American Journal of Emergency Medicine 57 (2022) 107–113

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Ability of pain scoring scales to differentiate between patients desiring analgesia and those who do not in the emergency department

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ARTICLE INFO

Article history:
Received 29 March 2022
Received in revised form 26 April 2022
Accepted 26 April 2022

Keywords:
Pain assessment
Numerical rating scale
Verbal rating scale
Pain management
Analgesia
Emergency department

ABSTRACT

Background and Importance: Pain is one of the most reasons for a visit to an emergency department (ED). Pain scores as the verbal rating scale (VRS) or numerical rating scale (NRS) are used to determine pain management. While it is crucial to measure pain levels, it is equally important to identify patients who desire pain medication, so that adequate provision of analgesia can occur.
Objective: To establish the association between pain scores on the NRS and VRS, and the desire for, and provision of, pain medication.
Design, settings and participants: Retrospective monocentric observational cohort study of ED patients presenting with painful conditions.
Outcomes measure and analysis: The primary outcome was to establish for each pain score (NRS and/or VRS), those patients who desired, and were ultimately provided with, pain medication, and those who did not. Secondary outcomes included establishing the prediction of pain scores to determine desire of pain medication, and the correlation between NRS and VRS when both were reported.
Main Results: 130,279 patients were included for analysis. For each patient who desired pain medication, pain medication was provided. Proportion of patients desiring pain medication were 4.1–17.8% in the pain score range 0.5–3.5, 31.9–63.4% in the range 4–6.5, and 65–84.6% in the range 7–10. The prediction probability of pain scores to determine desire for pain medication was represented with an AUROC of 0.829 (95% CI 0.826–0.831). The optimal threshold predicting the desire for pain medication would be a pain score of 4.25, with sensitivity 0.86, and specificity 0.68. For the 7835 patients with both NRS and VRS scores available, the Spearman-Rho coefficient assessing correlation was 0.946 ($p < 0.001$).
Conclusions: Despite guidelines currently recommending pain medication in patients with a NRS score > 4, we found a discrepancy between pain scores and desire for pain medication. Results of this large retrospective cohort support that the desire for pain medication in the ED might not be derived from a pain score alone.

1. Introduction

Pain is considered to be one of the most common reasons for a visit to an emergency department (ED) [1]. Since pain perception of each patient is individual, it is essential to carry out an objective pain assessment at triage and during treatment [1]. In triage algorithms and treatment guidelines, pain scores are used to determine treatment priority and pain management [2]. The verbal rating scale (VRS) or numerical rating scale (NRS) are such validated quick and easy pain scores for measuring pain, and are commonly used to quantify subjective pain perception [2].

While it is crucial to measure pain levels, it is equally important to identify patients who desire pain medication, so that adequate provision of analgesia can occur. It was previously observed that unidimensional pain scores such as the NRS or VRS might rather reflect the patients' emotional state than the amount of sensory pain they are experiencing [3]. Accordingly, using these scoring systems to guide pain management may lead to discrepancies between ED staff providing analgesia and patients' preferences. A recent case study, for example, found that ED staff are often conflicted about the patient's reported score and their own perceptions of the patient's pain intensity [4]. There is a lack of studies investigating the ability of pain scores to identify patients desiring analgesia and those who do not in the ED setting [2].

We hypothesized that the association between currently used pain scores and the desire for analgesia is poor. Therefore, the aim of this study was to investigate whether pain scores (NRS and/or VRS) can

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https://doi.org/10.1016/j.ajem.2022.04.046
0735-6757/

differentiate between patients in pain who desire (and were provided) pain medications and those who do not. In addition, we aimed to investigate whether there was an association between NRS and VRS using a large retrospective ED cohort, as both scores are used at the discretion of nurses, and physicians in our setting.

2. Methods

2.1. Design

This is a monocentric 9-year retrospective observational study conducted at the Cantonal Hospital of Sankt Gallen in Switzerland. The local ethics committee approved the study (EKOS 20/041). Data are reported according to the STROBE checklist [5].

2.2. Setting

The ED of the Cantonal Hospital of Sankt Gallen, Switzerland, is a tertiary center with an annual census of about 40,000 visits. It is primarily an ED for adult patients (age ≥ 16 years old). Occasionally, however, children in need of specialist consults such as ophthalmic and oto-rhino-laryngologist (ORL); hand-, −reconstructive, and/or neurosurgery are evaluated as well.

2.3. Selection of participants

Inclusion criteria were a documented pain score in the electronic health record with the numeric rating scale (NRS) and/or the verbal response scale (VRS). Exclusion criteria were no pain (pain scale of zero), lack of documented pain assessment using NRS and/or VRS, missing documentation if the patient desired pain medication, missing documentation when patients were provided with analgesia, error symbols in these chart fields in the electronic database search (i.e. not available).

