

Ambulatory surgery in orthopedics: experience of over 10,000 patients

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Abstract

Purpose The concept of day surgery is becoming an increasingly important part of elective surgery worldwide. Relentless pressure to cut costs may constrain clinical judgment regarding the most appropriate location for a patient's surgical care. The aim of this study was to determine clinical and quality indicators relating to our experience in orthopedic day surgery, mainly in relation to unplanned overnight admission and readmission rates. Additionally, we focused on describing the main characteristics of the patients that experienced complications, and compared the patient satisfaction rates following ambulatory and non-ambulatory procedures.

Methods We evaluated 10,032 patients who underwent surgical orthopedic procedures according to the protocols of our Ambulatory Surgery Unit. All complications that

occurred were noted. A quality-of-life assessment (SF-36 test) was carried out both pre- and postoperatively. Ambulatory substitution rates and quality indicators for orthopedic procedures were also determined.

Results The major complication rate was minimal, with no mortal cases, and there was a high rate of ambulatory substitution for the procedures studied. Outcomes of the SF-36 questionnaire showed significant improvement postoperatively. An unplanned overnight admission rate of 0.14 % was achieved.

Conclusions Our institution has shown that it is possible to provide good-quality ambulatory orthopedic surgery. There still appears to be the potential to increase the proportion of these procedures. Surgeons and anesthesiologists must strongly adhere to strict patient selection criteria for ambulatory orthopedic surgery in order to reduce complications in the immediate postoperative term.

We obtained permission from the Hospital Ethics Commission.

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Introduction

The concept of day surgery is becoming an increasingly important part of elective surgery worldwide [1]. Ambulatory procedures are now considered the norm for programmed surgical treatment, as patient and procedure-related selection criteria have widened [2]. Local structural and functional differences may explain the variation in outpatient surgery activity that is still observed among hospitals [3].

Decreased healthcare costs, efficacy of operative care, patient satisfaction, and dedicated staff are important factors that have led to an increase in its popularity. It has been estimated that the costs of day-surgery procedures are 25–68 % lower compared with those of inpatient care [4]. However, these potential advantages

disappear when patients require emergency care due to adverse events.

Unplanned admissions after ambulatory surgery are thought to occur in approximately in 0.5–1.5 % of cases [5, 6]. Direct admissions from a day surgical unit during a 5-year study [7] varied by service: 0.80 % for gynecology, 0.79 % for orthopedics, and 0.57 % for general surgery. The main risk factors reported for hospital admission are general anesthesia, duration of the procedure, uncontrolled pain, and bleeding. Some of these risk factors may be proxies for surgical and/or case complexity; however, there is currently no generally accepted measure of procedure complexity.

Assessment of quality of care is important for health control, but it is also crucial to the development and expansion of day-surgery services. Relentless pressures to cut costs and to provide services in the least costly setting may, in the absence of contrary evidence, constrain clinical judgments regarding the most appropriate location for a patient's surgical care [8].

The aim of this study was to determine the clinical and quality indicators relating to our experience in orthopedic day surgery, mainly the unplanned overnight admission and readmission rates, in a review of more than 10,000 patients who have used our service during the last 20 years. Additionally, we focused on describing the main characteristics of the patients that experienced complications, as well as comparing the patient satisfaction rates of those who underwent ambulatory and non-ambulatory procedures.

Methods

In this study, we evaluated the medical histories of 10,032 patients who underwent ambulatory orthopedic surgical procedures between June 1993 and June 2012. Our center is a teaching university hospital with a referral population of up to 300,000 people. It belongs to the National Health System, which provides free universal coverage and is financed through the resources of the Spanish Public Administration. The Orthopedic Academic Department has an Ambulatory Surgery Unit that includes three consultants with independent functionality. Four to five surgical sessions are held each week.

