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Patients' self-reported nausea: Validation of the Numerical Rating Scale and of a daily summary of repeated Numerical Rating Scale scores

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KEYWORDS: assessment, nausea, Numeric Rating Scale, postoperative, validation

Abstract

Aim and objectives: To validate the Numeric Rating Scale (NRS) for postoperative nausea assessments, and determine whether a central tendency, median, based on patients' self-rated nausea is a clinically applicable daily measure to describe patients' nausea after major surgery.

Background: Postoperative nausea causes major discomfort, risks for complications, and prolonged hospital stays. The NRS is recommended for the assessment of pain but is little explored for assessing nausea.

Design: A repeated measure design was carried out on patients who had undergone major surgery in three Swedish hospitals.

Methods: Nonparametric statistical methods were used to analyze (1) associations between the NRS and a verbal scale (no, mild, moderate, and severe) and (2) to analyze associations between Measure 1 (nausea scores postoperative Day 1) and Measure 2 (retrospective nausea scores at rest and during activity, postoperative Day 2).

Results: The mean age of the 479 patients (44% women) in the sample was 65 years (range, 22–93 years). Self-assessed nausea scores from the NRS and the verbal scale correlated well ($r_{\text{Spearman}} = .79$). Correlation between nausea at rest and nausea during activity was $r_{\text{Spearman}} = .81$. The calculated median scores (Measure 1) showed only moderate correlations with retrospective nausea scores (Measure 2); 4–9 ratings, $r_{\text{Spearman}} = .41$; 6–9 ratings, $r_{\text{Spearman}} = .54$.

Conclusions: NRS scores showed strong associations with a verbal scale, therefore the NRS seems to be a valid tool to measure nausea intensity. The quality of daily summarized median nausea scores needs to be further explored before clinical use.

Relevance to clinical practice: The use of the NRS in assessments of nausea in postoperative care will facilitate communication between patients and health care professionals regarding nausea intensity. When documenting nausea, it seems unnecessary to distinguish nausea at rest from nausea during activity.

What does this paper contribute to the wider global clinical community?

- Patients' self-assessed nausea scores from the NRS are adequate measures for nausea intensity.
- The quality of a summarized daily median nausea score derived from the NRS increases with the number of ratings collected; knowledge of the assessment procedure with the NRS needs to increase.
- It is not necessary to distinguish nausea at rest from nausea during activity when documenting nausea using the NRS; separate documentation on vomiting is necessary.

1 Introduction and background

Postoperative nausea and vomiting (PONV) after surgery affects many patients (Allvin, Ehnfors, Rawal, & Idvall, 2008; Macario, Weinger, Carney, & Kim, 1999). Urgent prevention and treatment of PONV is therefore indicated to minimize patient discomfort, the risk of medical complications (Apfel et al., 2012; Steenhagen, 2016) and the costs involved due to prolonged hospital stays (Bamgbade, Oluwole, & Khaw, 2017). When unrecognized by health care professionals, patients' experience of PONV is an important source of

dissatisfaction with care (Bamgbade et al., 2017; Roh et al., 2014) and, together with pain, is considered a major barrier to recovery (Allvin et al., 2008; Bamgbade et al., 2017). In postoperative care, fast-track surgery programs have become increasingly practiced not only in colorectal surgery settings (Spanjersberg et al., 2011) but also in urology (Maloney, Parker, Cookson, & Patel, 2017) and orthopedic settings (Zhu, Qian, Jiang, Ye, & Chen, 2017). To meet the goals of these programs, preventive strategies for PONV have been incorporated in treatment protocols (Feldheiser et al., 2016).

Research and guidelines have focused on pre- and perioperative prevention of PONV (Apfelbaum et al., 2013; Gan et al., 2014). Apfel, Läärä, Koivuranta, Greim, and Roewer (1999) identified the now widely used risk factors for scoring the risk of preoperative nausea: female sex, history of PONV and/or motion sickness, nonsmoking status, and use of postoperative opioids. Current guidelines for the prevention of postoperative PONV recommend multimodal prophylaxis before and during anesthesia based on this risk scoring (Gan et al., 2014). It has been shown that the use of this strategy can decrease PONV after major surgery from 30% to 13% on the day of surgery (Motamed & Bourgain, 2015). However, nausea on the day after surgery, which in the worst scenario can lead to vomiting, is often caused by postoperative treatment of pain (Apfel et al., 2012; Odom-Forren et al., 2013). This means that health care professionals need to pay attention to postoperative nausea (i.e., measure it using validated tools) in the post-anesthetic care unit as well on surgical wards (Van Der Wees et al., 2014).

