

# Pain Prevalence and Management in a General Hospital Through Repeated Cross-Sectional Surveys in 2011 and 2021

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**Background:** There is great scope for improving the quality of pain management. Although pain prevalence has been investigated in several countries, few studies have comparatively assessed changes in pain prevalence and management over a span of multiple years.

**Aim:** This work was aimed at determining the pain prevalence and evaluating the condition of pain management in a Chinese general hospital in 2021 and comparing them with corresponding data from 10 years ago.

**Methods:** Repeated single-center cross-sectional studies were initiated on June 14th, 2011, and September 2nd, 2021, in the same tertiary grade A Chinese general hospital. The same structured questionnaire was used to collect inpatient data on pain intensity and classification and pain management outcomes. We performed statistical analyses to compare categorical variables to assess changes over time.

**Results:** The sample sizes for the investigations in 2011 and 2021 were 2323 and 4454, respectively. In 2021, 24.34% of patients experienced pain; this percentage was significantly lower than that in 2011. Meanwhile, the prevalence of moderate and severe pain decreased from 14.73% in 2011 to 4.98% in 2021. The other six indicators of pain management outcomes also improved significantly. The percentages of patients using painkillers, opioid analgesics, and multiple analgesics increased from 44.61 to 51.38%, 24.01% to 44.61%, and 6.82% to 14.11%, respectively. Furthermore, the percentages of patients who received pain information and who actively reported pain increased from 27.56% to 96.5% and from 85.54% to 98.71%, respectively. The percentage of patients qualified to accurately use the Numerical Rating Scale increased from 10.5% to 79.98%.

**Conclusion:** The quality and outcomes of pain management improved greatly after the establishment and implementation of the pain management system. Nonetheless, pain of different intensities is common after major surgeries, and it is recommended that hospitals popularize and implement perioperative multimodal analgesia strategies to reduce the incidence of postoperative pain.

**Keywords:** pain, pain prevalence, pain management, pain assessment, pain treatment

## Introduction

The International Association for the Study of Pain (IASP) (2020) has put forth the following revised definition of pain: “An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage”.<sup>1</sup> Pain not only affects the quality of daily life of hospitalized patients but also leads to prolonged hospitalization and increased medical expenses.<sup>2</sup> In recent years, important progress has been made in pain research, and many investigative studies on pain prevalence have been conducted around the world. Surveys from various countries have shown the prevalence of pain to be between 23% and 84%.<sup>3–6</sup>

There is great scope for further improving pain management. However, few surveys have focused on pain prevalence in Chinese hospitals.<sup>7</sup> In addition, the systemic investigation of pain prevalence and management and comparison of changes over multiple years continue to lack. To achieve better pain treatment for hospitalized patients, it is necessary to

periodically assess pain incidence, which in turn would help determine the effectiveness of pain management. Therefore, this study was aimed at assessing the status of pain management in a Chinese general hospital in 2021 in comparison with the status 10 years ago (ie, in 2011).<sup>8</sup> We further aimed to summarize the experience of pain management and the effect of this decade, so as to provide a reference for further improving the quality of pain management.

## Methods

### Study Design

Repeated single-center cross-sectional studies were initiated on June 14th, 2011, and September 2nd, 2021, in the same tertiary grade A general hospital in the Zhejiang Province of China. The investigations were cross-sectional one-point prevalence studies based on pain surveys. The Hospital Pain Care Management Committee was responsible for the two repeated surveys.

### Participants and Settings

In the two studies, all inpatients in the same hospital were surveyed regarding their experience of pain management on June 14th, 2011, and September 2nd, 2021. Two new wings of the hospital were built during 2019–2020, which increased the number of wards from 87 to 140 and the number of beds from 3014 to 4800. The exclusion criteria were as follows: patients aged less than 6 years, patients admitted to the psychiatric ward, patients admitted to the intensive care units, and patients who were out of the ward at the time of the interview.

