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Pain in Austrian hospitals: evaluation of 1089 in-patients

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Summary
Background Despite the existence of internationally consistent guidelines for the management of pain, efficient regional anesthesia techniques, safe pain medications, and organizational structures, e.g., acute pain services, various studies have shown that pain is still common among both surgical and non-surgical in-patients.
Objective The primary objective of this study was to evaluate, on a multi-center basis, the point pain prevalence of surgical and non-surgical in-patients. We further analyzed pain intensities, in-hospital pain triggers, pain-related impairments, pain assessments, patient information about pain, and patient satisfaction with pain therapy. This benchmark information should lead to better implementation of pain management strategies and thus improve health care quality.
Methods We surveyed all adult in-patients in three general hospitals in Austria (general hospital Klagenfurt am Wörthersee, general hospital Villach, general hospital Wolfsberg) on the index day with two standardized questionnaires for both surgical and non-surgical patients.
Results Overall, a pain prevalence of 40.0%, with no statistically significant difference between surgical and non-surgical patients, was shown. Higher pain prevalence in female patients, high pain prevalence in the age group 18–30 years, and highest pain prevalence in the age group over 90 years old was found. Overall pain intensity was relatively low, but unacceptable maximum pain within the preceding 24 h was shown. Different in-hospital pain triggers like patient's care and mobilization were found. Our survey has shown that pain has an impact on personal hygiene, mobilization, mood, sleep, and appetite. However, patients were very satisfied with their pain therapy.
Conclusion Medical staff and nurses have to be sensitized to the urgent need to improve pain management strategies.

Keywords Pain management · Pain prevalence · Pain trigger · Pain-related impairment · Pain assessment

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Background

Despite the existence of internationally consistent guidelines for the management of pain [7, 20, 33, 36], efficient regional anesthesia techniques, safe pain medications, and organizational structures, e.g., acute pain services, various studies have shown that pain is still common among both surgical and non-surgical in-patients [23, 31, 34, 38, 42, 46, 47].

It has been shown that in different clinical settings, pain prevalence may reach more than 80%, with every third patient suffering from moderate to severe pain and every second patient showing pain on movement. Moreover, up to 40% of all patients in pain have no analgesic treatment at all [31].

Nevertheless, pain is an important indicator of quality health care [34] and has a major impact on patients' conditions [42]: pain may lead to prolonged hospital stay or readmissions due to increased postoperative morbidity, and is associated with pulmonary complications [42], suppressed immune function [29], anxiety or depression [19], stress [1], and also may reduce patients' physical activity [48]. It has been shown that sufficient pain release can improve recovery, reduce postoperative complication rates, and shorten hospitalization, and therefore leads to reduced health care costs [42].

Different epidemiological studies of pain prevalence have been conducted over the world [23, 31, 34, 42]. However, information about in-hospital pain triggers and the impact of pain on mobilization, deep breathing/coughing, mood, sleep, and appetite are lacking. Also, information about the frequency of pain assessment and patient information about pain are scarce.

The primary objective of this study was to evaluate, on a multi-center basis, the point pain prevalence of surgical and non-surgical in-patients. We further analyzed the current pain intensity at rest, the maximum/minimum pain within the preceding 24 h, and in-hospital pain triggers. We also studied pain-related impairment referring to personal hygiene, mobilization, deep breathing/coughing, mood, sleep, and appetite. We investigated the frequency of pain assessment, patient information about pain, expected pain intensity, strategies against pain, painkillers and side effects, patient satisfaction with pain therapy, and wish for additional painkillers. This benchmark information should lead to better implementation of pain management strategies and thus improve health care quality.

Methods

Setting, inclusion, and exclusion criteria

To assess the point prevalence of pain, we surveyed all adult in-patients in three general hospitals in Carinthia, Austria (general hospital Klagenfurt am Wörthersee, general hospital Villach, general hospital Wolfsberg) on the index day.

Absolute inclusion criteria were patients ≥ 18 years old who had given orally informed consent to participate in a standardized interview, hospitalized for at least 24 h, and able to speak German. Patients from pediatric units, patients with cognitive impairment, and patients with language or speech barriers were excluded.

Screening instruments, data collection

With two standardized questionnaires developed by our research team for both surgical and non-surgical patients, interviews were conducted by independent researchers not involved in the patients' care. Weeks before the survey, the general management, head nurses, and independent researchers received detailed information on aims and procedures.

An 11-part numeric rating scale (NRS 0–10) was used to collect scores for current pain and maximum/minimum pain within the preceding 24 h. Additional questions related to demographic data, pain localization, quality of pain, pain duration, pain triggers, frequency of pain assessment, pain-related impairment referring to personal hygiene, mobilization, deep breathing/coughing and mood, satisfaction with pain therapy, wish for additional painkillers, patient information about pain, expected pain intensity, strategies against pain, painkillers and side effects, sleep duration and sleep quality, appetite, and vomiting.

