International Journal for Quality in Health Care 2002; **Volume 14, Number 5**: 383–391

Assessing the factors influencing continuous quality improvement implementation: experience in Korean hospitals

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Abstract

Objective. To assess the extent of continuous quality improvement (CQI) implementation in Korean hospitals and to identify its influencing factors.

Design. Cross-sectional study by mailed questionnaire survey.

Study participants. One hundred and seventeen staff members with responsibility for CQI at 67 hospitals with ≥ 400 beds.

Main outcome measures. The degree of CQI implementation was measured using the Malcolm Baldrige National Quality Award Criteria (MBNQAC). Factors related to the degree of CQI implementation were the four components of the CQI pyramid, namely the cultural, technical, strategic, and structural attributes of individual hospitals.

Results. The average CQI implementation score across the seven dimensions by MBNQAC was 3.34 on a 5-point scale. The highest score was achieved in the dimension of 'customer satisfaction' (3.88), followed by 'information/analysis' (3.59), and 'quality management' (3.35). Regression analysis showed that hospitals which better fulfilled technical requirements, such as improving information systems ($P < 0.05$), using more scientific CQI tools, and adopting systematic problem-solving approaches ($P < 0.01$), tended to achieve higher degrees of CQI implementation. Although statistically insignificant, positive trends were observed for group/developmental culture and the degree of employee empowerment, and the use of prospective strategy.

Conclusion. It appears that the most important contributing factors to active CQI implementation in Korean hospitals were the use of scientific skills in decision-making and the adoption of a quality information system capable of producing precise and valid information.

Keywords: continuous quality improvement, customer satisfaction, employee empowerment, information system, Malcolm Baldrige National Quality Award Criteria, organizational culture

As competition in the health care market intensifies, health care institutions have tried to improve the efficiency and competitive advantages of their institutions by improving the cost-effectiveness and quality of care. This has resulted in the adoption of total quality management (TQM) and continuous quality improvement (CQI) approaches used by industry [1]. According to a recent investigation, approximately 98% of US hospitals employ TQM/CQI (CQI hereafter) concepts and tools [2].

Compared with other industrialized countries, the history of CQI in the Korean health care market is relatively short. It stems from the mid-1990s when Korean hospitals began to apply the concept of CQI within their organizations in an effort to deal with a rapidly changing market environment, and increasing pressure from patients and the government for a better quality of care. As a consequence of the rapid diffusion of CQI, the proportion of Korean hospitals that have an independent CQI department, charged with the

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development and management of institution-wide CQI programs, reached around 50, 75, and 72% for 400–599, 600–799, and >800 bed hospitals, respectively, in the year 2000 [3].

Despite the worldwide application of CQI, the extent and quality of the CQI programs performed in individual institutions vary considerably. A number of studies have been carried out to explain this variation. Among the most prominent studies were those conducted by Shortell *et al.* [4,5] and Boerstler *et al.* [6], which suggested that authoritative and hierarchical cultures, and top-down management approaches with limited employee empowerment are barriers to the facilitation of CQI. Findings from several other studies revealed that technical skills and the availability of data necessary to understand the complicated process of medical care were important ingredients in the successful implementation of CQI [2,5,7,8]. In addition, structural prerequisites such as infrastructure and human resources were also shown to be important attributes. In a survey of hospital CEOs in the United States and Canada, insufficient CQI skills, poor planning, placing a low strategic priority on CQI, and lack of employee participation were all identified as barriers to the effective implementation of CQI [2].

It should be noted, however, that many of these earlier studies were limited because they were based upon case studies and anecdotal investigations. In addition, most of the enhancing factors evaluated in these studies were those proven in non-health care settings. Thus, we lack empirical evidence on the internal factors of an organization that have proven validity in health care settings. In addition, past approaches used to identify influencing factors were fragmented and few studies presented a comprehensive model to illustrate the dynamics of the factors that contribute to successful CQI implementation. The CQI pyramid suggested by O'Brien *et al.* [9] after a systematic review of previous literature provides a conceptual framework for addressing the organizational facilitators of CQI and helps to overcome the limitation of prior studies by incorporating multi-dimensional organizational factors into a single model. However, the CQI pyramid has not been empirically proven due to the lack of convincing empirical evidence.