### Instrument

The main measurements in outcome evaluation were the prevalence of pain, which included pain intensity (presence of mild, moderate, or severe pain) and classification (pain due to surgery, acute pain caused by factors other than surgery, cancer-related pain, and chronic pain due to factors other than cancer). Prevalence was defined as the pain present at the time of the visit. Pain intensity was assessed mainly by using the Numerical Rating Scale (NRS),<sup>9</sup> whereby pain was rated on a scale of 0 to 10 or from “no pain” to “worst possible pain.” This scale is used widely, and scores are used to define severity as follows: 0 = no pain; 1–3 = mild pain; 4–6 = moderate pain; and 7–10 = severe pain.<sup>10</sup> For patients who could not understand the NRS, the Verbal Descriptor Scale (VDS) was used. The VDS uses words to describe pain, which commonly include “no pain”, “mild pain”, “moderate pain”, and “severe pain”.<sup>11</sup> The Behavioral Pain Scale (BPS) was used in patients with expression disorders.<sup>12</sup>

The secondary measure was pain management, which included painkillers used currently (analgesic drugs, opioid analgesics, and multiple analgesics), receipt of pain education (patients were asked if they had received pain education from the medical staff), reporting of pain (patients were asked if they had reported their pain to the medical staff), and expressing the NRS score correctly (investigators asked the patients and observed them for whether they reported pain intensity by using the NRS correctly).

### Data Collection

One hundred and twenty professionally trained nurses served as investigators. They used the same structured questionnaire to conduct face-to-face interviews with all inpatients on the interview day and collected electronic medical records to obtain basic patient information. Investigators were assigned in groups of 2 to ensure the authenticity and accuracy of the data. Demographic and clinical characteristics of the patients (age and sex), pain classification, and analgesic treatment were obtained from medical charts. The patients were directly questioned about the existence of pain intensity evaluations and pain management knowledge. Patients were asked whether they were experiencing pain and about the intensity of the pain experienced during the interview.

### Statistical Analysis

All statistical data were processed using SPSS 22.0 software. Descriptive statistics were used to calculate the mean, median, standard deviations, and percentage frequencies. Between-group comparisons were performed with the chi-square test and *t*-test. The level of significance was set at  $p < 0.05$ .

## Ethical Considerations

The studies were approved by the ethics committee of the hospital. Investigators assessed patients' pain for approximately 3 minutes and checked the electronic medical records. Given the low risk of the study, minor interactions with patients, and pain assessment being part of standard care, patients' verbal consent was sought and their responses were recorded by data collectors.

## Results

### Sample Characteristics and Pain Prevalence

A total of 6775 participants were included in the study (2321 patients in 2011 and 4454 in 2021). Table 1 shows the demographic characteristics and pain prevalence status of the participants. The number of surgical patients was 1026 (44.21%) in 2011 and 2293 (51.48%) in 2021, with the difference being significant. The total number of inpatients interviewed on June 14th, 2011, was 2321, of whom 733 (31.58%) complained of different grades of pain at the time of the interview. Meanwhile, 4454 inpatients were surveyed on September 2, 2021, of whom 1084 (24.34%) complained of pain during the interview. Pain prevalence among the sampled participants was significantly higher in 2011 than in 2021.

### Changes in Pain Characteristics from 2011 to 2021

As shown in Table 2, the mean age of the participants with pain was  $54.43 \pm 16.75$  years in the 2011 group and  $56.56 \pm 19.36$  years in the 2021 group. Male patients with pain accounted for 57.90% and 52.95% of the patients in 2011 and 2021, respectively. In the 2011 survey, 733 patients had pain symptoms, including 625 (85.27%) patients with mild pain, 82 (11.18%) with moderate pain, and 26 (3.55%) with severe pain. In 2022, there were 1084 participants with pain, including 1030 (95.02%) patients with mild pain, 48 (4.43%) with moderate pain, and 2 (0.55%) with severe pain. There was a significant difference in pain intensity between the two groups.

Among the patients who reported pain, the prevalence of moderate and severe pain was 14.73% in 2011 compared to 4.98% in 2021. When clinical departments were considered, those with the surgical patients had, in general, higher pain-prevalence rates than those with medical patients. The proportion of surgical patients in hospitals has increased significantly in the past 10 years, while the proportion of surgical pain increased from 51.71% in 2011 to 61.99% in 2021. The proportion of cancer pain and other chronic pain did not differ significantly between the two surveys (Table 2).

