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Original Research Article

Collaborative Quality Improvement to Manage Pain in Acute Care Hospitals

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Abstract

Objective. Collaborative quality improvement programs have been successfully used to manage chronic diseases in adults and acute lung complications in premature infants. Their effectiveness to improve pain management in acute care hospitals is currently unknown. The purpose of this study was to determine whether a collaborative quality improvement program implemented at hospital level could improve pain management and overall pain relief.

Design. To assess the effectiveness of the program, we performed a before-after trial comparing patient's self-reported pain management and experience before and after program implementation. We included all adult patients hospitalized for more than 24 hours and discharged either to their home or to a nursing facility, between March 1, 2001 and March 31, 2001 (before program implementation) and between September 15, 2005 and October 15, 2005 (after program implementation).

Setting. A teaching hospital of 2,096 beds in Geneva, Switzerland.

Patients. All adult patients hospitalized for more than 24 hours and discharged between 1 to 31 March 2001 (before program) and 15 September to 15 October 2005 (after program implementation).

Interventions. Implementation of a collaborative quality improvement program using multifaceted interventions (staff education, opinion leaders, patient education, audit, and feedback) to improve pain management at hospital level.

Outcome Measures. Patient-reported pain experience, pain management, and overall hospital experience based on the Picker Patient Experience questionnaire, perceived health (SF-36 Health survey).

Results. After implementation of the program only 2.3% of the patients reported having no pain relief during their hospital stay (vs 4.5% in 2001, $P = 0.05$). Among nonsurgical patients, improvements were observed for pain assessment (42.3% vs 27.9% of the patients had pain intensity measured with a visual analog scale, $P = 0.012$), pain management (staff did everything they could to help in 78.9% vs 67.9% of cases $P = 0.003$), and pain relief (70.4% vs 57.3% of patients reported full pain relief $P = 0.008$). In surgical patients, pain assessment also improved (53.7.3% vs 37.6%) as well as pain treatment. More patients received treatments to relieve pain regularly or intermittently after program implementation (95.1% vs 91.9% $P = 0.046$).

Conclusion. Implementation of a collaborative quality improvement program at hospital level improved both pain management and pain relief in

patients. Further studies are needed to determine the overall cost-effectiveness of such programs.

Key Words. Acute Pain; Analgesic; Organizational Function; Pain Management; Quality of Health Care

Introduction

The prevalence of pain among hospitalized patients ranges from 38% to 77% [1–3]. Pain in hospitalized patients is a significant source of dissatisfaction and interferes with normal activities and interpersonal relationships. It is associated with an increase in respiratory complications [4].

Numerous strategies have been used to improve pain management in hospitals. These include the distribution of educational material and guidelines to both staff members and patients, the use of clinical opinion leaders, formal audit and feedback, the development of computerized reminders and the implementation of formal in-hospital pain speciality consultations [5]. Both guidelines and educational material have been shown to improve staff knowledge and attitudes [6,7], but their impact on patients' outcomes is unknown [8]. Formal audit and feedback techniques improve pain management during the postoperative period, but appear ineffective in cancer patients [9–11]. Opinion leaders also have mixed effects on patients' pain management [12]. Computer-based decision support system seems to have a beneficial impact on physicians' prescribing practices and pain level documentation [13,14]. However, whether such improvements translate into better patient outcomes has not been demonstrated [15]. Pain speciality consultations have demonstrated benefits on patients outcomes, particularly on pain relief [16–18], but their cost-effectiveness needs still to be established [19].

Quality improvement collaboratives offer promising perspectives as a new method to enhance pain management at an institutional level. These are collaborative networks of multidisciplinary teams from various healthcare departments (or organizations) who share knowledge and experiences to work in a structured way to improve quality of care in specific areas [20]. Such collaboratives have been used successfully to improve the care of patients with chronic disease as well as the care of neonates [21–24]. They were also successfully used in nursing homes to improve overall pain management [25]. However, their effectiveness in more complex hospital settings is currently unknown. The purpose of this study was to assess the effectiveness of a collaborative quality improvement program aimed at improving overall pain detection and treatment relief in a teaching acute care hospital.

