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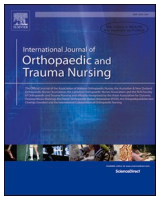

# Health and quality of life after discharge from hospital: A prospective study on opioid treatment for acute pain after trauma or surgery

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ABSTRACT

*Objectives:* The aim of this study was to examine opioid use, health, quality of life, and pain after discharge from hospital in opioid naïve patients receiving opioid treatment for sub acute pain after trauma or surgery.
*Methods:* A prospective cohort with a four-week follow-up was conducted. Of the 62 patients included, 58 remained in the follow-up. The following questionnaires were assessed: Numeric Rating Scale for pain (NRS), EQ-5D-5L (health-related quality of life) and EQ-VAS (self-reported health). Paired *t*-test, two-sample *t*-test and chi square test were used in the study.
*Results:* Every fourth participant still received opioid treatment at follow-up, and reported no significant increase in EQ-VAS. Overall, an improvement in EQ-5D-5L (0.569 (SD = 0.233) to 0.694 (SD = 0.152), $p < 0.001$) and EQ-VAS (55 (SD = 20) to 63 (SD = 18), $p = 0.001$) from baseline to follow-up was found. Pain intensity decreased in the same period (6.4 (SD = 2.2) to 3.5 (SD = 2.6), $p < 0.001$). An unmet need for information regarding pain management was reported by 32% of the participants.
*Conclusions:* Our findings show that patients with acute pain, treated with opioids, reported improved pain intensity, health-related quality of life and self-reported health four weeks after discharge. There is room for improvement regarding the provision of patient information on pain management.

## 1. Introduction

The world has seen an increase in use of opioid analgesics to treat acute and chronic pain, which has been followed by increased opioid misuse, abuse and opioid related deaths (Glare et al., 2019). Although a necessity in the management of acute pain, the long-term use of opioids is generally not recommended (Den Norske Legeforening, 2009). Still, long-term opioid use has been found in patients initially treated for acute pain after trauma (Åström et al., 2020) or surgery (Glare et al., 2019). Opioid prescribing at discharge from hospital for on-going acute pain should be done with careful consideration of individual needs and the risk factors for prolonged use (Macintyre et al., 2014). In relation to acute pain, and acute postoperative pain in particular, clinicians must weigh up the balance between adequate pain management and excessive opioid prescribing. Inadequate pain relief may cause unnecessary suffering for the patient, while excessive opioid prescribing after discharge from hospital or in the outpatient setting may lead to prolonged opioid use, misuse and opioid disorder which is a public health problem (Neuman et al., 2019). Inadequately managed acute postoperative pain may transition to chronic postoperative pain, and is associated with impaired function, recovery and quality of life (Gan, 2017). Predictors of severe postoperative pain such as smoking and physical health status have previously been identified in orthopaedic patients (Khalil et al., 2021). Veal et al. (2015) defines the sub acute period as the time from discharge from hospital to 3 months after surgery. The sub acute period after orthopaedic surgery was recognized as an area that requires scrutiny as moderate to severe pain intensity after discharge was found to be associated with persistent pain 12 months following surgery, and should be addressed to improve patient physical function and quality of life (Veal et al., 2015).

Quality of life (QoL) defined as the *individuals' perception of their position in life* (Whoqol Group, 1995), has been found to predict treatment success and to be of prognostic value across a wide range of diseases (Fayers and Machin, 2016). The term "health-related quality of life" (HRQoL) has been introduced in medical research to assess health, disease and disability, and its impact on QoL (Nordtvedt et al., 2016). It

