A patient-based national survey on postoperative pain management in France reveals significant achievements and persistent challenges.

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Abstract

We carried out a national survey on postoperative pain (POP) management in a representative sample (public/private, teaching/non teaching, size) of 76 surgical centers in France. Based on medical records and questionnaires, we evaluated adult patients 24 hours after surgery, concerning information, pre and postoperative pain, evaluation, treatment and side effects. A local consultant provided information about POP management. Data were recorded for 1900 adult patients, 69.3% of whom remembered information on POP. Information was mainly delivered orally (90.3%) and rarely noted on the patient's chart (18.2%). Written evaluations of POP were frequent on the ward (93.7%) with appropriate intervals (4.1 (4.0) hours), but not frequently prescribed (32.7%). Pain evaluations were based on visual analog scale (21.1%), numerical scale (41.2%), verbal scale (13.8%) or non numerical tool (24%). Pain was rarely a criterion for recovery room discharge (19.8%). Reported POP was mild at rest (2.7 (1.3), moderate during movement (4.9 (1.9) and intense at its maximal level (6.4 (2.0). Incidence of side effects was similar according to patient (26.4%) or medical chart (25.1%) including mostly nausea and vomiting (83.3%). Analgesia was frequently initiated during anesthesia (63.6%). Patient-controlled analgesia (21.4%) was used less frequently than subcutaneous morphine (35.1%) whose prescription frequently did not follow guidelines. Non-opioid analgesics used included paracetamol (90.3%), ketoprofen (48.5%) and nefopam (21.4%). Epidural (1.5%) and peripheral (4.7%) nerve blocks were underused. Evaluation (63.4%) or treatment (74.1%) protocols were not available for all patients.

This national, prospective, patient-based, survey reveals both progress and persistent challenges in POP management.

MESH Keywords Adult ; Aged ; Analgesia ; methods ; standards ; statistics & numerical data ; Analgesia, Epidural ; statistics & numerical data ; Analgesics ; adverse effects ; therapeutic use ; Analgesics, Non-Narcotic ; therapeutic use ; Analgesics, Opioid ; therapeutic use ; Disability Evaluation ; Female ; France ; Health Care Surveys ; Humans ; Male ; Middle Aged ; Nerve Block ; methods ; statistics & numerical data ; Pain Measurement ; Pain, Postoperative ; diagnosis ; drug therapy ; Physician's Practice Patterns ; statistics & numerical data ; Prospective Studies ; Quality Assurance, Health Care ; Questionnaires

Author Keywords Postoperative pain ; national survey ; improvement

Introduction

Surveys evaluating pain in hospitals have been conducted since the early sixties and continue to be published regularly [41]. Postoperative pain (POP) control has frequently been shown to be inadequate in many countries including France, in general surveys [1,13, 26,28] or studies focusing on patients undergoing surgery in individual teaching hospitals [48,62] at national [6,15,36,37,44,45,53] or international level [8,54]. The most frequent detected failings concern the information of the patient, limited pain evaluation, the under use of opioid and regional anesthesia techniques and inadequate organization. However, POP is a major concern for hospitalized patients [13] and may interfere with postoperative recover and increase postoperative morbidity [14]. Ad hoc evidenced-based guidelines for improving pain management, have been issued in several countries [4,43,50,51,63]. Acute pain services have been created either based on anesthesiologist staffs [42,56] or dedicated pain nurses [55]. Interventions designed to improve quality have been described in single hospital [7,30,32] or group of hospitals [33]. Medical students are now trained in pain evaluation and management and many medical meetings provide information about postoperative pain control.

The French Ministry of Health has supported effort to improve pain management, by initiating successive plans since 1994 concerning the right to pain relief for patients [20], nurses' professional obligations to evaluate pain [19], pain control recommendations for health establishments [18] and the obligation to provide patients with information [40]. Acute pain management has also recently been identified as an important element of evaluations of the professional activity of anesthesiologists [57] and of health establishments seeking certification [52].

A survey of anesthesia practice in France in 1996 has highlighted a 120% increase in number of anesthetics procedures since 1980, with a 14 fold increase in the number of regional anesthetic procedures [17]. Between 1990 and 1996, significant advances in knowledge and attitudes regarding pain and its management in the French general population occurred, with greater awareness of the importance of acute pain treatment and acceptance of morphine use [39].

No large-scale patient-based survey has evaluated changes in POP control in France since 1996 [48]. National surveys have been performed in other countries based principally on questionnaires sent to institution or professionals [6,15,34,36,44,45]. Strategies for improving responses to postal questionnaires have been proposed [29], but the information provided by such declarative studies is not reliable because they globally overestimate the quality of care [11]. We therefore designed an observational national survey of POP control for inpatient surgery. The aim was to obtain data for adult inpatients, 24 hours after surgery, from a representative sample of surgical centers. We used three sources of information: the patient, the patients' chart and interviews with healthcare providers. The French Anesthesia and Intensive Care Society (SFAR) and the Ministry of Health supported this survey, which was designed to evaluate the impact of the previous ministerial pain plan and French Anesthesia and Intensive Care Society POP management guidelines in routine daily practice, with a view to revising these guidelines and assisting policy-makers with decisions concerning future recommendations for POP control [46].