Methods

Setting and Program Description

The University Hospitals of Geneva (Switzerland) is a tertiary teaching hospital network of 2,096 beds with all types of specialties including geriatric, psychiatric and rehabilitation facilities.

We developed between 2002 and 2003 a collaborative quality improvement program aimed at improving overall pain assessment, management and relief. The program was designed to create synergies between departments and health care professionals while taking into account specificities of patients and medical/surgical specialties.

The collaborative quality improvement program was implemented in each of the eleven hospital departments. The core level included physicians, nurses and occupational therapists integrated into *departmental pain sections*. The second level was the *pain committee* which integrated two representatives (usually one physician and a nurse) of each department and specialists from the pain consultation service. The third level was the *coordination office* made of four representatives (physician, nurse, project manager, and administrator). The coordination office referred directly to the medical and nursing directorates of the hospitals for strategic decisions. The program also interacted with external partners of the network such as home care, multidisciplinary pain centre, palliative care units, hospital continuous education services. All other aspects were managed at the departmental level, the pain committee and coordination office playing, respectively, the role of scientific advisors and strategic managers (Figure 1).

The program used multifaceted interventions which included staff education, opinion leaders (physicians or nurses with a special interest and training in pain management, patient education as well as audit and feedback. It implemented in all departments: 1) validated pain measurement tools with instructions for use, 2) guidelines and information documents on pain diagnosis and treatment, 3) standards for the use of patient-controlled analgesia (PCA), 4) information leaflets for patients about pain and current available treatments, 5) staff education on pain and pain management in the hospital learning center, and 6) public lectures and an information desk for patients and visitors during the launch days of the annual campaigns of the International Association for the Study of Pain. Every 12 months, departmental representatives had to refer to the coordination office to discuss implemented initiatives and interventions at departmental level. Structured feedback on strengths and weaknesses of their management concept were also discussed.

Study Design and Selection of Participant

Before the beginning of the study we contacted the Geneva Hospital Ethics committee and as the overall project was defined as a quality-improvement activity with minimal risks to participants, the overall study was authorized by the Institutional Ethics committee without the request of a formal review submission. To assess the effectiveness of the program, we performed a before-after trial comparing patient's self-reported pain management and experience