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is an important outcome measure in patient care to improve symptom relief, care, and rehabilitation (Haraldstad et al., 2019). HRQoL is a much-studied aspect in the context of persistent pain, but less studied in patients suffering from acute and sub acute pain. To our knowledge, only a limited number of studies have been done to explore HRQoL or self-reported health in patients with acute non-malignant pain treated with opioids after discharge from hospital. Postoperative pain has been found to correlate with a decrease in HRQoL from postoperative day 1–14, but the severity of the analgesic side effects nausea and itching did not seem to affect HRQoL (Wu et al., 2003). Postoperative pain was also found by Strassels et al. (2004) to contribute to decreased HRQoL 4 weeks after discharge from hospital. Lapane et al. (2015) found similar results of pain impact on HRQoL over 28 days in patients with acute episodes of non-malignant pain. In light of concern regarding inadequate pain management and overprescribing of opioids, more knowledge is required on patient pain intensity, HRQoL, self-reported health and continued opioid use in patients with sub acute pain as only a few studies previously has addressed this.

The primary objective of this study was to assess HRQoL, self-reported health and pain intensity after discharge from hospital in opioid naïve patients receiving opioid treatment for sub acute non-malignant pain after trauma or surgery. The secondary objective was to assess the differences between those who continue opioid treatment and those who did not use opioids four weeks after discharge.

## 2. Methods

### 2.1. Study design and ethical approval

A prospective cohort from discharge to four weeks after was conducted. The study was approved by The Regional Committee for Medical and Health Research Ethics (REC 2019/7114) and informed consent was obtained from the participants.

### 2.2. Setting and participants

Patients ≥18 years with acute non-malignant pain, receiving an opioid prescription at hospital discharge, were recruited by competitive enrolment from the orthopaedic, neurosurgical and gastro surgical wards at a Norwegian University Hospital from October to December of 2019. Reduced cognitive function and opioid use on admission day were exclusion criteria. Patients admitted due to illness, trauma or elective surgery was included. The participants was recruited according to the inclusion and exclusion criteria after a pre-screening done by doctors or nurses at the wards.

### 2.3. Sample size

No sample size calculation was done, as minimum important difference in EQ-5D-5L in patients with acute pain has not been previously described. The predefined time period for inclusion was 9 weeks. Response rate was expected at 65%, as loss to follow-up must be expected with follow-up questionnaires (Polit and Beck, 2017).

### 2.4. Questionnaires and variables

All data was self-reported. After written consent, the participant was asked to complete the baseline questionnaire before leaving the hospital. Discharge was expected the same day or the day after completion of the baseline questionnaire in all participants. The follow-up questionnaire was completed by the participant at home four weeks after discharge and returned by standard mail. Basic demographics, reason for admission (illness, trauma or elective surgery) and use of addictive medication other than opioids such as benzodiazepines, Z-drugs or others were reported at baseline. At follow-up the participants was asked about use of opioids (yes/no), symptoms of withdrawal (yes/no), length of hospitalization and meetings with general practitioner (GP) regarding pain management, as well as received or needed information on tapering and cessation of opioid treatment. The questionnaires Numeric Rating Scale (NRS) for pain intensity and EQ-5D-5L for HRQoL and self-reported health was a part of both the baseline and the follow-up questionnaire.

### 2.5. Questionnaire: Health-related quality of life and self-reported health

HRQoL and self-reported health was measured by the questionnaire EQ-5D-5L, one of the most frequent generic QoL instruments used in medical and health research (Haraldstad et al., 2019). The instrument has shown good reliability, validity and responsiveness across a wide range of conditions and time frames, including various causes of acute pain and a short time frame as described by Bilbao et al. (2018) and in a systematic review by Payakachat et al. (2015). Part one of the questionnaire measures HRQoL through five dimensions; mobility, self-care, usual activities, pain/discomfort and anxiety/depression, (range 1–5), further calculated into one single index score from 0 (=equivalent to dead) to 1 (=full health). In the present study the Danish value set is used to calculate EQ-5D-5L index value, as no Norwegian value set was available at the time. Part two, EQ-VAS, is a visual analogue scale to elicit self-reported health on a scale from 0 (=worst possible health) to 100 (=best possible health) (EuroQol Research Foundation, 2019).