Methods

Sample

We used French Ministry of Health statistics on surgical activity to build a representative sample of surgical centers according to teaching status, source of funding (public/private) and level of surgical activity. Based on these criteria, we defined five strata: teaching hospitals (n=49), large (> 2700 surgical cases per year) public hospitals (n=1091), small public hospitals (n=106), large (> 3200 surgical cases per year) private centers (n=269) and small private centers (n=268). Centers performing fewer than five surgical procedures per day were excluded. Sample size was calculated to detect severe pain at rest in 50% of patients, based on incidence previously reported in similar survey [48], with a 2.5% precision and a 5% α error. As a compromise between precision, number of visits and local acceptability, we decided to investigate 25 patients at each centre. As postoperative pain is managed by a single anesthesia department at each center, precision may be decreased by clustering, but increased by stratification. Taking into account a global clustering effect of $\rho = 0.15$ (i.e. a design effect of 4.6), we set the sample size at 2000 patients. The order of magnitude of this effect was confirmed after interim analysis 6 months into the survey. We performed a self-weighted two-stage sampling design: (i) the number of selected hospitals in each stratum was proportional to the number of surgical cases in the corresponding stratum, and (ii) each hospital in a particular stratum was chosen with unequal probability, proportional to the number of annual surgical cases in this hospital.

Questionnaires

Experts in postoperative pain control (DF, members of the French Anesthesia and Intensive Care Society Pain and Regional Anesthesia Committee) designed three questionnaires to collect data from the patient (21 items), the patient's chart (80 items) and an interview with the local postoperative pain specialist (50 items). These questionnaires were used to crosscheck data concerning the information of the patient, pre- and postoperative pain, pain evaluation, treatment, side effects and pain management at the center (Appendix). They were tested and modified in a pilot survey including one centre from each stratum.

Preoperative pain evaluation was introduced during the survey and data were available for 750 patients. Pain at rest and pain during movement were evaluated at the time of the auditor's visit, using a numerical scale (NS) (0: no pain; 10 unbearable pain), with severe pain described as an NS pain intensity score ≤ 7, as previously suggested [5]. The maximal pain intensity reported by the patient was defined as the most intense pain between surgery and auditor's visit. Maximal pain scores at rest and during movement in the recovery room (RR) during the first night after surgery and the day after surgery, before the auditor's visit, were collected on the patient's chart. Side effects incidence was evaluated through both patient's interview and patient's chart analysis. They were considered as present when at least one episode since surgery was either described by the patient or recorded in the patient's chart. All information concerning analgesics prescription and administration was obtained from the patient's chart. As previously described [24], we analyzed the extent to which opioid or non opioid analgesic drug prescriptions were respected, by comparing the prescriptions made by physicians with drug administrations by nurses.

According to previous recommendations on minimum requirements for pain management [2], we chose a minimum of one written evaluation of pain as the criterion to evaluate the frequency of written pain evaluation. Pain intensity was evaluated with a visual analog scale (VAS), numerical scale (NS) or verbal pain scale (VPS). All these scales were considered to be numerical evaluation tools. Other tools for pain evaluation (e.g. qualitative appreciations such as “patient comfortable”, “no pain” or symbols used for evaluation such as “pain +++”) were considered to be non numerical tool of evaluation. Pain was considered as a criterion for RR discharge if a pain score was identified on patient's chart at the time of RR discharge. Nurses were interviewed in the RR and surgical department about the frequency of pain evaluation, pain evaluation as an RR discharge criterion, the timing of pain evaluation (i.e. pain evaluation after treatment) and the evaluation of side effects of analgesics. The patient's satisfaction score concerning staff behavior and global management of pain was evaluated with a numerical scale (NS) (0: not satisfied at all, 10: totally satisfied). Treatment protocols are recommendations for the

prescription of analgesic drugs. They may be strictly prewritten orders or guidelines for both nurses and physicians available in surgical wards. Postoperative pain quality programs involve the explicit autoevaluation of postoperative pain management, organized by healthcare professionals.

Realization of the survey

After selection, a letter was sent to both the hospital direction and the head of the anesthesia department of a selected center to obtain simultaneous agreement for participation. In case of no response within 2 months, a second letter was sent to both. In case of no response or clear refusal within two months after the second letter, the center was withdrawn from the survey and another one was selected.

A single auditor (AM) was recruited and trained in postoperative pain management and the carrying out of the survey, particularly during a pilot survey. Based on the results of the pilot study, the auditor visited one center per week, and reviewed 25 cases at that center. Informed consent was not considered necessary by the local ethic committee (Comité de Protection des Personnes pour la Recherche Biomédicale, Boulogne, France). All participants had to give their verbal consent. The randomization of patients at each center was based on a random sample drawing program designed by the statistician. The auditor randomly drew 25 patients from among those whose surgery had begun before midnight on the day before the visit. For institutions with multiple operative sites, we devised a procedure to take into account the representativity of each operative site based on the number of patients undergoing surgery at each site. Patients under 18 years of age or undergoing day surgery were excluded. The patient completed the anonymous questionnaire with the help of the auditor; chart questionnaire was filled by consulting anesthesiology preoperative visit, the intraoperative monitoring, the postoperative prescription and patient's monitoring in the RR and surgical department and interviewing nurse for specific questions; the pain referent collected specific information then filled his questionnaire at the end of the survey, with help of the auditor.

