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Postoperative pain assessment in hospitalised patients: National survey and secondary data analysis

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ABSTRACT

Background: Measuring pain is important for the adequate pain management of postoperative patients. The actual compliance with pain assessment in postoperative patients after implementation of a national safety program is unknown.

Objectives: The aim of this study is to examine the compliance with pain assessment in postoperative patients after implementation of a national safety program, according to the national quality indicators for pain assessment in postoperative patients. Furthermore, organisational factors associated with this compliance were determined.

Study design: In this study, two data sources were used: 1) data from an evaluation study of the Dutch Hospital Patient Safety Program; and 2) data from a questionnaire survey.

Methods: The compliance with two different pain process indicators was determined: 1) 3 pain measurements a day, all three full days after surgery; and 2) ≥ 1 pain measurement a day, all three full days after surgery. Multilevel logistic regression analysis was used to investigate the association between organisational factors in hospitals and compliance with pain process indicators.

Results: Data of 3895 patient records from 16 hospitals was included in this study. In 12% of the postoperative patients, pain was measured 3 times a day, all three full days after surgery. In 53% of the postoperative patients, pain was measured ≥ 1 time a day, all three full days after surgery. Compliance was highest in general hospitals compared to tertiary teaching and academic hospitals, and was statistically significantly higher at the surgery and surgical oncology department compared to the other departments.

Conclusions: Low compliance was shown with pain assessment in postoperative patients, according to the process indicator pain after surgery in Dutch hospitals. This suggests that the implementation of measuring pain in hospitals is still insufficient.

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What is already known about the topic?

- The prevalence of postoperative pain in patients remained consistently high over the past two decades.

- One of the factors responsible for inadequate pain management may be poor pain assessment.
- Limited information is available about the compliance to pain assessment in postoperative patients after implementation of a national safety program and influencing factors.

What this paper adds

- This study showed a low compliance with pain assessment in postoperative patients after implementation of a national safety program, according to the quality indicator pain after surgery in Dutch postoperative patients, i.e. the documentation of pain measurements is lower than reported to the Dutch Health Care Inspectorate.

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- The results of this study suggested that the implementation of pain measurements in hospitals is still insufficient.

1. Introduction

Postoperative pain management is an important element of adequate postoperative care (Wu et al., 2005). During the past two decades, there has been increased attention for improving postoperative pain management as a result of several new guidelines and improvements of techniques in managing perioperative pain. Despite these improvements, postoperative pain

management is often unsatisfactory and may increase the risk for patients to develop chronic pain conditions (Deumens et al., 2013; Kehlet and Holte, 2001). Approximately 20–80% of postoperative patients experience moderate to severe postoperative pain, and the prevalence has remained consistently high over the past two decades (Apfelbaum et al., 2003; Gan et al., 2014; Gerbershagen et al., 2013; Sommer et al., 2008; Warfield and Kahn, 1995).

Numerous factors might be responsible for inadequate pain management, including inadequate staff training, insufficient knowledge on the part of nurses and physicians, unhelpful staff- and patient attitudes, fear of analgesic side effects, lack of accountability, and poor pain assessment (Taylor and Stanbury,

Fig. 1. Flow diagram that displays the steps taken to obtain the final combination of data source 1 and 2 for analyses.

2009). If pain is not assessed systematically, it is difficult for practitioners to determine the effect of pain treatment and to adjust the treatment if necessary. Systematic pain assessment and documentation of pain scores help in characterising pain patterns precisely in individual patients (Carlson, 2010; Chapman et al., 2011). Previous research showed that systematic pain assessments can be integrated into the daily routine of nurses (Ista et al., 2013), and that an education program led to an improvement in the pain knowledge of nurses and even to a decrease in a patient's pain intensity (De Rond et al., 2001).

