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5 Pain monitoring analysis as a quality indicator: a retrospective study

Abstract

Introduction: To improve patient care and safety in hospital clinical settings, evidence-based and internationally comparable quality indicators (QI) need to be developed. The QI best demonstrates the pain management quality. This chapter aims to deliver an overview of the introduction of a pain monitoring QI and its use in clinical practice to evaluate the long-term monitoring effects of the pain QI in a clinical environment at one of the tertiary institutions in Slovenia.

Methods: A non-experimental quantitative study was carried out with a probabilistic random sample. Twenty per cent occupancy of the unit/department was analysed, and patient's documentation on the selected day at the tertiary institution for four consecutive years (2016 to 2019) was reviewed. Data were processed using bivariate and multivariate analysis.

Results: The study found a nonlinear pain monitoring increase across the five studied variables. The comparison between clinics did not show statistically significant differences ($F = 6.6$, $p = 0.14$) in the QI variables (pain assessment on admission, before and after therapy, appropriate analgesic, and daily assessment in patients with no pain).

Discussion and conclusion: The research provided insight into pain monitoring at a tertiary institution over 4 years. The data obtained might serve as the basis for surveys and policy-making at a national level, including protocol creation.

Keywords: Patient, pain, hospital

5.1 Introduction

Quality indicators (QI) were developed and are now being evolved by the Agency for Healthcare Research and Quality's (AHRQ). QI respond to the need for multidimensional, accessible criteria to improve performance in healthcare. The QI is a measurement tool to monitor, evaluate, and improve the quality of healthcare based on evidence-based practice [1]. In 1998, the American Nurses Association (ANA) designed the National Database of Nursing Quality Indicators (NDNQI). The database was created to meet the need to assess the impact of nursing on healthcare, the relationship between workload, workflow, and the relationship between nurses and patients. The connection between the nurse's recruitment and the outcomes and results in the work

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with patients was confirmed later. For the QI to be useful for monitoring the quality of care, it should be clinically relevant and reliable as well as valid [2].

Designing a QI is a multistep process that involves evaluating evidence if a particular indicator is used in clinical practice followed by pilot-testing of indicators. The National Database of Nursing Quality Indicators (NDNQI) continuously monitors and delivers validity and reliability tests. In nursing, a quality/outcome indicator is considered significant, if there is a connection or a multivariate link between single nursing aspects/process and the outcome. To evaluate a strong correlation between HR nursing structure and work outcomes, the NDNQI uses state-of-the-art methods, for example, mixed (hierarchical) model [3]. Evidence-based nursing used to be increasingly very important for patient outcomes. The status of patient care is now evaluated by QI [4].

Measuring outcome performance is crucial to improve quality as it provides information on current and previous performance to support further efforts for improvement. Therefore, the development and application of valid and reliable performance measurements are essential to improve the quality of care. This is one of the first steps in the improvement involving the selection, definition, and the use of performance indicators [5].

Patient safety indicators (PSIs) in AHRQ strengthen the clinical quality of the healthcare system. PSIs are a set of measures to coordinate quality improvement objectives throughout the system. They can be used to monitor trend data and provide root causes of any quality-related problem, even if documentation is the underlying problem. Without carefully prepared documentation, it is hard to identify true opportunities for quality improvement [6].

Many international organizations focus on pain management aiming to understand patients who are suffering from acute or chronic pain. Nursing personnel spend most of their time as the primary caregiver for the patient and are therefore crucial in the assessment and management of pain. In a hospital clinical setting, evidence-based and internationally comparable QI need to be developed to optimize patient care and safety. A reliable and valid QI for pain monitoring is the most suitable way to prove the quality of pain management. Pain assessment is crucial for effective pain management. Nurses have a unique role in the assessment of pain as they spend most of their time with the patient [7].