Data analysis

Quantitative data (pre and postoperative pain scores, pain relief scores, satisfaction scores, intensity of side effects, dose and interval for analgesics, interval for pain evaluation) are presented as mean and standard deviation (SD). Global variances were adjusted for the sampling design using the Horvitz-Thompson estimator [35,64]. ANOVA was used for the comparison of continuous data between groups. Percentages are presented with denominator (total number minus missing data) and numerator (number of patient with the studied characteristic) and are rounded to one decimal place. Values of $p < 0.05$ were considered significant. Analyses were carried out by the clinical research unit (CF, PA) using SAS (Cary, NC).

Results

Sample of patients studied

One hundred and twenty six surgical centers were contacted. Twenty nine centers did not respond to two successive solicitations. Thirteen centers declined participation. Eight centers were not included since we already had sufficient participants.

One thousand and nine hundred patients were included from June 2004 to July 2006 in 76 centers. Patient's number was 250, 150, 275, 425 and 800 in teaching public hospital, small and large non-teaching public and small and large private institutions respectively. The characteristics of the patients and surgery are given in table 1.

Preoperative information

Data concerning the information about POP given to patients before surgery are listed in table 2. We found that 30.7% of the patients were unable to remember the information they were given. Information was most given orally (90.3% (1190/1318) and a proof that it was delivered to the patient was noted in 18.2% (346/1899) of the patients' charts. However, 95.3% (1251/1313) of patients were satisfied with this information.

Postoperative pain evaluation

Pain intensity monitoring was prescribed for only 32.7% (621/1900) of cases (table 3). However, written postoperative pain evaluation was frequent in surgical wards (93.7% (1778/1898), at intervals of 4.1 hours (4.0) and was noted more frequently on a specific document dedicated to pain monitoring (78.3% (1381/1764) than on nursing records (55.1% (974/1767). Evaluation tools were not standardized, with a numerical scale (NS) used most frequently. Written pain score was available as a criterion for recovery room discharge for only 19.8% (363/1834) of patients.

Pain intensity

Data for pain intensity before and after surgery are listed in table 4. Preoperative pain was reported at the site of surgery in 62.7% (470/750) of patients. This preoperative pain, when present, had existed for more than a year in 35.6 % (168/472) of patients. Patients reporting preoperative pain had significantly more intense postoperative pain at rest (ANOVA, p=0.0002) and when moving (ANOVA, p=

0.001) than patients without preoperative pain. Mean postoperative numerical pain score for all patients, at the time of the auditor's visit, was 2.7 (1.3) at rest and 4.9 (1.9) during movement, with a maximal level of 6.4 (2.0) during the first 24 hours after surgery. Severe pain was present in 4.2% (71/1680) of patients at rest, 26.9% (452/1680) of patients during movement and maximal pain since surgery was severe in 50.9% (855/1680) of patients.

Analgesics

The analgesics administered during surgery are listed in table 5. Analgesics were administered intraoperatively in 63.6% (1207/1898) of patients. Non opioid analgesics, including paracetamol (82.3% (983/1194)), ketoprofen (39.6% (472/1193)) and nefopam (24.2% (288/1192) (Acupan® Biocodex, Paris France)), were frequently used during surgery. Intraoperative opioids were used less frequently than non opioid analgesics. The opioid analgesics used were intravenous infusions of tramadol (11.5% (137/1193)), morphine (14.1% (168/1191)) or subarachnoid morphine (4.9% (58/1191)) at a low dose (98 micrograms (1156)). Ketamine was used as an intraoperative antihyperalgesic (9.2% (110/1198)). Regional anesthesia, in the form of an intraoperative infiltration (1.3% (16/1191)), epidural (1.4% (17/1191)) or peripheral nerve blocks (6.7 (80/1191)) was rarely used during surgery.

Information about pain treatment organization

Information about the general organization of postoperative pain treatment is provided in table 6. Analgesics were prescribed for 98.2 % (1670/1701) of patients. Most (89% (315/354)) of the patients requesting rescue analgesics (18.8% (354/1885) received such treatment within 15 minutes. However, most patients waited until they were in intense pain before requesting rescue analgesia (94.5% (335/354)). Using a numerical scale from 0 to 10, patients reported high levels of pain relief (7.9 (1.5)) and satisfaction (9.2 (0.8)) with pain management. Written evidence of analgesic prescription before painful procedures was rarely found on the patient's chart (0.1% (2/1868). No protocol for postoperative pain management was found for 25.9% (492/1900) of the patients. Pain treatment was rarely (17% (323/1900)) adapted between surgery and the auditor's visit. Acute pain teams were available at only 14.5% of centers. The presence of an acute pain team was associated with greater use of written documents for informing patients (71% versus 59%; $p = 0.002$), the recording of this information being delivered on the patient's chart (18% versus 13%, $p = 0.03$) and use of pain score as an RR discharge criterion (20% versus 14%; $p = 0.007$). A postoperative pain quality program was available at 72.4% of centers. It was not associated with increases in any other indices of postoperative pain management quality.