The patient inclusion criteria for day surgery were as follows [9]:

- a. *Social status of the patient* the patient had an adequate family environment with a telephone available, no architectural obstacles, a responsible caregiver for the 24–48 h postoperative period, easy land communication with a hospital, and was over 18 months of age.
- b. *Patient comorbidities*: the patient did not have any uncontrolled metabolic or psychiatric illness, drug addiction, coagulopathy, epilepsy, history of severe anesthetic complications, symptomatic cardiac disease 6 months previous to surgery, or a body mass index exceeding 30, and was not undergoing anticoagulant treatment. We considered patients that were I and II or had controlled III and IV status according to the preoperative risk criteria established by the American Society of Anesthesiologists (ASA). Controlled arterial hypertension, stable chronic obstructive pulmonary disease, and diabetes treated with oral agents were not considered to be exclusion criteria.
- c. *Surgical technique*: patients with no complex preoperative preparation, little bleeding, and mild physiological aggression were included. The postoperative period needed to have been managed without invasive procedures.
- d. *Anesthesia*: the use of a safe method that allowed for a fast recovery profile was permitted.

Patients were discharged according to Korttila's criteria for day surgery [10]: vital signs were stable for at least 1 h; the patient was oriented to person, place, and time; was able to tolerate orally administered fluids; was able to void, to dress, and to walk without assistance; experienced no more than minimal nausea or vomiting; showed an absence of excessive pain and bleeding; and was discharged by both anesthetist and surgeon; also, written instructions for the postoperative period at home, including a contact place and a person who may be telephoned, were reinforced, and a responsible adult was present to escort the patient. In addition, the patient had to be able to swallow and cough, and explicit consent from the patient or the adult caregiver was necessary for discharge.

In the unit where this study was carried out, on the day before surgery, all of the patients were personally given detailed oral and written instructions to follow for the ambulatory procedure. Hospital contact phone numbers were provided for any eventuality.

During the immediate postoperative period, patients were transferred to a recovery room and discharged whenever they met the criteria described above. In most cases, all drains (if any had been placed) were removed the day after the surgical procedure.

Checks were done by a home-hospital unit during the first 48 h after discharge. This unit used a public phone to ask questions about the process. All patients were reviewed in the surgeon's office within 7 days of discharge.

A clinical evaluation was performed during the preoperative period and 1 week after surgery using the SF36 questionnaire [11] adapted for use in Spain, which is widely recommended as a tool for health status

assessments in care settings [11]. This questionnaire contains 36 items in nine separate domains. Eight of these domains each comprise two or more items, whereas the final one has only one item. The scaled score (between 0 and 100) for each domain is computed. Subjective satisfaction (scored from 0 to 10) was registered, and a comparative satisfaction study was performed on a subgroup of patients who were operated on under an inpatient regime of the most frequent processes. This latter group comprised patients operated on by orthopedic surgeons from our institution who work outside our Ambulatory Surgery Unit. Patients who did not fulfill the inclusion criteria for outpatient surgery for clinical reasons were excluded.

SPSS 16.0 and Student's *t* test for paired data were used for statistical analysis. Differences were considered to be significant when the *p* value was <0.05.

We were granted approval for this study by the ethics commission of our institution, and obtained written informed consent from all of the patients included in it.

Results

The sex distribution of the 10,032 patients evaluated was 3,819 males (38.1 %) and 6213 females (61.9 %). The