Data management

With reference to Melotti et al. [34], NRS scores were first divided into two major categories: no pain (NRS = 0) and any pain (NRS ≥ 1). To assess the prevalence of pain severity, scores of NRS ≥ 1 were further subdivided into three categories: mild pain (NRS ≥ 1 and ≤ 3), moderate pain (NRS ≥ 4 and ≤ 6), and severe pain (NRS ≥ 7).

Pediatric patients were excluded in this study. Patients ≥ 18 years of age were subdivided into seven 9-year interval subsets. The only 12-year interval subset was that of adults 18 to 30 years of age.

The wards of the three general hospitals were divided into two major area types: surgery and medicine. Hence, patients were classified into surgical and non-surgical patients.

Ethics

The study was approved by the Ethical Committee of Carinthia, conducted according to the Helsinki declaration and IASP's guidelines for pain research in animals and humans, and authorized by the hospital general management. The assessors personally informed all patients on the objectives of the study and that participation is voluntary and anonymous without affecting of their ongoing therapy. Orally informed consent was obtained before participation in the study.

Statistical analysis

Statistical data analyses were performed using the SPSS package for Windows version 18.0 (Statistical Package for Social Science; IBM® Corp., Armonk, NY, USA). Interval-scaled data are shown with mean values and standard deviation. Mean values were calculated for current pain, maximum/minimum pain, pain-related impairment, sleep and appetite, and grading of pain therapy. Ranked data are expressed as percentages. Group comparisons were made with continuous data using the *t*-test for independent samples. Post-hoc group comparisons were carried out using the Bonferroni test. For ordinally scaled

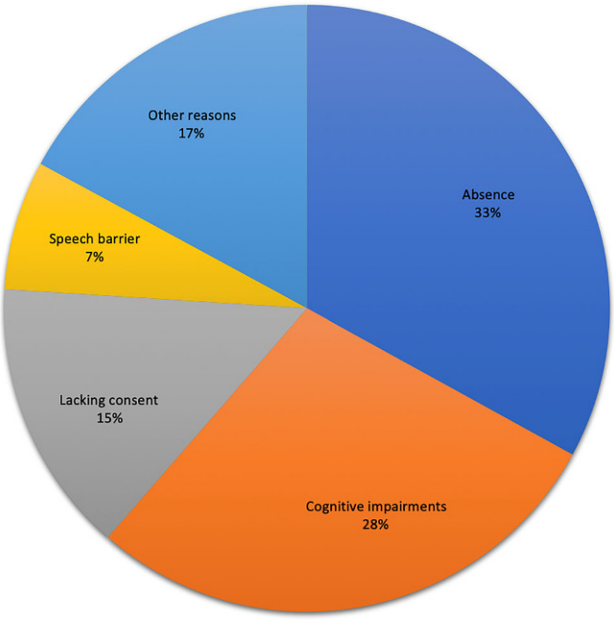


Fig. 1 Dropout rate

data, the Mann–Whitney U test was used. Simple frequency comparisons were made with the four-field chi-square test. The 95% level was set as the general level of significance.

Results

On the index day, a total of 1681 patients were surveyed and found to be potentially eligible for the study. Among them, 592 (35%) interviews were abortive. Reasons for non-participation were absence during the survey (33%), cognitive impairment (28.4%), lacking consent (14.6%), language/speech barrier (6.9%), and "other reasons" (17.1%), which included, e.g., conscience, hearing, or verbal communication impairment (see Fig. 1).

Of the 1089 questionnaires returned, no missing values for current pain were found, and hence were further analyzed. Missing information for secondary objectives did not result in exclusion.

Overall, 793 non-surgical and 296 surgical patients underwent analysis. Demographic data are shown in Table 1. The mean age was 66.4 (±17.9); 48.3% were females and 51.7% were males.

Data from pain-free patients (NRS = 0) were included in the evaluation, but also results excluding pain-free patients (NRS > 0) are shown (see Table 2 and 3).

Point pain prevalence

An overall point pain prevalence (NRS > 0) of 40.0% was found. There was no statistically significant difference ($p = 0.220$) between the overall point prevalence of surgical patients (43%) compared to non-surgical patients (37.1%).