### Comparison of Pain Management Indicators Between 2011 to 2021

Analgesic treatment was prescribed for 51.38% of the patients with different degrees of pain in 2021, a significant increase over 2011. Moreover, the results in 2021 showed that 30% of the patients with pain used opioid analgesics, and 14.11% of the patients received multimodal analgesic medication, which was a significant improvement over 2011. Pain information obtained and mastered by patients in the two surveys also showed significant differences. The rate of patients receiving pain information from medical staff increased from 27.56% to 96.5%. While 98.71% of patients reported their pain to nurses or doctors in 2021, only 85.54% did so 10 years ago. Meanwhile, 79.98% of the patients used NRS pain assessment tools to describe their pain intensity correctly, compared with only 10.5% 10 years ago (Table 3).

**Table 1** Comparison of Sample Characteristics and Pain Prevalence

Characteristics	2011 (n=2321)	2021 (n=4454)	$\chi^2$	P
Department			32.33	P < 0.001
Surgical, n (%)	1026 (44.21)	2293 (51.48)		
Medical, n (%)	1295 (55.79)	2161 (48.52)		
Pain occurrence, n (%)	733 (31.58)	1084 (24.34)	40.79	P < 0.001
Mild pain, n (%)	625 (26.93)	1030 (23.13)	20.74	P < 0.001
Moderate pain, n (%)	82 (3.53)	48 (1.08)	48.88	P < 0.001
Severe pain, n (%)	26 (1.12)	6 (0.13)	31.53	P < 0.001

**Table 2** Comparison of Pain Characteristics

Characteristics	2011 (n=733)	2021 (n=1084)	$\chi^2/t$	P
Sex			4.23	0.040
Male, n (%)	424 (57.90)	574 (52.95)		
Female, n (%)	309 (42.10)	510 (47.05)		
Age, years	56.91±12.86	56.59±12.54	0.73	0.463
Pain intensity, n (%)			54.79	< 0.001
Mild pain, n (%)	625 (85.27)	1030 (95.02)	51.22	< 0.001
Moderate pain, n (%)	82 (11.18)	48 (4.43)	30.07	< 0.001
Severe pain, n (%)	26 (3.55)	6 (0.55)	22.65	< 0.001
Pain classification			19.67	< 0.001
Surgical pain, n (%)	379 (51.71)	672 (61.99)	18.98	< 0.001
Acute pain due to factors other than surgery, n (%)	257 (35.06)	299 (27.58)	11.52	< 0.001
Cancer-related pain, n (%)	51 (6.96)	53 (4.89)	3.47	0.063
Chronic pain due to factors other than cancer, n (%)	46 (6.28)	60 (5.53)	0.44	0.509

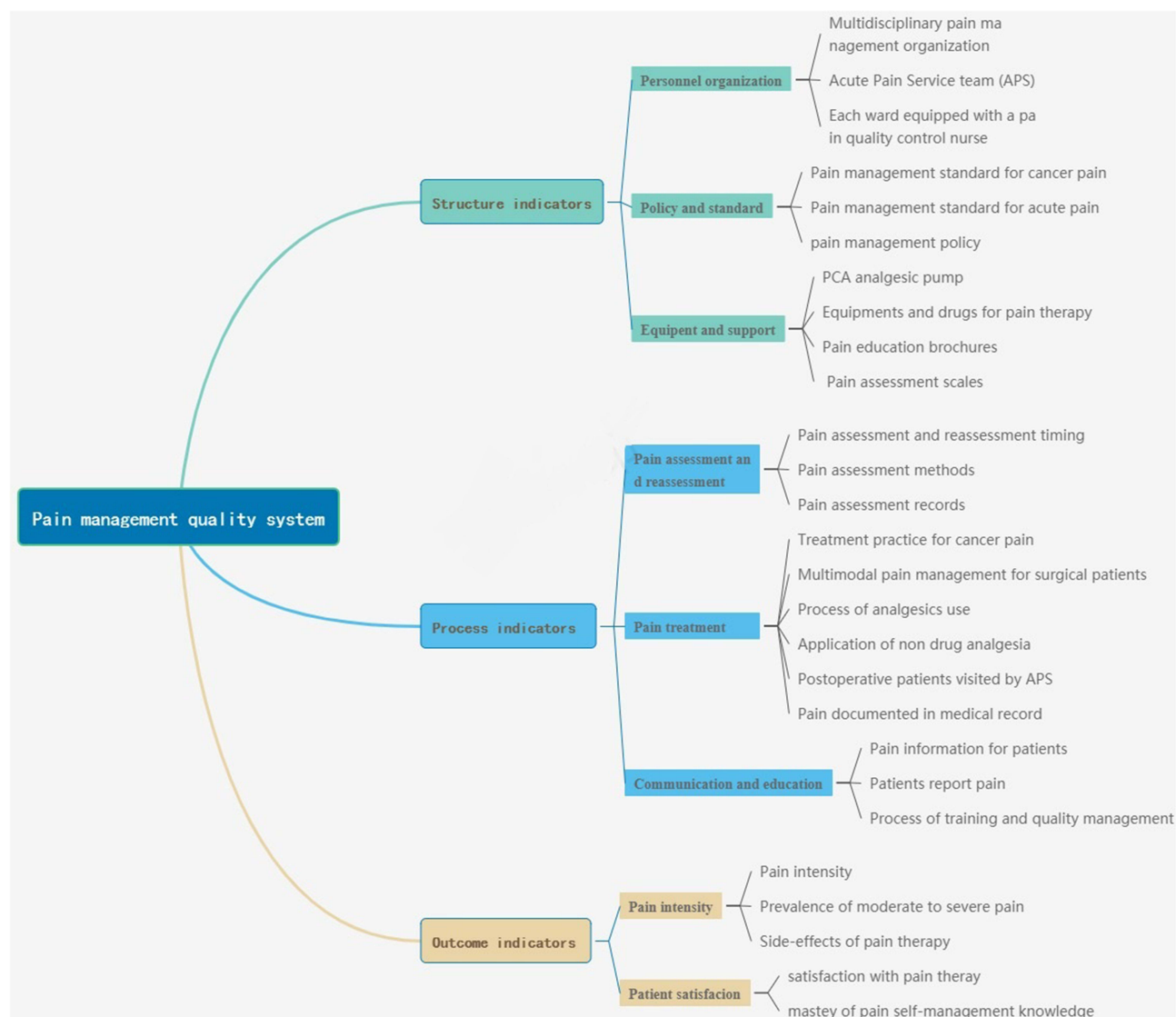
**Table 3** Comparison of Pain Management Indicators

