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Original Reports

Desire to Receive More Pain Treatment – A Relevant Patient-Reported Outcome Measure to Assess Quality of Post-Operative Pain Management? Results From 79,996 Patients Enrolled in the Pain Registry QUIPS from 2016 to 2019

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Abstract: **Acute postoperative pain is frequently evaluated by pain intensity scores. However, interpretation of the results is difficult and thresholds requiring treatment are not well defined. Additional patient-reported outcome measures (PROMs) might be helpful to better understand individual pain experience and quality of pain management after surgery. We used data from the QUIPS pain registry for a cross-sectional study in order to investigate associations between the desire to receive more pain treatment (D2RMPT) with pain intensity ratings and other PROMs. Responses from 79,996 patients were analyzed, of whom 10.7% reported D2RMPT. A generalized estimating equation Poisson model showed that women had a lower risk ratio (RR) to answer this question with "yes" (RR: .92, $P < .001$). Factors that increased the risk most were "maximal pain intensity ≥ 6/10 on a numerical rating scale" (RR: 2.48, $P < .001$) and "any pain interference" (RR: 2.48, $P < .001$). The largest reduction in risk was observed if patients were "allowed to participate in pain treatment decisions" (RR: .41, $P < .001$) and if they felt that they "received sufficient treatment information" (RR: .58, $P < .001$). Our results indicate that the (easily assessed) question D2RMPT gives additional information to other PROMs like pain intensity. The small proportion of patients with D2RMPT (even for high pain scores) opens the discussion about clinicians' understanding of over- und under-treatment and questions the exclusive use of pain intensity as quality indicator. Future studies need to investigate whether asking about D2RMPT in clinical routine can improve postoperative pain outcome.**

Perspective: ***This article presents characteristics of the patient-reported outcome measure "Desire to receive more pain treatment." This measure could be used to apply pain treatment in a more individualized way and lead to improved treatment strategies and quality.***

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Pain after surgery is still a major issue in healthcare.[3,16] Although there are efforts to objectify it.[7] Pain is still routinely assessed by asking patients to rate their subjective pain intensity on various scales, eg, the numeric rating scale, the visual analog scale, different faces pain scales, and others.[20] Often, pain treatment is then based on or at least influenced by these ratings.

However, such an approach has limitations. First, patients often have difficulties in using pain intensity scales. It seems difficult for them to classify their pain precisely or they are unfamiliar with the termini. Second, pain is a very subjective sensation that is strongly affected by several factors like age, sex, preexisting chronic pain, concomitant diseases/disorders, medication and multiple others.[6] This results in very broad response distributions of assessed pain scores even for presumably homogeneous patient cohorts.[4] In this context, it is unclear which pain scores require treatment and which do not.[24] In addition, there is an ongoing discussion which pain scores are ''too high'' or at which cut-offs pain can be labeled as low, moderate or severe.[5,17] In fact, the same pain intensity might affect one person more than another. Thus, pain intensity ratings on their own might not be suitable to decide whether a treatment is required or effective enough or not.

Another issue is that inter-individual differences in expectations may play a large role.[1,9,12] Some patients do not tolerate any pain at all whereas others are willing to endure pain to some extent.[28] Reasons for this are experienced or expected treatment-related side-effects, a belief that pain is part of the healing process and (again) age, gender, cultural, and psychological aspects, etc. A prominent example is perinatal pain. Some authors claim that mothers often refuse pain treatment for fear of negative effects on their newborns, even if their pain scores are very high.[14,26]

This raises the question whether there are alternatives to assessments of pain intensity that are more patient-specific and better indicate the necessity for treatment. The most obvious option is to ask patients directly whether they have a desire to receive more pain treatment. The desire to receive more pain treatment is one of the strongest predictors of patient satisfaction in postoperative pain (along with "pain relief received" and "more participation in treatment decisions").[21] We also know that dichotomous questions can be a reliable substitute for numerical rating scales.[18]

Our main aim was to analyze whether the patient-reported outcome measure "desire to receive more pain treatment" (D2RMPT) is a potential indicator for quality of pain management and treatment requirements in patients after surgery. We therefore analyzed the associations of D2RMPT with other pain-related patient-reported outcomes as well as treatment and process variables.

Materials and Methods

Data from the QUIPS Registry

We used data from the QUIPS registry from 2016 to 2019. QUIPS[15] collects pain-related patient-reported outcomes and processes of postsurgical patients. Nearly 200 hospitals in Germany and Austria participate in the data collection, each with a variety of wards of different specialties.

All participating hospitals obtained ethics approval from their local ethics committees (Jena University Hospital: approval number 2722-12/09). QUIPS is performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all included patients.

QUIPS uses a standardized process, in which an outcomes questionnaire is given to patients on the first postoperative day. Besides the patient-reported outcomes, demographics and process data like type of surgery, medication, and anesthesia are collected pre- and intraoperatively, in the postanesthesia care unit (PACU) and on the normal ward. Patients are included in QUIPS if they are 18 years or older and able and willing to participate.

Description of the Analyzed Variables

We used some original and some derived variables from the QUIPS questionnaire for the present data analysis. These items are listed and explained in Table 1.

Statistical Analysis

Dichotomous and categorical variables are presented in absolute and relative frequencies. In descriptive analysis on D2RMPT, the absolute and relative frequencies for the complete sample and within study wards were obtained. In addition, we report the median, first (Q_1) and third quartile (Q_3) of the ward-wise relative frequencies.