As shown in other countries, Korea is also experiencing a wide variation in the degree of CQI implementation among its health care institutions, and there is a need to determine the reasons for this discrepancy. Having achieved a rapid diffusion of CQI over a relatively short period, we feel that it is time to assess systematically the extent of CQI implementation in Korean hospitals, and to identify those organizational factors that affect the facilitation of CQI. Therefore, this study was carried out to assess the status of CQI implementation in Korean hospitals. Furthermore, we investigated organizational factors that influenced the successful implementation of CQI in Korean hospitals using the CQI pyramid concept, in an attempt to examine more comprehensively the dynamics between CQI implementation and its influencing factors. We hope that the factors identified will be of great use to institutions who are developing strategies to improve CQI implementation, and to those institutions in the early stages of CQI introduction. In particular, the experience of Korean hospitals, which have limited experience in using the CQI approach, provides valuable information to those that are planning or starting to adopt CQI into their health care industry.

Methods

Conceptual framework

The framework of this study, designed to assess the factors associated with CQI implementation, was derived from the concept of the CQI pyramid [9]. The CQI pyramid incorporates four dimensions that address organization-wide CQI efforts specifically: cultural, technical, strategic, and structural components. In the following sections, detailed descriptions of each component and the hypotheses for the association between each component and CQI implementation are presented.

Organizational culture. Organizational culture refers to 'the underlying beliefs, values, norms, and behaviors of the organization that either support or serve as a barrier to organization-wide improvement' [10]. It is well known that underlying culture has a strong influence on the productivity and efficiency of an organization [4–6,8,11]. In particular, employee empowerment and autonomy are key cultural factors, which are emphasized when an organization pursues CQI concepts.

According to Quinn and Kimberly, the ethos of a hospital can be classified into four cultural types, which can be group, developmental, rational, or hierarchical in nature [12]. Group culture emphasizes the development of human resources, affiliations, employee empowerment, teamwork, and consensus building. Developmental culture is characterized as one that pursues changes and growth, and one that regards innovative thoughts and prospective strategies as important assets. Organizations with rational cultures are highly performance oriented. The primary emphasis is upon planning, productivity, and efficiency. Finally, in the hierarchical culture, bureaucracy and stability are the underlying forces that move the organization, and compliance with organizational mandates, enforced roles, rules, and regulations are emphasized.

Because the underlying characteristics of both group and developmental cultures are close to the conceptual disciplines of CQI in many respects, we hypothesized that hospitals having greater aspects of group or developmental culture would be more likely to achieve a higher degree of CQI implementation. In addition, it was hypothesized that the degree of CQI implementation would be positively correlated with the extent to which hospitals empowered their employees and allowed them decision-making autonomy.

Technical component. This reflects the abilities of employees to use CQI tools. The sophistication of information systems and the scientific and systematic problem-solving skills that the organization possesses are also important aspects of this component [5]. In addition, the level of process orientation was believed to be a critical element. It was hypothesized

that hospitals supported by greater technical capabilities would tend to perform the activities required by CQI better.

Strategic component. The strategic component indicates the organization's overall strategic direction or behavior [5]. According to strategic type, organizations can be classified into three groups: defenders, analyzers, and prospectors [13]. While defenders maintain existing programs instead of pursuing changes, prospectors respond to environmental changes quickly. Those classified as analyzers have a tendency to make changes only after analyzing the outcomes from other institutions. Based on earlier studies [4,8], which found relationships between strategic type and CQI implementation, we hypothesized that institutions taking the prospective approach were more likely to actively implement CQI than those adopting analytical or defensive strategies.

Structural component. The structural component refers to infra-structural entities supporting CQI activities, for example, coordinating committees, councils, task forces, work groups, and reporting/accountability mechanisms [5]. It is believed that hospitals equipped with a CQI department or staff responsible for CQI find it much easier to conduct CQI activities [14,15]. In addition, allocating an independent budget for CQI activities and running a reward system for excellent CQI performance are all important structural factors.

Study population and data collection

We restricted the study population to large hospitals with $\geq$400 beds because the dissemination of CQI in Korea has been limited to larger hospitals. A total of 108 hospitals were identified to be eligible for the study, which represented approximately 13% of all Korean hospitals. A survey was conducted between 15 September and 30 October 2000 by a mailed questionnaire sent to the directors of CQI departments at each of the hospitals. For hospitals without a CQI department, the person most responsible for CQI activities or in charge of hospital accreditation was chosen. After two reminders to non-respondents, a total of 129 subjects from 79 hospitals completed the questionnaire (response rate 73.1%). After excluding 10 non-CQI hospitals, which informed us that they did not apply CQI concepts or perform any CQI activities, and two hospitals that submitted incomplete answers for key data elements, 117 responses from the remaining 67 hospitals were used in the analysis (effective response rate 62.0%). For hospitals with more than one respondent, we used mean within-hospital responses as the unit of analysis for inter-hospital comparisons.