	2011 (n=733)	2021 (n=1084)	$\chi^2$	P
Analgesics currently used, n (%)	327 (44.61)	557 (51.38)	8.03	0.005
Opioid analgesics currently used, n (%)	176 (24.01)	325 (30.00)	7.81	0.005
Multiple analgesics currently used, n (%)	50 (6.82)	153 (14.11)	23.44	< 0.001
Receipt of pain information, n (%)	202 (27.56)	1046 (96.5)	966.18	< 0.001
Reporting of pain, n (%)	627 (85.54)	1070 (98.71)	122.96	< 0.001
Expressing pain intensity (NRS) correctly, n (%)	77 (10.5)	867 (80)	845.63	< 0.001

## Discussion

This is the first report describing a 10-year follow-up investigation of pain prevalence in a general hospital in China. Few studies have reported pain prevalence in Chinese hospitals by obtaining data on pain status during hospitalization mainly by consulting electronic medical records (EMRs), and the incidence of pain has been found to be approximately 50%.<sup>7,13</sup> However, the accuracy of pain intensity recorded using EMRs may be influenced by nurses' behavior. To gain a more accurate understanding of patients' pain experience, we chose to conduct bedside interviews with patients. In general, the prevalence of pain during the hospital stay is higher than the proportion of pain occurrence at specific time points. The relatively low prevalence of pain in our two surveys (31.58%, 24.34%) may be related to the pain prevalence at the time point that we investigated.

Hospitals in China have developed rapidly in recent years. This comprehensive tertiary hospital in Zhejiang Province has developed from 3014 beds to more than 4800 beds over the past 10 years. Some studies have shown higher rates of pain in surgical patients than in medical patients.<sup>3,6</sup> Although the proportion of surgical patients has increased significantly from 44.21% to 51.48%, the incidence of pain in the hospital has indeed decreased from 31.58% to 24.34%, while the proportion of mild pain in all pain increased from 85.27% to 95.02%. This indicated a great improvement in pain control from 2011 to 2021, and the implementation of the pain management protocol contributed to this trend. In 2011, the hospital established a quality management and evaluation system for pain management based on the "structure-process-outcome" 3 D structure. The system contains 3 dimensions, 8 groups, and 27 indicators (Figure 1). Structural indicators include establishing organizations, policies, and standards for pain management as well as providing analgesic equipment and drugs. Process indicators include assessment and reassessment of pain, various types of pain treatment methods, employee pain management training, and patient education. The outcome measures were mainly patient pain intensity and satisfaction with analgesia. According to the current situation, there is a need for improving pain treatment; focusing on quality indicators is appropriate for achieving this goal.<sup>14</sup>