The associations between D2RMPT and demographic variables, patient-related outcomes and process variables were analyzed with a generalized estimating equation Poisson model (GEE-Poisson, with an exchangeable working correlation matrix) to account for the clustered structure of the data and the dichotomous nature of D2RMPT.[2,13,29,30] In detail, D2RMPT was entered as dependent variable and all demographic variables, patient-related outcomes and process variables were simultaneously entered in the model as independent variables. Relative risks (RR) and corresponding 95% confidence intervals (CI) were obtained from the regression coefficients.

To obtain relative risks of D2RMPT for the most common surgical procedures, we followed a similar approach in a subsample of patients. In detail, we

Table 1. Description of the Analyzed Variables

Domain	*Variable*	*Description*
Patient characteristics	Age: >60 years	Age was dichotomized to achieve a balanced distribution
	Sex	Male *vs* Female
	Pre-existing chronic pain	Yes *vs* No
Patient-reported outcomes	Worst pain: ≥ 6/10 NRS	According to (8, 18, 19) worst pain ratings (0-10 NRS) were dichotomized
	Pain interference	If patients indicated interference (yes *vs* No) in at least one of the primary interference variables (pain during movement, breathing/coughing, wake up from sleep, mood) the variable was set to yes
	Side effects	If patients indicated side effects (yes *vs* No) in at least one of the primary variables (tiredness, nausea, dizziness) the variable was set to yes
	Decision participation	Question: "Were you allowed to participate in decisions about your pain treatment as much as you wanted to?": original categorical item (0-10 NRS) was dichotomized based on median split (yes = ≥ 9/10 NRS)
	Sufficient treatment information	Question: "Have you been informed about different pain therapy options?": original dichotomous item
Process variables	Preoperative: Nonopioid analgesics/opioids	Based on information on drugs given Preoperatively in hospital: indicator was set to yes if any nonopioid analgesic/opioid was given
	Intraoperative: Anesthesia	Based on the original information intraoperative anesthesia was categorized in general anesthesia, regional anesthesia or the combination of both
	PONV prophylaxis	Original item, whether patient received intraoperative nausea and vomiting prophylaxis (yes *vs* No)
	PACU: nonopioid analgesics/opioids	Based on information on drugs given in PACU: indicator was set to yes if any nonopioid analgesic/opioid was given
	Ward: nonopioid analgesics/opioids	Based on information on drugs given on the ward: indicator was set to yes if any nonopioid analgesic/opioid was given
	Ward: medical prescription	Original item, is there an individual medical prescription (yes *vs* No)
	Ward: pain documentation	Original item, was pain documented (yes *vs* No)
	Patient-controlled analgesia (PCA)	Yes (vs No), if patient received PCA independent of the route

Abbreviation: PACU, postanesthesia care unit.

selected only surgical procedures that were performed at least 20 times in a minimum of 10 study wards each. In the following step we obtained a GEE-Poisson model with D2RMPT as dependent variable and the most common surgical procedures as independent variables (indicator variables). We report model predicted risks and corresponding 95% CI.

For the analysis, we used R Version 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria) with geepack.[8,27]

Results

Data from 79.996 patients in 422 wards was used for the main analysis (multivariate regression modeling). Fig 1 shows the study inclusion and the compilation of the analysis sample. To compare D2RMPT between different surgical groups, a sub-sample of 26,440 patients was drawn.

Descriptive Statistics and Study Population Characteristics

The percentage of D2RMPT across all included patients was 10.7% (n = 8,589/79,996). On ward level, D2RMPT showed a large variability (see Fig 2). The median percentage across wards was 10.8% ($Q_{1|3}$: 6.3% | 16.6%). Fig 3 shows the association of D2RMPT and worst pain ratings. With increasing maximal pain intensity, the D2RMPT is growing exponentially from about 2% at maximal pain ratings of 0 (no pain) to 2 NRS up to 38.5% at the strongest imaginable pain (10/10 NRS).

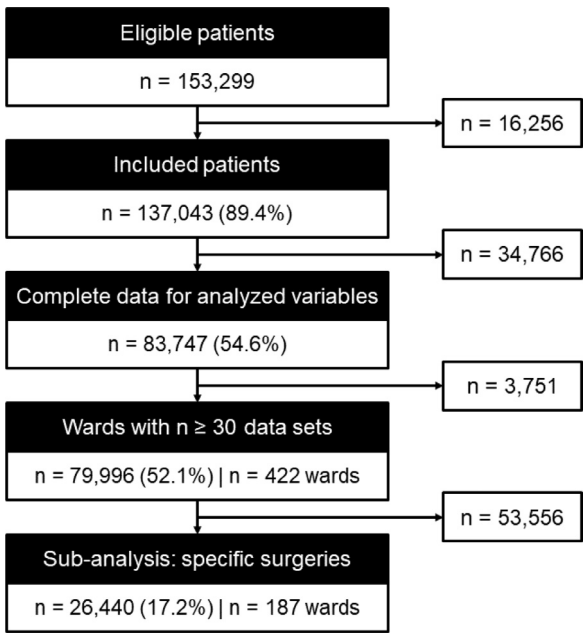

Figure 1. Flow-chart of analyzed sample.