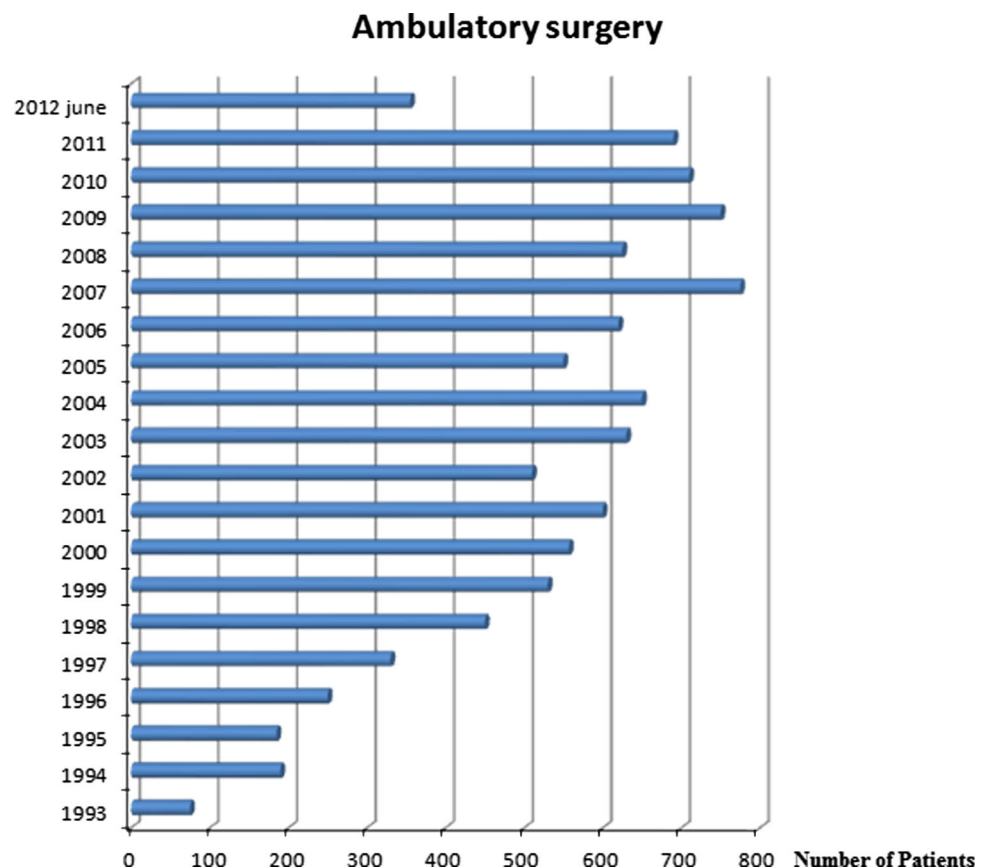
mean age was 42.1 years (range 2–80). The age distribution was as follows: 61 patients were younger than 15 years old (0.61 %), 1,184 (11.8 %) were aged between 15 and 30 years old, 1,884 (18.8 %) were between 30 and 45 years old, 3,529 (35.2 %) were between 45 and 60 years old, 2,835 (28.3 %) were between 60 and 75 years old, and 539 (5.6 %) patients were over 75 years old.

The number of patients living in rural areas was 1,506 (15.1 %), as compared to 8,526 (84.9 %) patients inhabiting urban areas.

ASA scores were distributed as follows: ASA I in 5,316 cases (53.0 %), ASA II in 4,468 cases (44.5 %), ASA III in 248 cases (2.5 %), and no patients with ASA IV.

Interventions occurred due a wide range of pathologies (Figs. 1, 2): joint mobilization, removal of osteosynthesis material, excision of synovial cysts, opening of pulleys for trigger fingers, nerve decompression (carpal tunnel syndrome, Guyon's syndrome, cubital algoparesis in the elbow), knee arthroscopy for meniscus resection, meniscus suture, and anterior cruciate ligament (ACL) reconstruction, shoulder arthroscopy for rotator cuff repair, acromioplasty and instability treatment; excision of neuromas, amputation of fingers, correction of toe deformities (hallux valgus, hammer toes) fingernail operations, tenotomies, removal of external fixators, arthrodesis and arthroplasty of