Opioids

The details of opioid prescriptions are given in table 7. Morphine was administered to 62.1% of patients, mostly subcutaneously (35.1 % (549/1564)), via patient-controlled analgesia (PCA; 21.4% (334/1562)) or orally (5.6% (107/1899)). Morphine PCA was most frequently used after visceral (25.8% (86/334), $p=0.005$), thoracic (55% (11/20, $p=0.0009$) and gynecologic surgery (30.7% 43/140, $p= 0.006$). Continuous intravenous morphine infusions were occasionally prescribed either alone (0.5% (9/1900) or in combination with PCA morphine (0.5% (10/1900). Subcutaneous morphine was administered regularly in 33.7% (186/549) of patients receiving this treatment. Individual doses of 10 mg were prescribed in 44.6% (240/537) of cases. Doses were separated by four hours for only 28.2% (147/523) of prescriptions. Subcutaneous morphine prescriptions were respected by the nurses in 63.7% (304/477) of cases. The criteria for subcutaneous morphine administration on demand were non specific in 53% of cases and based on a numerical pain score in the other 47% . The use of a non specific criterion was associated with a higher frequency of severe maximal pain (EN ≥ 7) described by the patient (χ^2, $p < 0.03$). Other prescribed opioids included, in descending order of frequency, tramadol (15.2%), nalbuphine (11.5%), dextropropoxyphene (6.3%), codeine (3.3%) and buprenorphine (1.2%). Tramadol was administered at doses and intervals conforming to recommendations. Tramadol prescriptions were frequently respected by nurses (83.3% (236/283)).

Non opioid analgesics

Non opioid analgesics (table 8) were frequently used (95.5% (1806/1891)): paracetamol (90.3% (1715/1900)), ketoprofen (48.5% (922/1900)) and nefopam (21.4% (407/1900)). Paracetamol was combined with PCA and subcutaneous morphine in 95.2% (317/333) and 95.8% (523/546) of cases, respectively. Ketoprofen was combined with PCA and subcutaneous morphine in 54.4% (181/333) and 52.2% (285/546) of cases, respectively. Nefopam was combined with PCA and subcutaneous morphine in 29.1% (97/333) and 20.1% (110/546) of cases, respectively. Two non opioid analgesics were combined with morphine PCA and subcutaneous morphine in 15.3% (51/333) and 22.7% of treated patients (124/546), respectively. PCA morphine was combined with paracetamol-ketoprofen (8.8%), paracetamol-nefopam (4.6%) and nefopam-ketoprofen (1.8%). Subcutaneous morphine was combined with paracetamol-ketoprofen (14.9 %), nefopam-ketoprofen (5.7%) and paracetamol-nefopam (2%). Three non-opioid analgesics were combined with PCA and subcutaneous morphine in 1.8% (7/333) and 1.8% (10/546) of treated patients, respectively. These non opioid drugs were frequently prescribed with a regular schedule and prescription was respected by nurses. Ketoprofen was the most frequent NSAID prescribed (99%), at doses and intervals in accordance with recommendations. Ketamine (0.7%) and parecoxib (1.8%) were rarely prescribed after surgery. Continuous regional anesthetic techniques were rarely used for postoperative pain control, with only 1.5% (28/1892) of patients having epidural and 4.7% (89/1889) peripheral nerve blocks. Lumbar epidural and femoral nerve blocks with continuously administered ropivacaine were the

most frequent. Epidural analgesia was mainly used in visceral (2.6%, 10/381, not significant in comparisons with other types of surgery) and thoracic surgery (17.4%, 4/23, p=0.0001 versus other type of surgery). Epidural analgesia was used in 5.4% (2/37) of patients undergoing colectomy. Continuous postoperative peripheral nerve block was used in 15.4% (88/570) of patients undergoing orthopedic surgery. Peripheral nerve block was used in 43% (n=54; 9.5% of orthopedic patients) of patients undergoing total knee arthroplasty.

Side effects

The side effects (SE) observed are listed in table 9. Written evaluations of SE were frequently found on patient's charts (80.1% (1522/1900)), and were more frequently found in a specific document (72.4% (1095/1513) than in a nursing report (55% (832/1513)). Monitoring (49% (931/1900)) and management (56.3% (1070/1900)) of SE were not frequently prescribed. Specific scores were rarely used for SE evaluation (26.8% (404/1508). Protocols for SE management were found for 53.3% of patients (408/776). The global incidence of SE was similar for information provided by the patient (26.4% (498/1888)) and written monitoring data from the patient's chart (25.1% (378/1505)). These side effects had a significant impact on the patient, as reflected by numerical scale scores for intensity (4.7 (1.2)). Postoperative nausea and vomiting were the most frequent side effects. The incidence of sedation, pruritus, urinary retention and motor block as estimated by the patient differed from that estimated from monitoring by nurses.

Discussion

This is the first national survey providing reliable information about postoperative pain (POP) management in France. It reveals significant improvements in terms of pain intensity, the reporting of pain in medical files, and the prescription of PCA morphine and combination of analgesics. However, preoperative patient information and evaluation, pain evaluation protocols, subcutaneous morphine use, the use of regional anesthesia, acute pain team development and quality improvement programs remain to be improved.