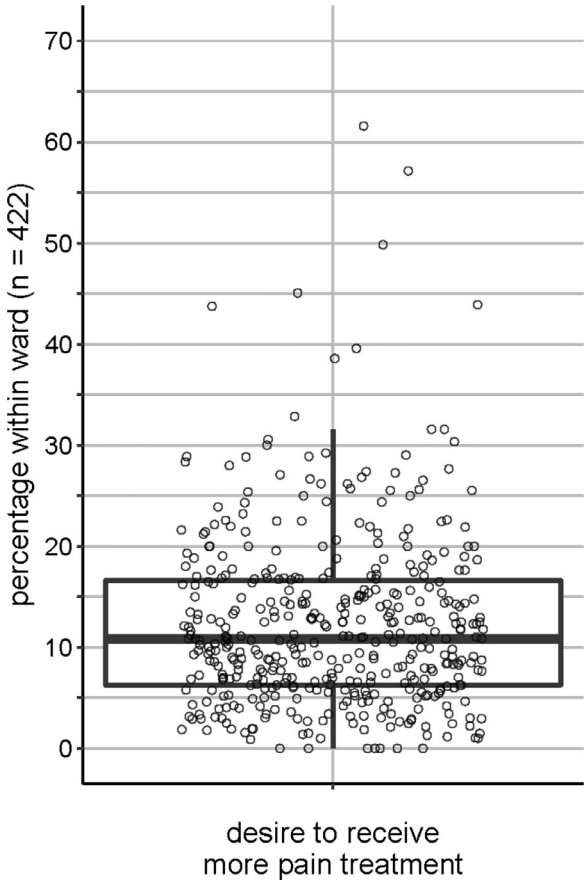

Figure 2. Box-plot of the percentages of desire to receive more pain treatment for each ward (n = 422, open dots). The median percentage of desire to receive more pain treatment over all wards was 10.8% (thick line in the boxplot).

Table 2 shows descriptive statistics for the independent variables of the regression models.

Multivariate Regression

Table 3 and Fig 4 show the results of the multivariable regression model. Females were less likely to report D2RMPT (RR: .92, $P < .001$), while age (RR: 0.97, $P = .122$) and pre-existing pain (RR: 1.06, $P = .058$) showed no significant association with D2RMPT. Regarding the patient-reported outcome measures, patients with maximal pain intensity ≥6/10 NRS (RR: 2.48, $P < .001$) and pain interference (RR: 2.48, $P < .001$) had a higher risk of reporting D2RMPT. Patients reporting any side effects (RR: 1.22, $P < .001$) also had a higher risk of reporting D2RMPT, but to a smaller extent. High ratings on perceived decision participation (≥ 9/10, RR: .41, $P < .001$) and the receipt of treatment information (RR: .58, $P < .001$) were associated with a lower risk for D2RMPT. Compared to patients with general anesthesia, patients with regional anesthesia (RR: 1.20, $P < .001$) or a combination of general and regional anesthesia (RR: 1.19, $P < .001$) had a higher risk of reporting D2RMPT. Preoperative opioid intake (RR: 1.15, $P < .001$), opioid intake in the PACU (RR: 1.05, $P = .049$) and on the normal ward (RR: 1.19, $P < .001$) were independently associated with a higher risk of reporting D2RMPT. Such an association was not observed for nonopioid analgesics in the course of treatment (all *P*-values >.05). Patients with patient-controlled analgesia (PCA) (RR: .87, $P < .001$), individual pain medication prescription on the ward (RR: .82, $P = .006$) and routine pain

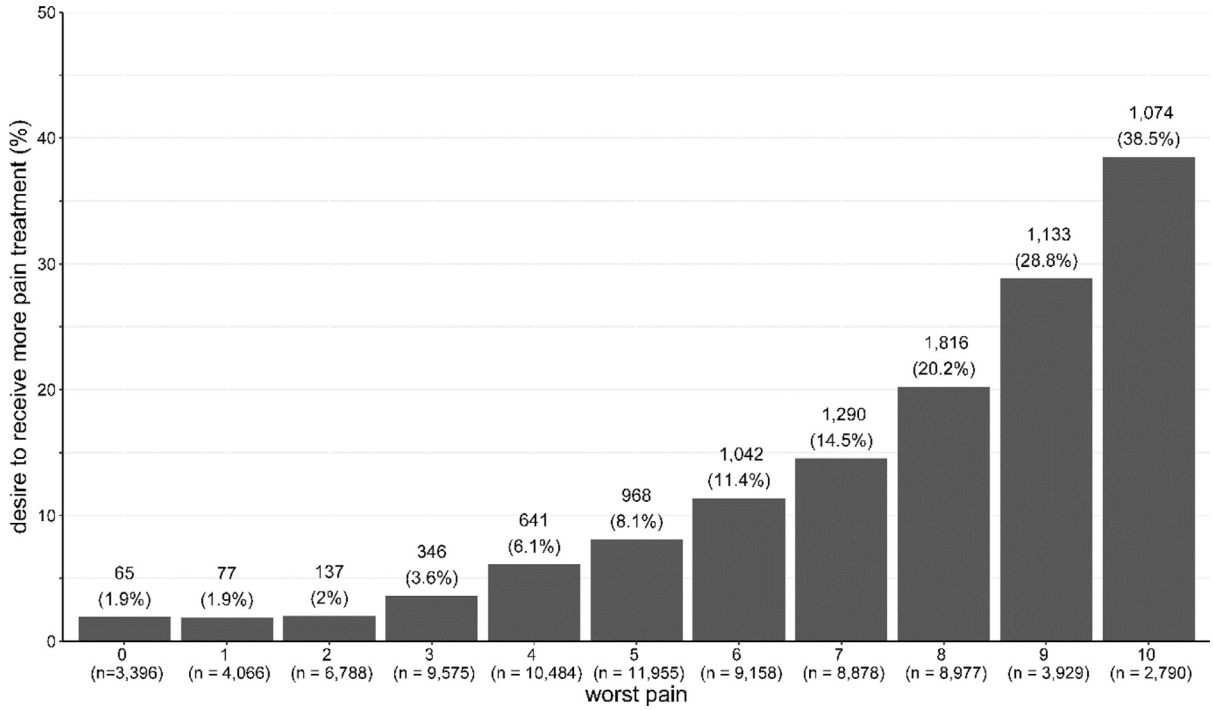

Figure 3. Relative frequencies of the desire to receive more pain treatment in relation to worst pain intensity scores on a numerical rating scale.