Despite the known positive effects of systematic pain measurements in postoperative patients, the compliance with assessing pain is still suboptimal (Ista et al., 2013). It has also been shown to slowly deteriorate after an education program (De Rond et al., 2001). No information is available about the actual compliance with the quality indicators for pain measurements. Limited information is available about the factors influencing the compliance with the guidelines for pain measurements (Berben et al., 2012; Carlson, 2010; Czarnecki et al., 2011; Ista et al., 2013). A study among inpatient palliative care centres showed that variations in pain management outcomes were affected by organisational factors such as organisational size and ownership (Castle and Engberg, 2008). A recent systematic review studied the effect of implementation strategies on pain assessment and showed that, besides organisational factors, also lack of knowledge and low priority given to pain management still influence adherence to pain assessment or clinical guidelines (Ista et al., 2013). Another organisational factor that might influence positively the execution of postoperative pain measurements is the presence of an Acute Pain Service (APS) team, which has been introduced in most hospitals (van Boekel et al., 2015) to facilitate improvements in postoperative pain management and patient outcomes (Bardiau et al., 2003; Miaskowski et al., 1999; Popping et al., 2008; Tighe et al., 1998). Insight into the factors related to the organisation structure associated with the execution of pain measurements is necessary, as this information may be used to influence these factors, if possible, and improve the assessment of pain.

The aim of the present study is to examine the compliance with pain assessment in postoperative patients after implementation of a national safety program. Furthermore, organisational factors including hospital characteristics and APS characteristics associated with this compliance will be determined.

2. Methods

2.1. Study design

For the present study, we used data from two sources. Data source 1 was a nationwide evaluation study of the Dutch Patient Safety Program (hereafter referred to as Safety Program), performed during the final period of the Safety Program (De Blok et al., 2013). Data was collected between November 2011 and December 2012, in a sample of 19 hospitals (2 academic, 6 tertiary teaching and 11 general hospitals), representing 20% of all Dutch hospitals. Hospitals were randomly selected using a stratified sample based on geographical regions and type of hospital. In each participating hospital a measurement was performed every four to six weeks by a trained research assistant during one year. This resulted in a total of 10 measurements for each hospital. During every measurement period in each hospital, a random sample of 20–25 patient records was drawn from all patient records of postoperative adult (≥ 18 year) patients admitted in the week before the measurement period.

Data source 2 was a nationwide survey in Dutch hospitals concerning the management of postoperative pain, performed between November 2011 and February 2012 (van Boekel et al.,

2015). Data was collected in 80 of the 96 Dutch hospitals performing surgical procedures. Information about the functional and organisational structure of APS teams was collected on the hospital level by means of a digital questionnaire.

Fig. 1 displays the steps taken to inclusion of patient records in data source 1, to extraction of organisational factors on hospital characteristics in data source 1, to extraction of organisational factors on Acute Pain Service (APS) characteristics in data source 2, and the final combination of data source 1 and 2 for analysis.

2.1.1. Pain measurement (data source 1)

The patient records were evaluated using a checklist focusing on: (1) the frequency of assessing standardised pain scores; (2) the severity of the pain by pain scores; and (3) interventions taken in the case of moderate to severe pain (pain score ≥ 4). For the present study, only patients hospitalised for at least three full days after surgery were included in the analyses. A documented patient self-reported pain score, which was obtained with a Numeric Rating Scale (NRS) or a Visual Analogue Score (VAS), was defined as a standardised pain assessment (VMS, 2009).

2.1.2. Process indicator pain (data source 1)

To support hospitals in the implementation of structured pain assessments, early recognition and treatment of pain was one of the ten themes within the national Safety Program (De Blok et al., 2013). Another measure that supports the implementation of structured pain assessments is the addition of a process indicator for pain to the quality indicators of the Dutch Health Care Inspectorate (IGZ in Dutch, hereafter abbreviated as HCI), the organisation that monitors health care quality and safety in the Netherlands. Following the national quality indicators for pain, the process indicator for pain is defined differently by the Safety Program and the HCI. In the present study, these process indicators were described as Pain Safety Program (Pain assessment-SP) and Pain Health Care Inspectorate (Pain assessment-HCI). Pain assessment-SP was defined as: the percentage of postoperative patients with ≥ 3 pain measurements a day, all three full days after surgery. We defined Pain assessment-HCI as: the percentage of postoperative patients with ≥ 1 pain measurement a day, all three full days after surgery. Both process indicators were calculated on the patient level (data source 1). Additionally, the mean reported Pain assessment-HCI of the included hospitals was calculated on the hospital level by using data from the open access webpage of the Health Care Inspectorate (Health Care Inspectorate, 2011).