Nausea, like pain, is a subjective symptom (Armstrong, 2003), which means that similar to pain, assessment of nausea intensity should ideally be based on documentable patient-reported measures (DeBlieck, LaFlamme, Rivard, & Monsen, 2013; Van Der Wees et al., 2014). Despite insufficient literature on whether routine nausea assessments are associated with fewer postoperative complications, the American Society of Anesthesiology

conclude that monitoring of nausea visualizes patients' suffering and thereby facilitates individualized treatment, which in turn could contribute to reduction of PONV-related risks for complications (Apfelbaum et al., 2013). However, there are no recommended assessment procedures in current guidelines, such as recommendations for certain scales to assess the presence and severity of postoperative nausea (Apfelbaum et al., 2013; Gan et al., 2014).

Studies on nurses' performances when assessing postoperative nausea are rare (Börjeson, Arweström, Baker, & Berterö, 2010). However, like pain, nausea has consequences for the patients' ability to recover postoperatively regardless of when it occurs during the postoperative period (Allvin et al., 2008). In assessments of postoperative pain, patients are asked to rate their pain with one-dimensional pain scales, such as the Numeric Rating Scale (NRS-11) (Hjermstad et al., 2011); however, the use of scales seems to be limited in assessments of nausea (DeBlieck et al., 2013) and is not included in nurses' procedures for managing patients nausea (Börjeson et al., 2010). The Visual Analog Scale (VAS) with the endpoints no nausea and worst possible nausea has been validated and described by patients as easy to use (Boogaerts, Vanacker, Seidel, Albert, & Bardiau, 2000; Meek, Kelly, & Hu, 2009). However, in the clinical context, it can be inappropriate to use different scales when assessing closely related postoperative symptoms. When assessing pain, the NRS has become the most recommended scale as a result of patients' preferences regardless of age and context (Hjermstad et al., 2011). Furthermore, the NRS has been suggested for assessments of side effects from analgesia such as nausea (Gordon et al., 2010). The NRS is used in research on the prevalence of postoperative nausea (Odom-Forren et al., 2013) and in measures of the quality of postoperative symptom management (Gordon et al., 2010). However, validations have been performed, when symptoms from cancer are measured, in the Edmonton Symptom Assessment Scale, (ESAS) (Oldenmenger, de Raaf, de Klerk, & van der Rijt, 2013) and in the emergency setting (Meek, Egerton-Warburton, Mee,

& Braitberg, 2015). To our knowledge the NRS is not validated for the assessment of postoperative nausea.

Recent studies have described the contribution of the NRS to communication when understanding patients' postoperative pain (Harper, Ersser, & Gobbi, 2007; Wikström, Eriksson, Fridlund, Årestedt, & Broström, 2014). To facilitate patients' recovery, that is, to relieve nausea-associated discomfort and medical risks, the use of patient-reported NRS scores may be just as applicable when communicating postoperative nausea as for pain. Furthermore, to meet the demand for documentation of symptom trajectories (DeBlieck et al., 2013; Gerbershagen, Aduckathil, van Wijck, Peelen, Kalkman, & Meissner 2013; Saranto & Kinnunen, 2009), a daily summary of patients self-reported postoperative pain were shown to be valid when assessments were frequent (Wikström et al., 2017). These results suggest that daily summaries of patients' self-reported postoperative nausea with the NRS are useful for evaluating postoperative nausea. Therefore, the aim was to (1) validate the NRS for postoperative nausea assessments and (2) determine whether a central tendency, median, based on patients' self-rated nausea is a clinically applicable daily measure to describe patients' nausea after major surgery.

2 Methods

2.1 Design and setting

A repeated measure design was used, comprising two sets of measurements of postoperative nausea on postoperative Days 1 and 2. The study was conducted at three general surgical and three general orthopedic wards at three different county hospitals, each with 300–400 beds. The catchment areas included 414,000 inhabitants from both rural and urban

environments. The NRS had been used for several years in these hospitals for assessing postoperative pain, but not for assessing nausea.