### 2.6. Questionnaire: Pain

The Numeric Rating Scale (NRS) was used to measure worst pain intensity over the last 24 h on a scale from 0 (=no pain at all) to 10 (=worst pain possible) (Breivik et al., 2008). The scale is frequently used across a wide range of painful conditions and has good sensitivity, reliability and validity (Ferreira-Valente et al., 2011; Hjermstad et al., 2011; Breivik et al., 2000). Pain catastrophizing was measured by the two-item Coping Strategies Questionnaire (CSQ) developed from the full version CSQ, which has shown good validity and sensitivity for patients with pain (Jensen et al., 2003). The two-item CSQ is scored on a scale from zero to six, or ‘never do’ to ’always do that’ and is being used in research and clinical practice in Norway (Landmark et al., 2018; Fredheim et al., 2008).

### 2.7. Statistical methods

All data was processed and analysed using the statistical software Stata 16.0 Statistical Data Analysis (StataCorp, 2019). To assess differences between groups, two-sample t-tests were used for all continuous variables and chi-square test for all categorical variables (Table 1). A histogram was produced to evaluate normal distribution for all continuous variables. The variables were approximately normally distributed. Wilcoxon rank-sum test was done as a control, and comparable findings were identified for the continuous variables with both parametric and non-parametric tests. Paired t-tests were used to assess the repeated measures from baseline and follow-up (Table 2).

## 3. Results

### 3.1. Participant characteristics

Of the 62 participants included, 58 participants completed the follow-up questionnaire four weeks after discharge, yielding a response rate of 94% (see Fig. 1). Participant characteristics are displayed in Table 1. The majority of the 58 respondents were women (59%) and the mean age was 55 years (SD = 17), with a range from 18 to 83 years old. Trauma was the reason for admission for 72% of the participants, while the remainder was admitted due to illness or elective surgery. With competitive enrolment, the majority of the participants (90%) were recruited from the orthopaedic wards, while a minority of participants

**Table 1**
Participant characteristics and comparison of the group using and not using opioids at follow-up.

| | All | Not using opioids | Using opioids |
|---|---|---|---|
| | *n = 58* | *n = 43* | *n = 15* |
| Age | 55(17) | 53(17) | 59(17) |
| Sex/Men[a] | 24(41) | 19(44) | 5(33) |
| *Baseline (at discharge from hospital)* | | | |
| Use of addictive medication[a] | 10(18) | 7(16) | 3(21) |
| Trauma as reason for admission[a] | 42(72) | 30(70) | 12(80) |
| Number of days admitted | 5(4) | 5(4) | 6(4) |
| Pain catastrophizing | 2.5(1.3) | 2.3(1.3) | 3(1.1) |
| NRS pain intensity | 6.4(2.2) | 6.2(2.3) | 6.9(1.9) |
| EQ-5D-5L index value | 0.569 (0.231) | 0.583 (0.231) | 0.531 (0.237) |
| EQ-VAS | 55(20) | 58(20) | 43(16) |
| *Follow-up (four weeks)* | | | |
| NRS pain intensity | 3.5(2.6) | 3(2.5) | 5.1(2.2) |
| EQ-5D-5L index value | 0.694 (0.152) | 0.701 (0.158) | 0.673 (0.132) |
| EQ-VAS | 63(18) | 66(17) | 55(19) |
| Symptoms of withdrawal[a] | 12(21) | 6(14) | 6(40) |
| Received information on pain management[a] | 11(19) | 7(17) | 4(27) |
| Need of information on tapering and cessation[a] | 18(32) | 11(26) | 7(47) |
| Knowledge of whom to contact regarding pain management[a] | 32(55) | 22(51) | 10(67) |
| Meeting with general practitioner[a] | 11(19) | 5(12) | 6(40) |

n: Number of participants.
Continuous variables reported as mean and standard deviation (SD) calculated using two sample *t*-test.
[a] Categorical variables reported as numbers and percentages (%) calculated using chi-squared test.