2.1.3. Organisational factors: hospital characteristics (data source 1)

Hospital characteristics were collected during the measurement in the hospitals. Admission department was determined in the patient record on the patient level and subsequently categorised to the departments cardiology, urology, surgery, orthopaedics, surgical oncology, and others. Other characteristics were collected at the hospital level, and could be identified on public websites about Dutch hospitals (e.g. Wikipedia). Type of hospital was categorised in academic (university medical centre), tertiary teaching, and general hospitals. In the Netherlands, teaching hospitals provide specialised medical care and are committed to training and education. The size of the hospital was defined as the number of beds, ranging from 197 to 1320 in the participating hospitals.

2.1.4. Organisational factors: APS characteristics (data source 2)

The standardised visit of the APS for all postoperative patients was dichotomised to yes (all postoperative patients) and no (no visit, or only patients with intravenous patient-controlled analgesia/epidural catheter/loco regional catheter/uncommon pain medication/others). The feedback of the results to the department

was dichotomised to yes (feedback was delivered to the department) and no (no feedback was delivered). The *presence of a periodic training program by the APS* was also dichotomised to yes (training for nurses, physicians or both) and no (no training).

The final factor included as organisational factor was the *method of delivering data on the process indicator pain to the HCI*. All hospitals deliver information annually about the process indicator for pain defined as the percentage of standardised pain measurements performed in postoperative patients. The information about the method used for delivering the process indicator is published on the website of the HCI (Health Care Inspectorate, 2011). The data was collected from this website and dichotomised into: 1) deliver continuously; and 2) deliver a sample of measurements.

2.2. Statistical analysis

For the present study, only matched data from hospitals included in both data sources ($N=16$) were included. The mean percentages Pain assessment-SP and Pain assessment-HCI were calculated on the patient level. A multilevel logistic regression analysis was conducted to investigate the association between organisational factors and compliance with the process indicators. A two-level multilevel structure was used, whereby the measurements on the patient level were clustered within hospitals. Separate multilevel logistic regression analyses were performed using compliance with the process indicators as dependent variables, and the organisational factors as independent variables. Categorical independent variables were analysed by adding separate indicator variables for the categories to the model. The proportion of variance (R^2) was calculated for the investigated factors, and can be interpreted as the percentage of the variance between hospitals in the compliance with the process indicator that can be explained by the organisational factors investigated. The intraclass correlation coefficient (ICC) was calculated to investigate the proportion of the total variance that remains after correction of the organisational factor. This indicates if any relevant, unexplained influence of the difference between individual hospitals on the pain outcome remains.

Descriptive analyses were performed using Stata version 12.1 and the multivariate analyses were executed using MLwiN version 2.24.

3. Results

The number of included records from data source 1 ranged from 210 to 283 in each hospital. Records with missing data for the process indicator pain were excluded ($N=23$), resulting in a sample of 3895 patient records. Table 1 shows the admission characteristics and the mean pain process indicators of the included patients and hospitals. The results are shown on patient level, even though characteristics were determined on hospital level, as in the multilevel analyses data was also analysed on patient level. The mean age of the sample was 63.9 (SD 15.6) years and the majority was female 55.6%; $N=2201$ (missing sex $N=263$). In 75.5% of the patients ($N=2450$), not all postoperative patients were automatically visited by APS teams, but only specific patient groups. In almost two-thirds of the patients hospital APS teams delivered feedback regarding the department results on pain measurements to the department ($N=2045$; 63.0%). In 65.5% of the patients ($N=1931$), the APS teams provided a periodic training to nurses, physicians or both. In the majority of the patients hospitals delivered data on the process indicator continuously to the Health Care Inspectorate ($N=2659$; 72.2%). Some hospitals delivered random samples, which meant that they only sent data on pain measurements of a selected group of patients (see Table 1).