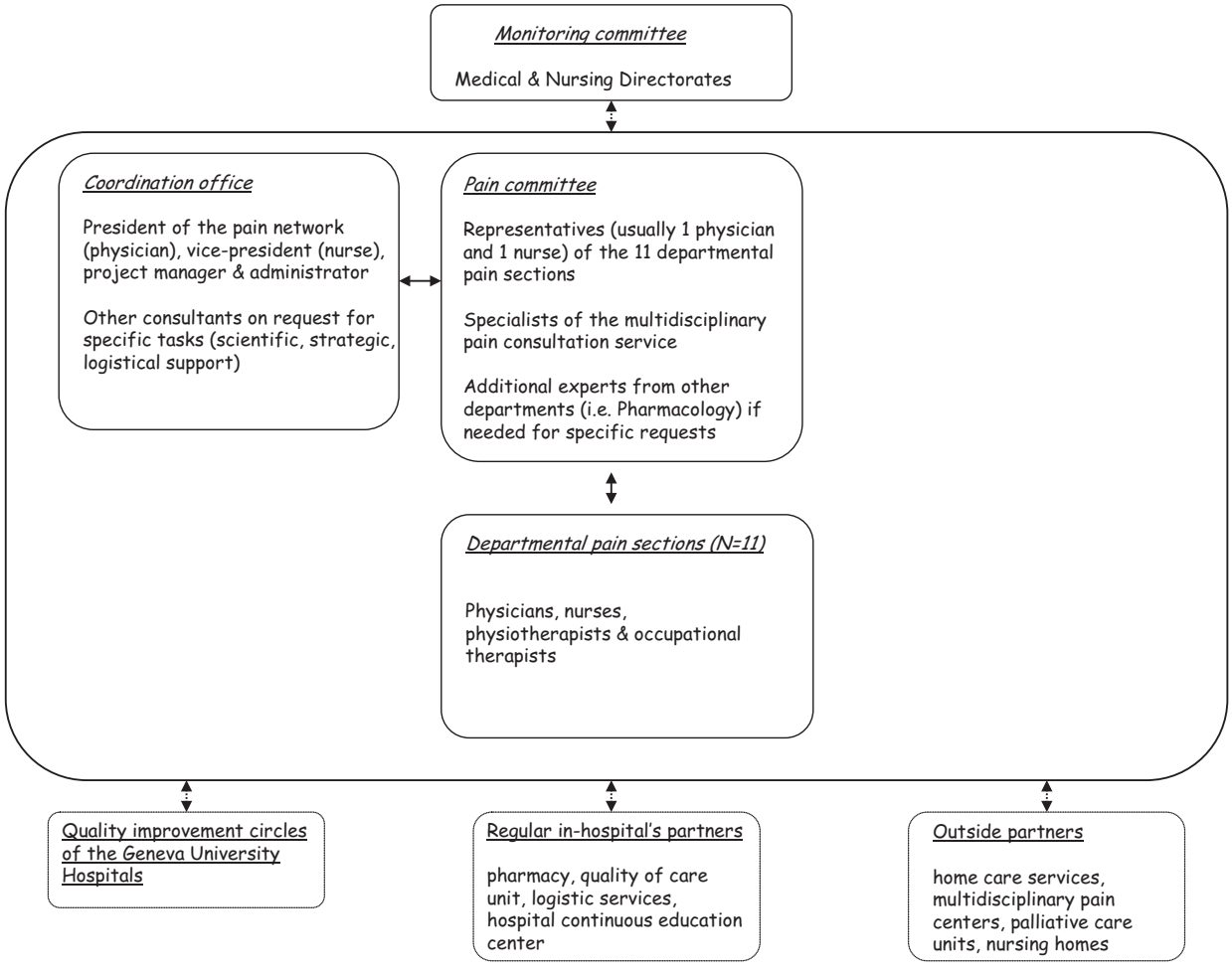

Figure 1 Structure of the pain collaborative quality improvement network.

before and after program implementation. We included all adult patients hospitalized for more than 24 hours and discharged either to their home or to a nursing facility, between March 1, 2001 and March 31, 2001 (before program implementation) and between September 15, 2005 and October 15, 2005 (after program implementation). Patients were identified through the hospital administrative database and part of a larger routine assessment of patient satisfaction. We excluded all patients who had left the city, died or were too sick to complete a study questionnaire or who did not speak French.

Method of Measurement and Data Collection

We used the 40-item Picker Patient Experience questionnaire (PPE-40) to measure nine specific aspects of in-hospital patient experience: emotional support, respect for patient preferences, involvement of family and friends, information and education, information specific to surgery, continuity and transition, coordination of care, physical comfort and overall impression. The physical comfort dimension of the PPE-40 includes three items assessing pain experience: [1] waiting time before the requested pain medication was brought to the patient [2] having received enough pain medication, and [3] overall impression that the staff did everything they could to control pain.

We added to the original questionnaires selected items of the SF-36 Health Survey (perceived general health; feeling downhearted and blue) and seven items to elicit patient feedback regarding pain experience and management and to monitor the performance of the quality improvement program.

Patient demographic characteristics (age, sex, nationality) and information on hospital departments and patients stay were also collected through additional questions added to the survey and from the hospital administrative database. Paper-based questionnaires were sent by mail four to eight weeks after discharge, with up to two reminders sent during the next following three months.

Data Analysis

As recommended by the developers of the PPE-40 questionnaire we coded each item dichotomously to indicate the presence or absence of a problem [26]. A summary problem score for each of the dimension was also created with a range from 0 (no reported problems) to 100 (all items reported as problems). Other items (SF-36 Health Survey and seven items questionnaire) were analyzed individually as categorical variables [27]. Patients from the department of geriatrics (N = 74) and gynecology–obstetrics (N = 524) were excluded from the analysis because of sampling issues at the time of data collection in 2005 in these departments.

For descriptive analyses of participants' characteristics and responses to the SF-36, seven items and Picker questionnaire, we used percents and mean score with 95% CI for summary problem scores. Before-and-after comparisons for pain perception, overall management (seven items questionnaire) and in-hospital patient experience (PPE-40) including pain and other physical comfort items, were performed with the chi-square test and binary logistic regression. As acute post-operative pain experience differs from other kinds of pain, analyses were stratified accordingly and all patients reporting a surgical intervention during their hospital stay were analyzed separately.