The average number of beds (550) for non-responding hospitals was significantly smaller than that of the participating hospitals (667; $P<0.05$) (Table 1). Among the responding hospitals, non-CQI hospitals had a smaller number of beds (average 456) than CQI hospitals (697; $P<0.001$). Moreover, a greater proportion of the CQI hospitals (50.7%) had teaching status than non-CQI hospitals (40.0%) or non-responding hospitals (31.0%) (Table 2). There was no significant difference between CQI hospitals (44.9%) and non-CQI hospitals (30.3%) in terms of the proportion of urban hospitals. The proportion of public hospitals was similar for both the CQI hospitals (4.3%) and non-responding hospitals (3.4%), whereas non-CQI hospitals contained a higher proportion (10%) of the public hospitals.

Survey questionnaire

The questionnaire was divided into two sections. In the first section, we measured the degree of CQI implementation in each organization, and the second section comprised four subsections, each of which included questions about the extent to which the organization fulfilled each of the four components of the CQI pyramid.

Degree of CQI implementation. In the present study, the degree of CQI implementation was defined as the extent to which the institution employs the CQI concept and tools in its management protocol. It was measured using the Malcolm Baldrige National Quality Award Criteria (MBNQAC), as developed by the United States Chamber of Commerce in 1993, and modified by Shortell and co-workers for health care institutions [4,16]. The MBNQAC is composed of seven dimensions and 58 question items. The seven dimensions are: leadership, strategic quality planning, customer satisfaction, information and analysis, human resources management, quality management, and organizational performance results.

A pilot test was performed with an expert panel consisting of the directors from quality improvement departments of selected hospitals. We excluded the 15 items, which panel members agreed were irrelevant to the circumstances of Korean hospitals or which showed low internal consistency by Cronbach's alpha. As a result, the remaining 43 items were included in the study. For each question, the respondents rated their hospitals on a 5-point scale, where 1 referred to strong disagreement, 3 to neutral, and 5 to strong agreement.

Four components of the CQI pyramid. These comprise: (1) organizational culture; (2) technical component; (3) strategic component; and (4) structural component.

(1) Organizational culture. To define the type of culture that dominates in individual hospitals, we used the survey instrument developed by Zammuto and Krakower, which was derived from Quinn and Kimberly's competing value models [4,12,17]. The instrument is composed of 20 questions divided into five dimensions: institutional character, leader, cohesion, main concern of organization, and reward system. Each dimension is composed of four questions and each question describes characteristics of the dimension for each of the four cultural types: group, developmental, rational, and hierarchical culture.

In general, each organization has mixed characteristics of the four cultural types with varying degrees of emphasis, so it is unrealistic to fit an organization into only one of the four cultural types. Thus, instead of choosing one cultural type, respondents were asked to distribute 100 points among the four descriptions for each cultural type on the basis of the extent to which the description matched with the culture of their institutions. To test the hypothesis that hospitals with more group or developmental culture are more likely to achieve a higher degree of CQI implementation, the mean value of the combined points assigned to group and

Table 1 Average bed number in the hospitals surveyed

	Responding hospitals			Non-responding hospitals
	CQI hospitals	Non-CQI hospitals	Mean	
	697 ± 319[1]	456 ± 418[1]	667 ± 313[2]	550 ± 169[2]
Total	69	10	79	29

Non-CQI hospitals, hospitals responding that they do not apply CQI concepts or perform any CQI activities; CQI hospitals, the rest of the responding hospitals.
[1]$P<0.001$ (mean difference between CQI and non-CQI hospitals); [2]$P<0.05$ (mean difference between responding and non-responding hospitals).

