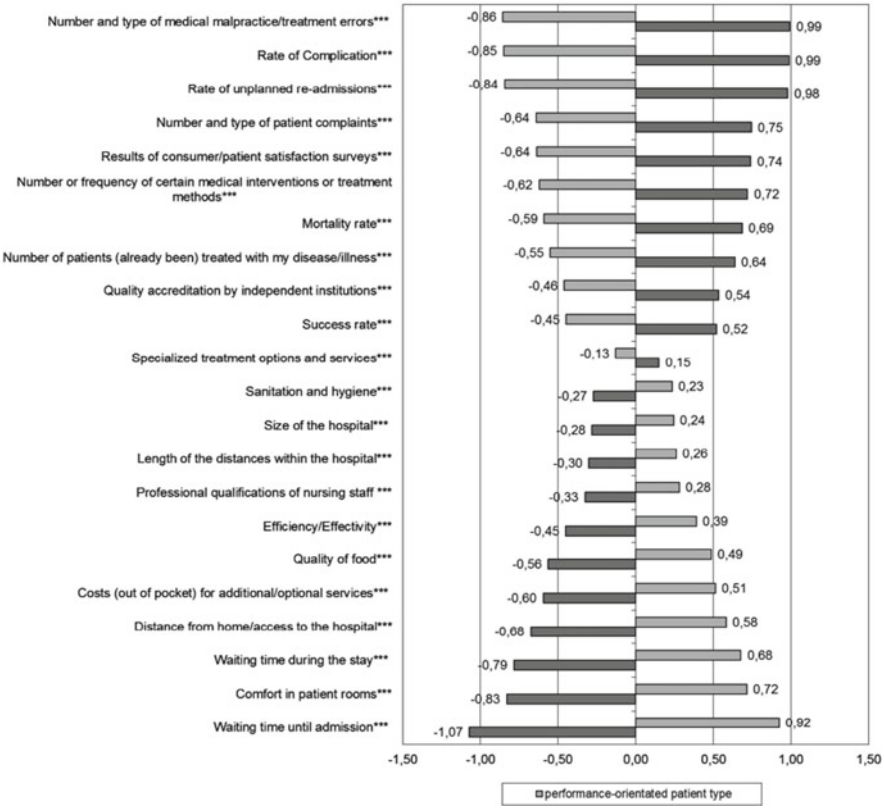

Fig. 15.9 Two-step clustering results—significant preference score differences. ***t-test, Mann–Whitney U-test $p<0.001$

paternalistic preference (e.g. tendency to follow doctor's advice without any questioning) (F 8.504, $p<0.05$) and found current information services on hospital quality less sufficient (F 6.611, $p<0.05$) than performance-orientated participants. Among the cluster one patients' information involvement is even higher (F 18.330, $p<0.001$) as well as the perceived risk of hospital choice (F 5.386, $p<0.05$) compared with the second patient cluster. Outcome-oriented respondents tend to be rather private insured (F 4.870, $p<0.05$) and have a higher social status (F 17.525, $p<0.001$).

15.7 Conclusion

We have presented here the results of the first comprehensive study in the research field of consumers' information needs on hospital quality.

Summarizing, the assessment of information involvement in hospital quality provides important insights into information needs. The analysis shows a high consumer involvement in information regarding hospital quality. Besides the general importance and the need of participation, the need of certainty turned out to be the strongest predictor.

The research also demonstrates how choice-based experiments can be used to provide estimates of the importance of quality information. The BWS task used forced respondents to discriminate between the quality indicators on offer, unlike rating scales. Moreover it turned out to be less cognitively demanding than other choice-based tasks, therefore well applicable on hospital patients.

The empirical results revealed that within 35 attributes/quality indicators, patients rated indicators of structure quality as the most important information. Information about process quality was moderately relevant from the patients' point of view. Objective results of outcome quality were more important for patients than subjective outcome indicators. The cluster analysis showed evidence for two significantly distinguished types of respondents: patients with more interest for information on outcome quality and patients with higher preferences to information on performance quality.

The findings can subsequently be used by patient information services to improve the information supply regarding hospital quality. Current information services on hospital quality, i.e. Internet portals should be tailored. Further, from the perspective of lean thinking the study goes to show how patients perspectives on service quality is also a necessary consideration in trying to examine waste and design and develop appropriate flows of patients and resources so that quality healthcare delivery can ensue.

15.8 Limitations

The present study exhibits some limitations. The cross-sectional design of the study and the relatively small sample size may limit the interpretation of our data. Due to the lack of research on consumers' information needs on hospital quality, further studies should follow based on larger samples. Moreover the information involvement scale as well as the BWS design could also be useful for further investigations on different types of health-related patient information (i.e. information flyer about medication or treatment options as well as information websites). We welcome participatory efforts.

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