Most previous national surveys on POP control have been based on postal questionnaires sent to professionals [6,15,36,37,44,45,53]. In such studies, there is a risk of overestimation of professional practice and the patient remains an expert witness of care quality. Our patient-based results therefore provide a reliable nationwide evaluation of POP management. We also stratified all French surgical centers according to institutional and activity level criteria and then constituted a representative sample, by random sampling within each stratum. The distribution of surgical specialties in our survey was similar to that reported in 1996, with orthopedic, visceral and gynecologic/obstetric surgery most frequent [17]. Our survey was carried out by a single trained auditor, maximizing data homogeneity. However, it was subject to several limitations. Data were obtained only for the first day after inpatient surgery in adult patients. We therefore have no information for pediatric patients or patients undergoing day surgery. We also have no information for later times, when a gap has been reported to open up between initial intensive analgesia and oral analgesics [60], or for persistent pain [47]. The survey was performed over 24 months, during which time practices may have changed. We also have no information about SE management.

Between 1973 and 1999, the incidence of moderate-severe POP decreased significantly, by 1.9% per year (1.1–2.7%) [27]. Accordingly, comparison with the largest previous patient-based survey on POP control in France [48] showed that the incidence of severe pain at rest decreased from 46.3% to 4.2% between 1996 and 2007. Our results also compare favorably with recent reports, with similar results for the incidence of severe POP at rest (1–5%) reported in 1998 by Harmer et al. [33], and higher incidences reported in 2002 by Dolin et al. [27] (10.9%) and 2003 by Apfelbaum et al. (i.e. 47%) [3]. Mean maximal numerical pain score in the first 24 hours in previous studies was lower (3.7–4.8) [4] or higher (6.8–7.1) than that in our survey [42]. This may be due to differences in both the surgical population and pain management. Overall, our results for POP intensity compare favorably with recent patient- and literature-based surveys.

There are several possible reasons for these improvements in POP management in France. The cornerstone of POP management is the regular evaluation of pain score and its reporting in the patient's file, making pain visible [55]. Our survey reveals a high frequency of pain reporting (> 90%) in surgical wards, comparing favorably with previous French surveys in 1996 (0% reporting) [48] and 2000 (64–82% reporting) [30], recent surveys in Germany (53.4% reporting) [61], the United Kingdom (57% reporting) [59] and a recent European declarative survey (44% reporting) [8]. It has been suggested that educating nurses about pain and daily pain assessment with a numerical rating scale can improve the communication, assessment and documentation of patients' pain [23] and improve analgesic administration by nurses [24].

Our report also reveals an increase in morphine use, particularly via PCA, since 1996 (21.4% versus 2%) [48]. The optimal frequency of PCA use remains unclear, and the frequency of use varies considerably with type of surgery and survey but increases in PCA prescription is considered an improvement of pain management [31]. In a recent European declarative survey, PCA pumps were used by almost half the respondents after major orthopedic or abdominal surgery [8]. There is therefore probably room for improvement in France. Similarly, balanced analgesia may improve POP management [38]. We found that non opioid analgesics were more widely prescribed in France (95.5%) than in a European survey in which intravenous non opioid drugs formed part of the first-line analgesic treatment after major surgery according to 64 to 72% of respondents (depending upon surgery type), and balanced analgesia use in more than 75% of patients was declared by 71% of respondents [8]. A combination of two non opioid analgesics with morphine may be considered optimal

balanced analgesia [22]. Such a combination was observed for 15.3% of PCA and 22.7% of subcutaneous morphine prescriptions. This frequency cannot definitively be considered optimal, but suggests that physicians have understood the benefits of multimodal therapy.

This survey also reveals persistent limitations in POP management. One in three patients could not remember the information they were given concerning postoperative pain. Similar results have been published for the USA [3,42] and Spain [53]. Anesthesiologists in France must meet patients several days before surgery [21]. This facilitates the delivery of information about pain control, as shown by the higher frequency of preoperative information than in other European countries [8]. Information was mostly provided orally and was rarely reported on the patient's chart. Efforts should be made to define the optimal organization of preoperative patient information. The high incidence of chronic preoperative pain at the site of surgery is surprising. Our survey, like previous reports [47], suggests that preoperative pain leads to greater POP, but other factors may be involved. We think anesthesiologists should collect information about preoperative pain as a factor predictive of POP [47].

Pain evaluation before RR discharge remains insufficient. This factor has been identified as predictive of pain control quality [49] and is used for the professional evaluation of French anesthesiologists [57]. A more standardized tool for POP evaluation should be used in surgical wards. The NS has the advantage of clinical validity and simplicity [25]. The VAS requires equipment and the precision of the measure has no clinical significance [16]. Pain should be assessed and reported in the patient's file on movement (3.6% in our survey) and after treatment (1.4% in our survey). Similar inadequacies of pain evaluation on movement have been reported in other European countries [8].

The widespread use of subcutaneous morphine suggests that education and rationalization are required to improve the quality of prescription. Nurses only partly respected opioid prescription, and this has been shown to be predictive of poor pain control [24,49]. We also identified an association between non numerical criteria for morphine administration on demand and higher maximal pain score. This confirms the importance of a clear protocol for pain evaluation and treatment, particularly for opioid analgesia on demand.