Fig. 1 Number of ambulatory interventions per year



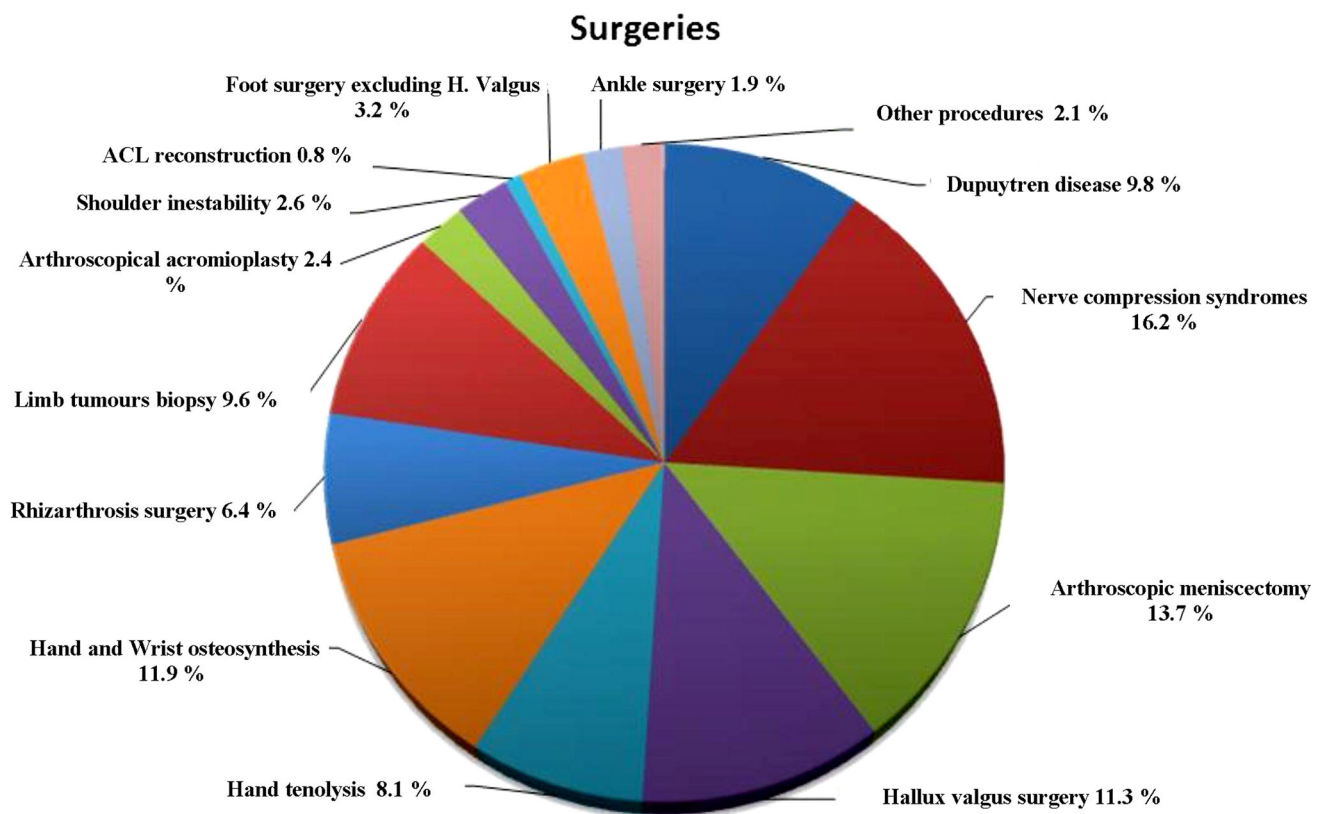


Fig. 2 Surgical distribution per procedure

the fingers, osteosynthesis of hand fractures, fasciectomy for Dupuytren's disease, removal of foreign bodies, skin grafting, neurorrhaphy, nerve grafting, palliative surgery of peripheral nerve paralysis, tenorrhaphy, and tenolysis.

Regional anesthesia was used in 7,524 cases (75 %), local anesthesia was used in 2,411 cases (24.1 %), and general anesthesia was used in 97 cases (0.9 %).

The average duration of the intraoperative period, from the patient entering the theater until their exit to the recovery postsurgical area, was 27 min (range 11–115). The average time the patient spent in the unit, from arrival to discharge, was 185 min (range 25–320).