Table 1

Admission characteristics and pain process indicators in 3895 postoperative patients from 16 hospitals.^a

Characteristics	N patients (%)
Type of hospital	
Academic	475 (12.2)
Tertiary teaching	930 (23.9)
General	2490 (63.9)
Admission department	
Surgery	2005 (51.5)
Urology	154 (4.0)
Cardiology	97 (2.5)
Orthopaedics	1091 (28.0)
Surgical oncology	186 (4.8)
Others	362 (9.3)
Number of beds, mean (SD)	488.2 (293.3)
APS visit	
No	2450 (75.5)
Yes	797 (24.6)
APS Feedback to department	
No	1202 (37.0)
Yes	2045 (63.0)
APS Training	
No	1018 (34.5)
Yes	1931 (65.5)
Delivering method process indicator to HCI	
Continuous	2659 (72.2)
Sample of measurements	1023 (27.8)
Pain assessment-SP ^b , % (SD)	11.7 (32.1)
Pain assessment-HCI ^b , % (SD)	53.3 (49.9)
Reported Pain assessment-HCI ^c , % (SD)	78.2 (19.2)

APS, Acute Pain Service; Pain assessment-SP, Pain Safety Program; Pain assessment-HCI, Pain Health Care Inspectorate.

^a Process indicator Pain Safety Program: percentage postoperative patients with ≥ 3 pain measurements a day, all 3 full days after surgery.

^b Process indicator Health Care Inspectorate: percentage postoperative patients with ≥ 1 pain measurement a day, all 3 full days after surgery.

^c Process indicator Health Care Inspectorate, reported by the included hospitals ($N=16$).

3.1. Process indicator pain

In 11.7% (SD 32.1) of the patients, at least 3 pain measurements were performed on all three full days after surgery (Pain assessment-SP). The percentage increased if the process indicator of the HCI was used (Pain assessment-HCI). The mean percentage for observed Pain assessment-HCI was 53.3% (SD 49.9). The mean reported Pain assessment-HCI was 78.2% (SD 19.2).

In Table 2 is shown how many pain measurements were performed on each day of the three full days after surgery.

3.2. Factors influencing pain documentation

Table 3 presents the results of the multilevel analyses of the association between organisational factors and compliance with process indicators. The ICC was high for all organisational factors,

Table 2

Compliance with pain assessments in three days after surgery ($N=3895$).

Day after surgery	Number of pain assessments	N patients (%)
Day 1	0	493 (12.7)
	1	637 (16.4)
	2	856 (22.0)
	≥ 3	1909 (49.0)
Day 2	0	909 (23.3)
	1	624 (16.0)
	2	931 (23.9)
	≥ 3	1431 (36.7)
Day 3	0	1640 (42.1)
	1	680 (17.5)
	2	751 (19.3)
	≥ 3	824 (21.2)

Table 3

Multilevel logistic analysis of the association between organisational factors and compliance with process indicators Pain assessment-SP and Pain assessment-HCI.