Pain that alleviates relatively quickly is referred to as acute pain. Prolonged pain is referred to as chronic or persistent pain. There are various definitions of acute and chronic pain. Some experts claim that acute pain lasts no longer than 30 days, while others argue that acute pain can be associated with any pain that resolves within 3 or 6 months. With its protective and healing function, acute pain serves as a useful survival mechanism. Chronic pain is most commonly described as pain lasting longer than 3–6 months or pain lasting longer than the normal healing time for the associate pathological process. Complex psychological and social factors may be encompassed in the pain [8]. Pain management in Europe focuses on the application of a biopsychosocial approach. This approach monitors the development

of pain through a complex interaction of biological (genetics, biochemistry, etc.), psychological (mood, thoughts, beliefs), and social (cultural, family, socioeconomic, etc.) aspects. In this way, pain management consists of pharmacological (drugs), non-pharmacological therapies (exercise, cognitive behavioral therapy), patient education, invasive approaches, if necessary, and long-term pain management programs for people with chronic pain [8].

Patients referred to a facility with acute or chronic pain do not have any guarantee that their pain will be treated appropriately from an organizational perspective. In one study [9], 89% of hospitals declared to provide adequate pain management; however, only a few hospitals adhered to expert protocols. Considering the lack of adequate pain management, there are many concerns regarding the quality of monitoring. Thirty-eight per cent of patients report that their pain is not adequately managed [10]. Pain is the most common symptom in emergency care patients with more than half of patients reporting moderate pain intensity. Critically ill and intubated patients who are unable to communicate are even at greater risk of inadequate pain management [11]. Nurses lack knowledge about pain management, the complex practices in emergencies, factors affecting the detection, and nurses' judgment, assessment, and management of pain in critically ill patients are not well understood [12].

Casarett et al. [13] suggest that satisfaction with pain management can be measured and investigated reliably. Joy et al. [14] found that a multimodal training model improved the level of pain knowledge in nurses reporting patients pain. Patients expect rapid pain relief; however, this is not often achievable. Despite multiple inspiring developments in analgesic therapy, many obstacles remain in the assessment, monitoring, record keeping, and reassessment of pain [15].

5.1.1 Purpose and goals

The purpose of this study was to analyse pain monitoring data after QI introduction, following education of nursing staff, to identify the effectiveness of monitoring pain assessment in patients. The objective of the chapter is to evaluate the long-term monitoring of effects resulting from the introduction of the pain QI in a clinical setting in one of the tertiary facilities in Slovenia. A research question and hypothesis were developed as follows:

- Research question: Has the pain monitoring performance improved after the QI was introduced among nursing staff during the study period?
- Hypothesis: There are statistically significant differences in pain monitoring between departments within the institution.

5.2 Methods

A non-experimental quantitative research design – a retrospective study research design was applied.

5.2.1 Instrument description

Instead of collecting new data, information already obtained for monitoring the QI in the institution was used. The data was obtained using the following form: Control of compliance with the QI of pain monitoring in UKC Maribor. The form includes data on the organizational unit and the number of patients hospitalized on the selected day as well as the number of patient documentation included in the monitoring. In addition, the form includes the patient's ID number and six binary (Yes/No) items for pain monitoring: was the patient's pain assessed at admission; was the pain in patients, who did not report pain, assessed and recorded once a day; was pain assessment performed and documented before analgesia and one hour after analgesia, and was the patient-administered an appropriate analgesic according to the pain assessment. Initially, pilot monitoring was carried out in the first quarter of 2016. Monitoring documentation/review was repeated in autumn 2016 and 2017, 2018, and 2019.

5.2.2 Sample description

Monitoring was carried out on an ad-hoc documentation sample to conduct the analysis. Insight into the QI implementation, pain monitoring, and patient's health records (20% random sample all patients included for each unit) in the period from 2016 to 2019 enabled data collection. In 2016, the monitoring was carried out at 27 departments/units, and records of 142 patients were reviewed. In 2017, records of 181 patients in 31 departments/units were reviewed. In 2018, records of 158 patients at 31 departments/units were reviewed. In 2019, records of 102 patients at 21 departments/units were reviewed. Monitoring was carried out at the Division of Surgery, the Division of Internal Medicine, the Division of Gynecology and Obstetrics, and independent medical departments.

5.2.3 Research process and data processing description

We requested authorization to perform data analysis for the period from 2016 to 2019. SPPS version 20.0 (SPSS Inc., Chicago, IL, USA) was used for data analysis. Basic statistical calculations were used for individual variables as follows: arithmetic means/average, standard deviation, minimum, and maximum value, and percentages. ANOVA

was used to determine statistically significant differences between divisions/independent medical departments/units. A statistical value less than 0.05 was considered significant.