Table 1 Description of sample

Characteristic	Sample	*n* (%)
Patients	Total/excluded	1681/592
Non-surgical/surgical patients	Included in analysis	793 (78.4%)/296 (21.6%)
Sex	Female/male	784 (48.3%)/838 (51.7%)
Mean age (years)	Total	66.4 ± 17.9
Mean age (years ± SD)	Female/male	65.6 ± 19.3/67.2 ± 16.4

SD standard deviation

Table 2 Main results (part 1)

Pain prevalence (%)	Total patients	40.0
	Female/male	53.1/46.9
	Non-surgical/surgical patients	37.1/43
Current pain intensity (NRS ± SD)	Total patients	1.6 ± 2.4
	Non-surgical patients	1.4 ± 2.3
	Surgical patients	1.9 ± 2.4
	Total patients (NRS > 0)	3.8 ± 2.3
	Non-surgical patients (NRS > 0)	3.6 ± 2.3
	Surgical patients (NRS > 0)	2.8 ± 1.1
Maximum pain within the preceding 24 h (NRS ± SD)	Total patients	3.9 ± 3.3
	Non-surgical patients	2.9 ± 3.2
	Surgical patients	4.9 ± 3.3
	Female/male	5.1 ± 2.9/4.6 ± 3.1
	Total patients (NRS > 0)	6.0 ± 2.6
	Non-surgical patients (NRS > 0)	5.6 ± 2.6
	Surgical patients (NRS > 0)	6.5 ± 2.5
Maximum pain within the preceding 24 h (NRS ± SD)	Total surgical patients	1.2 ± 1.6
Pain assessment (%)	None	13.6
	1–3 times	35.9
	> 3 times	50.5
Pain assessment—non-surgical/surgical patients (%)	None	13.9/0
	1–3 times	36.3/13.3
	> 3 times	49.8/86.7
Pain assessment (%)	Nursing staff	94.9
	Medical staff	74.2

NRS numeric rating scale, *SD* standard deviation

Point pain prevalence and gender

In general, female patients showed a trend ($p = 0.65$) toward a higher point pain prevalence (53.1%) compared to male patients (46.9%). There was a statistically significant ($p = 0.009$) difference between females and males when comparing point pain prevalence after surgical procedures (35.3% vs. 50.0%). No significant differences between females and males were found for no pain, mild pain, or severe pain categories.

Table 3 Main results (part 2)

Results	Sample	*p*-value
Pain prevalence m/f	Total patients	0.650
Pain prevalence m/f	Non-surgical patients	0.369
Pain prevalence m/f	Surgical patients	0.009*
Pain prevalence non-surgical/surgical patients	Total patients	0.654
Pain prevalence non-surgical/surgical patients	Total patients VAS > 0	0.220
Pain assessment	Non-surgical/surgical patients	0.278
Sleep duration non-surgical patients	Total patients/VAS > 0	0.000*
Sleep duration surgical	Total patients/VAS > 0	0.002*
Appetit non-s	Total patients/VAS > 0	0.002*
Appetit surgical	Total patients/VAS > 0	0.031*
Current pain non-surgical patients	m/f	0.261
Current pain surgical patients	m/f	0.156
Current pain	Non-surgical/surgical patients	0.017*
Current pain	Non-surgical/surgical patients VAS > 0	0.014*
Current pain	Total patients/VAS > 0	0.025*
Maximum pain	Non-surgical/surgical patients	0.000*
Maximum pain	Non-surgical/surgical patients VAS > 0	0.030*
Maximum pain	Total patients/VAS > 0	0.000*
Current pain/gender	Non-surgical patients	0.261
Current pain/gender	Surgical patients	0.761

*Statistically significant *p*-value

Point pain prevalence and age

The mean age was 66.4 years (±17.9). Patients ≥ 18 years of age were subdivided into seven 9-year interval subsets. The only 12-year interval subset was that of adults with 18 to 30 years of age.

Whereas non-surgical patients showed nearly constant point prevalence rates throughout ages (with the highest pain prevalence in the age group 91–99 years), surgical patients showed three extremes (see Fig. 2): pain prevalence among members of the age group 18–30 years old was high (61.5%), whereas that of the age group 31–40 years old was the lowest in the sample. The age group 91–99 years old showed the highest pain prevalence of the survey (80%).

Pain intensity (current pain at rest, maximum/minimum pain within the preceding 24 h)

The mean overall current pain intensity at rest during the evaluation was 1.6 (±1.4). This pain intensity was significantly ($p = 0.017$) higher in surgical patients than in non-surgical patients (1.9 vs. 1.4).

Results with excluded pain-free patients showed a mean overall pain intensity of 3.8 (±2.3) with significantly ($p = 0.014$) higher scores in non-surgical patients (3.6 vs. 2.8).

14.6% percent of the patients with a pain score greater than NRS 0 had experienced severe pain (NRS > 6), 37.1% had moderate pain (NRS ≥ 4 and ≤ 6), and 48.3% showed mild pain (NRS ≥ 1 and ≤ 3).

Compared to pain prevalence, in surgical patients, pain intensity among members of the age group 18–30 years old was also high (4.4), with decreasing scores in the age group 51–60 years old. The age group 91–99 years old also showed the highest current pain intensity at rest of the survey (5.3).