To ensure that patient's characteristics did not differ before and after program implementation we also compared demographic characteristics and health status. All statistical tests were two-sided, with a significance level of 0.05. We performed all analyses using the Statistical Package for Social Sciences (SPSS-Version 17.0.1, SPSS Inc, Chicago, IL).

Results

Patient Characteristics

In 2001, 2,156 patients received a questionnaire by mail and 2,204 in 2005. Participation rates were 70% in 2001 and 65% in 2005. We identified 58% of patients who had undergone a surgical procedure. There was no difference in patients' self-reported health status and socio-demographic characteristics before and after program implementation (Table 1). Only the proportion of patients hospitalized in the department of surgery differed between the two periods (44% in 2001 vs 38% in 2005, $P = 0.017$). However, this did not impact on overall analysis.

Pain Intensity and Management Before and After Program Implementation

On average, two thirds of patients experienced pain during their hospital stay (67.3% in 2001 and 63.8% in 2005, $P = 0.077$). The prevalence of pain experience was higher if patients had undergone surgery than if they had not, for both years (75.6% vs 53.1% in 2001; 71.7% vs 48.9% in 2005).

Table 1 Comparison of patients' characteristics before (2001) and after (2005) the implementation of a multimodal hospital program

	2001 % (N = 1,237)	2005 % (N = 1,113)	*P* value
Sex			0.918
Female	48.1	47.9	
Male	51.9	52.1	
Age			0.294
18–44 years	23.4	25.7	
45–64 years	33.1	33.8	
>65 years	43.4	40.5	
Nationality			0.149
Swiss	58.0	54.9	
Other	42.0	45.1	
Perceived health status			0.352
Excellent or Very Good	21.3	23.9	
Good	48.9	47.4	
Fair or Poor	29.8	28.7	
Felt downhearted and blue in past 4 weeks			0.961
Seldom/Never	46.5	46.6	
All of -/Most of -/ Some of the time	53.5	53.4	
Medical Department			**0.017**
Internal medicine	32.8	29.6	
Surgery	37.8	44.0	
Psychiatry	8.1	6.6	
Neurosciences	21.3	19.9	

After implementation of the program, a statistically significant improvement in self-reported pain level and pain management were observed (Table 2). Only 2.3% of the patients reported no pain relief during their hospital stay after program implementation compared to 4.6% before program implementation ($P = 0.05$). Overall pain management improved significantly as patients reported that their pain intensity was more regularly assessed ([63.8% vs 58.3%], $P = 0.012$), pain assessment tools were more often used ([50% vs 35%], $P < 0.001$) and that staff did everything they could to help more often after than before program implementation ([81.9% vs 76.5%]), $P = 0.020$.

In the stratified analysis, we found that these improvements were more important for respondents who did not undergo surgery (Table 3). These improvements were related in nonsurgical patients to both pain treatment (90.1% in 2005 vs 84.3% in 2001 received enough pain killers) and to the regular use of pain assessment tools (42.3% vs 27.9% regularly assessed). In surgical patients, improvement were not related to pain killers as fewer patients reported having received enough pain killers after program implementation than before (87.1% vs 89.4%, but difference was not significant). In both surgical and nonsurgical patients, the waiting time for a pain killer decreased slightly, but not significantly.

In contrast with improvements in pain intensity and management following program implementation, other areas of patients' experience of their hospital stay remained stable between 2001 and 2005. Patients reported fewer problems with involvement of family and friends, information specific to surgery and physical comfort (including pain), other aspects of care deteriorated, particularly coordination of care (Table 4).

Discussion

This study confirms the benefits of a collaborative quality improvement program to enhance pain assessment and management for both surgical and nonsurgical patients in a university-affiliated hospital. After program implementation significantly fewer patients reported that they experienced no pain relief during their hospital stay. In nonsurgical patients, improvements were observed for pain measurement, pain management, and pain intensity. In patients who underwent surgery, pain measurement also improved as did pain treatment. Our study results are similar to the findings of Dobscha et al. who found that in primary care patients, a quality improvement collaborative program that included education, audit and feedback, guidelines and multidisciplinary collaboration had significant benefits on pain-related disability and intensity compared with usual treatment [27–29]. In another study on nursing homes, Baier et al. identified a 41.1% reduction in pain prevalence after implementation of a collaborative quality improvement program [25]. Like in our study, this program included both a multi-faceted intervention (educational, audit and feed-back, mentoring) and multidisciplinary collaborative teams from various nursing facilities working together in a structured way to improve overall pain management.