2.2 Sample

The inclusion of 582 patients undergoing scheduled major surgery in the three general surgical and three general orthopedic wards (Table 1) was based on convenience sampling. Designated research nurses identified patients eligible for the study 1–2 weeks before surgery between October 2012 and January 2015. The inclusion criteria were patients aged 18 years or older, scheduled for major general or orthopedic surgery and expected to have a length of stay ≥ 2 days, oriented to time and environment and able to understand both spoken and written Swedish. Postoperative intensive care was an exclusion criterion. Of the 582 eligible patients, 541 participated of which 479 completed the study. Figure 1 shows the flowchart of the patients and data collection on Days 1 and 2.

Table 1 Sociodemographic and clinical data

	Total n=479
Age, mean, [range]	65 [22-93]
Women, n (%)	211 (44)
Country of birth (%)	
Sweden	451 (94)
Other	27 (6)
Smokers	28 (6)
Motion sickness	34 (8)
Preoperative daily intake of	
Analgesia (opioids ^a)	66 (14)
Antiemetics	5 (1)
Type of surgery, n (%)	
Cystectomy and nephrectomy	22 (5)
Prostatectomy	67 (14)
Other urology	4 (0.8)
Lower abdominal surgery	89 (19)
Vascular	6 (1)
Other general surgery	2 (0.4)
Knee replacement	76 (16)
Hip replacement	149 (31)
Neck and back	49 (10)

Other orthopaedic surgery	15 (3)
ASA^b n (%)	
>II	60 (13)
Anaesthesia, n (%)	
Regional	245 (51)
Sedation	167 (35)
General	267 (56)
Postoperative analgesia n (%)	
Opioids ^d	362 (78)
Epidural	120 (26)
Antiemetics ^c	119 (25)

^a Codeine, tramadol, morphine, oxycodone, fentanyl, buprenorfin

^b ASA, American Society of Anesthesiologists physical status classification

^c Metoclopramid, ondansetron, granisetron, mекlozin,

^d Morphine, oxycodone

Figure1 Flowchart of patients and data collection

2.3 Data collection

Designated study nurses at each site collected sociodemographic data such as age, sex, country of birth, smoking, and motion sickness preoperatively. Postoperatively, clinical data such as surgical procedure, anesthetics, and postoperative pharmaceuticals were obtained from electronic medical records.

2.3.1 Measure 1

On postoperative Day 1, nurses practicing on the wards were instructed to ask the patients to assess their current nausea with the verbally communicated NRS every fourth hour, during incidents of nausea between the scheduled hours and at reassessments after receiving antiemetics. When the patient was asleep, no assessment was made. A protocol designed for the study was used to document the patients' self-rated nausea scores and time of scoring. The instructions were based on an international guideline for assessing postoperative pain (Gordon et al., 2010) because no detailed guidelines for the assessment of postoperative nausea were found.

2.3.2 Measure 2

On the morning of postoperative Day 2, the patients received a questionnaire with five questions applicable to this study. In Questions 1 and 2, the patients were asked to assess their average nausea scores at rest and during activity from postoperative Day 1. They registered their scores on a horizontal NRS scale. In Questions 3–5, the patients were asked to assess their average nausea on a horizontal verbal scale (no, mild, moderate, severe nausea) and to register the number of occasions with nausea and vomiting from postoperative Day 1.

2.4 Ethical considerations

The Helsinki Declaration WMA (2013) was followed with regard to inclusion of patients in this study. Patients were asked about participation regardless of ethnicity, sex, or socioeconomic status. After receiving verbal and written information, patients' eligible for the study were asked to give verbal consent. The Ethical Review Board in Linköping, Sweden gave ethical approval (M249-08).