Table 2. Descriptive Statistics of Independent Variables

			Overall		Ward-wise		
Domain	Variable	ref.	n	%	median	Q_1	Q_3
Patient characteristics	Age: >60 years		35,524	44.4	42.8	28.7	57.5
	Sex	[female]	45,206	56.5	51.7	42.9	60.9
	Pre-existing chronic pain	[yes]	35,738	44.7	29.7	18.4	65.5
Patient-reported outcomes	Worst pain: intensity ≥ 6/10 NRS		33,732	42.2	45.1	30.9	56.3
	Pain interference	[any]	58,137	72.7	76.0	63.6	84.7
	Side effects	[any]	41,617	52.0	57.1	45.5	65.7
	Decision participation	[≥ 9]	43,288	54.1	48.4	38.5	59.0
	Sufficient treatment information	[yes]	64,247	80.3	78.3	64.4	88.4
Process variables	Preoperative: nonopioid analgesics	[any]	9,233	11.5	1.3	0.0	9.6
	Preoperative: opioids	[any]	7,744	9.7	1.2	0.0	6.2
	Intraoperative: anesthesia	general	51,190	64.0	75.8	50.0	94.4
		regional	11,527	14.4	3.6	0.0	14.6
		both	17,279	21.6	10.0	1.4	32.5
	Intraoperative: PONV prophylaxis	[yes]	46,482	58.1	56.3	25.3	82.6
	PACU: nonopioid analgesics	[any]	37,745	47.2	47.4	14.8	71.7
	PACU: opioids	[any]	43,903	54.9	54.3	39.7	67.8
	Ward: nonopioid analgesics	[any]	73,984	92.5	95.4	89.8	98.4
	Ward: opioids	[any]	42,901	53.6	45.3	22.2	72.3
	Ward: medical prescription	[yes]	78,333	97.9	99.7	97.5	100.0
	Ward: pain documentation	[yes]	73,870	92.3	98.2	86.7	100.0
	Patient-controlled analgesia	[yes]	11,642	14.6	5.1	0.5	20.0

Abbreviations: PONV, postoperative nausea and vomiting; PACU, postanesthesia care unit; NRS, numerical rating scale.
The Overall Columns Depict Absolute (n) and Relative (%) Frequencies within the Complete Analysis Sample. The Ward-Wise Columns Display Medians, First (Q1) and Third Quartiles (Q3) Over the Study Wards

Table 3. Results of the Multivariable Regression Model

Variable	Reference	RR	95% CI		P
Intercept		*.07*	*.06*	*.09*	***<.001***
Age: >60 years	[*vs* ≤60 years]	.97	.93	1.01	.122
Sex: female	[*vs* male]	.92	.88	.96	**<.001**
Pre-existing pain chronic: yes	[*vs* no]	1.06	1.00	1.12	.058
Worst pain: intensity ≥ 6/10 NRS	[*vs* < 6/10 NRS]	2.48	2.17	2.83	**<.001**
Pain interference: any	[*vs* none]	2.48	2.24	2.74	**<.001**
Side effects: any	[*vs* none]	1.22	1.16	1.29	**<.001**
Decision participation: ≥ 9	[*vs* < 9]	.41	.39	.44	**<.001**
Sufficient treatment information: yes	[*vs* none]	.58	.54	.61	**<.001**
Preoperative: nonopioid analgesics (any)	[*vs* none]	.96	.88	1.05	.364
Preoperative: opioid (any)	[*vs* none]	1.15	1.06	1.25	**.001**
Intraoperative: regional anesthesia	[*vs* general anesthesia]	1.20	1.11	1.29	**<.001**
Intraoperative: general + regional anesthesia	[*vs* general anesthesia]	1.19	1.10	1.28	**<.001**
Intraoperative: PONV prophylaxis: yes	[*vs* no]	.95	.90	1.00	.055
PACU: nonopioid analgesics (any)	[*vs* none]	.99	.94	1.04	.588
PACU: opioid (any)	[*vs* none]	1.05	1.00	1.10	**.050**
Ward: nonopioid analgesics (any)	[*vs* none]	.97	.88	1.06	.468
Ward: opioid (any)	[*vs* none]	1.19	1.11	1.27	**<.001**
Ward: medical prescription: yes	[*vs* no]	.82	.72	.94	**.006**
Ward: pain documentation: yes	[*vs* no]	.87	.82	.94	**<.001**
Patient-controlled analgesia: yes	[*vs* no]	.87	.80	.94	**<.001**

Abbreviations: PONV, postoperative nausea and vomiting; PACU, postanesthesia care unit; NRS, numerical rating scale.
Regression Coefficients of the Independent Variables are expressed as relative risks (RR) and corresponding 95% confidence intervals (95% CI). Significant *P*-values are in Bold.

documentation (RR: .87, $P < .001$) had a lower risk of reporting D2RMPT. Patients with intra-operative PONV-prophylaxis (RR: .95, $P = .055$) tended to have a lower risk of reporting D2RMPT, but the *P*-value did not meet level of significance.