2.4. Measurements

Data from all electronic health records of the ED between 01.01.2011 and 31.12.2019 were analyzed. Pain scores (NRS and/or VRS used in our ED at the provider's discretion), and desire for pain medication (yes/no) are standard fields in the ED electronic health record. The first pain assessment is performed in a dedicated section of this electronic form, either at triage, or in the ED treatment booth. The first reported pain score was chosen for the analysis. The following data were collected: age, sex, chief complaint on presentation (see Appendix, Table S1) according to the Swiss Emergency Triage Scale (SETS) and the corresponding triage level (1–4) [6], pain assessment using NRS and/or VRS, desire for pain medication (yes/no), and provision of pain medication (yes/no; all analgesics at the provider's discretion, topical medication excluded). Numeric pain scores given with an interval of contiguous numbers were recorded using the mean (e.g. 6–7 = 6.5). The VRS was transformed into the NRS with the following rule: very mild (1–2 = 1.5), mild (3–4 = 3.5), moderate (5–6 = 5.5), severe (7–8 = 7.5), and very severe (9–10 = 9.5). In a minority of patients, numeric pain values were given at rest and in motion, and collected accordingly. For the primary outcome, the highest value was chosen. Formal triage with the SETS was introduced at our institution in 2014, so that triage level and chief complaint were collected for patients from this date onwards.

2.5. Outcomes

The primary outcome was to determine the distribution of patients who desired and were provided pain medication, and those who did not, stratified by pain score (NRS or VRS). Secondary outcome was to establish the prediction of pain scores to determine desire (and provision) of pain medication.

2.6. Analysis

The primary outcome was calculated with percentages and illustrated with bar charts. AUROCs with 95% confidence intervals (CI) were used to establish the prediction probability of pain scores (NRS or VRS) to determine desire for analgesia. As previous guidelines have suggested to consider no administration of pain medication for pain score < 4 [7], and studies suggested pain relief for pain scores <4 [8], AUROC was calculated additionally for the range 4–10, which is a range in that pain medication should always be given. The following subgroups were defined: NRS or VRS by sex, age (<18, 18–64 and > 64), Triage Priority (1–4), and chief complaint classes (see appendix, Table S1).

Significant differences in pain score distributions in the subgroups were established with the Kruskal-Wallis Test; discrepancies in desire for, and provision of, pain medication with the Chi-squared Test. Pain scores, sex, age, triage priority, and chief complaint were used in a logistic regression to evaluate improvement in the prediction of the desire, and provision of pain medication, compared to pain scores alone. The procedure of DeLong [9] was used to estimate the variance of the AUROC in the subgroups, from which 95% CI and tests of significance for the difference between two AUROCs were derived. Each AUROC of the subgroups was compared with the AUROC with all patients, and all pain scores (NRS or VRS). The correlation between NRS and VRS when both were reported was calculated with Spearman's rho coefficient. R version 4.0.2 (R foundation for statistical computing, Vienna, Austria) was used as statistical software. Logistic regression models were fitted with the R base function glm. To check whether the functional relationship of a logistic model was appropriate, the shape of the logistic curve was compared to a smoothing line obtained by fitting a generalized additive model with a thin plate smoothing term for pain score (function gam in R package mgcv). The comparison indicated that a quadratic function of pain score should be used as a predictor in the logistic model. Using a cubic function did not significantly further improve the fit.

3. Results

From 01.01.2011 and 31.12.2019, there were 329,909 ED visits. The database search revealed 204,392 patient visits with a pain score documented in the electronic health record. After applying the exclusion criteria, 130,279 patient visits qualified for the analysis (Fig. 1). Baseline demographics are shown in Table 1.

For each patient who desired pain medication, pain medication was provided. This information was available for all ED visits included in the study. Distribution and proportion of patients desiring pain medication for each pain score was 4.1–17.8% in the pain score range 0.5–3.5, 31.9–63.4% in the range 4–6.5, and 65–84.6% in the range 7–10. All distribution and proportion of patients for each pain score is reported in Fig. 2. The prediction probability of all pain scores (i.e. range 0.5–10), and desire for pain medication was represented by an AUROC of 0.829 (95% CI 0.826–0.831). The AUROC declined to 0.661 (95% CI 0.657–0.665, $p < 0.001$) when analyzing pain scores solely in the range from 4 to 10. The AUROCs for all of the subgroups did not change substantially, ranging from 0.777 to 0.863 (Appendix, Table S2). Moderate to severe pain (score ≥ 6) was more frequent in females than in males, in patients 18–64 years than in younger or older patients, in patients with triage priority 3 than in the other triage priorities, and in those with chief complaint classes starting with 13 (abdominal symptoms), 14 (urological symptoms) or 18 (rheumatologic symptoms) compared with other chief complaint classes (Fig. 3). All those differences in pain scores were generally matched by differences in the frequency of desire for pain medication, except for triage priority. Here, the frequency of desire for pain medication decreased from score 1 to score 4, suggesting that triage priority is an independent predictor of the desire for pain medication, besides the pain score (Fig. 4).