No major complications were recorded. Only 14 patients (0.1 %) required overnight admission after surgery. The reasons for admission were suspected pneumothorax (two patients), monitoring the vascular status of the toes when slow revascularization persisted 2 hours after surgery (four patients), non-acceptance of discharge due to general discomfort (three patients), lack of a responsible adult to accompany the patient (four patients), and vomiting (three patients). The main characteristics of these 14 patients were: a mean age of 69.5 years (range 62–78); ASA grade III in 11 cases (78.6 %) and grade II in three cases (21.4 %); regional anesthesia was administered in eight cases (57.1 %) and general anesthesia in seven patients

(42.9 %). The mean surgical mean duration was 65 min (range 35–115).

Thirty-five patients (0.4 %) left the hospital by ambulance due to the postoperative indication of not being able to bear weight on a lower limb. One hundred twenty-one patients needed attention in the emergency department during the first 24 h after discharge (1.2 %) because of pain (86 patients) or bleeding (35 patients); there were five subsequent hospitalizations because of knee pain and swelling after ACL reconstruction and one (0.1 %) after arthroscopic knee arthrolysis.

During the first 48 h after surgery, a medical consultation by phone was needed by 1,785 patients (17.8 %) due to concerns regarding postoperative prescriptions (126 patients), discomfort (954 patients), or bleeding (705 patients). Of these queries, 1,779 (98 %) were resolved by phone.

Painkillers were needed for a mean postoperative period of 4.5 days (range 1–29). The following complications were recorded during the first clinical revision that took place 7 days after surgery: a Swanson metacarpophalangeal prosthesis infection in a rheumatoid patient that required surgical revision; two deep infections in diabetic patients operated on for Dupuytren's disease, with one requiring amputation of the fifth finger; suture dehiscence in four patients, one of whom was diabetic; superficial

Table 1 Clinical indicators: main characteristics of the patients who needed unplanned admission

Indicator	N	Mean age and range (years)	Sex	ASA risk (cases)	Comorbidities (patients)	Procedures (cases)	Mean surgical time and range (minutes)	Complications/reasons (cases)
Overnight admission	14 patients	69.5 (39–77)	9 females 5 males	Grade II: 4 Grade III: 11	Diabetes: 3 Hypertension: 4 Hypothyroidism: 2 Dyslipidemia: 2	Joint mobilization: 1 Hallux valgus surgery: 8 Shoulder arthroscopy: 2 Hand fracture fixation: 2 Nerve grafting: 1 ACL reconstruction: 5 Knee arthrolysis: 1	65 (35–115)	Suspected pneumothorax: 2 Monitoring vascular status: 4 General discomfort: 3 Lack of a responsible adult: 4 Vomiting: 3
Readmission rate within 24 h	6 patients	35.4 (22–45)	4 females 2 males	Grade I: 5 Grade II: 1	Diabetes: 1		72 (55–90)	Pain and swelling: 6
Readmission rate 1–28 days after discharge	5 patients	58.3 (33–72)	2 females 3 males	Grade I: 1 Grade II: 2 Grade III: 2	Rheumatoid disease: 1 Hepatitis B: 1 Diabetes: 2 Hypertension: 2	Dupuytren's disease: 2 Rhizarthrosis surgery: 2 Metacarpophalangeal prosthesis: 1	55 (35–80)	Deep infection: 4 Intra-articular hematoma: 1

infections were found in four patients, all of which resolved with outpatient care; intra-articular hematoma due to a suction drainage malfunction in six patients. The number of patients requiring admission at some point between 24 h and 28 days after surgery was five (0.05 %; Table 1).

Subjective outcomes refer to those patients capable of understanding and answering the items of the SF-36 questionnaire (9,977 patients, 99.5 %). The results of the questionnaire revealed a significant improvement in the quality-of-life index postoperatively as compared to preoperatively ($p < 0.0001$; Table 2). The mean satisfaction value for the management of all surgical procedures was 8.55/10 (range 4–10). The results for patient satisfaction with day and inpatient surgery during the last 5 years are shown in Table 3. No significant differences were recorded overall, so choosing ambulatory management of the procedure did not result in a decrease in patient satisfaction.