Surgery-Specific Sub-Analysis

Fig 5 shows the results of the sub-analysis for the most frequent surgical procedures in the QUIPS registry. The model predicted risks for the D2RMPT ranged from 17.0% for caesarean section to 10.5% for laparoscopic hernia

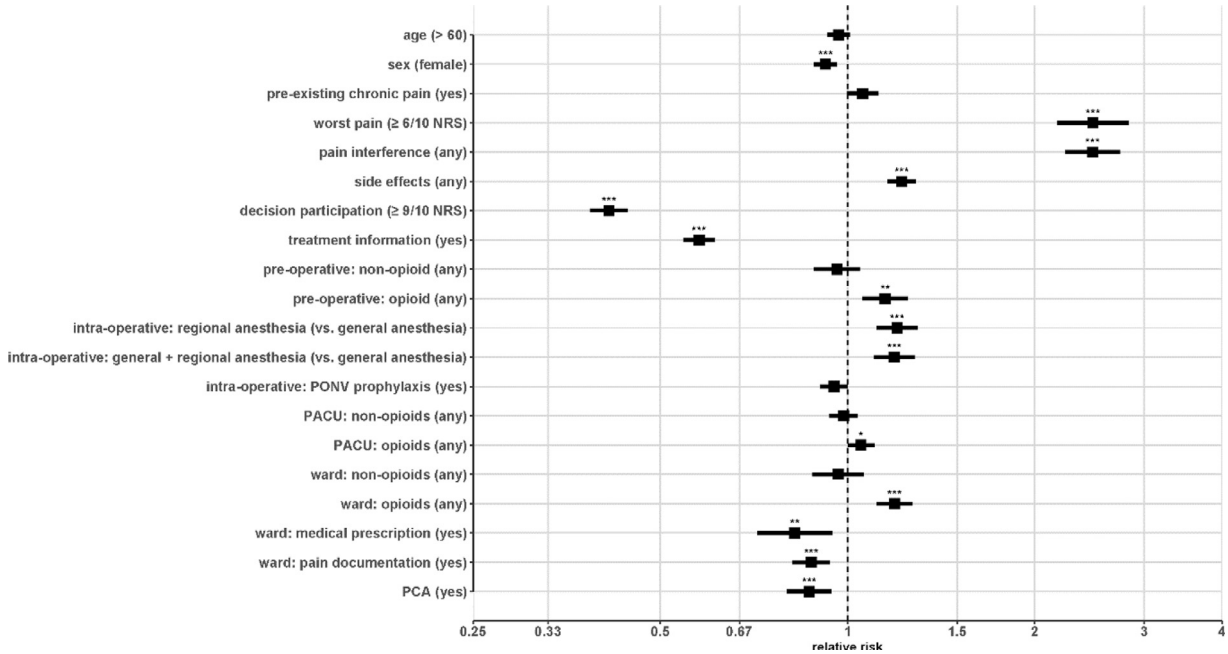

Figure 4. Results of the multivariable regression model. Relative risks (squares) and corresponding 95% confidence intervals (black lines) are shown for the independent variables (*:$P < .05$, **: $P < .01$, ***: $P < .001$; PACU, postanesthesia care unit; PCA, patient-controlled analgesia; PONV, postoperative nausea and vomiting).