	Pain assessment-SP ^a % compliance (95% CI)	R ^{2b}	ICC hospital ^c	Pain assessment-HCI ^d % compliance (95% CI)	R ²	ICC hospital
Type of hospital		23.44	24.92		15.33	26.71
Academic	6.61 (1.41–25.91) ⁺			56.03 (21.42–85.62)		
Tertiary teaching	2.08 (0.64–6.49)			27.22 (10.97–53.17)		
General	10.57 (5.67–18.86)			59.22 (42.18–74.30)		
Admission department		2.12	31.87		–15.56	36.46
Surgery	8.96 (4.80–16.13) ^{**}			49.05 (32.38–65.93) ^{***}		
Urology	6.26 (2.51–14.74)			25.36 (13.17–43.21) ^{***}		
Cardiology	3.37 (1.07–10.08)			38.73 (21.14–59.84) ^{***}		
Orthopaedics	5.61 (2.84–10.77) ⁺			53.93 (36.50–70.45) ^{***}		
Surgical oncology	9.85 (1.07–52.40)			89.18 (62.93–97.56) ^{***}		
Others	1.91 (0.64–5.31)			30.55 (17.17 – 48.27)		
Number of beds, estimate (SE)	–0.001 (0.001) ^e	5.08	30.90	–0.0006 (0.001) ^e	0.27	31.46
APS visit		5.42	27.02		1.75	33.90
No	6.21 (3.10–12.03)			47.42 (28.45–67.16)		
Yes	11.91 (3.54–33.28)			66.52 (30.57–89.97)		
APS feedback to department		3.49	27.57		5.34	32.66
No	5.09 (1.81–13.49)			39.05 (17.02–66.68)		
Yes	8.97 (4.22–18.07)			59.80 (38.01–78.29)		
APS Training		11.38	27.03		18.27	28.60
No	11.78 (4.13–29.30)			71.95 (44.95–88.96) ⁺		
Yes	5.35 (2.44–11.34)			38.23 (21.56–58.24)		
Delivering method process indicator to HCI, N (%)		–0.40	33.39		2.22	32.19
Continuous	6.66 (3.10–13.71)			44.89 (27.77–63.32)		
Sample of measurements	8.32 (2.36–25.41)			62.20 (32.13–85.12)		

APS, Acute Pain Service; Pain assessment-SP, Pain assessment Safety Program; Pain assessment-HCI, Pain assessment Health Care Inspectorate.

^a Process indicator Pain Safety Program: percentage postoperative patients with ≥ 3 pain measurements a day, all 3 full days after surgery.^b Proportion of variance between hospitals that can be explained by the investigated factor.^c Proportion of total variance after correction of the investigated factor.^d Process indicator Health Care Inspectorate: percentage postoperative patients with ≥ 1 pain measurement a day, all 3 full days after surgery.^e Because this analysis concerns a continuous outcome variable, the estimate and SE were shown.⁺ $P < 0.05$.^{**} $P < 0.01$.^{***} $P < 0.001$.

at least 24.92, showing high variation between hospitals in the compliance with the process indicator pain. The R^2 was highest for type of hospital (23%), indicating that this factor explained to the largest extent the differences between hospitals in compliance with Pain assessment-SP. In tertiary teaching hospitals, pain was statistically significantly less often measured for both process indicators (2% and 27%) compared to academic hospitals (7% and 56%) and general hospitals (11% and 59%). 25% (ICC 24.92) of the total variance in compliance with the process indicator Pain assessment-SP cannot be explained by type of hospital. The compliance with the process indicator was highest on the surgical oncology department, but was not statistically significant due to the relatively low number of records. The surgery and orthopaedics department had a statistically significantly higher compliance with the pain process indicators compared to the other departments. The negative R^2 for the factor Admissions Department (–15.56), showed that the differences between hospitals were covered by this factor, resulting in an underestimation of 16% of the differences in compliance with Pain assessment-SP between hospitals.

The absence of a periodic training program by the APS was associated with a higher compliance with the process indicator Pain assessment-HCI. For the other APS characteristics, no statistically significant association was found.

4. Discussion

This study provides insight into the compliance with pain assessment in postoperative patients after implementation of a national safety program, and examined organisational factors on the hospital level and the department level associated with this

compliance. The results of this study showed a low compliance with pain assessment in postoperative patients, according to the process indicator pain after surgery in Dutch postoperative patients. In 53% of the postoperative patients, pain was measured at least once a day on all three full days after surgery. In only 12% of the postoperative patients was pain measured at least three times a day, all three full days after surgery.

Following our results of the compliance with pain assessment in postoperative patients, according to pain process indicators, general hospitals had a better compliance with pain measurements compared to tertiary teaching and academic hospitals. This difference could not be explained by the size of the hospital, as the number of beds was not associated with compliance. Other factors that were not measured might possibly play a role in the varying compliance, for example hospital or department culture, priorities of the organisation, education possibilities or research. The compliance with the process indicator was relatively high for patients admitted to the surgical oncology department and statistically significantly higher for the surgery and orthopaedics departments compared to the other departments. This might be explained by the relatively high percentage of patients with pain on these departments (van den Beuken-van Everdingen et al., 2007), whereby the importance of measuring pain is stressed and is more part of the daily routine. In future qualitative studies, more information should be collected about facilitators and barriers of performing pain measurements. This information might assist in distinguishing strategies for good compliance with pain measurements, which may help other hospitals to improve compliance.