5.3 Results

We found an increase in pain monitoring for all five items, except VAS monitoring at admission (90%) and one hour after the therapy was administered (71%) in 2018. Table 5.1 shows the pain monitoring analysis for the facility.

The analysis of results using ANOVA analysis for comparison between divisions showed no statistically significant differences ($F = 6.6$, $p = 0.14$) (Tab. 5.2).

Figure 5.1 shows the distribution of the variables between divisions across all five variables in the period from 2016 to 2019. This chart demonstrates the percentage of pain assessment at admission in the monitored period has been improving nonlinearly at the Division of Surgery (KK), increasing unevenly at Independent Medical Departments (SAM), and nonlinearly at the Division of Gynecology and Obstetrics (GIN), while this trend was not seen at the Division of Internal Medicine (KIM).

According to the tertiary level institution standard, it is necessary to check the presence of pain once a day in patients who do not report pain. During the follow-up period, monitoring improved nonlinearly at the Division of Surgery, nonlinearly at Independent Medical Departments, and nonlinearly at the Division of Gynecology and Obstetrics (GIN). A positive trend was also seen in the Division of Internal Medicine (KIM); however, this trend has not been maintained.

Pain assessment monitoring before analgesic administration improved nonlinearly across all divisions and independent medical departments. The monitored variable of appropriate analgesic administration improved nonlinearly across all divisions and independent medical departments. When monitoring the variable “assessment of pain after therapy administration” one can see the nonlinear improvement across all divisions and independent medical departments.

The Division of Surgery and Independent Medical Departments achieved improvement across all variables. The Division of Gynecology and Obstetrics achieved similar results; however, slightly lower percentage levels. At the Division of Internal Medicine, improvement was achieved in three of the five variables.

Tab. 5.1: Pain monitoring in the period from 2016 to 2019 at the facility.

Year	*n*	a	SD	Min/max	b	SD	Min/max	c	SD	Min/max	d	SD	Min/max	e	SD	Min/max
2016	142	78%	0.29	0/100	70%	0.29	0/100	57%	0.31	0/100	74%	0.24	0/100	39%	0.27	0/100
2017	181	91%	0.12	66/100	91%	0.14	50/100	87%	0.17	0/100	87%	0.18	0/100	82%	0.18	0/100
2018	158	90%	0.14	50/100	93%	0.12	50/100	83%	0.21	20/100	80%	0.34	20/100	71%	0.35	20/100
2019	102	96%	0.19	33/100	93%	0.26	57/100	100%	0.14	50/100	100%	0.5	10/100	100%	0.5	0/100

a, VAS at admission; b, once daily; c, before analgesics; d, appropriate analgesic administration; e, 1 h after analgesic administration; min/max, minimal value/maximal value; *n*, no. of records to be followed; SD, standard deviation.

Tab. 5.2: Results of a one-way analysis of variance (ANOVA).

Source of variation	Sum of square	Df	Mean square	*F*	*p*-Value
Between groups	8.208454603	15	0.547230307	6.594397517	0.14
Within groups	36.51301494	440	0.082984125		
Total	44.72146954	455			

df, degree of freedom; *F*, *F*-value; *p*, statistical significance.

5.4 Discussion

The research showed that in all five variables an average increase in pain assessment monitoring was noted in the tertiary institution, after QI and the training of head nurses were introduced, at the facility level. The research question "Has the pain monitoring performance improved after the quality indicator was introduced among nursing staff during the study period?" can be answered affirmatively. A prior study reported that nursing staff noticed improved pain monitoring over four weeks by 30% [16]. The literature review confirmed the relevance of education. Continuous education and training are effective in sharing knowledge and developing pain management skills [17, 18]. A recent study found that after a pain management program was introduced for nursing personnel, the number of hospitalized patients who reported moderate to severe pain as well as the psychological and physical consequences of pain decreased [17]. However, only 42.3% of nurses reported moderate to extreme satisfaction with professional pain education in critically ill patients. Satisfaction in nursing staff was not investigated in our study; however, this might be an opportunity for further research. The most common obstacles to hamper the pain assessment and management defined by nurses are as follows: sphere of nurse's activity (65.3%); patient instability (54.4%); inability to communicate with the patient (53.3%); and sedation, which hinders the assessment of pain (50%). Barriers and options for pain assessment and management along with pain training differed significantly depending on the nurses' experience and the hospital type [19].