Multifaceted interventions implemented at organizational level and which include different approaches such as for instance educational, feedback-recommendations, role models, information to patient strategies have been shown to improve pain management in nursing home patients, emergency departments and to some extent, in palliative care [30–33]. However, what collaborative quality improvement programs add to these traditional approaches are the multidisciplinary collaborative teamwork dimension. The strength of this approach relies on the use of experts and peers to exchange and advice on best practices to guide and improve pain management. This is why the American Pain Society, the Agency for Health Care Policy and Research (AHCPR) and the Joint Commission of accreditation of healthcare organization (JCAHO) [34–36] recommend different elements of structure and process to improve pain management and more expressly, an interdisciplinary group working continuously on improvements in pain management.

Many different types of collaborative quality improvement programs have been developed in various countries and settings such as neonatology, primary care and women's care to improve the surveillance and treatment of infection, asthma, and chronic heart failure [24,37,38]. These programs represent significant investments of time and human resources and do not seem to be always fully effective. If most interventions manage to improve the process of care not all result in substantial improvements in patient outcome. If for instance Pierce-Bulger et al. found a significant increase life-expectancy in preterm infants following implementation of a quality improvement collaborative [24], other studies on the same population did only show improvement in treatment prescription and administration (surfactant) but no real impact on patient outcome such as the rate of spontaneous pneumothorax in preterm infants [37]. This may be due to the fact that multifaceted multidisciplinary interventions impact at different levels of a healthcare organization. Depending on hospital structure and organization, staff and patients characteristics, the result of such large scale interventions become difficult to predict. In our study for instance overall pain management process improved. After program implementation, pain assessment tools were more often used, pain more often assessed and hospital staff did more often all what they could to relieve pain. This resulted in a significant improvement in patient outcome with only 2.3% reporting no pain relieve during their hospital stay. However, our collaborative quality improvement program seemed to benefit particularly to patients who did not undergo surgery. These improvements appeared to be significantly related in nonsurgical patients to both pain treatment and to the regular use of pain assessment tools to guide timely administration of painkillers. On the other side, in surgical patients, improvement did not seem to be related to pain killers as fewer patients reported having received enough pain killers after program implementation than before. It seems their treatment was however more

Table 2 Comparison of patients' self-reported pain management processes and outcomes, before (2001) and after (2005) the implementation of a multimodal hospital program

	2001 %	2005 %	*P* value
	(N = 1,237)	(N = 1,113)	
Were in pain during your hospital stay?*	67.3	63.8	0.077
	(N = 832)	(N = 710)	
In general, pain intensity was?			0.092
Severe	45.7	44.8	
Moderate	40.4	44.6	
Mild	13.9	10.6	
Pain management processes			
Were you informed about pain and its management?			0.651
Yes, definitely	51.4	53.2	
Yes, to some extent	25.7	25.8	
No	22.9	21.0	
Was your level of pain regularly assessed?			**0.012**
Yes, regularly	58.3	63.8	
Yes, sometimes	26.6	26.0	
No	15.1	10.3	
Was a pain assesment tool used (e.g., visual analog scale, "pain ruler", 0 to 10 numeric scale)?			**<0.001**
Yes, regularly	34.6	50.0	
Yes, sometimes	17.4	21.2	
No	47.9	28.8	
Did you receive a treatment to relieve pain?			0.058
Yes, regularly (several days)	67.1	68.2	
Yes, sometimes	19.4	21.9	
No	13.5	9.9	
When you asked for painkillers, how long did you wait on average†‡			0.125
Less than 10 minutes	80.4	84.6	
More than 10 minutes	19.6	15.4	
Was your treatment modified in case you were not relieved?			0.577
Yes, it was modified	34.6	36.6	
No, it was not modified	13.8	12.2	
I was always relieved	51.5	51.3	
Overall, did you receive enough painkillers?†			0.851
Not enough	7.0	7.1	
Enough	87.7	87.0	
Too much	5.2	5.9	
Pain management outcomes			
Do you think the hospital staff did everything they could to help control your pain?†			**0.020**
Yes, definitely	76.5	81.9	
Yes, to some extent	19.6	15.9	
No	3.8	2.1	
Overall, was your pain relieved during your stay?			**0.050**
Yes, definitely	71.2	74.2	
Yes, to some extent	24.2	23.5	
No	4.6	2.3	