Table 2 Baseline characteristics of the hospitals surveyed

Characteristics	Responding hospitals			Non-responding hospitals ($N=29$)
	CQI hospitals[1] ($N=69$) *N* (%)	Non-CQI hospitals ($N=10$) *N* (%)	Mean ($N=79$) *N* (%)	*N* (%)
Teaching hospital	35 (50.7)	4 (40.0)	39 (49.4)	9 (31.0)
Urban hospital[2]	31 (44.9)	3 (30.3)	34 (43.0)	15 (51.7)
Public hospital	3 (4.3)	1 (10.0)	4 (5.0)	1 (3.4)

[1]Non-CQI hospitals, hospitals responding that they do not apply CQI concepts or perform any CQI activities; CQI hospitals, the rest of the responding hospitals.
[2]Urban hospitals, hospitals located in areas with population ≥ 3 million.

developmental culture was computed. Hospitals were then classified into two groups: those showing a mean value of at least 50 points and those with a mean value of <50 points. The first group was classified as having a predominantly group or developmental culture in their organizations.

In addition, to measure the level of employee empowerment, respondents rated their institutions on a 5-point scale: a hospital allowing its employees a substantial degree of delegating power was awarded 5, a neutral degree of delegating power 3, and minimal delegating power 1.

(2) Technical component. The technical abilities of the organization were measured using four dimensions: (1) whether or not CQI training programs were provided to employees; (2) the number of major work units, from a total of eight, in Korean hospitals (business management, patient affairs, outpatient care, in-patient care, human resources management, financing and accounting, purchasing and inventory control, and laboratory tests), which were equipped with a computer-based automated system (i.e. the degree of implementation of organization-wide information systems); (3) rating their institutions on a 5-point scale, according to the extent to which they are process- and system-oriented; and (4) assigning a 5-point scale to their institutions on the basis of the degree to which they used scientific measurements and systematic approaches to problem solving.

(3) Strategic component. Types of strategic approaches that the institution usually employs to respond to changes in the external environment were evaluated using three strategic approaches, as suggested by Miles and Snow [13]. The survey asked the respondents to select one of the three approaches that best described their hospital's usual response.

(4) Structural component. To assess the degree of infrastructural entities in place to carry out CQI programs, the survey determined: (1) whether the hospital had an independent CQI department; (2) whether the hospital allocated an independent budget for CQI; and (3) the number of full-time employees working in the CQI department.

Data analysis

In order to examine the degree of CQI implementation among the participating hospitals, the mean score across the seven dimensions of MBNQAC was computed. The level of internal consistency reliability was evaluated for the question items belonging to each of the seven dimensions and was found to be satisfactory by the Cronbach test ($\alpha = 0.75$–0.93).

To examine whether there were significant differences between CQI implementation scores of the hospitals with different cultural, technical, strategic, or structural characteristics, *t*-tests and analysis of variance (ANOVA) were performed for each characteristic. Controlling for hospital bed number, four reduced regression models were performed with cultural, technical, strategic, or structural factors as predictors, respectively. The dependent variable for each model was defined as the average score across the seven dimensions of MBNQAC. Finally, a full regression model

Table 3 CQI implementation scores using Malcolm Baldridge National Quality Award Criteria

Dimension (No. of question items)	CQI implementation score[1]				
	Hospital bed number			Mean	*F* value
	400–599 ($n = 31$)	600–799 ($n = 15$)	≥800 ($n = 21$)		
Leadership (10)	3.13 ± 0.67	3.12 ± 0.62	3.30 ± 0.78	3.20 ± 0.69	0.37
Strategic quality planning (5)	3.01 ± 0.49	3.13 ± 0.61	3.19 ± 0.71	3.10 ± 0.59	0.56
Customer satisfaction (6)	3.77 ± 0.62	4.06 ± 0.52	3.90 ± 0.56	3.88 ± 0.58	1.23
Information and analysis (5)	3.38 ± 0.54	3.70 ± 0.59	3.81 ± 0.62	3.59 ± 0.60	3.81[2]
Human resources management (5)	2.94 ± 0.51	3.22 ± 0.60	3.19 ± 0.66	3.08 ± 0.58	1.74
Quality management (5)	3.27 ± 0.63	3.30 ± 0.61	3.51 ± 0.65	3.35 ± 0.63	0.95
Performance results (7)	3.07 ± 0.57	3.24 ± 0.68	3.37 ± 0.68	3.20 ± 0.63	1.40
Mean[3]	3.23 ± 0.46	3.40 ± 0.48	3.47 ± 0.57	3.34 ± 0.50	1.58

[1]Continuous quality improvement (CQI) implementation scores were computed for each of the seven dimensions of the Malcolm Baldridge National Quality Award Criteria by calculating the average for the respondents' rating of their hospitals on a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).
[2]$P < 0.05$.
[3]Mean scores across the seven dimensions.

was performed incorporating all the predictors from the four reduced models, in order to examine the independent associations between each of these factors and the degree of CQI implementation.