To sum up, our Ambulatory Orthopedic Surgery Unit achieved the following quality indicators:

- Unplanned overnight admission: 0.14 %
- Readmission rate within 24 h: 0.06 %
- Readmission rate 1–28 days after discharge: 0.05 %
- Emergency room visit rate: 1.21 %
- Cancellation of booked procedures: 1.51 %
- Ambulatory orthopedic surgery/all elective surgeries of the orthopedic department for the period studied: 38.4 %.

Reasons for cancellation of booked procedures (152) were: acute illness in 112 cases (73.7 %), decision by the patient in 16 cases (10.5 %), and lack of surgical material in 24 cases (15.8 %).

The substitution rate for different surgical interventions, defined as the number of ambulatory surgeries divided by all surgeries performed for a specific procedure [5], is shown in Table 4.

In summary, the total number of ambulatory procedures performed without unplanned admission was 10,007. The mean direct cost of day admission in our institution during the last 20 years was €375.4. The economic results derived from the data analyzed in our review indicate that the resulting savings have been at least €3,756,627.

Discussion

Public health policies and corporate incentives have encouraged ambulatory surgery. This has been one of the most rapid and fundamental changes in medical care during the past 20 years. It can be considered a way to enhance access and control costs [8]. However, this extraordinary diffusion has occurred without the outcome assessments that are usually associated with such a fundamental change in health care practices and policies [12].

Table 2 SF-36 test

SF-36 item: mean value (0 :most abnormal, 100: normality)	Preoperative period ^a	1st week postoperatively ^a	<i>p</i> value
General health I	42.5 (16.5)	85.4 (7.2)	0.000*
Limitation of activities	66.4 (14.3)	79.7 (9.8)	0.000*
Physical health problems	54.7 (18.3)	75.4 (6.4)	0.000*
Emotional health problems	49.3 (14.2)	90.5 (7.4)	0.000*
Social activities I	63.8 (16.6)	81.2 (13.2)	0.000*
Pain	44.7 (15.4)	86.1 (7.5)	0.000*
Energy and emotions	66.3 (12.5)	93.2 (7.6)	0.000*
Social activities II	55.9 (18.2)	82.3 (9.1)	0.000*
General health II	45.2 (14.3)	87.1 (10.2)	0.000*
Total	54.3 (16.2)	83.2 (11.3)	0.000*

^a Mean and standard deviation (in parentheses) are shown

* Statistically significant results

We reviewed our experience of ambulatory surgery for orthopedic interventions. We focused on the characteristics of the day-surgery facilities, patients, procedures, and on defining quality of care. After thoroughly researching the available literature, we failed to find similar papers describing ambulatory assessments of the procedures of our specialty.

Our patient selection criteria were rather uniform and in line with present-day recommendations [13]. In the future, the demand for day surgery among the increasing elderly population and patients with notable comorbidities will undoubtedly increase. Therefore, surgeons and anesthesiologists must strongly adhere to these criteria in order to reduce complications in the immediate postoperative period [14].

Table 4 Current substitution rates for different procedures performed during follow-up (from June 2011 to June 2012)

Procedure	Substitution rate during follow-up (%)
Carpal tunnel decompression	96.5
Arthroscopic meniscectomy	75.6
Hallux valgus correction	82.5
Rhizarthrosis surgery	96.4
Osteosynthesis of hand and wrist bones	88.2
Anterior cruciate ligament reconstruction	30.1
Dupuytren’s disease	86.4
Arthroscopic shoulder instability repair	35.5
Tenolysis of trigger finger	98.5