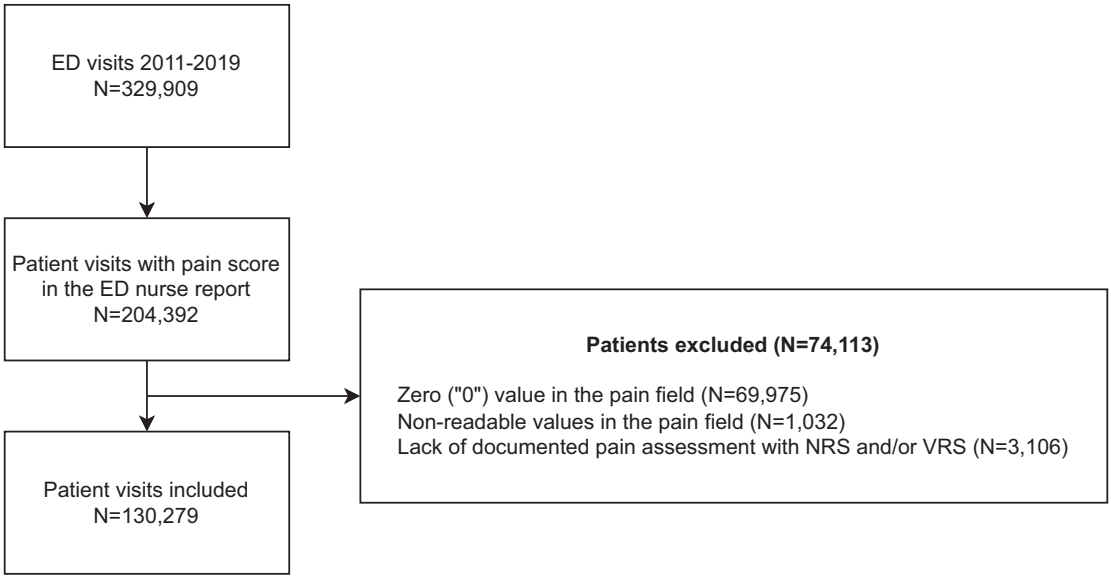

Fig. 1. Patient visits inclusion chart.
ED = Emergency Department, NRS = Numerical Rating Scale, VRS = Verbal Rating Scale.

The overall shape of the relationship between pain score and the proportion of patients desiring pain medication was sigmoid and described by a logistic regression model (Appendix, Fig. S1). In a multiple logistic regression, pain score, sex, age group, triage priority, and chief complaint were significantly related to the desire for pain medication in addition to the pain score. All factors also significantly modified the association between pain score and desire for pain medication (interaction effects). However, the triage priority and the chief complaint were far more important than age and sex (Appendix, Table S3). The modelled relationships between pain scores and desire for pain medication for subgroups of patients are illustrated in Appendix, Fig. S2. Despite significant differences in regression lines between triage priority scores and chief complaint classes, the prediction of desire for analgesia based on the multiple regression was only slightly better than that based on pain score alone (for the same set of patients), as illustrated by the ROC curves (Fig. 5). The optimal threshold predicting the desire for pain medication would be a pain score of 4.25, with sensitivity 0.86, and specificity 0.68 (prediction based on pain scores); a predicted probability of 0.37 with sensitivity 0.87 and specificity 0.68 (prediction based on model).

For the 7835 patients with documented NRS and VRS the Spearman-Rho coefficient assessing correlation was 0.946 ($p < 0.001$) (Fig. 6).

Table 1
Patient demographics

		N	%
Pain scale used	Total	130,279	100
	NRS	66,623	51.1
	VRS	71,491	54.9
	NRS + VRS	7835	6.0
	NRS with both score at rest and in motion	4608	3.5
Sex	Total	130,279	100
	Male	68,020	52.2
	Female	62,259	47.8
Age	Total	130,279	100
	Overall (median, IQR)	50	32–68
	< 18	3685	2.8
	18–64	88,654	68
	≥ 65	37,940	29.2
Triage Priority (SETS)	Total	58,455	44.9
	1	3724	6.4
	2	10,141	17.3
	3	42,964	73.5
	4	1626	2.8
Chief Complaint (SETS)	Total	58,455	44.9
	Chest pain (1002)	3783	6.5
	Extremity trauma (1210)	7044	12.1
	Abdominal Pain (1303)	6221	10.6
	Flank pain (1401)	2182	3.7
	Back pain (1801)	2949	5.0

Patient proportion in subgroup categories is related to the number of patient visits in the main subgroup (grey background). We report the 5 most frequent chief complaints on presentation. The complete list of all chief complaints with proportion of patient visits is given in the table S1. NRS = numerical rating scale, VRS = verbal rating scale, SETS = Swiss Emergency Triage Scale, IQR = interquartile range.

4. Discussion

Despite the worldwide use of the NRS/VRS to assess for analgesic requirement, this study showed that almost 20% of the patients with pain in the lower range (NRS/VRS 0.5–3) still expressed desire for pain medication, and up to 35% in the high range (NRS/VRS 7–10) did not. Prediction of pain scores to determine desire of pain medication was acceptable, probably due to the high number of patients with low pain scores not desiring pain medication. Taking into consideration only the middle-high range (i.e. 4–10), we observed poor discriminatory ability.

Several rather small ED studies have investigated the association between NRS and/or VRS, and the desire for analgesia, or analgesic requirement respectively. It appears that in patients evaluated with the NRS to assess pain, around 30 to 50% of patients presenting in the ED with pain, do not desire pain medication [10-13]. Another small ED study using the Visual Analog Scale (VAS) demonstrated that the VAS lacked an acceptable discriminatory ability for identifying patients desiring pain medication [2] which is similar to what we found in this study. We have to emphasize that an inverse trend was observed by pregnant women, with a remarkable desire for analgesia in the low NRS scores (i.e. 1–3) [14].