2.5 Data analysis

Sociodemographic and clinical data were analyzed by descriptive statistics (frequency, percentage, mean, and range). The NRS scores were categorized into four groups (0 = no nausea, 1–3 = mild, 4–6 = moderate, 7–10 = severe) for analyses of the incidence of nausea (Boogaerts et al., 2000). When the association (Spearman rank correlation) between the NRS and a verbal scale (no, mild, moderate, and severe) was determined, the full range of the NRS was used. To determine the construct validity of the NRS, the verbal scale served as the gold standard (Allvin et al., 2011). In the analyses of median NRS scores based on patients' self-rated nausea scores in Measure 1, it was deemed both clinically and statistically appropriate to exclude patients from the analyses who had less than four nausea scores recorded on postoperative Day 1. This decision was based on the assumption that nausea fluctuates over time (Armstrong, 2003) and that median measures need more than three observations to represent a relevant measure from an 11-score scale. When necessary, the median was rounded upward to the nearest integer. IBM SPSS Statistics (IBM Corp., Armonk, NY) was used for analyses of the data.

To determine the clinical applicability of a daily summarized score of nausea (median), the patterns of change between Measure 1 and Measure 2 were analyzed by the Svensson method (Svensson, 2012). From Measure 1, patients' median scores were analyzed using the continuous NRS. From Measure 2, patients' retrospective average scores at rest and during activity were analyzed using the continuous NRS. The patterns of change between the measures; pairwise agreements (percentage agreement), systematic disagreements (relative position, relative concentration) and individual variability (relative rank variance) were analyzed separately using a free software program (Avdic & Svensson, 2010). Paired categorical data that inherit a ranking without information regarding the size between scores are suitable for this method. In the Svensson analyses, pairwise agreements represent pairwise

identical answers, which are reported as percentage agreement. The group-level systematic disagreement, measured by the relative position estimates the systematic change in probability (%) between Days 1 and 2 of reporting less nausea on Day 2 than on Day 1, minus the probability of reporting more nausea on Day 2 than on Day 1 (or vice versa). The relative concentration, based on the cumulative frequency of variables, ranging from -1 to 1 , represents the calculation of the concentration of the systematic change. A value close to 1 indicates answers concentrated to a certain score on the NRS in Measure 1, and a negative score indicates a concentration to a certain score in Measure 2. The individual variability, analyzed by the relative rank variance ranges from 0 to 1 . A result > 0.20 indicates a non-negligible heterogeneity (Avdic & Svensson, 2010). The analyses of relative position and relative rank variance are described with 95% confidence intervals. A relative position close to 0 (confidence interval that covers 0) and a percentage agreement close to 100% indicates no significant change between the two set of measures.

3 Results

3.1 Demographic and clinical data

In total, 479 patients scheduled for major general ($n = 190$) or orthopedic ($n = 289$) surgery completed the study (Table 1). The proportion of woman, pre- and postoperative intake of opioids, and postoperative antiemetics were higher in the orthopedic group; smokers, general anesthesia, and postoperative epidurals were higher in the general surgery group.

3.2 Self-rated nausea from Measures 1 and 2

The proportion of patients who had their nausea registered with the NRS ≥ 4 times in Measure 1 was 84% (Table 2). In Measure 2, the proportion of patients who reported

retrospective average nausea with the NRS and on a verbal scale was 97% at rest and 97% during activity.

Table 2 Frequency of patients' self-rated nausea, collected by nurses, Measure 1

Number of ratings	Total, n (%) n=479
0-3	76 (16)
4	131 (27)
5	127 (27)
6	88 (18)
7	47 (10)
8	9 (2)
9	1 (0.2)

Preoperative moderate to severe nausea was reported by 4%. Postoperative moderate to severe nausea in Measure 2 was reported by 17% at rest and 23% during activity (Table 3). One to three incidences of nausea and vomiting were reported by 167 (37%) and 104 (22%) patients, respectively, and 109 (24%) and 21 (5%) patients reported ≥ 4 incidences of nausea and vomiting.