The mean overall maximum pain within the preceding 24 h (independent of rest, movement, or other triggers of pain) was 3.9 (±3.3), with significantly ($p = 0.000$) higher scores in surgical patients. Results excluding pain-free patients showed a mean score of 6.0 (±2.6), with significantly ($p = 0.030$) higher scores in surgical patients compared to non-surgical patients (6.5 vs. 5.6).

No significant differences in maximum pain scores within the preceding 24 h in the different age group members were found. The mean minimum pain within the preceding 24 h was 1.2 (±1.6) in surgical patients. Exclusion of pain-free patients showed a minimum pain of 2.1 (±1.8). Minimum pain within the preceding 24 h was not evaluated in non-surgical patients.

There was no significant difference regarding pain intensity and gender.

In-hospital triggers of pain

In general, 20.8% of patients reported triggers of pain during the hospital stay (multiple-response question): the main triggers were patient care (41.9%) and mobilization (31.9%). Diagnostic or therapeutic procedures (22.5%) and transportation (18.8%) are painful, as was wound care (10.0%; Fig. 3).

Pain assessment and patient information about pain

Overall, 86.4% of patients were frequently asked to rate their pain in terms of pain intensity (NRS), localization, pain quality, pain at rest, and in movement. There was no significant difference ($p = 0.278$) between the pain assessments of surgical patients compared to non-surgical patients.

13.9% of all non-surgical patients were never asked to rate their pain, whereas 100% of surgical patients were asked at least once. Independent of surgical or non-surgical wards, nursing staff evaluated pain more often (94.9%) compared to doctors (74.2%).

Patients with planned surgery were informed by a doctor about pain in general (70.4%), pain assessment (77.9%), pain intensity (83.2%), pain concepts (70%), painkillers (75.3%), side effects (61.1%), and also about outcome without pain therapy (49.5%) using a standardized information sheet.

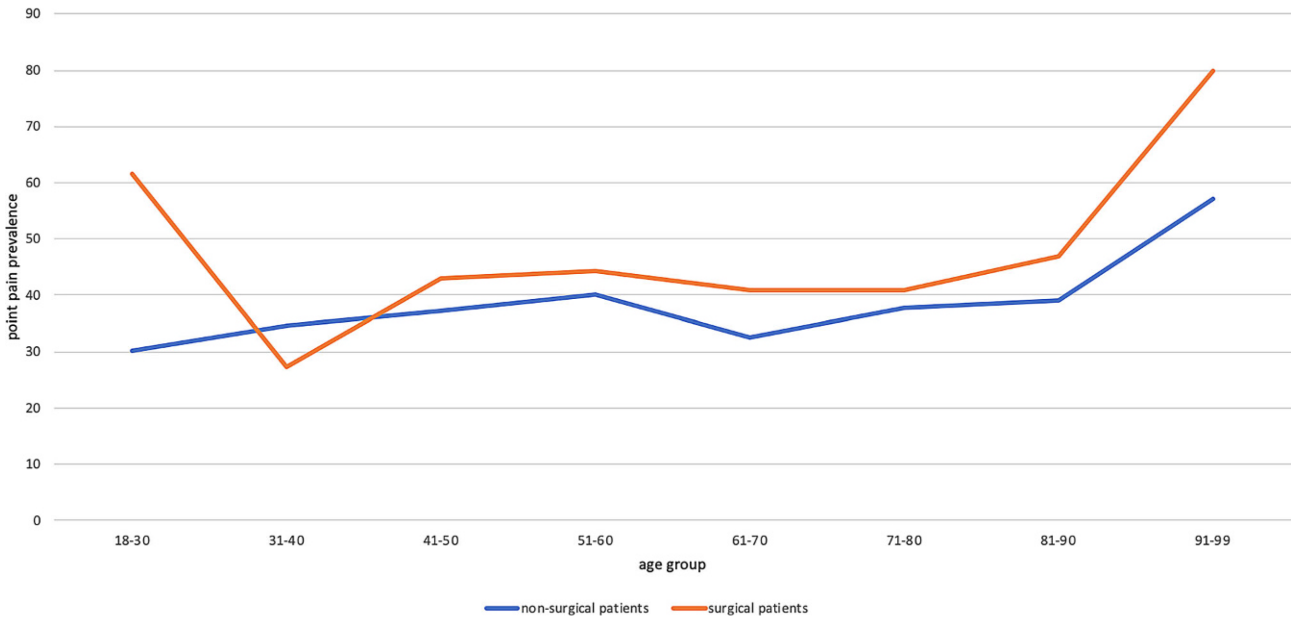
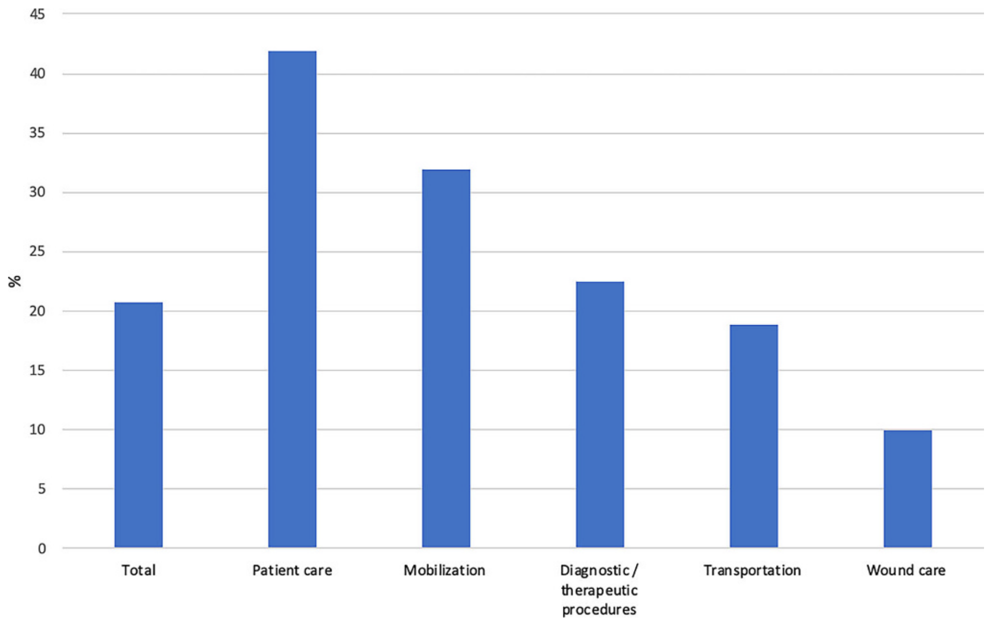