Worldwide, several guidelines mention unidimensional pain scores as a tool to manage acute pain: the focus is usually on the description of the various pain medication classes and the pain intensity at which they are to be administered [15-20]. What is missing from the algorithms, however, is the patient's desire regarding the administration

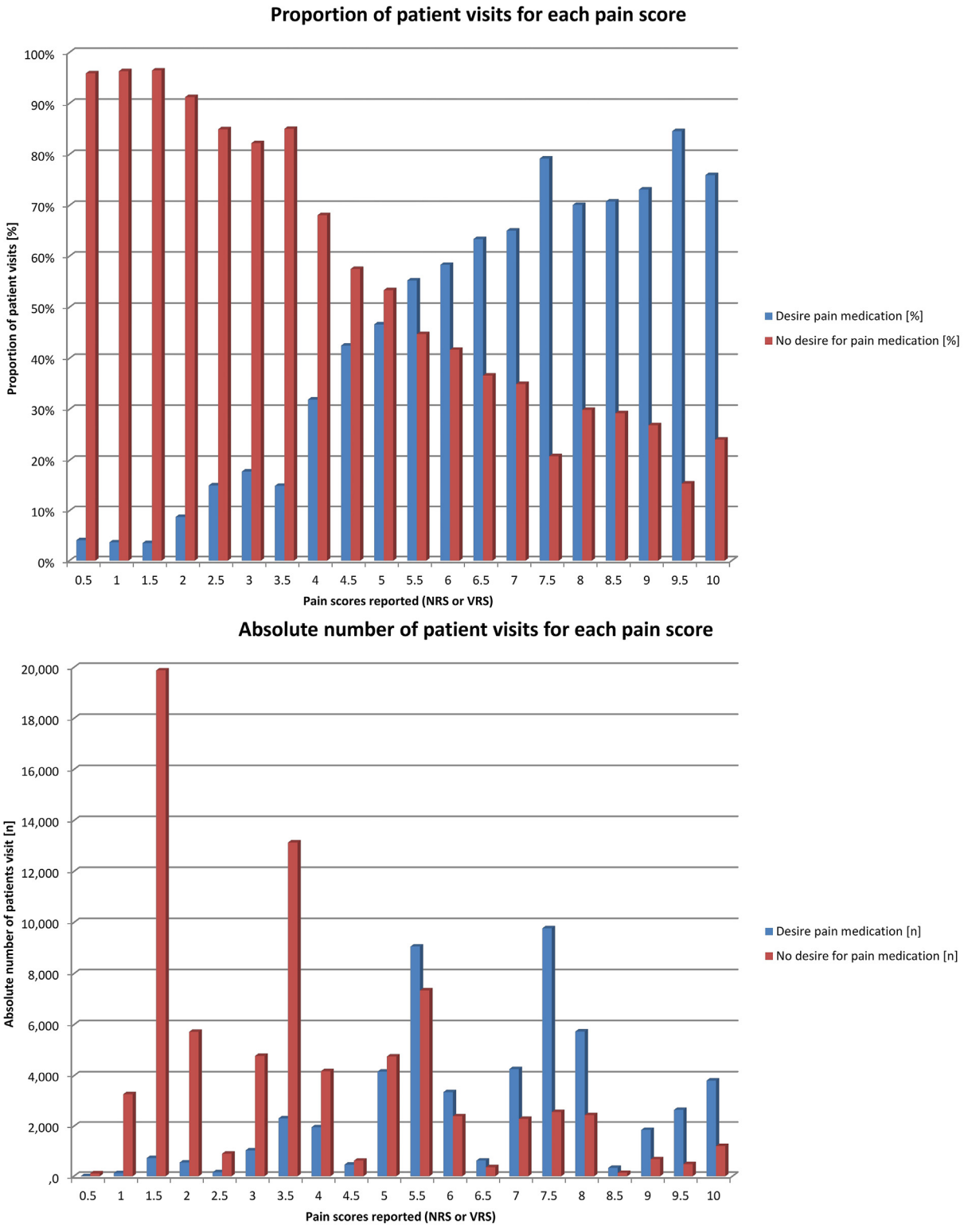

Fig. 2. proportion of patient visits ($n = 130{,}279$) desiring (or not) pain medication for each pain score.
Top panel: proportion of patient visits stratified by patients desiring pain medication (blue) versus patients not desiring pain medication (red). Bottom panel: absolute number of patient visits with patients desiring pain medication (blue) versus patients not desiring pain medication (red). Each patient who desired pain medication received provision of pain medication. Data are reported for both, numerical rating scale (NRS) or verbal rating scale (VRS). Numeric pain scores given with an interval of contiguous numbers were taken with the mean (e.g. 6–7 = 6.5). The VRS was commuted into the NRS with the following rule: very mild (1–2 = 1.5), mild (3–4 = 3.5), moderate (5–6 = 5.5), severe (7–8 = 7.5), and very severe (9–10 = 9.5).

of pain medication. The pain score is only used to determine the class of pain medication that is considered adequate for the patient's pain severity. What distinguishes the Dutch guideline from the other guidelines is that patients with an NRS < 4 are asked about the tolerability of their pain. From an NRS > 4, however, it is only determined which class of pain medication should be administered [21]. In 2020 the European