Table 3 Frequency of patients in no, mild, moderate and severe nausea, Measure 1 and 2I

Nausea intensity	Preoperative retrospective average nausea n=475	Measure 1 self-rated nausea, (median) 4-9 ratings, n=403	Measure 2 at rest retrospective average nausea n= 463	Measure 2 during activity retrospective average nausea n= 464	Measure 2 retrospective nausea, verbal scale n=458
0 (no nausea)	401 (84)				
1-3 (mild)	55 (12)				
4-6 (moderate)	16 (3)				
7-10 (severe)	3 (0.6)				
0 (no nausea)		353 (87)	236 (51)	214 (46)	214 (47)
1-3 (mild)		43 (11)	147 (32)	144 (31)	147 (32)
4-6 (moderate)		6 (2)	58 (12)	57 (12)	68 (15)
7-10 (severe)		1 (0.2)	22 (5)	49 (11)	29 (6)

3.3 Associations between NRS and a verbal scale

The correlation between retrospective nausea NRS scores at rest and the verbal scale (no, mild, moderate, severe nausea) was $r_{\text{Spearman}} = .79$ ($p < .001$), and the association between

retrospective nausea NRS scores during activity and the verbal scale was $r_{\text{Spearman}} = .79$ ($p < .001$).

Analyses of changed patterns showed a percentage agreement of 76% at rest and 74% during activity. The relative position at rest was 0.09 (95% CI, 0.06–0.12), the relative concentration was 0.04 (95% CI, 0.00–0.09) and the individual variation, relative rank variation, was 0.007 (95% CI, 0.003–0.01).

3.4 Associations of average nausea scores between Measures 1 and 2

Rank correlations for calculated individual median scores from Measure 1, based on four ratings, versus retrospective average nausea from Measure 2, were $r_{\text{Spearman}} = .41$ ($p < .001$) at rest and $r_{\text{Spearman}} = .38$ ($p < .001$) during activity. The correlation between average nausea at rest and during activity was $r_{\text{Spearman}} = .81$ ($p < .001$). At rest, a pattern of strengthened correlations was seen with increased number of ratings: 5–9 ratings, $r_{\text{Spearman}} = .45$ ($p < .001$); 6–9 ratings, $r_{\text{Spearman}} = .54$ ($p < .001$).

3.5 Patterns of change between Measures 1 and 2

The cumulative distribution between the measures (Figure 2) illustrates that many patients who obtained a NRS median of 0 in Measure 1 stated a higher average score in Measure 2. For the group with 4–9 ratings, the percentage agreement between median NRS nausea scores from Measure 1, and retrospective average NRS scores from Measure 2 was 51% at rest and 46% during activity. The analyses of systematic group changes using nausea at rest or during activity in Measure 2 showed similar significant changes toward higher nausea scores at the second measure. At rest, the relative position was 0.33 (95% CI, 0.28–0.38) and the relative concentration was -0.05 (95% CI, 0.14–0.04). During activity, the relative position was 0.33 (95% CI, -0.28 to 0.38) and the relative concentration was -0.11 (95% CI, -0.21 to 0.01). The individual variation (relative rank variation) was within the

expected outcome both at rest 0.02 (95% CI, 0.01–0.04) and during activity 0.03 (95% CI, 0.01–0.05).

When patients who reported no nausea for both measures (n = 194; Measure 2, nausea at rest) were excluded in the analyses, the percentage agreement dropped to 2%. The relative position was 0.78 (95% CI, 0.72–0.85), relative concentration was 0.41 (95% CI, 0.26–0.57), and relative rank variation was 0.20 (95% 0.10–0.29). These results imply that systematic (group) changes in reported nausea NRS scores caused significant disagreements between the two measures both at rest and during activity, whereas individual variations were within the expected outcome and therefore were not a source of disagreement.

4 Discussion

The main results showed strong correlation between patients' NRS scores versus a verbal scale. However, acceptable reliability of daily median scores was not obtained, despite

higher correlation coefficients of patients' retrospectively reported nausea with more frequent nausea ratings. A significant change toward higher retrospectively reported nausea was shown. A large proportion of patients reported retrospectively one or more incidences of nausea (61%) and one or more incidences of vomiting (27%), and a small group of patients (4%) suffered from nausea before surgery. Furthermore, patients reporting nausea at rest and nausea during activity showed high correlation.