Despite examining the data for statistically significant differences in pain monitoring between divisions across the institution, we found that statistically significant differences could not be confirmed. The study did demonstrate the percentage of documented pain recorded in the electronic medical charts by nurses varied per unit [20]. A moderately positive association was noted between work experience (in years) and the level of perceived pain intensity [12].

The research discovered the lowest values for the appropriate analgesic application in 2016. Values continued to rise in 2017 whereas a decline was noted in 2018. According to the past research, documentation of pain is poorly recorded by

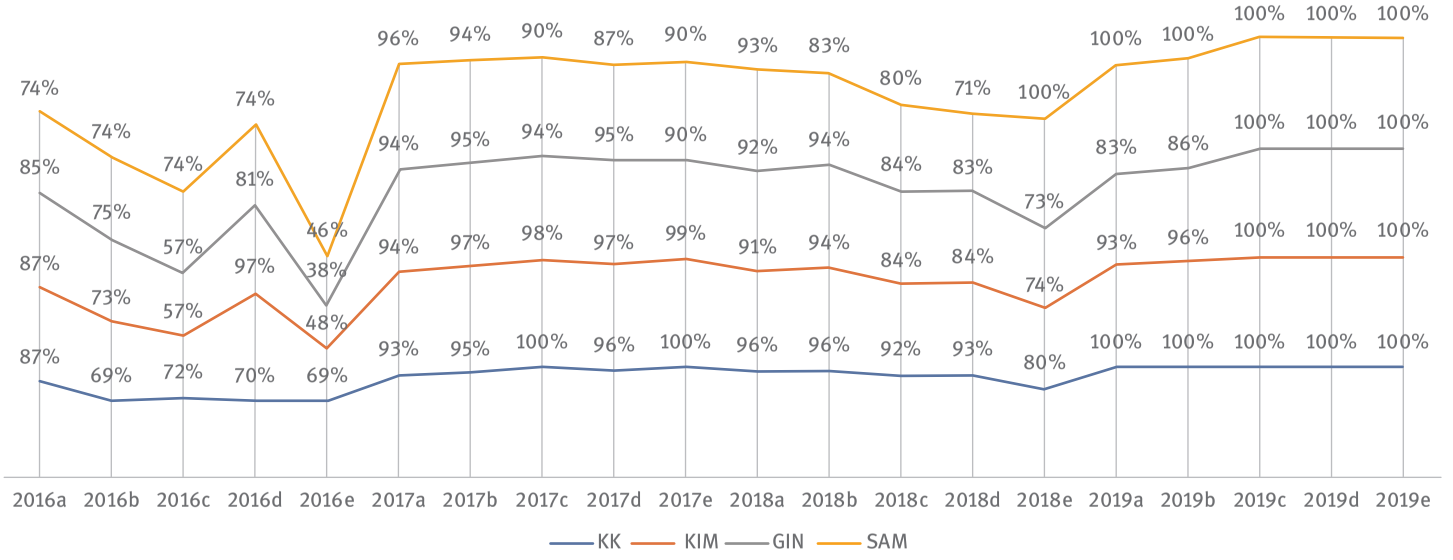

Fig. 5.1: Comparison of pain monitoring variables based on quality indicators between divisions for the period from 2016 to 2019. a, VAS at admission; b, once daily; c, before analgesics; d, appropriate analgesic administration; e, 1 h after analgesic administration; GIN, Division of Gynaecology and Obstetrics (GIN); KK, Division of Surgery; KIM, Division of Internal Medicine; SAM, increasing unevenly at independent medical departments.

nurses and even high levels of pain did not result in nurses administering more analgesics. Nurses often do not seem to trust the patient's assessment of pain [21]. Despite extensive improvements in analgesics, barriers remain in pain assessment, management, record keeping, and reassessment. Our research demonstrated that nurses would benefit from continuous training, including education on opioid use. Nurses are in a unique position for assessing and managing pain [15]. A survey investigating nurses' perspectives on barriers and options for conducting nursing assessments following workshops has identified numerous factors affecting nurses' ability to perform optimal pain assessment. The most common obstacles mentioned were lack of time, poor health, and lack of equipment [22].