**Table 2**
Change in pain intensity, HRQoL and self-reported health from baseline to follow up.

| | Baseline Mean (SD) | Follow-up Mean (SD) | Difference Mean (SD) 95% CI | p-value |
|---|---|---|---|---|
| **NRS pain intensity (0–10)** | 6.4(2.2) | 3.5(2.6) | 2.9(3.2) 2.03 to 3.73 | **<0.001** |
| Not using opioids | 6.2(2.3) | 3.0(2.5) | 3.2(3.2) 2.21 to 4.21 | **<0.001** |
| Using opioids | 7.0(1.9) | 5.1(2.2) | 1.6(3.0) 0.13 to 3.58 | **0.037** |
| **EQ-5D-5L index value (0–1)** | 0.569 (0.233) | 0.694 (0.152) | −0.125(0.191) −0.176 to −0.074 | **<0.001** |
| Not using opioids | 0.583 (0.231) | 0.701 (0.158) | −0.119(0.207) −0.182 to −0.055 | **<0.001** |
| Using opioids | 0.529 (0.245) | 0.672 (0.132) | −0.144(0.136) −0.222 to −0.065 | **0.002** |
| **EQ-VAS (0–100)** | 55(20) | 63(18) | −8.9(19.9) −14.22 to −3.68 | **0.001** |
| Not using opioids | 58(20) | 66(17) | −8.2(19.2) −14.08 to −2.29 | **0.008** |
| Using opioids | 43(16) | 55(19) | −11.3(22.5) −24.27 to 1.70 | 0.083 |

Paired *t*-test used for all variables.

was recruited from the gastro surgical and the neurosurgical ward. The participants' mean number of days of admission to hospital was 5 (SD = 4). While all participants received opioid treatment at baseline, 18% reported use of additional addictive medication such as benzodiazepines, Z-drugs or others at baseline.

### 3.2. Health-related quality of life and self-reported health

For the participants, HRQoL measured by EQ-5D-5L index value, increased from discharge to four weeks after discharge (from 0.569 (SD = 0.231) to 0.694 (SD = 0.152), 95% CI: −0.176 to −0.074, p < 0.001). Table 2 and Fig. 2 present changes in the EQ-5D-5L index value for all participants, and divided by groups. EQ-5D-5L index value increased for both those not continuing opioid treatment at four weeks, (from 0.583 (SD = 0.231) to 0.701 (SD = 0.158), 95% CI: −0.182 to −0.055, p < 0.001) and those continuing opioid treatment, (from 0.529 (SD = 0.245) to 0.672 (SD = 0.132), 95% CI: −0.222 to −0.065, p = 0.002). No significant difference was found in EQ-5D-5L index value between groups at either discharge (0.583 (SD = 0.231) vs. 0.531 (SD = 0.237), p = 0.472) or four weeks later (0.701 (SD = 0.158) vs. 0.673 (SD = 0.132), p = 0.505). There was an improvement in participants' mean self-reported health, measured by EQ-VAS, from baseline to follow-up (from 55 (SD = 20) to 63 (SD = 18), 95% CI: −14.22 to −3.68, p = 0.001). Table 2 and Fig. 3 display the changes in self-reported health for all participants, and divided by groups. The participants not using opioids at follow-up were more likely to report increased self-reported health (from 58 (SD = 20) to 66 (SD = 17), 95% CI: −14.08 to −2.29, p = 0.008), than those continuing opioid treatment (from 43 (SD = 16) to 55 (SD = 19), 95% CI: −24.27 to 1.70, p = 0.083). Those continuing opioid treatment reported lower self-reported health at baseline than those not using opioids, (43 (SD = 16) vs. 58 (SD = 20), p = 0.010). There was no significant difference between the groups at follow-up (66 (SD = 17) vs. 55 (SD = 19), p = 0.052).