Major complications in our review were minimal, and there were no deaths. Despite the fact that a controlled IV ASA risk was not considered an exclusion criterion, there was no patient with such a risk who had a concomitant disease such as coagulopathy or cardiopathy that excluded them from our study. Quality of care was evaluated based on the rates of unplanned overnight admission, patient returns to hospital within 24 h, admission within 24 h and during the first month after surgery, and cancellation of booked procedures. Those outcomes were lower than seen in other studies of ambulatory surgery overall [14–17]. In this respect, the data provided by Matilla et al. [18], after a thorough study of day surgery of all specialties in Finland, revealed rates of admission of 5.9 % and readmission within 24 h postoperatively of 0.1 %. As such, our study may provide a benchmark to evaluate future outpatient orthopedic surgery disposition rates. In the same way, we found high replacement rates for procedures such as knee

Table 3 Comparison of patient satisfaction with procedure management between interventions performed in day surgery (DS) and the inpatient regime (IP) over the last five years (from June 2007 to June 2012)

Procedure	DS (<i>n</i>)	Mean satisfaction with DS (sd)	IP surgery (<i>n</i>)	IP Surgery satisfaction (sd)	<i>p</i> for satisfaction with DS vs satisfaction with IP
Carpal tunnel decompression	522	8.6 (1.3)	19	8.2 (1.6)	0.162
Arthroscopic meniscectomy	492	8.2 (1.8)	276	8.4 (1.5)	0.118
Hallux valgus correction	381	8.1 (1.8)	255	8.3 (1.3)	0.127
Rhizarthrosis surgery	375	9.1 (0.5)	38	8.8 (0.8)	
Osteosynthesis of hand and wrist bones	353	8.6 (1.2)	278	8.4 (1.5)	0.071
Anterior cruciate ligament reconstruction	28	7.8 (2.1)	163	8.3 (1.5)	0.130
Dupuytren’s disease	315	7.9 (1.8)	49	8.2 (1.2)	0.260
Arthroscopic shoulder instability repair	39	8.1 (1.4)	126	7.8 (1.7)	0.318

sd standard deviation

p refers to the *p* value

* Statistically significant results; *n* number of patients

arthroscopy, osteosynthesis of the hand, and carpal tunnel decompression when compared with other published studies, which have reported rates of up to 83.1, 70.7, and 64.3 %, respectively [19].

As in other articles [15–17], pain and bleeding are still the most common reasons for adverse events after ambulatory surgical procedures. In our experience, most of the patients who needed unexpected overnight admission or readmission during the first 24 h after surgery were of advanced age, had an ASA status of III, or had undergone a lengthy surgery. Efforts must be made in the management of ambulatory surgery in orthopedics to reduce unplanned admission rates. Therefore, a detailed specific preoperative clinical evaluation must be performed close to the time of intervention. This practice should lead to the detection of conditions that contraindicate an ambulatory procedure. Operations must be as minimally invasive as possible. Clear postoperative indications must be given to the patients with a strict ambulatory follow-up.

We consider it essential to promote factors that influence immediate recovery, such as the use of postoperative analgesia and anti-emetic prophylaxis [20]. In the same way, the dressing of the limbs after surgery is a critical factor. An inappropriate choice or placement could cause serious adverse events, and it is necessary to avoid bandages that could create compression and vascular problems, such as a full plaster.

Clinical indicators from the SF-36 score revealed favorable outcomes in the immediate postoperative period. The results for patient satisfaction with day and inpatient surgery did not show significant differences, so ambulatory management did not lead to a decrease in patient satisfaction.

Our institution has shown that good-quality ambulatory orthopedic surgery with high patient satisfaction is achievable. It appears that there is still the potential to increase the proportion of these procedures, and best practices should be sought. The efficacy and quality of the process itself requires further study. Figures for clinical indicators and the proportion of day surgeries among all elective surgeries at individual hospitals and nationally should be made easily accessible for benchmarking and quality control, with an automated reporting system. In the future, day surgery should be the norm for elective surgery.

Conflict of interest The authors declare that they have no conflict of interest.

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