The reported prevalence of moderate to severe nausea was 23%, which corresponds well with the proportion of patients who were given antiemetics (25%). Incidences of late nausea (>24 hours after anesthesia) may be caused by factors other than anesthesia, such as the type of surgical procedure (Gan et al., 2014) and opioids given postoperatively (Odom-Forren et al., 2013). In this sample, most patients were given opioids. It is shown that high-risk patients (>3 risk scores) despite receiving preventive strategies report nausea and interference with function (White, Sacan, Nuangchamnong, Sun, & Eng, 2008). Similar results are reported for day surgery populations (Apfel et al., 2012; Odom-Forren et al., 2013), which means that high-risk patients and patients receiving opioids need to be identified and assessed. Fast-track programs and day surgery have developed rapidly (Prabhakar, Cefalu, Rowe, Kaye, & Urman, 2017), highlighting the importance of an active approach before these patients return home. To detect patients with nausea, the use of patients' self-rated scores is recommended (Apfelbaum et al., 2013; DeBlieck et al., 2013). Frequent assessments of nausea are an important strategy to invite patients to participate in care. The results from this sample showed that severe nausea during activity was slightly more frequent. However, the strong associations between self-reported nausea at rest and during activity (correlation $r = .81$ and percentage agreement of 76% at rest and 74% during activity) indicate that it might not be necessary to separate nausea measures at rest and during activity when documenting nausea.

The results showed that the NRS is a valid scale for the assessment of postoperative nausea. Patients self-assessed nausea scores from NRS versus a verbal scale (no, mild, moderate, and severe) associated well ($r = .79$), which means that NRS adequately measures patients' intensity of postoperative nausea. Results from the emergency setting shows that the NRS as well as the VAS significantly distinguish no, mild, moderate, and severe nausea. The cut point for no, mild, moderate and severe nausea were 0, 4, 6 and 9 respectively (Meek et al., 2015). A cut point of 4 on the VAS has been debated in the postoperative context (Boogaerts et al., 2000). The same applies for the ESAS when used in the context of cancer (Oldenmenger et al., 2013). Like other symptoms nausea is a subjective experience. When symptoms occur in clusters such as when pain and fatigue also are present, symptoms may interact (Armstrong 2003). Some patients tend to underscore symptoms, such as pain (van Dijk, Vervoort, van Wijck, Kalkman, & Schuurmans, 2016). This behavior may also apply for nausea. In postoperative recovery, the importance of retaining an appetite (Allvin, Berg, Idvall, & Nilsson, 2007; Steenhagen, 2016) means that any nausea, regardless of score, affecting food intake should be avoided as far as possible. Therefore, the use of fixed cut points when offering treatment for nausea is considered doubtful.

The summarized medians from the patients self-rated nausea scores on postoperative Day 1 were significantly lower ($p < .001$) than their retrospectively reported nausea. The analyses based on 4–9 ratings showed only moderate correlations ($r_{\text{Spearman}} = .41$) at rest and ($r_{\text{Spearman}} = .38$) during activity. However, with an increased number of ratings, the correlations increased to $r_{\text{Spearman}} = .54$. There could be several reasons why a greater proportion of patients obtained a median of 0 than the proportion who retrospectively scored 0. One reason could be caused by a statistical error when calculations of medians were made. If more than 50% of their ratings were 0, the median would become 0 despite higher scores for the remaining

ratings. Another reason could be that the health care professionals may not have managed to obtain the patient's true experience. To our knowledge, assessment of nausea that allows patients to rate their intensity of nausea on the NRS has not been explored. However, one can assume that some of the communication barriers that are identified among patients in the field of pain can be transferred to the nausea assessment situation. The accuracy of health care professionals in assessing patients' pain is reported to rely on several aspects, such as clinical experience, the timing of the assessment, patients' experience of symptoms, and vulnerability (Ruben, van Osch, & Blanch-Hartigan, 2015).

Nurses' experiences of using the NRS in assessments of nausea in this study was limited, which means that differences between the measures could have arisen because nurses may have registered $\text{NRS} = 0$ when the patients did not mention nausea instead of asking them for a score. Experiences from nurses assessing pain highlight the complexity of communication in assessment situations (Lauzon Clabo, 2008; Wikström et al., 2014). A need for a multimodal communication approach based on earlier experiences has been identified, which means allowing patients to rate their pain using instruments and share the meaning of the scoring. Health care professionals carry out additional observations of symptom-related behaviors to detect patients who are reluctant to discuss pain. The same should apply to assessments of nausea. Another reason why the daily summarized medians do not satisfactorily mirror patients' experiences of nausea might be the timing of the assessments. In the context of this study, meals were typically served in between the time of assessments, which meant that incidences of nausea in connection with meals could have been missed. Future assessments of nausea in connection with meals might be a way to increase the quality of nausea assessments. However, before clinical use of daily median nausea scores, influencing factors, that is, how and when patients are assessed, need to be further explored.