### 3.3. Pain and pain management

There were 15 participants (26%) who reported continued opioid treatment at follow-up four weeks after discharge. A decrease was found in participants' mean pain intensity from baseline to follow-up (from 6.4 (SD = 2.2) to 3.5 (SD = 2.6), 95% CI: 2.03 to 3.73, p < 0.001). Table 2 and Fig. 4 display the decrease in pain intensity for all participants and divided by groups of those using and not using opioids. Those not using opioids at four weeks after discharge reported a greater decrease in pain intensity to a lower level at follow-up (from 6.2 (SD = 2.3) to 3 (SD = 2.5), 95% CI: 2.21 to 4.21, p < 0.001) than those using opioids (from 7 (SD = 1.9) to 5.1 (SD = 2.2), 95% CI: 0.13 to 3.58, p = 0.037). As shown in Table 1, there was a greater difference regarding pain intensity at follow-up between those who did not continue opioid treatment and those who did (3 (SD = 2.5) vs. 5.1 (SD = 2.2), p = 0.005), than at baseline (6.2 (SD = 2.3) vs. 6.9 (SD = 1.9), p = 0.218). More participants among those continuing opioid treatment had experienced symptoms of withdrawal after discharge (p = 0.032). Those continuing opioid treatment had met with their GP more often regarding pain and pain management in the first four weeks after discharge (p = 0.016). There were no significant differences between the groups regarding received information, need for more information or knowledge of whom to contact in case of challenges regarding pain management. While 81% of the participants reported that they had not received information about tapering or cessation of opioids at the hospital, 32% reported an unmet need for more information regarding pain management.

## 4. Discussion

An improvement was found in HRQoL, self-reported health and pain intensity from discharge to four weeks later in participants receiving opioid treatment for acute non-malignant pain. Participants who continued opioid treatment at follow-up reported lower self-reported health at baseline and higher pain intensity at follow-up than those who did not continue opioid use.

Previous studies suggest that pain impacts HRQoL and self-reported health in patients with acute pain (Wu et al., 2003; Lapane et al., 2015; Lindberg et al., 2013). Our finding of improved HRQoL after discharge