The limited use of regional anesthetic techniques for pain control was disappointing. It first resulted from the low frequency of use of intraoperative infiltration techniques. Furthermore, 43% of patients scheduled for total knee arthroplasty received peripheral nerve block analgesia and 5.4% patients scheduled for colectomy received continuous epidural analgesia. This frequency of use is insufficient, although a clear improvement has occurred since 1996, when postoperative continuous regional anesthesia was not used at all [48]. A recent declarative European survey also reported that peripheral nerve blocks were the firstline treatment for 53% of patients undergoing major orthopedic surgery [8]. However, recent declarative [8,15,53,61] or patient-based [42] surveys have described much higher frequencies of epidural analgesia use (> 60%). This limited use of epidural analgesia may have contributed to the high maximal pain score obtained in our survey and does not facilitate the development of rehabilitation programs [9,58]. The reasons for this limited use may include higher risks [12], medical and legal concerns, insufficient reimbursement, insufficient training of anesthesiologists [10] and organizational difficulties.

The organization of the centers was assessed by direct observation and interview of the professionals. Evaluation and treatment protocols, which help to improve pain control [33], were lacking for 37% and 26% of patients, respectively. Acute pain teams and pain quality programs were not available at 85% and 28% of audited centers, respectively. Acute pain teams seem to be more frequent in declarative surveys (32–63%), particularly in large hospitals [15,36,53,54]. As previously reported [42], our analysis suggests that presence of acute pain teams is associated with other improvements in pain management organization.

The results of this survey should facilitate the development of revised POP control guidelines, 10 years after publication of the previous guidelines. They should facilitate the definition of target groups and the tailoring of the required changes to these groups.

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Footnotes:

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Table 1

Patients and surgery characteristics

Sex, percentage of men (%)	45.5 (858/1885)
Age (year)	55.9 (12.7)
Time between the start of surgery and the auditor's visit (hour)	24 (3.1)
Type of surgery (%)	
- Orthopaedic	29.9 (564/1887)
- Visceral	22 (415/1887)
- Gynaecology/obstetric	14.3 (264/1887)
- Cardiac and vascular	9.2 (174/1887)
- Urology	7.4 (140/1887)
- ENT and stomatology	4.8 (91/1887)
- Neurosurgery	3.8 (72/1887)
- Thoracic surgery	1.2 (23/1887)
- Other	7.5 (142/1887)
Duration of surgery (%)	
- < 1 hour	18.1 (340/1876)
- 1–2 hours	50.7 (951/1876)
- > 2 hours	31.2 (585/1876)
Elective surgery (%)	95.4 (1810/1897)
Type of anesthesia (%)	
- General anesthesia	79.2 (1504/1899)
- Epidural anesthesia	1.3 (25/1899)
- Spinal anesthesia	13.8 (262/1899)
- Peripheral nerve block	9.9 (188/1899)
- Sedation	2.7 (51/1899)
- Local anesthesia	2.9 (55/1899)

ENT: ear, nose and throat surgery

Table 2

Preoperative information about postoperative pain

Information remembered by the patient (%)	69.3 (1315/1897)
Patient satisfied with preoperative information (%)	95.3 (1251/1313)
For patients who remembered the information they were given	
- Oral information recalled by the patient (%)	90.3 (1190/1318)
- Written information recalled by the patient (%)	60.6 (794/1310)
- Contract on pain control recalled by the patient (%)	36.3 (689/1898)
Information noted as delivered on the patient's chart (%)	18.2 (346/1899)
Postoperative analgesic protocol noted on the patient's chart (%)	20.1 (382/1900)
Contract on pain control noted on the patient's chart (%)	4.4 (83/1896)
Patient asked to notify pain (%)	95.9 (1816/1894)

Table 3

Evaluation of postoperative pain

Postoperative pain evaluation prescribed (%)	32.7 (621/1900)
In the absence of pain evaluation prescription, protocols available for postoperative pain evaluation (%) (%)	63.4 (795/1254)
At least one written evaluation in the recovery room (%)	55.2 (1049/1900)
At least one written evaluation in the surgical ward (%)	93.7 (1778/1898)
If written evaluation carried out, frequency of multiple evaluations (%)	
- According to the patient's chart	97 (1723/1776)
- According to the nurse	100 (1776/1776)
Time between written pain evaluations (hour)	
- According to the patient's chart	4.1 (4.0)
- According to the nurse	2.1 (1.6)
Document for written pain evaluation (%)	
- Nursing report	55.1 (974/1767)
- Specific document dedicated to pain monitoring	78.3 (1381/1764)

Pain evaluation at rest (%)	100 (1828/1828)
Pain evaluation on movement (%)	3.6 (65/1810)
Pain evaluation after analgesic administration (%)	
- According to the patient's chart	1.4 (26/1829)
- According to the nurse	98.3 (1796/1827)
Pain score included in recovery room discharge criteria (%)	
- No	64.9 (1190/1834)
- Yes but not applied to the patient	15.4 (282/1834)
- Yes and applied to the patient	19.8 (363/1834)
Evaluation tool for pain at rest in the recovery room (%)	
- Visual analog scale	21.4 (222/1036)
- Numerical scale	43.3 (449/1036)
- Verbal pain scale	18.5 (192/1036)
- Non numerical tool	16.7 (173/1036)
Evaluation tool for pain at rest during the first night after surgery (%)	
- Visual analog scale	19.7 (327/1693)
- Numerical scale	41.3 (699/1693)
- Verbal pain scale	13.8 (234/1693)
- Non numerical tool	25.3 (428/1693)
Evaluation tool for pain at rest the day after surgery (%)	
- Visual analog scale	21.1 (299/1416)
- Numerical scale	41.2 (583/1416)
- Verbal pain scale	13.8 (195/1416)
- Non numerical tool	24 (340/1416)