Results

Degree of CQI implementation

The average score across the seven dimensions of MBNQAC (CQI implementation score, hereafter) was computed to be 3.34, which is within the range of 'neutral' to 'agree' (Table 3). Of the seven dimensions, 'customer satisfaction' achieved the highest score (3.88 ± 0.58), followed by 'information and analysis' (3.59 ± 0.60), and 'quality management' (3.35 ± 0.63). Although statistically insignificant, it was observed that the CQI implementation score was higher throughout the seven dimensions as the size of the hospital increased, indicating that larger hospitals tend to carry out CQI activities more successfully than smaller ones.

Association between the degree of CQI implementation and the four components of CQI pyramid

As shown in Table 4, approximately 28.4% of the participating hospitals were classified as having a stronger disposition of group/developmental culture and showed a higher degree of CQI implementation (score = 3.53) than those having a weaker disposition (3.27) ($P = 0.0474$). Hospitals with the greatest emphasis on employee empowerment achieved a higher implementation score (3.75) than those with medium (3.25) and low degrees of empowerment (2.98) ($P = 0.0001$).

The factors that described the degree of technical ability to perform a CQI program, with the exception of the presence of a CQI training program, significantly affected the degree of CQI implementation ($P < 0.01$) (Table 5). CQI was adopted more actively by hospitals with a better information system, and those that were more process oriented and used more scientific means and systematic problem-solving skills.

Hospitals taking a prospective approach to determine their primary strategic orientation (3.70) tended to conduct CQI more actively than those taking an analytical (3.22) or defensive approach (3.30; $P = 0.0143$) (Table 6). Finally, all three structural factors, namely the presence of a CQI department and full-time CQI staff, and the allocation of an independent budget to CQI programs, had significant effects on CQI implementation ($P < 0.01$) (Table 7).

Of the four reduced regression models (i.e. models 1–4 in Table 8) that were analyzed with cultural, technical, strategic, or structural factors as predictors, respectively, model 2 (with a set of technical factors as predictors) had greatest explanatory power (adjusted $R^2 = 57.35$). On the other hand, model 3, which analyzed relationships with strategic factors, had an adjusted R^2 value of only 7.84%. With the exception of some of the structural factors, the overall statistical significance and direction of the association between the degree of CQI implementation and each component of the CQI pyramid remained the same after adjusting for hospital bed number in each of the above models.

The results of the full regression model show that hospitals with better information systems ($P < 0.05$) and those using a scientific and systematic problem-solving approach ($P < 0.01$) tended to show higher degrees of CQI implementation. While statistically insignificant, positive associations were observed for group or developmental culture, the degree of employee empowerment, the use of a prospective strategy and the structural support.

Table 4 Hospitals' cultural characteristics and CQI implementation scores

Cultural characteristics	*n* (%)	Mean score[1] (SD)	*t*- or *F*-value	*P* value
Group/developmental culture score				
<50	48 (71.6)	3.26 (0.48)	− 2.02	0.0474
≥ 50	19 (28.4)	3.53 (0.53)		
Degree of employee empowerment				
Low	15 (22.4)	2.98 (0.28)	15.98	0.0001
Medium	32 (47.8)	3.25 (0.33)		
High	20 (29.8)	3.75 (0.59)		

Low, strongly disagree or disagree; Medium, neither agree nor disagree; High, agree or strongly agree.
[1]Mean continuous quality improvement (CQI) implementation score is an average score across the seven scales of MBNQAC on a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

Table 5 Hospitals' technical capabilities and CQI implementation scores

Technical capabilities	*n* (%)	Mean score[1] (SD)	*t*- or *F*-value	*P* value
Offers CQI training program				
No	3 (4.5)	3.09 (0.17)	0.88	0.3802
Yes	64 (95.5)	3.35 (0.51)		
Sophistication of information system				
Low[2]	7 (10.4)	3.00 (0.37)	5.74	0.0051
Medium[2]	18 (26.9)	3.13 (0.45)		
High[2]	42 (62.7)	3.49 (0.49)		
Degree of process- and system-focus				
Low[3]	3 (4.5)	3.11 (0.42)	9.07	0.0003
Medium[3]	15 (22.4)	2.93 (0.30)		
High[3]	49 (73.1)	3.48 (0.49)		
Usage of scientific/systematic problem-solving approaches				
Low[3]	9 (13.4)	2.82 (0.41)	27.29	0.0001
Medium[3]	29 (43.3)	3.13 (0.30)		
High[3]	29 (43.3)	3.71 (0.43)		