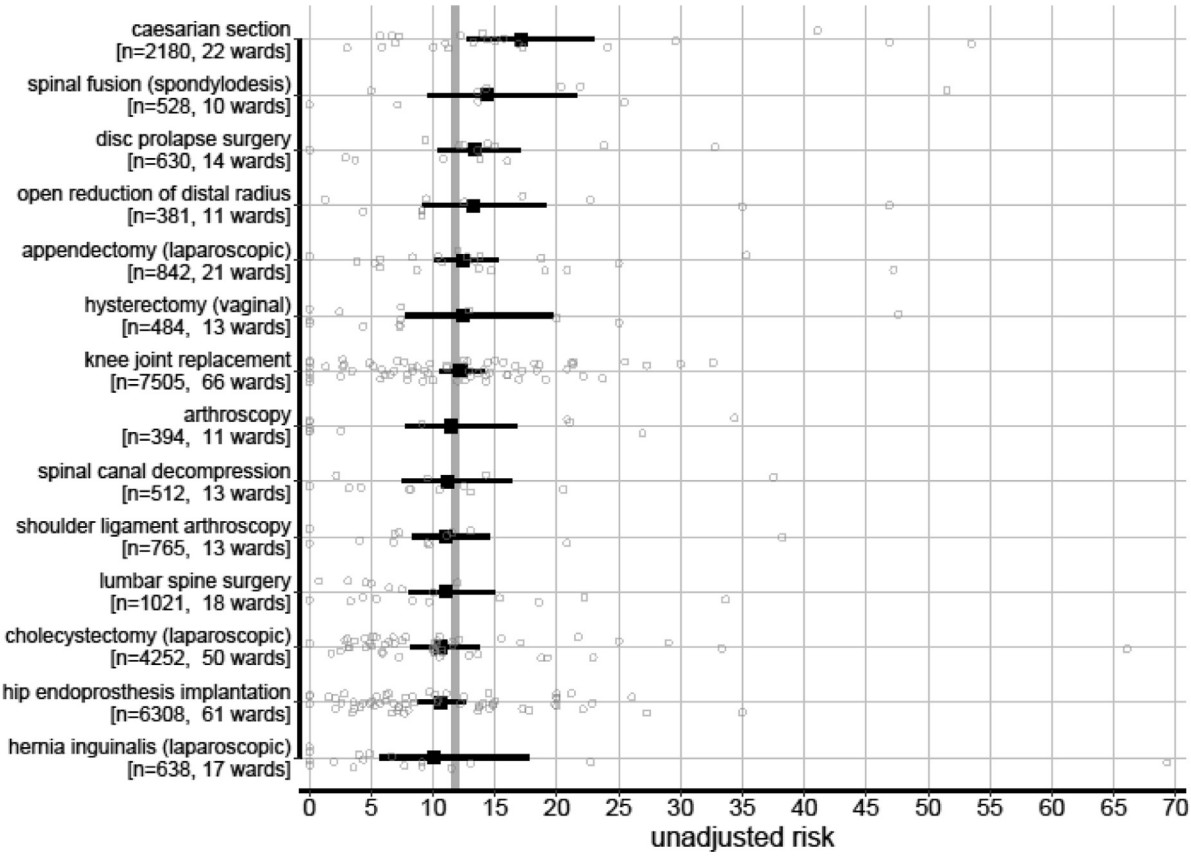

Figure 5. Unadjusted risks of the desire to receive more pain treatment for the most common surgeries in the QUIPS database. The black squares and lines indicate the model-predicted risk and the corresponding 95% confidence interval. The gray dots indicate the raw risk within the different study wards. The gray line indicates the median of the model-predicted risks.

inguinalis surgery with a median of 11.8% ($Q_{1|3}$: 11|13%) across all analyzed surgeries.

Discussion

In this analysis, we investigated characteristics related to the patient-reported outcome measure (PROM) "desire to receive more pain treatment" (D2RMPT) and associations to other PROMs like pain intensity as well as patients' and surgical characteristics. Data from 79,996 patients from the QUIPS postoperative pain registry were included. D2RMPT increased exponentially with maximal pain intensity to nearly 40% for the highest scores indicating the need for discussion about insufficient treatment for high-pain patients. It is also worth noting that over 60% of patients with high pain intensity ratings do not desire more pain treatment. Clinicians' common understanding that high pain scores automatically have to result in treatment thus has to be challenged.

Strongest factors that were associated with an increase of the risk for D2RMPT were maximal pain intensity and pain-related interference. Low pain-related interference might explain in part why patients with high pain intensity often do not desire more pain treatment. Strongest factors that were associated with less D2RMPT were patients' participation in treatment decisions and sufficient treatment information. Thus, patients' involvement in pain management might modulate D2RMPT itself.

High Variability

The rates of D2RMPT vary considerably both between wards and in specific surgery groups. This is similar to other patient-reported outcome measures like, eg, maximal pain scores.[4,21] This shows again the highly subjective and individual nature of pain, but it also shows that there are large differences between hospitals underlining that improvement is possible.

Age does not Matter but Men Want More Pain Killers

D2RMPT shows some interesting associations with other factors. Whereas higher age is usually correlated with lower maximal pain scores.[4,19,21,23] older patients do not want more or less pain treatment than younger patients. Further, women tend to report higher maximal pain scores than men in most studies. However, women have less D2RMPT despite the strong correlation between maximal pain and D2RMPT. Thus, D2RMPT might be an independent quality indicator that yields information about pain management in addition to pain intensity ratings. The observation that women report higher maximal pain but do not want more pain treatment, nonetheless, is a very important finding. It should be taken into account in clinical settings.

Interesting Associations with Patient-Reported Outcome Measures and Medication

Maximal pain intensity scores and pain-related interference with movement, breathing/coughing or sleeping showed the strongest associations with D2RMPT. The first is not surprising. The higher the pain, the more uncomfortable the patient feels. Increased D2RMPT is thus a logical consequence for patients. Pain-related interference is strongly correlated with maximal pain scores ($r = .36$, $P < .001$). This hints that the burden of interference is very high for patients and that its clinical relevance is underrated.

The higher D2RMPT in patients with treatment side effects brings up another interesting discussion. One would expect that patients who are undertreated have fewer side effects (due to less medication received). However, our data paints a different picture: Opioids in any phase of care increase the risk for D2RMPT. A possible explanation is this: Patients with more severe surgeries presumably have higher pain and thus receive more opioids. This can increase their medication side effects. But the pain relief is still not sufficient, which leads to a higher D2RMPT. This might show that patients with severe pain still need (and want) more medication than they already received. In general, side effects do not contradict this perception.

Administered nonopioid analgesics did not show the same association. In our analysis, there is no significant association between nonopioid analgesics and D2RMPT. It is possible, though, that our analysis does not paint the whole picture. We looked at nonopioid analgesics as a whole. Specific nonopioids (-types) and combinations thereof might have stronger effects and need deeper investigations. Further, nonopioids are given as baseline analgesics to many patients and they are usually not drugs on request, indicating why administration of nonopioid analgesics is not associated with D2RMPT.

The association between D2RMPT and the presence of pre-existing chronic pain shows a borderline significance ($P = .058$). This is somehow surprising because pre-existing pain is one of the main predictors for high pain scores.[10,19,22] Patients with pre-existing pain often use medication before hospital admission and are thus less sensitive to medical treatment perioperatively.[4,10,22] On average, this leads to a larger need for drugs (and/or a higher pain intensity). But this is only marginally reflected in a higher D2RMPT. It is possible, that these patients already receive higher doses perioperatively. Another explanation could be that patients with pre-existing pain have higher pain-intensity "baseline-levels" and high pain intensity ratings do not reflect their requirement to be treated (because their perception is that the pain intensity is not much increased compared to their usual pain level). The latter would mean that adding the assessment of D2RMPT to singular pain-intensity assessment is worthwhile.