Nurses' expertise and skills are essential for detecting and managing acute pain in critically ill patients [12]. In our study, the most alarming data was the following: at the beginning of monitoring in 2016, the lowest performance values across the five variables were noted in the ICUs, where critically ill patients are treated. The study highlighted the negative impact of poor cross-professional communication associated with analgesic use and the impact of nurses' workload on administering analgesics which, on the one hand, might reduce the quality and enhance the continuous pain treatment, on the other hand, in severely ill patients. It has been found that the level of pain intensity reported by nurses increased with their years of expertise. The skill-set and competencies that are required for the effective and safe management of the demands posed by critically ill patients, particularly pain assessment and treatment, are very complex [11]. Inadequate acute pain management may result in higher morbidity and mortality [23, 24]. An intervention initiated by a nurse is one of the most significant strategies for managing symptoms promptly, for example, analgesia in acute pain patients. Policies or protocols for nurses, with necessary competencies adopted by the facility, usually include independent initiation of treatment based on clinical judgment and/or investigations before a physician's instructions [25]. However, in Slovenia, we have not identified such an appropriately regulated practice. A multidimensional monitoring and treatment approach is required due to the many causes of chronic pain. As a result, the quality of pain management is challenging and complex, reflecting not only decision-making in health care but also organizational structure and processes [9].

5.5 Conclusion

Quality assessment and timely intervention by nurses are critical for the management of pain and are essential for quality and evidence-based care. This study aimed to evaluate the long-term monitoring effects of pain following the introduction of a pain QI in a clinical setting in one of the tertiary institutions. Standardized tools help maintain the attention of nursing staff; however, the critical judgment of nurses is

also of vital importance in the initiation of pain therapies. To identify the breadth of the issue, further research is necessary to determine whether nursing staff have sufficient education and knowledge on the importance of monitoring pain and in determining their attitudes and perceptions about pain. In-depth monitoring of pain assessment across individual units (emergency centres, ICUs, paediatric wards, and geriatric departments) and multicentre research would be reasonable. Investigation into root causes is necessary to organize further pain monitoring activities and provide support for nursing's management of pain. Better awareness of modalities aimed at pain reduction is necessary across all management levels within the facility. Furthermore, it is essential to adopt future protocols at the national level for analgesics administration.

The objectives of the research have been achieved nevertheless; the study has its limitations. This research was conducted as an analysis of pain monitoring data in a tertiary facility with the interpretation of pain monitoring over 4 years. The research results provided us an insight; however, the data cannot be generalized outside the facility due to the sample size. The fact that the produced QI is not widely accepted can also be considered a limitation to the study. Every healthcare professional is responsible for pain management and every healthcare professional should have optimal education in best practices of pain management. To ensure the generalizability of the results, we recommend that further studies be conducted with larger sample groups in all healthcare institutions in Slovenia.

References

[1] Agency for Healthcare Research and Quality. Quality indicators, 2021. (Accessed September 20, 2021, at https://www.qualityindicators.ahrq.gov)
[2] Berg K, Mor V, Morris J, Murphy KM, Moore T, Harris Y. Identification and evaluation of existing nursing homes quality indicators. HCF, 2002, 23(4), 19–36.
[3] Gajewski B, Hart S, Bergquist-Beringer S, Dunton N. Inter-rater reliability of pressure ulcer staging: Ordinal probit Bayesian hierarchical model that allows for uncertain rater response. Stat Med, 2007, 26(25), 4602–4618.
[4] Dubois CA, D'Amour D, Pomey MP, Girard F, Brault I. Conceptualizing performance of nursing care as a prerequisite for better measurement: A systematic and interpretive review. BMC Nurs, 2013, 12(7), 1–20.
[5] Mitchell PM. Definition patienty safety and quality care. In: Hughes RG, Ed. Painty safety and quality indicator: An evidence-based handbook for nurses. Agency for Healthcare Research and Quality, ZDA Rockville MD, 2008, Chapter 1.
[6] Agency for Healthcare Research and Qulaity. Improving Value and Efficiency in Hospitals and Medical Offices: A Resource List for Users of the AHRQ SOPSTM Value and Efficiency Supplemental Items, 2019. (Accessed September 20, 2021, at https://www.ahrq.gov/sites/default/files/wysiwyg/sops/quality-patient-safety/patientsafetyculture/valueresourcelist.pdf)
[7] Gregory J. Use of pain scales and observational pain assessment tools in hospital settings. RCNi, 2019, e11308.