**Figure 1** Pain quality management system based on the “structure-process-outcome” 3D structure.

Nurses are primarily responsible for patient pain assessment and education. Since different populations need different assessment methods, several pain assessment tools, including the NRS, VRS, BPS, and CPOT, were available for the staff to choose from. The NRS is the most popular pain assessment tool in Chinese hospitals. Moreover, the scale is considered the most widely applicable and reliable tool for patient-reported pain assessment<sup>15</sup> When the patient's pain score is above 3, the nurse should report to the doctor for pain intervention. In 2011, only 10.5% of the patients were able to express pain intensity correctly by using the NRS and only 27.56% had received pain education by the medical staff, which indicated that few patients were encouraged to participate in pain management at that time. Over the year, there has been a greater emphasis on encouraging patients to focus on medical safety, and the hospital has paid more attention to patient-reported outcomes of pain management. Pain reporting and detection is a crucial element of every diagnostic and therapeutic pain guidance pathway. In recent years, the accuracy of pain assessment records and the implementation rate of pain health education have become important indicators of the quality of nursing monitoring. Nurses use pain assessment tools to assess patient pain and implement pain health education in daily clinical work so that most of the patients can self-assess pain intensity with specific tools, report pain in time, and cooperate with pain treatment. As a result, the proportion of patients receiving pain health education has increased from 27.56% to 96.50%, and the rate of

the patients who were qualified to accurately use the NRS increased from 10.5% to 80%. However, the results of the 2021 survey also found that approximately 2% of the patients still did not report pain and endured it alone, which may be related to the patients' attitude towards pain and concerns about the side effects of analgesic drugs.

Our findings show that surgical pain represents more than half of the total causes of pain in hospitalized patients. Controlling postoperative pain is an important task in hospital pain management. Pain is central to patients' surgical experience, and is routinely measured in the hospital. The pain management approach based on ERAS (enhanced recovery after surgery) has been widely used in recent years. The procedure for surgical pain management includes recognition and assessment of pain, provision of appropriate interventions, and evaluation of these interventions with the patients to ensure that they are effective and appropriate.<sup>16</sup> Surgical pain management can be improved by administration of adequate painkillers.<sup>17</sup> This is consistent with our finding that the proportion of patients using opioid analgesics and multiple analgesics increased significantly in 2021 compared with that in 2011. The use of multimodal pain management provides a reasonable basis for enhancing postoperative pain control, optimizing analgesia, reducing adverse effects, and improving patient satisfaction.<sup>18,19</sup> However, at 14.11%, the percentage of patients with pain who received multiple analgesics remained low in 2021 as well. Pain control after major surgery remained largely inadequate, and a significant proportion of patients still experienced moderate to severe pain after major surgery. Barriers to optimal pain management include difficulties in identifying and assessing pain, improper attitude toward the pain of health care staff and patients themselves, as well as communication barriers between nurses and doctors.<sup>20–22</sup> Therefore, employee pain training and effective communication are still very important and need to be further improved.

## Limitations

Despite the evaluations of pain prevalence discussed above, some limitations of our study need to be highlighted. First, we focused only on pain prevalence at a time point without investigating pain incidence over a period of time. Second, although we conducted a detailed hospital pain survey in 2021; some of the data collected in 2021 were not included in 2011. Therefore, this comparative study is lacking in some important information.

## Conclusion

Our findings indicated that the quality and outcome of pain management improved greatly after the establishment and implementation of the pain management system. In recent years, paying attention to patients' pain feeling and achieving a pain-free hospital have been widely adopted and promoted by an increasing number of Chinese health professionals. Nevertheless, pain of different intensities is also common after major surgeries, and it is recommended that hospitals popularize and implement perioperative multimodal analgesia strategies to reduce the incidence of postoperative pain.

## Ethical Approval and Consent to Participate

The studies were approved by the ethics committee of the First Affiliated Hospital, Zhejiang University School of Medicine (approval no. IIT20220154A). All investigations were conducted in accordance with the code of ethics outlined in the Declaration of Helsinki.

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## Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare no conflicts of interest.

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