Decrease the D2RMPT by Improving Patient-Involvement and Hospital Processes

Patient involvement turned out to have the strongest beneficial association with D2RMPT. If patients feel that they are well-informed about postoperative pain

treatment and are involved in treatment decisions, they show a much lower risk of D2RMPT. From our point of view, this is one of the strongest findings of our study. It indicates that the choice of analgesic drug or technique influence D2RMPT less than appropriate communication.

Patient-controlled analgesia (PCA) also reduces the risk for D2RMPT but less than patient information and decision participation. This is interesting because PCA is some form of "patient involvement" and one could assume that patients with PCA are better informed and feel that they participate in their pain treatment. However, PCA shows to be an independent factor in the statistical model. Its smaller association leads to the question if its high cost is worthwhile in comparison to cheaper measures that decrease D2RMPT.

In hospitals that use clear medication prescription processes and document pain scores regularly, the D2RMPT is significantly reduced. Both processes are part of guidelines [11,20] but do still not seem to be applied consequently.

D2RMPT Cannot Replace Pain Scores Completely

Can clinicians only rely on D2RMPT and forget about assessing pain scores? For several reasons, we don't think so. First, as a binary value, D2RMPT is easily assessed and can be of help when deciding about treatment. But D2RMPT does not tell the whole story. On average and for lower pain scores, D2RMPT is relatively small (around 10%). It does not distinguish a patient's status to the same extent as maximal pain does. Second, even for the highest maximal pain score, only about 40% of patients have D2RMPT. Many patients seem to be reluctant to ask for more medication even if they are under such a lot of pain. When asked for their desire to get (more) opioids, a similar observation was made previously.[25] The reasons for not wanting (more) opioids despite having high pain intensity were "tolerable pain" (60%) and "fear of side effects" (22%). In such cases, it is thus important that clinicians communicate with patients and better understand patients' needs in order to decide if and how to change pain management.

D2RMPT has a rather narrow and skewed distribution. This limits its value in scientific research settings as it makes it difficult for statistical analysis. Scientists may prefer continuous variables that are more balanced over the patient sample.

From our point of view, D2RMPT should be used as a complementary measure. It can tell clinicians about the need for more treatment in undetermined situations. This is true specifically in patients with a mismatch between pain intensity scoring, pain-related functional interference, and/or behavior. It might summarize these and other factors like psychosocial situation, pain sensitivity, communication/information issues and the perception of care as a whole.

Some open questions remain, though. How strong is the influence of these other factors exactly? Why do a lot of patients with high pain intensity scores report no D2RMPT? And if they do report D2RMPT, what kind of pain treatment do patients exactly want?

Conclusions

Clinicians should strive for patient-oriented solutions. The simple question whether they have a desire to receive more pain treatment gives patients more influence in the process of care. Our data shows that D2RMPT is a comprehensible and easily obtainable outcome, which might be of value in daily routine and – to a limited extent – in clinical studies. However, more research Is needed in order to decide which patient-related outcome measures are best suitable for discriminating between effective and ineffective pain management for individual patients.

All factors that have a beneficial effect on D2RMPT (information, participation, prescriptions, pain measurement) are relatively easy to implement and inexpensive. They fit well in the current discussions about individualized treatment and patient involvement in the healthcare sector. By taking these little steps, clinicians can decrease the patients' burden and increase satisfaction with treatment.

Limitations

QUIPS suffers from the same limitations as other registries. Data collection is standardized but data quality is not as high as in randomized controlled trials. It is not possible to study causative factors but only associations. Thus, future prospective studies need to define a causative relation, for example, better treatment with lower D2RMT:

For the analysis, we included independent factors that are well-known from the literature and available in the QUIPS registry. However, pain is influenced by a multitude of factors, some of which we might not even be aware of. The selection of factors in our analysis might hence miss out on important information, e.g., patient history (including medication), comorbidities, psychosocial aspects, hospital structures, behavior/communication of staff, etc.

Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jpain.2021.01.002.

References

1. Adamczyk AK, Ligeza TS, Wyczesany M: The dynamics of pain reappraisal: the joint contribution of cognitive change and mental load. Cogn Affect Behav Ne 20:276-293, 2020

2. Cooper SA, Desjardins PJ, Turk DC, Dworkin RH, Katz NP, Kehlet H, Ballantyne JC, Burke LB, Carragee E, Cowan P, Croll S, Dionne RA, Farrar JT, Gilron I, Gordon DB, Iyengar S, Jay GW, Kalso EA, Kerns RD, McDermott MP, Raja SN, Rappaport BA, Rauschkolb C, Royal MA, Segerdahl M, Stauffer JW, Todd KH, Vanhove GF, Wallace MS, West C, White RE,

Wu C: Research design considerations for single-dose analgesic clinical trials in acute pain: IMMPACT recommendations. Pain 157:288-301, 2016

3. Correll DJ, Vlassakov KV, Kissin I: No evidence of real progress in treatment of acute pain, 1993-2012: scientometric analysis. J Pain Res 7:199-210, 2014

4. Gerbershagen HJ, Aduckathil S, van Wijck AJ, Peelen LM, Kalkman CJ, Meissner W: Pain intensity on the first day after surgery: a prospective cohort study comparing 179 surgical procedures. Anesthesiology 118:934-944, 2013