Fig. 2 Point pain prevalence and age

Fig. 3 In-hospital pain triggers



Pain-related impairment

Patients rated their pain-related impairment (personal hygiene, mobilization, deep breathing/coughing, and mood) on an 11-part numeric rating scale between 0 (no impairment at all) and 10 (full burden of pain).

Patients with NRS > 0 showed impairments in personal hygiene (2.9 ± 3), mobilization (4.5 ± 3), deep breathing/coughing (1.5 ± 2.7), and mood (2.3 ± 3). There was no statistical difference in pain-related impairment between surgical and non-surgical patients.

Sleep

Patients rated their sleep on an 11-point numeric rating scale between 0 (no sleep at all) and 10 (highest quality sleep). Sleep in both surgical and non-surgical patients with NRS > 0 was highly impaired by pain (5.1 ± 3.5), with nocturnal pain peaks. 46.8% of all patients slept for more than 6 h, whereas 41.3% slept 3–6 h. 11.9% slept less than 3 h. Results excluding pain-free patients showed that patients with NRS > 0 slept significantly shorter and had a lower sleep quality in both surgical ($p = 0.002$) and non-surgical wards ($p = 0.000$).

Appetite

Patients rated their appetite between 1 (no appetite) and 4 (normal appetite) on a 4-point numeric rating scale. Overall, 63.6% of all patients had a normal appetite, with no significant difference between surgical and non-surgical patients.

In patients with NRS > 0, appetite was significantly impaired in both surgical ($p = 0.031$) and non-surgical ($p = 0.002$) patients. 25% of patients with pain had to vomit within 1 h after food intake.

Patients' satisfaction with pain therapy

Patients rated their satisfaction with pain therapy on an 11-point numeric rating scale between 0 (dissatisfied) and 10 (perfectly satisfied). In general, both surgical (9.4 ± 1.6) and non-surgical (8.9 ± 2.3) patients were very satisfied with their pain therapy, with an overall patient satisfaction of 9.0 (±2.1). Exclusion of pain-free patients showed an overall patient satisfaction of 8.7 (±2.7). Non-surgical patients with NRS > 0 scored their satisfaction (8.2 ± 2.7) lower than surgical counterparts (9.2 ± 2.7).

Wish for more painkillers

In total, 6.8% of all patients wished to receive more painkillers.

Discussion

The present survey describes benchmark data regarding pain prevalence, pain intensity, and in-hospital pain triggers, as well as pain-related impairment, a quality of pain assessment, and patient information about pain on the multi-center basis of three general hospitals in Carinthia, Austria.

When planning studies on pain prevalence, typically described biases have to be avoided [34]: the sample should not be restricted to known painful situations or particular departments, hence missing the remaining population, and, conversely, when many different hospitals are combined in a large multi-center study, the single institution may fade in the big data. Our study involved the total in-patient population of three general hospitals in Carinthia, Austria, and thus, due to similar pain management strategies, guideline-based standard operating procedures, and comparable patient populations, leads to representative results.