Patients experiencing postoperative symptoms such as nausea and pain are vulnerable when communicating with health care professionals. Patients' tolerance for pain and fear about analgesics are related not only to their own preconceptions but also to perceived judgments from health care professionals (Eriksson, Wikström, Fridlund, Årestedt, & Broström, 2016; van Dijk et al., 2016). Patients who assume that pain will resolve soon describe being tough on themselves (Eriksson et al., 2016; van Dijk et al., 2016). This might also be the case with nausea, despite the knowledge that nausea is more dreaded than pain after surgery procedures (Eberhart, Morin, Wulf, & Geldner, 2002; Macario et al., 1999). Another dilemma is the fluctuation of symptoms over time and the overall complexity in the symptom experience when several symptoms are present (Armstrong, 2003). Therefore, patients' experiences of frequent self-ratings of several postoperative symptoms at the same time needs to be further investigated.

4.1 Limitations

A limitation associated with the first aim was the use of retrospective assessments when validating the NRS causing a risk for measurement error. However, to ensure the quality of collected measures patients performed their retrospective assessments by using the written verbal scale and the written NRS at the same time without any delay. When answering the second aim another limitation was the risk of measurement error in Measure 2 due to the collection of patients' retrospective NRS scores of nausea. To our knowledge, it is not known how experiences of intensity of nausea are remembered from the day before. Experiences of worry and tiredness have been shown to have an impact on memory capacity regarding pain (Khoshnejad, Fortin, Rohani, Duncan, & Rainville, 2014), which may apply also to memory of nausea. Therefore, as recommended by Kimberlin and Winterstein (2008), a short timeframe was used between the measures.

The fact that nausea was not distinguished at rest and during activity in Measure 1 as in Measure 2 explains why several analyses were made to find out potential differences between nausea at rest and during activity. Research on symptom experiences has shown that symptoms such as pain have individual variations, which means that exact scoring is difficult to achieve (Armstrong, 2003; Wolrich et al., 2014). This knowledge is probably transferrable to nausea assessment because nausea is one of many symptoms that is considered to be a subjective experience (Armstrong, 2003). The statistical rationale was therefore based on the perspective that self-rated nausea NRS scores should be treated as ordinal data. The choice of using only nonparametric statistical methods is supported by Svensson (2001, 2012). The Svensson method (Avdic & Svensson, 2010) contributed with analyses of both systematic and individual impacts on discrepancies identified between the two measures in this study.

5 Conclusions

Scores on the NRS showed strong associations versus a verbal scale, which means that the NRS score seems to measure nausea intensity adequately in the postoperative clinical context. Individual summarized median scores from patient's nausea ratings (4–9 ratings) on postoperative Day 1 had only moderate associations with patient's retrospectively reported experience. A pattern of strengthened association, still moderate, was found with an increased number of ratings up to 9. The quality of assessments of nausea may be strengthened by coordination with meals and increasing health care professionals' awareness that communication barriers might be similar to those shown in communication of pain.

6 Implications for clinical practice

To our knowledge, assessment of nausea with the NRS has not been well studied in the postoperative context, which means that this study could contribute with new knowledge. The use of patients NRS scores contributes to patient-reported outcome measures both in daily clinical situations and in measures of quality. It is not recommended to expose patients who are in a vulnerable situation just after surgery to different scales. The NRS is widely used in assessments of postoperative pain. The close association between the NRS and a verbal scale was therefore, an important result for the clinical use of the NRS when assessing postoperative nausea. However, the results show that before clinical use of a daily summarized nausea score from the NRS, there is a need to ensure the quality of health care professionals' assessment procedures. For patients with longer hospital stays postoperatively, high quality median measures could become a simple solution to visualize nausea and thereby ensure attention for patients with ongoing nausea in clinical reasoning and decisions. When summarizing daily nausea scores a calculating function in electronic medical records could facilitate the calculation.

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