* See methods for details on how patients who experienced pain were identified.
† Items from the dimension "Physical Comfort" of Picker Patient Experience survey (see Table 4).
‡ Only 393 respondents in 2001 and 383 in 2005 asked for pain medication and answered this item.

Table 3 Comparison of patients' self-reported experience of pain and its management before (2001) and after (2005) the implementation of a multimodal hospital program: Analysis of all respondents stratified by patients who did[a] and did not[b] undergo surgery

	Patients who underwent surgery[a]			Patients who did not undergo surgery[b]		
	2001 %	2005 %	*P* value	2001 %	2005 %	*P* value
	(N = 689)	(N = 682)		(N = 435)	(N = 352)	
Were you in pain during your hospital stay?	75.6	71.7	0.100	53.1	48.9	0.237
	(N = 521)	(N = 489)		(N = 231)	(N = 172)	
In general, pain intensity was?			0.127			0.571
Severe	44.9	43.5		49.6	50.3	
Moderate	41.2	46.2		37.5	40.1	
Mild	13.8	10.3		12.9	9.6	
Pain management processes						
Were you informed about pain and its management?			0.610			0.469
Yes, definitely	55.4	55.4		45.5	49.1	
Yes, to some extent	23.0	25.1		27.5	29.2	
No	21.6	19.5		27.0	21.6	
Was your level of pain regularly assessed?			0.116			0.210
Yes, regularly	60.4	65.2		54.6	62.0	
Yes, sometimes	27.7	26.5		25.1	24.0	
No	11.9	8.3		20.3	14.0	
Was a pain assesment tool used (e.g., visual analog scale, "pain ruler", 0 to 10 numeric scale)?			**<0.001**			**0.002**
Yes, regularly	37.6	53.7		27.9	42.3	
Yes, sometimes	17.7	21.4		17.4	20.8	
No	44.7	24.9		54.8	36.9	
Did you receive a treatment to relieve pain?			**0.046**			0.667
Yes, regularly (several days)	74.8	73.9		55.4	58.3	
Yes, sometimes	17.1	21.2		22.1	22.8	
No	8.2	5.0		22.5	18.9	
When you asked for painkillers, how long did you wait on average?[†‡]			0.437			0.299
Less than 10 minutes	83.2	85.6		72.4	79.0	
More than 10 minutes	16.8	14.4		27.6	21.0	
Was your treatment modified in case you were not relieved?			0.388			0.099
Yes, it was modified	36.8	39.7		32.0	26.9	
No, it was not modified	8.2	9.7		22.8	16.6	
I was always relieved	54.9	50.6		45.1	56.6	
Overall, did you receive enough painkillers?[†]			0.501			0.202
Not enough	5.1	6.6		11.4	6.2	
Enough	89.4	87.1		84.3	90.1	
Too much	5.5	6.4		4.3	3.7	
Pain management outcomes						
Do you think the hospital staff did everything they could to help control your pain?[†]			0.258			**0.003**
Yes, definitely	80.8	83.9		67.9	78.9	
Yes, to some extent	17.8	14.2		23.5	19.9	
No	1.3	1.8		8.6	1.2	
Overall, was your pain relieved during your stay?			0.847			**0.008**
Yes, definitely	77.8	77.0		57.3	70.4	
Yes, to some extent	20.5	21.6		33.0	26.5	
No	1.8	1.4		9.6	3.1	

[†] Items from the dimension "Physical Comfort" of Picker Patient Experience survey (see Table 4).
[‡] Only 262 respondents in 2001 and 285 in 2005 asked for pain medication among patient who underwent surgery, similarly 105 and 81 among those who did not.