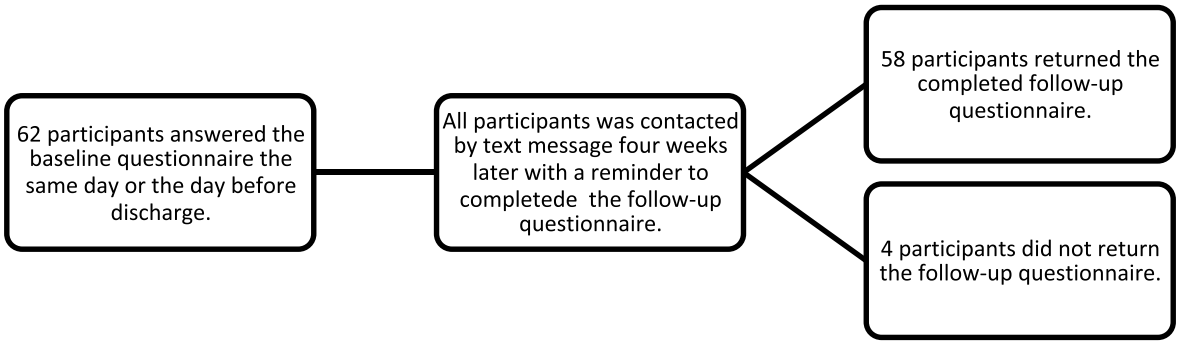


**Fig. 1.** Recruitment tree.

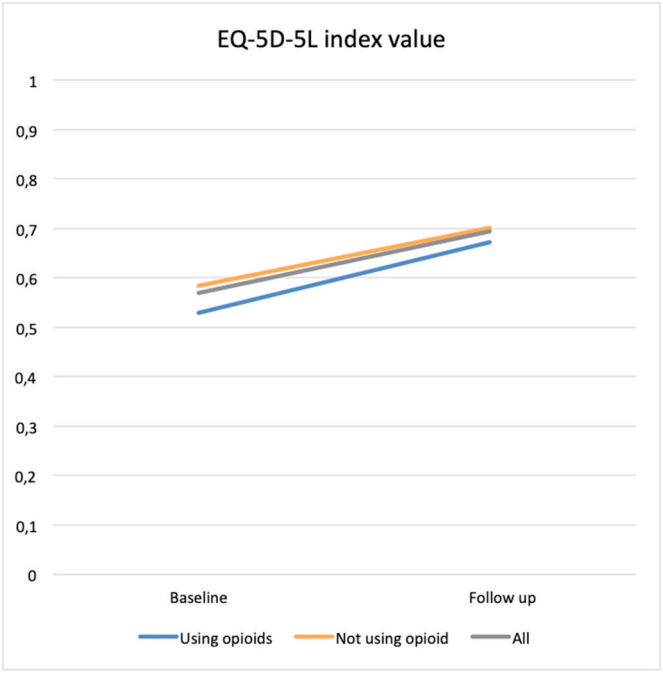


**Fig. 2.** Increase in HRQoL from baseline to follow-up.

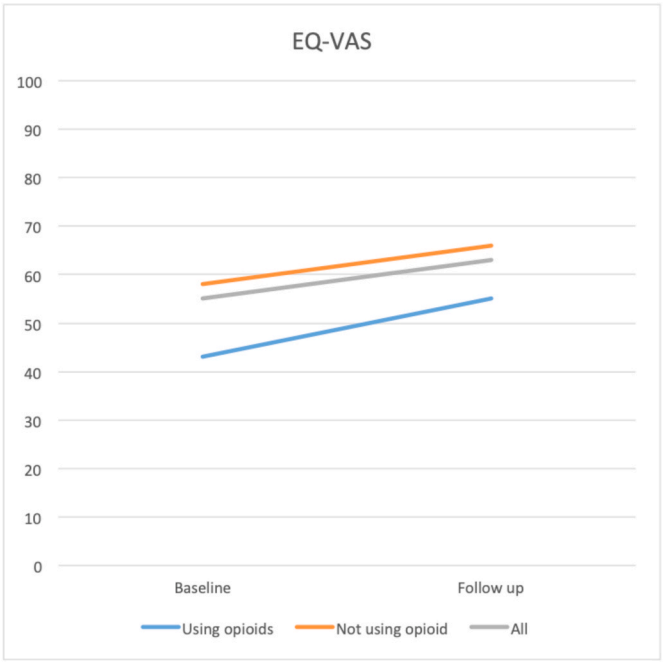


**Fig. 3.** Increase in self-reported health from baseline to follow-up.

from hospital in patients with acute non-malignant pain is expected and in line with previous studies (Klapwijk et al., 2017). To our knowledge, no previous study has examined the development of HRQoL and self-reported health four weeks from discharge in patients who initiated opioid treatment during hospital admission and continued this treatment after discharge. Although the EQ-5D-5L score increased during follow-up, it's still lower than the Norwegian population value (Garratt et al., 2021) and lower than the Danish population norm (Sørensen et al., 2009) as would be expected in early stages of recovery. Our findings are in line with an American study, finding lower HRQoL than the population norm one month postoperatively (Strassels et al., 2004). Still, it was a surprisingly large number of participants that reported use of opioids four weeks after discharge and this group may require more attention regarding pain, pain management and HRQoL in the sub acute phase.