Table 4

Preoperative and postoperative pain intensity

Frequency of preoperative pain at the surgical site (%)	62.7 (470/750)
Mean preoperative pain intensity at rest (NS)	4.3 (2.8)
Mean preoperative pain intensity on movement (NS)	6.4 (2.2)
Frequency of preoperative pain for more than one year (%)	35.6 (168/472)
Global frequency of postoperative pain since surgery (%)	88.6 (1672/1887)
For all patients with postoperative pain	
- Frequency of continuous pain (%)	64.6 (1083/1677)
- Frequency of intermittent pain (%)	35.4 (594/1677)
- Frequency of pain at rest (%)	90.6 (1519/1677)
- Frequency of pain on movement (%)	99.6 (1674/1677)
- Intensity of pain at rest at the time of auditor's visit (NS)	2.7 (1.3) (n = 1680)
- Intensity of pain on movement at the time of auditor's visit (NS)	4.9 (1.9) (n = 1680)
- Intensity of maximal pain since surgery (NS)	6.4 (2.0) (n = 1680)
- Severe pain at rest (%) (NS ≥ 7)	4.2 (71/1680)
- Severe pain on movement (%) (NS ≥ 7)	26.9 (452/1680)
- Severe pain as maximal pain since surgery (%) (NS ≥ 7)	50.9 (855/1680)
- Maximal written pain score during the first night after surgery (NS)	2.8 (2.5)
- Maximal written pain score in the recovery room (NS)	2.6 (2.8)
- Maximal written pain score the day after surgery (NS)	1.8 (2.2)
For patients with or without preoperative pain (NS)	
- Intensity of postoperative pain at rest for patient without preoperative pain	2.2 (1.9) (n = 240)
- Intensity of postoperative pain on movement for patient without preoperative pain	4.1 (2.3) (n = 240)
- Intensity of maximal pain since surgery for patient without preoperative pain	5.7 (2.5) (n = 240)
- Intensity of pain at rest after surgery for patient with preoperative pain	2.7 (2.1) (n = 427)**
- Intensity of pain on movement after surgery for patient with preoperative pain	4.7 (2.2) (n = 427)*
- Intensity of maximal pain since surgery for patient with preoperative pain	6.0 (2.3) (n = 427)

NS: numerical scale

* p = 0.001;

** p = 0.0002; ANOVA for patients with preoperative pain versus patients without preoperative pain

Table 5

Intraoperative analgesics

Intraoperative analgesics (%)	
- Global frequency of intraoperative analgesics (%)	63.6 (1207/1898)
- Paracetamol (%)	82.3 (983/1194)
- Ketoprofen (%)	39.6 (472/1193)
- Parecoxib (%)	0.9 (11/1192)
- Nefopam (%)	24.2 (288/1192)
- Tramadol (%)	11.5 (137/1193)
- Morphine (%)	14.1 (168/1191)
- Kétamine (%)	9.2 (110/1198)
- Clonidine (%)	0.3 (4/1191)
- Peripheral nerve block (%)	6.7 (80/1191)
- Intraoperative epidural block (%)	1.4 (17/1191)
- Intraoperative infiltration (%)	1.3 (16/1191)
- Subarachnoid morphine (%)	4.9 (58/1191)
- Mean dose for subarachnoid morphine (micrograms)	98 (1156)

Table 6

General organisation of postoperative analgesia

Global frequency of postoperative analgesia (%)	98.2 (1670/1701)
Frequency of rescue analgesia (%)	18.8 (354/1885)
Frequency of patients requesting rescue analgesia when pain became too intense (%)	94.5 (335/354)
Time to obtain rescue analgesia (%)	
- < 5 min	71.2 (252/354)
- < 15 min	17.8 (63/354)
- 15–30 min	2 (7/354)
- 30–60 min	1.2 (4/354)
- > 60 min	5.3 (19/354)
- not administered	2.5 (9/354)
Mean pain relief (NS)	7.9 (1.5)
Mean patient satisfaction score (NS)	
- For staff behavior concerning postoperative pain treatment	9.2 (0.8)
- For the global management of postoperative pain	9.0 (1.1)
Written information about pain treatment before painful procedure (%)	0.1 (2/1868)
Frequency of protocols for postoperative pain treatment (%)	74.1 (1408/1900)
Frequency of adaptation of postoperative analgesics over 24 hours (%)	17 (323/1900)
Frequency of postoperative pain quality program (% of centers)	72.4% (55/76)
Frequency of dedicated acute pain team (% of centers)	14.5% (11/76)

NS: numerical scale

Table 7

Postoperative prescription of opioids

Morphine treatment (%)	62.1 (1180/1900)
Mean morphine titration bolus (mg)	2.6 (1.2)
Mean morphine titration interval (min)	8.7 (4.9)
Morphine patient-controlled analgesia (PCA) prescribed (%)	21.4 (334/1562)