Pain prevalence

Already in 1993 in the US, Gu et al. [18] showed an in-hospital pain prevalence of 70%. 9 years later, Salomon et al. [37] found a pain prevalence of 55% in France. In Italy [12] and Germany [42], similar results were shown. In 2008, a high pain prevalence of 71% was found in Canada [39]; a result which worsened 2 years later to a pain prevalence of 84% [38]. In a large cohort of 2252 surgical and 999 non-surgical patients in 25 hospitals, Maier et al. [31] found a pain prevalence of more than 80% of all in-patients, with every third patient complaining of moderate to severe pain and every second patient showing pain on movement.

Melotti et al. [34] reported that among in-patients, pain prevalence may oscillate between 45% and 94%. In a previous survey in Austria in 2014 [23], we found a pain prevalence of 40.8% in the general hospital Klagenfurt and 45.7% in the Wilhelminen hospital (Vienna).

Compared to all these surveys, our result, with a pain prevalence of 40.0% and no statistically significant difference between surgical and non-surgical patients, is very positive.

But there are some limitations of this present result that deserve mention. The dropout rate of 35% was relatively high, and 28% of these patients were excluded because of cognitive impairments. So, to avoid under- as well as overestimation of pain, it is very important to implement methods for pain assessment in patients with cognitive impairments.

Gender, pain prevalence, pain intensity

Overall, female patients showed a trend toward a higher point pain prevalence (53.1%) compared to male patients (46.9%), with a statistically significant difference between females and males when comparing pain prevalence after a surgical procedure (50% vs. 35.3%). No gender-specific difference in pain intensity was found. These results confirm the findings of several past surveys [12, 23, 34, 48]. Different arguments for understanding this phenomenon have been reported [3]: biopsychosocial mechanisms, gender-specific features like hormones, coping strategies, behavioral differences, endogenous opioids, or female-related pathologies. When excluding obstetrics and gynecology patients, Melotti et al. [34] showed that gender differences in pain prevalence disappeared. They thus concluded that women do not differ from men when specific female-related pathologies are excluded.

Our results of gender-specific pain prevalence may be questioned, because it was not possible to exclude patients from obstetrics and gynecology wards in our statistical analysis.

Knowing that statistically, female patients may show higher pain prevalence, gender-specific pain management strategies with respect to underlying female-related pathologies are desirable.

Age and pain prevalence

In our survey, we found high pain prevalence rates in surgical patients in the age group 18–30 years old and highest pain prevalence rates in the age group 91–99 years old. In contrast, we found the lowest pain prevalence rates of the survey in the age group 31–40 years old.

An association of pain with age was also shown in other surveys [12, 34]. In a review [17] of clinical and laboratory-based evidence for age-related differences in perception and report, most clinical studies suggest a relative decrease in the intensity of postoperative pain in the elderly. However, due to controversial results [15] with tentative evidence that older adults may be more sensitive to mechanically evoked pain, final interpretation is problematic. Nevertheless, our bimodal distribution of pain prevalence rates suggests that both the young and the very old are the most important pain predictors and, hence, the efficacy of pain treatment among members of these age groups has to be improved. Especially in very old adults, a structured pain assessment is crucial [4].

In-hospital pain triggers

In this study, various in-hospital pain triggers have been investigated: patient care and mobilization were shown to be the main triggers of severe pain, followed by diagnostic and therapeutic procedures, transportation, and wound care.

This result is worse compared to our previous survey [23], in which only 14% of patients reported such pain triggers. Interestingly, fewer patients showed pain during mobilization and diagnostic or therapeutic procedures, but more patients reported pain during patient care compared to 2014. In order to avoid these triggers of severe pain in the future, it is of crucial importance to adopt existing pain management strategies and to improve staff awareness to improve care quality.

Pain intensity (current pain at rest, maximum/minimum pain within the preceding 24 h)

The mean overall current pain intensity at rest during the evaluation was 1.6, but upon excluding pain-free patients, the pain intensity at rest improved to 3.8 during the interview, with significantly higher scores in non-surgical patients. Though the majority of these patients (48%) declared mild pain (NRS $\geq$ 1 and $\leq$ 3), every third patient (37%) complained about moderate pain (NRS $\geq$ 4 and $\leq$ 6).

This result supports the finding of Maier et al. [31], who also showed that the mean intensity of pain at rest was significantly higher in non-surgical patients than in surgical patients. There are various explanations as to why pain management in non-surgical wards is not optimal [31]: different patients experience pain that is not associated with the actual diagnosis, e.g., low back pain in a cardiac ward patient, but also painful symptoms of internal disorders, e.g., abdominal pain or angina pectoris are often insufficiently treated. It has been shown that except for cancer patients, patients without malignancies receive pain medication later when they are in pain and receive ineffective medication more often. It has been stated that clinicians are more familiar with pain care for cancer pain than for other painful situations like treatment of resistant angina pectoris.