5. Gerbershagen HJ, Rothaug J, Kalkman CJ, Meissner W: Determination of moderate-to-severe postoperative pain on the numeric rating scale: a cut-off point analysis applying four different methods. Brit J Anaesth 107:619-626, 2011

6. Gordon DB, Polomano RC, Pellino TA, Turk DC, McCracken LM, Sherwood G, Paice JA, Wallace MS, Strassels SA, Farrar JT: Revised American Pain Society Patient Outcome Questionnaire (APS-POQ-R) for quality improvement of pain management in hospitalized adults: preliminary psychometric evaluation. J Pain 11:1172-1186, 2010

7. Gruss S, Treister R, Werner P, Traue HC, Crawcour S, Andrade A, Walter S: Pain intensity recognition rates via biopotential feature patterns with support vector machines. PLoS One 10, 2015

8. Halekoh U, Hojsgaard S, Yan J: The R Package geepack for generalized estimating equations. J Stat Softw 15:1-11, 2006

9. Henderson LA, Di Pietro F, Youssef AM, Lee S, Tam S, Akhter R, Mills EP, Murray GM, Peck CC, Macey PM: Effect of expectation on pain processing: A psychophysics and functional MRI analysis. Front Neurosci-Switz 14:6, 2020

10. Ip HYV, Abrishami A, Peng PWH, Wong J, Chung F: Predictors of postoperative pain and analgesic consumption a qualitative systematic review. Anesthesiology 111:657-677, 2009

11. Joshi GP, Van de Velde M, Kehlet H, Collaborators PWG: Development of evidence-based recommendations for procedure-specific pain management: PROSPECT methodology. Anaesthesia 74:1298-1304, 2019

12. Koyama T, McHaffie JG, Laurienti PJ, Coghill RC: The subjective experience of pain: Where expectations become reality. P Natl Acad Sci USA 102:12950-12955, 2005

13. Liang KY, Zeger SL: Longitudinal data-analysis using generalized linear-models. Biometrika 73:13-22, 1986

14. Marcus H, Gerbershagen HJ, Peelen LM, Aduckathil S, Kappen TH, Kalkman CJ, Meissner W, Stamer UM: Quality of pain treatment after caesarean section: Results of a multicentre cohort study. Eur J Pain 19:929-939, 2015

15. Meissner W, Mescha S, Rothaug J, Zwacka S, Goettermann A, Ulrich K, Schleppers A: Quality improvement in postoperative pain management results from the QUIPS Project. Dtsch Arztebl Int 105, 2008. 865-U868

16. Meissner W, Zaslansky R: A survey of postoperative pain treatments and unmet needs. Best Pract Res-Clin 33:269-286, 2019

17. Moore RA, Straube S, Aldington D: Pain measures and cut-offs - no worse than mild pain as a simple, universal outcome. Anaesthesia 68:400-412, 2013

18. Rothaug J, Weiss T, Meissner W: How simple can it get? Measuring pain with NRS items or binary items. Clin J Pain 29:224-232, 2013

19. Schnabel A, Yahiaoui-Doktor M, Meissner W, Zahn PK, Pogatzki-Zahn EM: Predicting poor postoperative acute pain outcome in adults: an international, multicentre database analysis of risk factors in 50,005 patients. Pain Rep 5: e831, 2020

20. Schug SA, Palmer GM, Scott DA, Halliwell R, Trinca J: Acute pain management: scientific evidence, fourth edition, 2015. Med J Australia 204, 2016. 315-U356

21. Schwenkglenks M, Gerbershagen HJ, Taylor RS, Pogatzki-Zahn E, Komann M, Rothaug J, Volk T, Yahiaoui-Doktor M, Zaslansky R, Brill S, Ullrich K, Gordon DB, Meissner W: Correlates of satisfaction with pain treatment in the acute postoperative period: Results from the international PAIN OUT registry. Pain 155:1401-1411, 2014

22. Sommer M, de Rijke JM, van Kleef M, Kessels AGH, Peters ML, Geurts JW, Patijn J, Gramke HF, Marcus MAE: Predictors of acute postoperative pain after elective surgery. Clin J Pain 26:87-94, 2010

23. Tighe PJ, Le-Wendling LT, Patel A, Zou BM, Fillingim RB: Clinically derived early postoperative pain trajectories differ by age, sex, and type of surgery. Pain 156:609-617, 2015

24. van Dijk JF, van Wijck AJ, Kappen TH, Schuurmans MJ: Postoperative pain assessment should not be solely based on numeric ratings! Commentary on van Dijk et al. (2011) Response. Int J Nurs Stud 49:632-633, 2012

25. van Dijk JFM, Kappen TH, Schuurmans MJ, van Wijck AJM: The relation between patients' NRS pain scores and their desire for additional opioids after surgery. Pain Pract 15:604-609, 2015

26. Whitburn LY, Jones LE, Davey MA, McDonald S: The nature of labour pain: An updated review of the literature. Women Birth 32:28-38, 2019

27. Yan J, Fine J: Estimating equations for association structures. Stat Med 23:859-874, 2004

28. Yao ZF, Hsieh SL: Neurocognitive mechanism of human resilience: A conceptual framework and empirical review. Int J Env Res Pub He 16:5123, 2019

29. Yelland LN, Salter AB, Ryan P: Performance of the modified poisson regression approach for estimating relative risks from clustered prospective data. Am J Epidemiol 174:984-992, 2011

30. Zou GY, Donner A: Extension of the modified Poisson regression model to prospective studies with correlated binary data. Stat Methods Med Res 22:661-670, 2013