Analgesic for PCA	
- Morphine (%)	88.6 (296/331)
- Morphine + ketamine (%)	11.4 (46/331)
Mean morphine PCA bolus (mg)	1.2 (1)
Mean morphine PCA interval (min)	9.5 (8.0)
Continuous morphine infusion with PCA (%)	0.5 (10/1900)
Continuous morphine infusion without PCA (%)	0.5 (9/1900)
Subcutaneous morphine (%)	35.1 (549/1564)
Systematic administration of subcutaneous morphine (%)	33.7 (186/549)
Interval for subcutaneous morphine administration (%)	
- 4 hours	28.2 (147/523)
- 6 hours	59.4 (311/523)
- 8 hours	9.3 (49/523)
- 12 hours	0.2 (1/523)
- None	7.5 (39/523)
Dose of subcutaneous morphine (%)	
- 10 mg	44.6 (240/537)
- 5 mg	44.9 (241/537)
- Other	11.4 (61/537)
Respect of subcutaneous morphine prescription by nurses (%)	63.7 (304/477)
Oral morphine (%)	5.6 (107/1899)
Frequency of tramadol/IV tramadol/systematic use of tramadol (%)	15.2/82.2/75.9
Mean tramadol dose (mg) and/interval (h)	140 (133)/8.9 (8.3)
Respect of tramadol prescription by nurses (%)	83.3 (236/283)
Frequency of buprenorphine/IV buprénorphine (%) (n)	1.2/29.6

Frequency of nalbuphine (%) (n)	11.5 (218)
Frequency of dextropropoxyphene (%) (n)	6.3 (117)
Frequency of codeine (%) (n)	3.3 (21)

Qualitative data are expressed as percentage.
Quantitative data are expressed as mean (SD).
PCA: patient controlled analgesia

Table 8

Postoperative non opioid analgesics

Non opioid analgesics	
- Global frequency (%)	95.5 (1806/1891)
- Paracetamol	
Frequency of use (%)	90.3 (1715/1900)
Fixed schedule prescription (%)	98.2 (1684/1715)
Respect of prescription by nurses (%)	94.3 (1599/1696)
Mean paracetamol dosage (mg) and interval (h)	999 (46)/6.1(1.3)
- NSAID: use of ketoprofen/naproxen/ibuprofen/diclofenac (%)	99/0.2/0.2/0.6
- Ketoprofen	
Frequency of use (%)	48.5 (922/1900)
Fixed schedule prescription (%)	97.8 (902/922)
Respect of prescription by nurses (%)	91.7 (842/917)
Mean ketoprofen dose (mg) and interval (h)	90 (56)/8.6 (5.0)
- Nefopam	
Frequency of use (%)	21.4 (407/1900)
Fixed schedule prescription (%)	89.5 (364/407)
Respect of prescription by nurses (%)	89.6 (358/400)
- Frequency of parecoxib use (%) (n)	1.8 (34)
- Frequency of celecoxib use (%)	0
- Frequency of ketamine use (%) (n)	0.7 (13)
Postoperative continuous regional anesthetic techniques	
- Epidural analgesia (%)	1.5 (28/1892)
- Lumbar epidural/thoracic epidural (n)	21/7
- Epidural analgesia based on ropivacaine/bupivacaine/sufentanil/morphine (n)	22/3/6/2
- Modality of administration: continuous infusion/intermittent bolus/PCA (n)	23/3/2
- Continuous nerve blocks (%)	4.7 (89/1889)
- Femoral nerve block (%)	67.8
- Interscalene block (%)	17.1
- Sciatic block (%)	15.4
- Posterior lumbar block (%)	2
- Axillary block (%)	3.3
- Nerve block uses ropivacaine/bupivacaine/lidocaine (%)	88.4/11.5/3
- Modality of administration: continuous infusion/intermittent bolus/PCA (%)	79.1/19.9/12.3

Table 9

Side effects since surgery

Frequency of side effects evaluation (%)	
- According to the patient's chart	80.1 (1522/1900)
- According to the nurse	97.4 (1851/1900)
Document for written pain evaluation (%)	
- Nursing report	55 (832/1513)
- Specific document for evaluation of side effect	72.4 (1095/1513)
Monitoring of side effects is prescribed (%)	49 (931/1900)
Specific score to monitor side effects (SE) (%)	26.8 (404/1508)
Management of side effects is prescribed (%)	56.3 (1070/1900)
If no prescription of SE management, protocols available for SE management (%)	53.3 (408/776)
Global incidence of side effect according to	
- The patient's chart (%)	25.1 (378/1505)
- The patient (%)	26.4 (498/1888)
Mean intensity of SE according to the patient (NS; 0: no SE, 10 unbearable SE)	4.7 (1.2)
For patients with side effects	
Incidence of PONV according to	
- The patient (%)	83.3 (417/501)
- The patient's chart (%)	51.5 (178/345)
Incidence of sedation according to	
- The patient (%)	11.5 (57/492)
- The patient's chart (%)	26.3 (90/344)
Incidence of urinary retention according to	
- The patient (%)	3.0 (15/492)
- The patient's chart (%)	20.8 (71/341)
Incidence of constipation according to	
- The patient (%)	0,2 (1/492)
- The patient's chart (%)	0 (0/344)
Incidence of pruritus according to	
- The patient (%)	6.5 (32/492)
- The patient's chart (%)	2.1 (7/344)
Incidence of motor block according to	
- The patient (%)	0 (0/492)
- The patient's chart (%)	9.5 (33/344)

PONV: postoperative nausea and vomiting

All side effects incidence are cumulative over the entire period from surgery until the visit of the auditor