While an increase was found in both HRQoL and self-reported health for our total study population, no significant change was found in self-reported health from baseline to follow-up in participants continuing opioids at follow-up. Due to the observational design and small study sample of this study, we cannot state that low self-reported health predicts prolonged opioid use. The potential risk of opioid misuse, drug diversion and opioid use disorder should still be considered when prescribing opioids at discharge and it has been suggested that opioid treatment may be required for less than 15 days postoperatively depending on the procedure (Neuman et al., 2019). Previous studies that report the prevalence of opioid use four weeks after discharge in opioid-naïve patients with acute pain who received an opioid prescription at discharge have not been identified. The participants in this study who continued opioid use four weeks after discharge may have had more severe trauma or surgery, which would require longer period of recovery and may be part of the explanation of prolonged opioid use and small increase in self-reported health. The significance of opioid use at four weeks after discharge is not known, but persistent opioid use has previously been identified up to two years after surgery (Macintyre et al., 2014; Deyo et al., 2017). It has been suggested that the prevalence after one year is higher in patients suffering from severe trauma (Åström et al., 2020). As the majority of the participants in the present study reported trauma as reason for admission, one may expect a continued high prevalence of opioid users beyond four weeks after discharge. The continued use of opioid should also be seen in the perspective of the participants reporting no clinically significant reduction in pain intensity at follow-up, more frequent meetings with their GP and a higher frequency of symptoms of withdrawal, which suggests a higher burden in participants with continued opioid use. The most plausible explanation for the present findings of higher pain intensity at follow-up and higher frequency of symptoms of withdrawal among those continuing opioid treatment is that higher pain intensity is treated with a higher

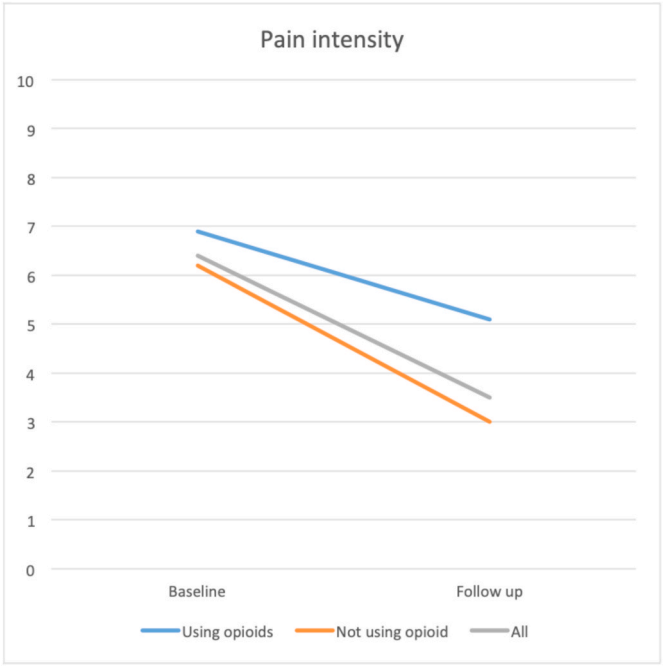


**Fig. 4.** Decrease in pain intensity from baseline to follow-up.

opioid dose, probably in participants with the most severe trauma or surgery. Physical addiction can be present after only two weeks of daily opioid use, which can give symptoms of withdrawal during cessation (Helsedirektoratet, 2015). In case of symptoms of withdrawal, slower tapering is preferred (Den Norske Legeforening, 2009), which may partly explain continued use and more frequent meetings with their GP among the participants in this group. Prolonged opioid use has previously been found to be associated with increased health care utilization and cost in opioid-naïve patients (Brummett et al., 2019). There was no significant difference between the groups regarding age, sex or pain catastrophizing at baseline, which has previously been found to be associated with prolonged or increased opioid use (Macintyre et al., 2014; Neuman et al., 2019; Ip et al., 2009). A larger sample size may have resulted in other findings.