Hence, in non-surgical wards, the next crucial step would be to improve the quality of pain management especially in non-cancer patients with, e.g., more prophylactic measures as well as staff reacting faster to reported pain, even when the pain is not associated with the actual disease.

Overall, the mean maximum pain levels within the preceding 24 h (independent of rest, movement, or other triggers of pain) was unacceptably high in this survey, as has been reported in previous surveys [42].

The mean score for maximum pain during the 24 h preceding the interview was 3.9, but results excluding pain-free patients showed a mean score of 6.0 with significantly higher scores in surgical patients. The mean minimum pain within the preceding 24 h was 2.1 in the evaluation of patients complaining of pain.

In view of the fact that guidelines in postoperative pain therapy and research into the subject date back several years [42], this may come as a surprise. Nowadays, in the surveyed hospitals, patients after major surgery receive highly effective procedures like peridural anesthesia. When those procedures are not indicated, e.g., in small or medium procedures, interdisciplinary algorithms exist to provide optimal pain care. However, severe pain after surgery has been shown to cause problems for recovery [30] and stands in contrast to fast-track surgery. The reasons for the highest pain scores found in the postoperative population are complex. They range from inadequate pain assessment, low staff awareness, prejudices of non-painful interventions, to inadequate pain therapy before known pain triggers, e.g., mobilization or patient care.

According to recent guidelines in acute perioperative and posttraumatic pain therapy [2], the goal of a sufficient pain therapy is not a "pain-free patient" or a "pain-free hospital," but rather a patient with minimal impairments in breathing, mobilization, and sleep due to pain and, finally, acceptable pain intensities in a subjective perception. Furthermore, according to Levy et al. [28], a numeric pain scale used alone is misleading and may lead to an oversupply of pain medication.

Unacceptably high pain intensities of NRS > 3 at rest and NRS > 4 during mobilization [2, 31] in our survey have to lead to interventions for improving pain therapy after surgery. Furthermore, re-evaluation of analgesic prescription schemes is urgent.

Different limitations of this evaluation deserve mention: we did not evaluate the duration of the maximum pain in the preceding 24 h. So, in order to show an insufficient pain therapy, not only the pain in the preceding 24 h but also the duration of this pain is relevant. Moreover, various in-hospital pain triggers (mobilization, patient care, diagnostic and therapeutic procedures, transportation, and wound care) are present. Here, NRS scores > 4 should lead to pain treatment according to recent guidelines [2]. In this present study we did not evaluate the NRS scores of these in-hospital pain triggers. Here, further evaluations are needed in order to differentiate the pain intensities of different in-hospital pain triggers.

Pain intensity among members of the age group 18–30 years was also high (4.4), with decreasing scores in the age group 51–60 years old (3.2) The age group 91–99 years old showed the highest current pain intensity at rest of the survey (5.3). No significant differences in maximum pain scores within the preceding 24 h between different age groups were found.

Nevertheless, our bimodal distribution of pain prevalence rates suggests that both the young and the very old are most important pain predictors and, hence, the efficacy of pain treatment among members of these age groups must be improved. Especially in very old adults, a structured pain assessment is crucial [4].

Pain assessment and patient information about pain

On both surgical and non-surgical wards, patients were frequently asked to rate their pain in a structured pain assessment. Interestingly, nursing staff evaluated the pain more often compared to doctors, so that physicians should be reminded to emphasize pain evaluation in order to provide optimal pain care for all patients.

In the surveyed hospitals, pain is characterized as a "vital sign." Nursing staff are trained in pain assessment and must document pain scores in the patient chart at least twice a day. Nurses must inform physicians when pain scores exceed NRS ≥ 3 or BPS ≥ 4.

In our preoperative evaluation, 3 out of 4 patients receive standardized preoperative information about pain, a result that we believe is good, but which should be improved to raise patient awareness on adequate pain therapy and to improve patient satisfaction.

Although overall patient satisfaction was good (9 on an 11-part numeric rating scale between 0 and 10), exclusion of pain-free patients showed a lower (8.2) patient satisfaction in non-surgical patients—a result that may reflect the higher current pain intensity in non-surgical patients. Postoperative patients were very satisfied with their pain therapy, which stands in contrast to the highest maximum pain within the preceding 24 h.

Impairments

An interesting finding in our study is the impact of pain on personal hygiene, mobilization, deep breathing/coughing, and mood.

It has been shown that pain has a major impact on patients' physical status and may lead to increased morbidity, decreased recovery, and longer hospital stay with increased healthcare costs [42]. It is well known that unrelieved pain may reduce physical activity [1, 42, 48] and immune function [29, 42]. The impact of pain on mobilization in our study is alarming, because inadequate pain therapy can cause pulmonary complications [29, 42] and thus increase morbidity, mortality, and hospital stay.