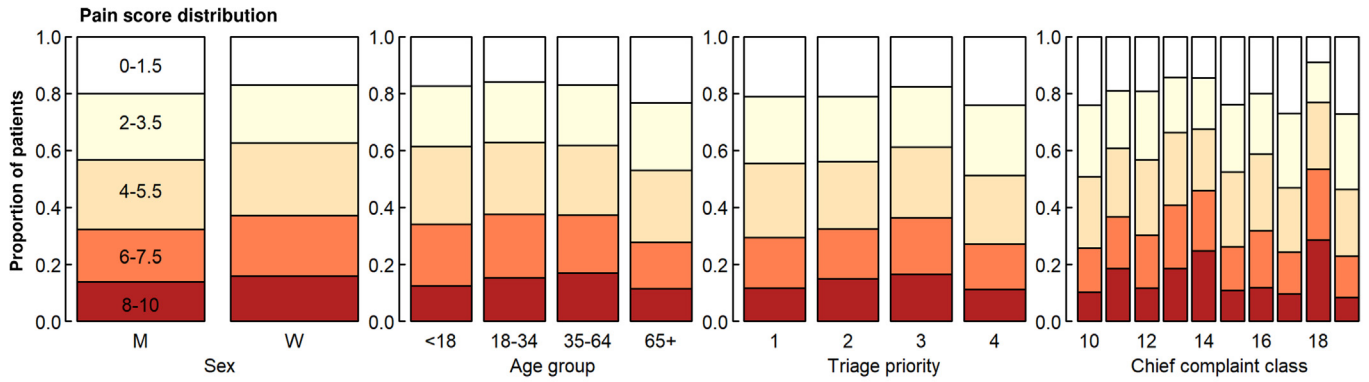

Fig. 3. distribution of patients' pain scores stratified by subgroup.
Frequency of pain scores according to patient characteristics (i.e. subgroup; from left to right: sex, age group, triage priority, and chief complaint by presentation). Chief complaint code classes are reported in appendix table S1.

Society of Emergency Medicine provided Guidelines for the management of acute pain in emergency situations [21,22]. However, recommendations for pharmacological management of acute pain are still driven by scores on the NRS, VRS or VAS. A policy statement of the American College of Emergency Physicians suggests instead that pain therapy should not be based on the pain score alone, but on an overall accounting of patient status [16].

Our results showed a relatively weak association between pain scale scores and the desire for pain medication. Based on this data, every fifth patient with mild pain would be potentially deprived of pain medication. Furthermore, up to 35% of the patients with severe, and very severe pain, according to the NRS/VRS would receive pain medication, although not desired. The question remains whether desire for pain medication would correspond with analgesic requirement, i.e. patient's need for analgesia. In patients with patient-controlled analgesia (PCA), a postoperative study showed a similar sigmoid curve as our results between VAS pain scores, and morphine consumption, suggesting a correlation between desire, and requirement of analgesia [23]. As pain is a subjective, multidimensional experience, a multidimensional framework might be better when assessing pain [24]. By solely using unidimensional pain scales such as the NRS/VRS, the attempt to make quick conclusions about the patient's needs appear inappropriate. Accordingly, the use of multidimensional pain scales in the ED might improve pain assessment [25]. Further research should also evaluate the patients' desire for pain medication as part of pain assessment in the ED, as it might reflect the need for analgesia.

Lastly, the correlation between NRS and VRS in this study was excellent (Spearman-Rho 0.946), suggesting that these scales might be interchangeable. Similar results were reported in the setting of osteoarthritic knee pain [26]. On the other hand, conflicting results with weak correlation of NRS and VRS exist. In one study for example, different understandings of the terms used in VRS between individuals are given as one possible reason for the poor correlation [27]. Nevertheless, our large cohort may have avoided this bias.

4.1. Limitations

The major limitation of this study is the retrospective, monocentric design. Since we excluded all patients with a pain score of zero, the overall exclusion rate was high. However, only 4138 visits (2%) were excluded due to non-readable pain scores or missing pain documentation with NRS and/or VRS in the electronic health record. Nevertheless, it is conceivable that patients with a pain score of zero ultimately received pain medication. Despite the inclusion of children in certain situations (see *Setting* section), this group included 3865 subjects, representing only a small percentage (2.8%) of our cohort. However, a retrospective pediatric study with closed extremity fractures showed comparable results, suggesting a poor correlation between NRS and provision of analgesia [28]. Further, we cannot prove that all patients who desired pain medication actually received them despite this being documented in the chart. Some patients might have eloped, changed their mind, declined, or otherwise did not receive medication.

Because of the large cohort, we could not perform an analysis for every individual patient, instead we analyzed ED visits. Accordingly, a comparison between visits for individual patients was not possible.