[1]Mean CQI implementation score is an average score across the seven scales of MBNQAC on a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).
[2]Korean hospitals are divided into eight major work units. Scoring for this variable was based on the number of units equipped with a computer-based automated system and was ranked as follows: Low = ≤ 4 equipped units; Medium = 5–7 equipped units; High = all 8 units equipped.
[3]Low = strongly disagree or disagree; Medium = neither agree nor disagree; High = agree or strongly agree.

Table 6 Hospitals' strategic approach to change and CQI implementation scores

Approach type	*n* (%)	Mean score[1] (SD)	*F* value	*P* value
Defender	17 (25.4)	3.30 (0.47)	4.54	0.0143
Analyzer	36 (53.7)	3.22 (0.50)		
Prospector	14 (21.0)	3.70 (0.41)		

[1]Mean CQI implementation score is an average score across the seven scales of MBNQAC on a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

Discussion

We examined the overall status of CQI implementation in Korean hospitals with ≥ 400 beds, and determined which organizational attributes played a critical role in facilitating or preventing the establishment of the CQI approach in individual hospitals. We also attempted to prove empirically the concept of the CQI pyramid, which is a theoretical framework suggested by O'Brien *et al.* to describe facilitators or inhibitors of CQI implementation [9].

The mean score computed across the seven dimensions of MBNQAC was 3.34 ± 0.50, which is very close to the score achieved by US hospitals (3.33 ± 0.15), which was calculated for a sample of 61 hospitals with an average bed number of 223 [4]. The mean scores for each of the seven

Table 7 Hospitals' structural support and CQI implementation scores

Structural support	*n* (%)	Mean score[1] (SD)	*t* value	*P* value
CQI department				
No	25 (37.3)	3.12 (0.46)	− 3.01	0.0040
Yes	42 (62.7)	3.47 (0.48)		
Full-time CQI staff				
No	23 (34.3)	3.07 (0.32)	− 4.03	0.0002
Yes	44 (65.7)	3.48 (0.53)		
Budget for CQI				
No	39 (58.2)	3.16 (0.39)	− 3.77	0.0004
Yes	28 (41.8)	3.59 (0.54)		

[1]Mean CQI implementation score is an average score across the seven dimensions of MBNQAC on a 5-point scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree).

dimensions ranged from 3.08 to 3.88, all of which fit into the neutral (3) to slightly agree (4) response categories, suggesting ample room for improvement.

According to the regression results of the full model, the technical component of the CQI pyramid was found to have the strongest impact on the facilitation of CQI among Korean hospitals. In particular, the level of sophistication of the information system (i.e. automated computing system) and of the analytical scientific skill and the systematic approach used in the problem-solving process were the most significant predictors of CQI implementation score. This finding is in agreement with a previous finding that the lack of an adequate information system and inadequate level of the technical skills required for CQI served as barriers against the implementation of CQI in a health care area [18]. Thus, our findings confirm that relevant scientific analytical skills and the establishment of a quality information system capable of managing valid data are key success factors for CQI implementation.

In contrast to the finding of a previous study [4], the organization's overall strategic type was not found to be significantly related to CQI implementation in our study. This is probably because the initiation of CQI in Korea is more driven by external pressures, such as the need to meet the requirements of the Hospital Standards Accreditation program and the government's Hospitals Services Evaluation program than by any internal strategic management need. Thus, for many Korean hospitals, CQI was not initiated within the framework of strategic management requirement, and the relationship between CQI and hospital management strategies was limited.

Structural factors were not significantly associated with the CQI implementation score for the participating hospitals. This may be because structural elements have an indirect impact on CQI implementation, and serve as supporting roles that enable the organization to fulfill its cultural, technical, and strategic requirements.

Although the basic framework of this study is very similar to that of the study by Shortell *et al.* [4], the results of our study showed a slight difference. For example, in Korean hospitals, the presence of a group/developmental culture and the degree of employee empowerment did not play a significant role in facilitating CQI implementation. At least three hypotheses arise to explain the difference in the results of the two studies. Firstly, the difference could result from the fact that Shortell's investigation did not include the additional covariates that are included in the current study. For instance, cultural variables were significant predictors in the current study in model 1, but their impacts were much weakened by the introduction of the additional variables in the 'full' model.