[8] European Pain Federation. What is the definition of pain? N.d. (Accessed September 22, 2021, https://europeanpainfederation.eu/history/what-is-pain)
[9] De Meji N, Köke A, Thomassen I, Kallewaard JW, van Kleef M, van der Weijden T. Quality indicator fort he assessment of pain clinic care: A step forward? Quality from profesionals and patients perspective (QiPP). IASP, 2018, 12, 2593–2605.
[10] de Meji N, Albère K, van der Weijden T, van Kleef M, Patijn J. Pain treatment facilities: Do we need quantity or quality?. J Eval Clin Pract, 2014, 20(5), 578–581.
[11] Varndell W, Fry M, Elliott D. Pain assessment and interventions by nurses in the emergency department: A national survey. J Clin Nurs, 2020, 29(13–14), 2352–2362.
[12] Varndell W, Fry M, Elliott D. Exploring how nurses assess, monitor and manage acute pain for adult critically ill patients in the emergency department: Protocol for a mixed methods study. Scand J Travma Resusc Emerg Med, 2017, 25(1), 75.
[13] Casarett DJ, Hirschman BK, Miller RE, Farrar TJ. Is satisfaction with pain management a valid and reliable quality indicator for use in nursing homes? J Am Geriatr Soc, 2002, 50(12), 2029–2034.
[14] Joy JA, Novosel LM, Ren D, Engberg S. Effect of a QI intervention on nursing assistants' pain knowledge and reporting behavior. Pain Manag Nurs, 2021, 22(2), 150–157.
[15] Pretorius P, Searle J, Marshall B. Barriers and enablers to emergency department nurses' management of patients' pain. Pain Manag Nurs, 2015, 16(3), 372–379.
[16] Roos-Blom MJ, Gude WT, Spijkstra JJ, de Jonge E, Dongelmans D, de Keizer NF. Measuring quality indicators to improve pain management in critically ill patients. Jcc, 2019, 49, 136–142.
[17] Germossa GN, Hellesø R, Sjetne IS. Hospitalized patients' pain experience before and after the introduction of a nurse-based pain management programme: A separate sample pre and post study. BMC Nurs, 2019, 18(1), 40.
[18] Sinclair PM, Kable A, Levett-Jones T, Booth D. The effectiveness of internet-based e-learning on clinician behaviour and patient outcomes: A systematic review. Ijns, 2016, 57, 70–81.
[19] Köse Tamer L, Sucu Dağ G. The assessment of pain and the quality of postoperative pain management in surgical patients. Sage, 2020, 1–10.
[20] Goudman L, Duarte V, De Smedt A, Copley S, Eldabe S, Moen M. Cross-country differences in pain medication before and after spinal cord stimulation: A pooled analysis of individual patient data from two prospective studies in the United Kingdom and Belgium. INS, 2021, 24.
[21] Watt-Watson J, Stevens B, Garfinkel P, Streiner D, Gallop R. Relationship between nurses' knowledge and pain management outcomes for their postoperative cardiac patients. J Adv Nurs, 2001, 36(4), 535–545.
[22] Baillot A, Chenail S, Barros Polita N, Simoneau M, Libourel M, Nazon E, Riesco E, Bond DS, Romain AJ. Physical activity motives, barriers, and preferences in people with obesity: A systematic review. PLoS One, 2021, 16(6), e0253114.
[23] Lord B, Varndell W. Pain management. In: Curtis K, Ramsden C, Eds. Emergency and trauma care for nurses and paramedics. 3rd ed. Sydney, NSW, Elsevier, 2019.
[24] Schug SA, Palmer GM, Scott DA, Halliwell R, Trinca J. Acute pain management: Scientific evidence. 4th ed, 2015.
[25] Burgess L, Kynoch K. Effectiveness of nurse-initiated interventions on patient outcomes in the emergency department: A systematic review protocol. JBI Database System Rev Implement, 2017, 15(4), 873–881.