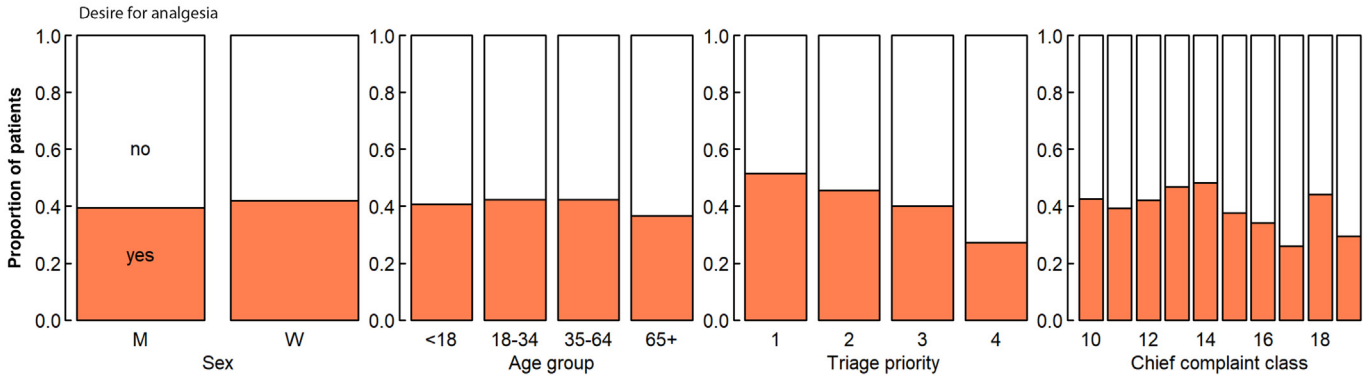

Fig. 4. distribution of patients' desire for analgesia stratified by subgroup.
Frequency of desire for analgesia according to patient characteristics (i.e. subgroup; from left to right: sex, age group, triage priority, and chief complaint by presentation). Chief complaint code classes are reported in appendix table S1.

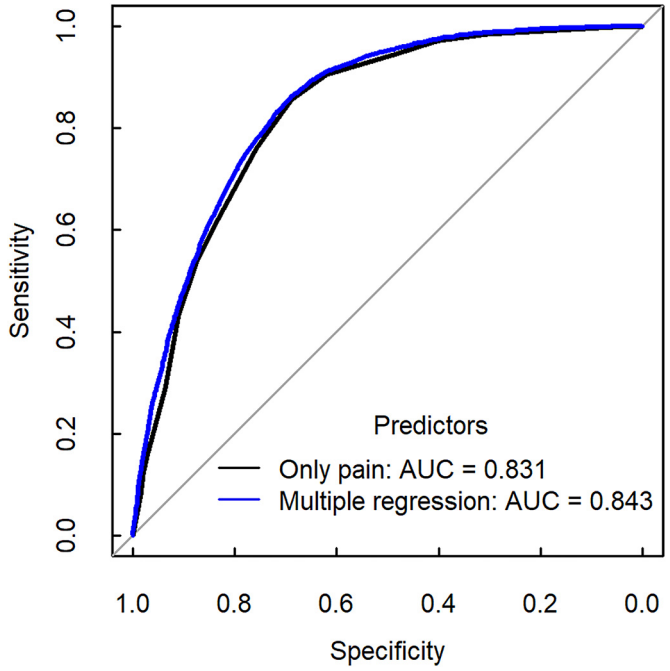

Fig. 5. Receiver operating characteristic for desire of analgesia, and pain score/multiple regression.
Receiver operating characteristic (ROC) curve analysis for the prediction of desire of analgesia based on pain score alone or based on a multiple logistic regression model including pain score, triage priority, and chief complaint. AUC = Area Under the Curve.

Furthermore, the analysis was based on the first documented pain score in the electronic health record. Patients desiring analgesia later in the course of their ED evaluation were not taken into account. Changing pain scores during the same visit for the same patient were not analyzed. Consequently, we could not assess adequacy of pain relief for patients receiving analgesics. Additionally, we were unable to analyze which pain medications were administered because such orders are made in paper form. Hence, we do not know, which pain medication was suggested to the patient. Further, we did not investigate non-pharmacological treatment such as splinting.

It was left to the discretion of the treating clinicians, which pain score (NRS and/or VRS) they applied in order to determine pain intensity. It is conceivable that patients could have indicated different pain intensities depending on which of the two pain scales was used. However, we were able to show an excellent correlation in patients in which both scales were used. We are unable to report why for some patients both scales were used.

Patient satisfaction in the ED and the association with analgesia were examined in several studies [10,29,30]. In this study, we could not investigate the patient satisfaction because this is not part of the regular chart documentation. For the same reason, we could not analyze the reason for not desiring analgesia. Lastly, we could not determine whether pain was acute, transient or chronic.

5. Conclusion

In summary, despite the fact that many guidelines currently recommend pain medication in a patient with a NRS score > 4, we found a discrepancy between pain scores and desire for pain medication. Results of this large retrospective cohort support that the desire for pain medication in the ED might not be derived from a pain score alone.

Meetings

No prior presentations.