Table 4 Mean problem scores across the 9 dimensions of Picker's patient experience survey, before (2001) and after (2005) the implementation of a multimodal hospital program

	2001 Mean score [95% CI] (N = 1,237)	2005 Mean score [95% CI] (N = 1,113)	*P* value
Emotional support	32.0 [30.2–33.8]	33.7 [31.8–35.7]	0.191
Respect for patient preferences	28.9 [27.5–30.3]	30.2 [28.7–31.8]	0.212
Involvement of family and friends	24.4 [22.7–26.1]	23.2 [21.4–24.9]	0.312
Information and education	29.5 [27.8–31.1]	29.2 [27.5–31.0]	0.839
Information specific to surgery	24.1 [22.1–26.2]	23.5 [21.4–25.6]	0.691
Continuity and transition	32.7 [30.9–34.5]	35.1 [33.1–37.0]	0.075
Coordination of care	22.9 [21.5–24.2]	25.9 [24.4–27.4]	**0.003**
Physical comfort	16.9 [15.5–18.3]	15.7 [14.3–17.1]	0.234
Overall impression	10.2 [9.2–11.2]	9.8 [8.8–10.8]	0.609

often modified when patients were not relieved that suggests that alternative treatments were used such as PCA, regional blocks with catheters and epidural anaesthesia for postoperative pain management in surgical wards, which were all initiated at the time of our program implementation.

Furthermore, our program did not significantly improve patients' level of information about pain and pain management. This was a bit unexpected as our intervention included an educational component with information leaflets for patients about pain and available treatments. This suggests that printed material alone is probably not sufficient to inform patients and that it should be completed by face to face interaction with healthcare professionals, audiovisual materials and group discussions [39–41].

Finally, developing a hospital wide collaborative quality improvement program requires extra efforts and costs. For our program these represented approximately US$300,000 per annum, divided into direct costs (information leaflets-annual campaigns: US$10,000) and indirect costs (reallocation of staff members into pain program activities: US$290,000). Whether such investment is cost effective and can contribute to reduce for instance length of hospital stay or unplanned hospital readmissions for pain is unclear. Evidence in the literature regarding this aspect is controversial, particularly as systematic reviews and well designed trials are difficult to perform in this area [42]. However, it is known from a number of studies published on cancer patients that poorly managed pain and unplanned hospital readmissions can cost as much as US$5 million per annum (approximately US$20,000 per patient) to a single institution [43,44]. If only a few readmissions (15 in our institution) can be avoided through the implementation of a collaborative quality improvement program, it is probably worth the efforts. However, further studies are needed in this area to provide definitive conclusions as to whether collaborative quality improvement programs are cost-effectiveness and can contribute to reduce costs associated to prolonged length of hospital stay and unplanned readmissions for pain management.

A number of limitations of this study have to be mentioned. First, we relied on patients' self-reported experience. But even though patient recall may be inaccurate [45,46] there is no reason why such biases should differ between 2001 and 2005. Second, there was no validation of information by medical records or other sources. As a result, we relied mainly on patients' perception and beliefs regarding pain and its treatment. It is unclear whether patients are trustworthy observers and judges of issues related to the quality of care they receive. There is however an increasing body of evidence to suggest that this may be the case [47,48].

Another limitation relates to respondents' characteristics. Patients who accepted to answer the hospital satisfaction survey may have more interest in pain management, than patients who did not. Nonparticipants may have poorer outcomes than study participants [49]. The third limitation in our study relates to the before-after design. Although patients' characteristics and perceived health status were similar before and after program implementation, a number of unmeasured confounding factors such as patients' beliefs, mood at the time of the survey completion, conflicts with hospital staff may still have influenced our study findings. Furthermore, patients received the questionnaire 4 to 8 weeks after their pain experience which may have minimized before/after differences. Finally, as our study was performed in a single teaching hospital, it may lack generalizability to other settings.

Despite these limitations our study demonstrated improvement in both process and outcome of patient pain management following implementation of a collaborative quality improvement program.

Conclusion

Implementation of collaborative quality improvement programs in acute care hospitals is an effective approach to improve pain measurement, pain management, and pain relief in hospitalized patients. Further studies are needed to determine the overall cost-effectiveness of such programs.

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