It is of great concern that 81% of the participants reported that they did not receive information on tapering or cessation of opioids at discharge, and that 32% reported an unmet need for information. This finding is in line with an Australian study where almost 30% of the participants reported not receiving adequate information on analgesics use following discharge after total knee arthroplasty (Chan et al., 2013). Inadequate provision of information at discharge from hospital has previously been reported by patients in Norway (Holmboe and Bjærtnes, 2016). Many patients have difficulty understanding the information given at the hospital, and previous studies have found that 40%–80% of received information is forgotten or remembered incorrectly (Kessels, 2003). This may be part of the explanation for the high number of patients reporting not having received information. The consequences of insufficient information have not been explored in the present study. It is recommended that sufficient information is provided preferably both verbally and in a written format to enable patients to manage their opioid treatment safely after discharge (Macintyre et al., 2014). Veal et al. (2015) has suggested that pain management after discharge is addressed with patient education and additional follow-up with health care practitioners. The authors of this study are under the impression that there is a great potential of nursing care in this matter. Considering approximately every third participant was discharged from hospital without sufficient information in regard to on-going opioid treatment for acute pain, there seems to be room for improvement in clinical practice regarding the provision of patient information on pain management.

## 5. Strengths and limitations

The primary strengths of this study are the prospective design, self-reported data and the response rate of 94%. As one of the inclusion criteria was acute non-malignant pain, it was not unexpected that there would be an overweight of participants recruited from orthopaedic wards. The size of the overweight was unexpected and could have been reduced by extended inclusion at the other wards. The study has limitations, one of them being the small sample of 58 participants continuing to follow-up and 15 participants continuing opioid treatment, and the results must be seen in light of this. The significance of opioid use at four weeks after discharge can be questioned, but the findings of this study may shed light on a need for early intervention to prevent persistent opioid use. The study is limited regarding information on medical history, current diagnosis or opioid dosage, and indication and duration of pain medication, and no such information is available. In the baseline questionnaire the participants were asked if they were admitted due to illness, trauma or elective surgery. Regrettably the participants admitted due to illness or trauma was not asked if they underwent surgery, but as all participants was recruited from surgical departments one can assume a large number did have surgery during admission. However, the diversity in medical condition in a small sample patient group such as in the present study, limits the possibility of the analysis. There are limitations when studying HRQoL and health, and the concept of HRQoL is subject for debate as there is no clear consensus on the definition or how to measure it (Moons et al., 2006). Non-medical aspects of QoL are not explored in this study and their effect on HRQoL and self-reported health may have been underestimated, while the effect of pain on HRQoL may have been overestimated. One of the limitations of using EQ-5D-5L in addition to NRS in a study on pain, is that pain/discomfort is one of the 5 dimensions in the first part oft the questionnaire measuring HRQoL and could explain some correlation with pain. The same limitation would be present if using another well-known questionnaire, the Short Form SF-12, as previously stated by Lapane et al. (2015). HRQoL is frequently studied in relation to chronic pain, but less studied in patients suffering from acute pain (Wu et al., 2003).

## 6. Conclusion

The findings from this study suggest that opioid naïve patients with acute non-malignant pain treated with opioids reported improved pain intensity, HRQoL and self-reported health four weeks after discharge. Those not continuing opioid at follow-up reported a clinically significant decrease in pain intensity, while those continuing opioids still had moderate pain intensity four weeks after discharge. The provision of patient information at discharge regarding opioid treatment can be improved and additional follow-up in the sub acute phase may have positive effects. This should be addressed in clinical practice when planning follow-up of pain management after discharge. Future research may explore how self-reported health and HRQoL can be improved in patients receiving opioid treatment for acute non-malignant pain.

## Ethical statement

Informed consent has been obtained from all individuals included in this study. The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration. The study has been approved by the Regional Committees for Medical and Health Research Ethics (REC 2019/7114). The study was reported to the Data Protection Officer and was approved by the Head of Departments of the surgical wards where the participants were recruited.

## Financial disclosure

Authors state no funding involved.

## Declaration of competing interest

All authors contributed in planning the study design, analysing and interpreting the results, and drafting or critically revising the manuscript. Authors state no conflict of interest.

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