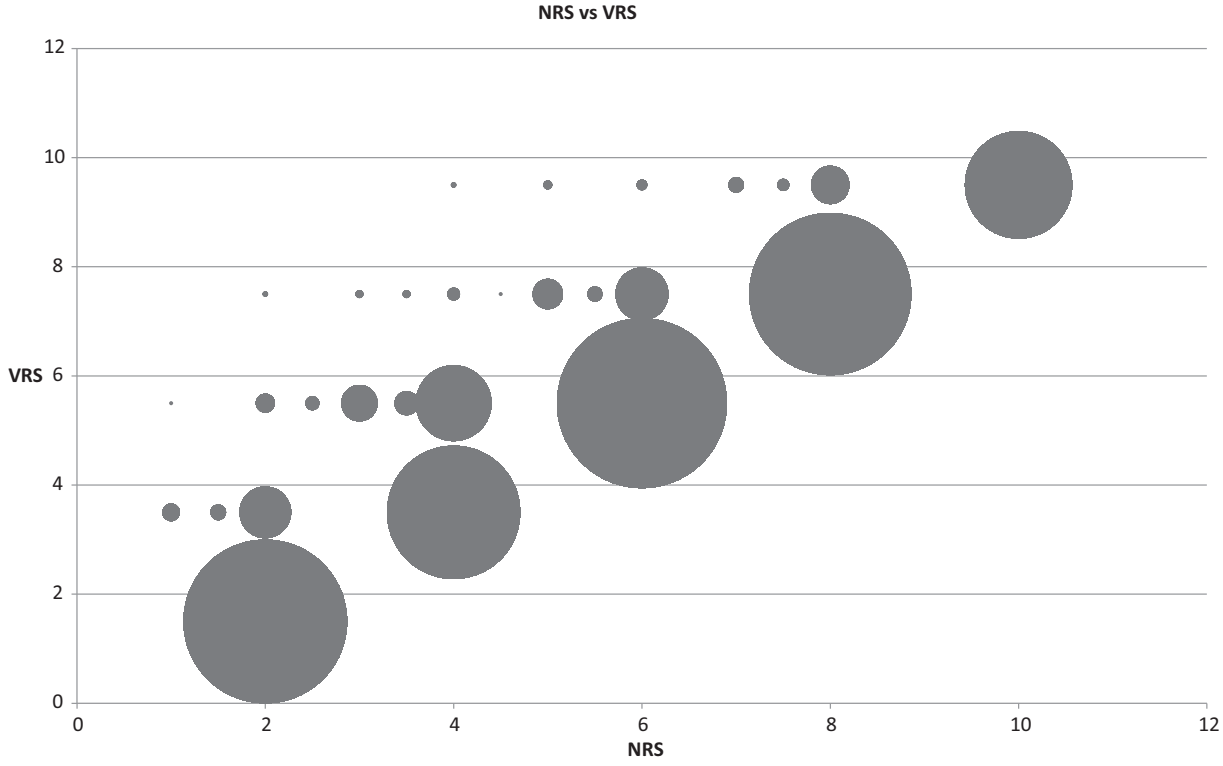

Fig. 6. correlation between NRS and VRS.
Graphic correlation between numerical rating scale (NRS) and verbal rating scale (VRS) when both reported ($N = 4608$). The Spearman-Rho coefficient assessing correlation was 0.946 ($p < 0.001$).

Conflicts of Interest and source of funding

None declared.

Author contributions

BM and CHN conceived the study and designed the trial. BM and CHN supervised the conduct of the trial and data collection. LS and BM collected the data. Sabine Güsewell (see acknowledgement) provided statistical advice and analyzed the data. LS drafted the manuscript, and all authors contributed substantially to its revision. BM takes responsibility for the paper as a whole.

CRediT authorship contribution statement

Lisa Schweizer: Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Robert Sieber:** Writing – review & editing, Visualization, Validation. **Christian H. Nickel:** Writing – review & editing, Validation, Supervision, Methodology, Data curation, Conceptualization. **Bruno Minotti:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Acknowledgement

Sabine Güsewell, Clinical Trial Unit, Cantonal Hospital of St. Gallen, St. Gallen, Switzerland, for statistical analysis.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajem.2022.04.046.