Frequent assessment of pain in patients provides information to decide on interventions enhancing optimal pain relief (van Dijk et al., 2016). The optimal frequency of pain measurements is

unknown and depends on the needs of an individual patient. Important is that pain intensity is assessed regularly, using a standardized measuring instrument (Meissner et al., 2015). In our study, we used the national quality indicators for pain assessment, the process indicator of the Safety Program and the HCI, with ≥ 3 and ≥ 1 pain measurements a day respectively. The process indicator of the Safety Program is rather strict, demanding a pain measurement every eight hours (based on the usual working hours of a nursing shift). In only 12% of the postoperative patients pain was measured at least three times a day, all three full days after surgery. This percentage is quite low, however, ≥ 3 pain measurements a day in all postoperative patients may be rather ambitious and not relevant in all cases. Otherwise, the compliance with the process indicator of the HCI, asking for ≥ 1 pain measurements a day, was not higher than one out of two (53%), which does not apply to the definition of “regularly”. Therefore, there is room for improving the nurses’ adherence to pain assessment recommendations.

Remarkably, we found that hospitals with a training program by the APS for nurses and/or physicians had a lower compliance with the pain process indicators. Education of nurses in pain management has been shown to improve nurses’ knowledge of pain (McNamara et al., 2012). Successful use of guideline recommendations in clinical practice does however not only depend on education alone but also on the availability of staff and time, cooperation with other professionals, and attitudes of nursing personnel (Clark, 2003; Meesterberends et al., 2014; Moore and Price, 2004). A negative attitude toward pain assessment and management is a barrier in implementing practice change (Shaban et al., 2012). In our study we did not have information about participation, experiences with, and duration of the training. The compliance may decrease if the interval between periodic training is too long (De Rond et al., 2001). Presumably, hospitals with no training by the APS do have a hospital-wide program whereby the hospital takes responsibility for the training and possibly more personnel is trained in pain management.

The other investigated organisational factors were not associated with compliance with the process indicator pain. We expected a better compliance with pain measurements if the APS was implemented in hospitals (van Boekel et al., 2015), but having a standardised visit of the APS for all postoperative patients did not influence the compliance. The delivering of feedback of results to the department did not influence this either. The content, timing and method of delivering feedback was not investigated and might differ between the hospitals. These results emphasise the need to investigate the use of the APS in hospitals and to implement the APS on an evidence-based and unambiguous manner.

Our results of observed Pain assessment-HCI showed a much lower compliance percentage (53%) compared to the data reported by hospitals to the HCI (78%). This discrepancy might be explained partly by a different interpretation of the definition of the process indicator. No time period is included in the definition of the HCI and, whereas we defined the Pain assessment-HCI as performing at least one pain measurement a day after surgery, it can also be interpreted as at least one pain measurement on any day after surgery. This will then increase the calculated process indicator, but at the same time make it less useful for the improvement of patient care as the pattern of pain experienced by a patient cannot be measured with just one measurement. Furthermore, if pain was asked about but not measured or documented in a standardised manner (NRS or VAS) it was not counted as measurement, but could be reported as measurement to the HCI. Another explanation might be the external pressure to publish the process indicator, which determines the ranking of the hospital on various ranking lists (Van Boekel et al., 2014).