In our study, patients' moods were negatively affected by pain. This conformed to the results of earlier studies [42], which showed that pain is associated with anxiety [19, 35, 42], stress [1], depression [6, 19], and even suicidal thoughts [22]. In consequence in-patients should be frequently asked about these symptoms in a standardized way (e.g., using different questionnaires) and treatment should be tailored accordingly.

Katz [24] described that unrelieved pain has a profoundly negative effect on quality of life, with no age group or type of pain excepted. It has been shown that effective pain control improves quality of life and thus renders inadequate efforts at pain management unacceptable. According to these findings, in our previous survey [23], we found a decreased quality of life in non-surgical patients with pain. Although we did not measure quality of life directly in the current study, we also found a negative impact of pain on patients' ability to perform adequate personal hygiene, which, in conclusion, negatively affects quality of life. Adequate pain therapy with non-narcotic agents including non-selective NSAIDs and coxibs as well as opioids has been shown to positively affect patients' quality of life [24].

Sleep

Sleep in both surgical and non-surgical patients with NRS > 0 was highly impaired by pain with nocturnal pain peaks. Results showed that patients with NRS > 0 slept significantly shorter and had a lower sleep quality in both surgical and non-surgical wards. In an earlier study [23], we also showed sleep disturbances in more than 50% of patients with pain.

Different factors are associated with sleep disturbances: age [9, 43], preoperative comorbidities [43] such as obstructive sleep apnea [9, 10], type of anesthesia [25], severity of surgical trauma [9], environmental factors such as noise and lights [13], and, possibly the most important factor, pain [13]. In a prospective questionnaire survey of 102 surgical patients, Dolan et al. [13] showed that pain was the predominant factor responsible for sleep disturbances. It has also been shown [8, 13, 40] that pain perception can be affected by poor sleep causing a hyperalgesic state. It was demonstrated [11, 13, 27] that effective analgesia is a reliable factor for preventing sleep disturbances; however, opioid analgesia decreases postoperative sleep quality by affecting REM sleep and obstructive sleep apnea [9, 43, 45].

It is known that sleep disturbances negatively affect postoperative recovery [13] and have potentially multisystemic effects in critically ill patients [13, 26]. Sleep disturbances are associated with an increased risk of delirium [43, 44] and, in high-risk patients, with major cardiac events [16].

Hence, as a consequence, inpatients should be asked about their sleep quality and possible sleep disturbances, and pain management should be tailored accordingly.

Appetite

In patients with NRS > 0, appetite was significantly impaired in both surgical and non-surgical patients. This result confirmed the finding that acute and chronic illnesses are associated with poor appetite and decreased nutritional intake, and subsequently lead to weight loss due to caloric deprivation [41]. The association between loss of appetite and pain was shown in a study of Malick et al. [32] in headache patients: 94% of patients with poor appetite reported that they lose their appetite in unison with the onset of head pain, both without nausea or before nausea.

Appetite is a complex occurrence that is modified by environmental factors, dysphagia, depression, or altered taste. An association of decreased appetite with pain intensity has also been shown, which was maintained after controlling mood and taste- or appetite-altering medications [5]. Postoperative pain, which leads to loss of appetite and caloric deprivation, may have a great impact on postoperative recovery and morbidity. Also in non-surgical patients, loss of appetite due to pain may worsen comorbidities like depression [5] or neuropsychiatric functions [21]. Moreover, a connection between pain and decreased attention and concentration has been shown [14].

Appetite stimulation with pharmacological interventions has little efficacy but notable side effects [41]; therefore, adequate pain therapy is crucial.

Conclusion

A multi-center pain prevalence study was conducted to acquire benchmark data for evaluation of pain management in surgical and non-surgical patients. Overall, a pain prevalence of 40.0%, with no statistically significant difference between surgical and non-surgical patients, is a satisfactory result. However, higher pain prevalence in female patients, high pain prevalence in the age group 18–30 years, and highest pain prevalence in the age group over 90 years old was found. Overall pain intensity was relatively low, but unacceptable maximum pain within the preceding 24 h was shown. One must pay attention to in-hospital pain triggers like patients' care and mobilization. Our survey has shown that pain has an impact on personal hygiene, mobilization, mood, sleep, and appetite. However, patients were very satisfied with their pain therapy.

Although our survey is only representative for three general hospitals in Carinthia, Austria, we hope that medical staff and nurses can be sensitized to the urgent need to improve pain management strategies and thus improve health care quality.

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Conflict of interest S. Neuwersch-Sommeregger, M. Köstenberger, W. Pipam, S. Demschar, B. Trummer, C. Breschan, and R. Likar declare that they have no competing interests.

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