References

[1] Capponi R, Loguercio V, Guerrini S, Beltrami G, Vesprini A, Giostra F. Does the numeric rating scale (NRS) represent the optimal tool for evaluating pain in the triage process of patients presenting to the ED? Results of a muticenter study. Acta Biomedica Atenei Parm. 2016;87(3):347–52.
[2] Blumstein HA, Moore D. Visual analog pain scores do not define desire for analgesia in patients with acute pain. Acad Emerg Med Off J Soc Acad Emerg Med. 2003;10(3):211–4.
[3] Clark CW, Yang JC, Tsui S-L, Ng K-F, Clark SB. Unidimensional pain rating scales: a multidimensional affect and pain survey (MAPS) analysis of what they really measure. Pain. 2002;98(3):241–7.
[4] Sampson FC, Goodacre SW, O'Cathain A. The reality of pain scoring in the emergency department: findings from a multiple case study design. Ann Emerg Med. 2019;74(4):538–48.
[5] Vandenbroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. PLoS Med. 2007;4(10):e297.
[6] Rutschmann OT, Hugli OW, Marti C, Grosgurin O, Geissbuhler A, Kossovsky M, et al. Reliability of the revised Swiss emergency triage scale: a computer simulation study. Eur J Emerg Med. 2018;25(4):264–9.
[7] Berben SAA, Kemps HHLM, van Grunsven PM, Mintjes-de Groot JAJ, van Dongen RTM, Schoonhoven L. Guideline 'Pain management for trauma patients in the chain of emergency care'. Ned Tijdschr Geneeskd. 2011;155(18):A3100.
[8] Jensen MP, Martin SA, Cheung R. The meaning of pain relief in a clinical trial. J Pain. 2005;6(6):400–6.
[9] DeLong ER, DeLong DM, Clarke-Pearson DL. Comparing the areas under two or more correlated receiver operating characteristic curves: a nonparametric approach. Biometrics. 1988;44(3):837–45.
[10] Benedetti E, Proietti A, Miccoli P, Basolo F, Ciancia E, Erba PA, et al. Contrast-enhanced ultrasonography in nodular splenomegaly associated with type B Niemann-pick disease: an atypical hemangioma enhancement pattern. J Ultrasound. 2009;12(3):85–92.
[11] Singer AJ, Garra G, Chohan JK, Dalmedo C, Thode HC. Triage pain scores and the desire for and use of analgesics. Ann Emerg Med. 2008;52(6):689–95.
[12] Allione A, Melchio R, Martini G, Dutto L, Ricca M, Bernardi E, et al. Factors influencing desired and received analgesia in emergency department. Intern Emerg Med. 2011;6(1):69–78.
[13] Todd KH, Ducharme J, Choiniere M, Crandall CS, Fosnocht DE, Homel P, et al. Pain in the emergency department: results of the pain and emergency medicine initiative (PEMI) multicenter study. J Pain. 2007;8(6):460–6.
[14] Beilin Y, Hossain S, Bodian CA. The numeric rating scale and labor epidural analgesia. Anesth Analg. 2003;96(6):1794–8.
[15] Schug SA, Palmer GM, Scott DA, Halliwell R, Trinca J. Acute pain management: scientific evidence, fourth edition, 2015. Med J Aust. 2016;204(8):315–7.
[16] Optimizing the treatment of acute pain in the emergency department. Ann Emerg Med. 2017;70(3):446–8.
[17] South Office E, Guidelines African Acute Pain. South Afr J Anaesth Analg. 2016:S1–137.
[18] Recommandations formalisées d'experts 2010: sédation et analgésie en structure d'urgence (réactualisation de la conférence d'experts de la SFAR de 1999) | SpringerLink [Internet]. Available from: https://link.springer.com/article/10.1007%2Fs13341-010-0019-9; 2021.
[19] Savoia G, Coluzzi F, Di ia C, Ambrosio F, Della Corte F, Oggioni R, et al. Italian intersociety recommendations on pain management in the emergency setting (SIAARTI, SIMEU, SIS 118, AISD, SIARED, SICUT, IRC). Minerva Anestesiol. 2015;81(2):205–25.
[20] Smith S, France J, Smith L, Beal R. Management of Pain in adults; best practice guideline from the Royal College of emergency medicine; 2021.
[21] Hachimi-Idrissi S, Coffey F, Hautz WE, Leach R, Sauter TC, Sforzi I, et al. Approaching acute pain in emergency settings: European Society for Emergency Medicine (EUSEM) guidelines-part 1: assessment. Intern Emerg Med. 2020;15(7):1125–39.
[22] Hachimi-Idrissi S, Dobias V, Hautz WE, Leach R, Sauter TC, Sforzi I, et al. Approaching acute pain in emergency settings; European Society for Emergency Medicine (EUSEM) guidelines-part 2: management and recommendations. Intern Emerg Med. 2020;15(7):1141–55.
[23] Aubrun F, Langeron O, Quesnel C, Coriat P, Riou B. Relationships between measurement of pain using visual analog score and morphine requirements during postoperative intravenous morphine titration. Anesthesiology. 2003;98(6):1415–21.
[24] Love-Jones SJ. Pain as a subjective, multidimensional experience. In: Abd-Elsayed A, editor. Pain: a review guide [internet]. Cham: Springer International Publishing; 2019 Available from: https://doi.org/10.1007/978-3-319-99124-5_35. [cited 2021 22]. p. 141–4.
[25] Im DD, Jambaulikar GD, Kikut A, Gale J, Weiner SG. Brief pain inventory-short form: a new method for assessing pain in the emergency department. Pain Med Malden Mass. 2020;21(12):3263–9.
[26] Alghadir AH, Anwer S, Iqbal A, Iqbal ZA. Test-retest reliability, validity, and minimum detectable change of visual analog, numerical rating, and verbal rating scales for measurement of osteoarthritic knee pain. J Pain Res. 2018;11:851–6.
[27] Dijkers M. Comparing quantification of pain severity by verbal rating and numeric rating scales. J Spinal Cord Med. 2010;33(3):232–42.
[28] Weng Y-M, Chang Y-C, Lin Y-J. Triage pain scales cannot predict analgesia provision to pediatric patients with long-bone fracture. Am J Emerg Med. 2010;28(4):412–7.
[29] Brown T, Shetty A, Zhao DF, Harvey N, Yu T, Murphy M. Association between pain control and patient satisfaction outcomes in the emergency department setting. Emerg Med Australas EMA. 2018;30(4):523–9.
[30] Downey LVA, Zun LS. Pain management in the emergency department and its relationship to patient satisfaction. J Emerg Trauma Shock. 2010;3(4):326–30.