The national safety management system (SMS, or VMS in Dutch) embeds patient safety in healthcare practice. It is the system through which hospitals continuously identify risks, implement improvements, and establish, evaluate and modify policy. The national Safety Program was part of the safety management system and “early recognition and treatment of pain” was one of the implemented themes. Also in other countries, Safety Programs were installed, such as in Canada (Canadian Patient Safety Institute. Safer Healthcare Now! 2016. Available from <http://www.patientsafetyinstitute.ca/en/About/Programs/SHN/Pages/default.aspx> (accessed 25 August 2016)) and Scotland (Scottish Patient Safety Programme. Programmes 2016. Available from <http://www.scottishpatientsafetyprogramme.scot.nhs.uk/> (accessed 25 August 2016)). All countries claim that the awareness of patient safety has increased. However, limited or no data is available on specific themes, such as pain. Additionally, differences in measurements and the data collection method made it impossible to compare our results with other national programs. Another regional program: the “Health care services project ‘Action Alliance Pain-Free City Muenster’”, which was conducted from January 2010 to December 2013 in Germany did not report on compliance with pain measurements in hospitals (Lehmkuhl et al., 2011; Pogatzki-Zahn et al., 2015). Based on a single quasi-experimental study in an academic hospital, a percentage pain assessment during 24 h of 55% was measured (Michaels et al., 2007). This percentage may be comparable to our findings of the process indicator of the HCI (53%).

Despite recommendations of the national Safety Program and the mandatory character of reporting the process indicator to an external Inspectorate, the results of this study suggested that the implementation of pain measurements in hospitals is still insufficient. An explanation of this might be the lack of knowledge or awareness of the importance of measuring pain in postoperative patients on a structured daily basis (Taylor and Stanbury, 2009; Berben et al., 2012; Czarnecki et al., 2011), low priority given to pain management, time constraints, insufficient medication orders (Czarnecki et al., 2011), or lack of local opinion leaders or champions involved (Campbell et al., 2004; Ellis et al., 2007). However, measuring and documentation of pain every day in a structured manner will improve the individual care of patients and the overall quality of care by enabling the analysis of aggregated data (Bardiau et al., 2003; Carr and Goudas, 1999). Therefore, better implementation strategies to improve the nurses’ adherence to pain assessment recommendations should be considered. As studied in a recent systematic review, implementation strategies vary and there is no preferred strategy available (Ista et al., 2013). The best suggestion of implementing postoperative pain assessment in hospitals may be a strategy based on an analysis of barriers, experienced by nurses in the hospital. A multifaceted strategy would be best, addressing at least good education on the importance of pain assessment itself, the disappearance of organisational barriers, and feedback on personal performance of nurses (Ista et al., 2013). Involving the patient by a patient-centric strategy may also be worthwhile, but this should be explored in future research (Franck et al., 2011; Haller et al., 2011).

4.1. Strengths and limitations

The strength of this study is the representativeness of the included hospitals, whereby the results can be generalised to the national hospital population. Combining data of two studies enables analysing the association between several organisational factors and the compliance with process indicators for pain. However, we were limited to the variables measured in the two studies. Possibly other factors, for example other organisational factors, team characteristics, personnel characteristics or patient

characteristics such as diagnosis, comorbidity or disease complexity influence the execution of pain measurements, but we were limited to the measured variables.

A limitation of combining the datasets is, however, that some hospitals were not included in both studies and had to be excluded for the analysis. Because of the low number of included hospitals, department level could not be used in the multilevel analyses and we could only analyse the influence of the presented organisational factors separately. Additionally, the composite explained variance of the investigated factors could not be determined. Our study showed that the departments certainly have some influence, due to the large differences in compliance, but it is also the fact that the hospitals had systematic influence. Adding Admissions Department to the multilevel model for Pain assessment-HCI resulted in a negative R^2 , suggesting that the differences between hospitals is masked by this factor. In future studies, a sufficient number of hospitals, and measurements of each department should be included to determine the differences on both hospital and department level.

5. Conclusions

This study showed a low compliance with pain assessment in Dutch postoperative patients after implementation of a national safety program, according to the process indicators for pain after surgery, suggesting that the implementation of pain assessment in hospitals is still insufficient.

Competing interests

None declared.

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None.

Ethical approval

The evaluation study of the Safety Program (data source 1) has been approved by the Medical Ethics Committee of the VU Medical Centre Amsterdam, with protocol number 2011/359. Ethical approval of the survey in Dutch hospitals (data source 2) was not required as data was collected on hospital level.

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