Secondly, while Shortell *et al.* used only those dimensions that were coherent under factor analysis, dropping the customer satisfaction and performance results scales, the present study used all the seven components of MBNQAC to measure the degree of CQI implementation. To examine how sensitive our study results are to dropping the two components, we re-analyzed the regression models using only five components of MBNQAC and compared the study results. Overall, the explanatory power of each model (model 1 to the 'full' model), measured by adjusted R^2, was not significantly changed, and the directions of the relationship between the dependent variable and each explanatory variable remained the same. However, there was a noticeable change in the new analysis results so that the variable of 'empowerment' became statistically significant in the 'full' model.

Thirdly, dropping the 15 questions from the original MBNQAC in this study could be another explanation for the different study results. Finally, it is possible that the different results are simply due to differences between Korean and US hospitals.

Several limitations of this study must be mentioned. Firstly, this study is based on a cross-sectional design, and both the influencing factors and degree of CQI implementation were evaluated concurrently. Thus, the causal relationship between the influencing factors and the degree of CQI implementation addressed in this study needs to be studied further. Secondly, individual hospitals were evaluated on the basis of the responses from only one or a small number of persons responsible for CQI within their organizations, and, therefore, the degree to which this survey accurately represents the real situation in individual hospitals is limited. In addition, certain

Table 8 Regression results on the CQI implementation scores and associated factors

	Model 1		Model 2		Model 3		Model 4		Full model	
Variables	β(S.E.)	T	β(S.E.)	T	β(S.E.)	T	β(S.E.)	T	β(S.E.)	T
Cultural factors										
Group/developmental culture score	0.15 (0.11)	1.29[1]							0.04 (0.10)	0.44
Empowerment	0.35 (0.06)	6.21[2]							0.07 (0.07)	1.03
Technical factors										
CQI training										
No										
Yes			−0.34 (024)	−1.43					−0.24 (0.25)	−0.97
Information system			0.05 (0.02)	2.50[1]					0.04 (0.02)	2.24[1]
Process-dominant			0.16 (0.08)	2.04[1]					0.10 (0.08)	1.20
Scientific/systematic approach			0.35 (0.06)	5.43[2]					0.28 (0.07)	4.03[2]
Strategic approach										
Defender										
Analyzer					−0.07 (0.14)	−0.45			−0.04 (0.10)	−0.41
Prospector					0.38 (0.18)	2.06[1]			0.20 (0.14)	1.43
Structural factors										
CQI department										
No										
Yes							0.07 (0.11)	0.61	0.02 (0.10)	0.19
Full-time CQI staffs										
No										
Yes							0.28 (0.11)	2.45[1]	0.04 (0.06)	0.66
Budget to CQI										
No										
Yes							0.00007 (0.0003)	2.25[1]	0.00001 (0.0003)	0.31
Adjusted R^2 (%)	39.81		57.35		7.84		17.66		59.51	
F value	15.11		18.21		2.82		4.43		8.84	
P value	0.0001		0.0001		0.0465		0.0033		0.0001	

[1]$P<0.05$, [2]$P<0.01$. All the regression models (model 1 to the 'full' model) were adjusted for hospital bed number.

questions included in the survey required subjective judgments to be made, or relied upon the perceived values of the individual respondents, and, therefore, there is a risk that the answers do not correctly reflect the reality. However, because the individuals chosen were considered to have expert knowledge of the situations within their organizations with respect to CQI, these individuals were undoubtedly the most appropriate choice for the purpose of this survey.

In summary, this study enabled us to assess systematically the implementation status of CQI in Korean hospitals, which have a relatively short experience of CQI concepts and are in the process of undergoing many organizational changes subsequent to the adoption of CQI. The major findings of this study confirm that the use of scientific CQI techniques and quality information systems are the most critical elements that help the organization perform active CQI implementation, although structural support and an organizational culture that is compatible with CQI philosophy also play an important role. It is hoped that this study will make a significant contribution to the accumulating scientific evidence on the identification of organizational factors associated with the facilitation of CQI in the health care setting.

Acknowledgements

The research upon which this article is based was supported by the Korean Society of Quality Assurance in Health Care.

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Accepted for publication 31 May 2002