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A belated welcome to 2021! While much of the world is still paralysed by the impact of COVID 19, ongoing vaccination programmes have now started, offering potential hope of a return to normality before too long. Given the ongoing limitations on travel, once again the IAAS is planning another virtual meeting scheduled for April of this year. As before, there will be a cocktail of lectures chaired by Arnaldo Valadon and Vicente Vieira, with the date scheduled for 10th April 2021. Like last time, there will also be a free paper session for the 17th April, for which submissions are invited by 20th March. Similar to the October meeting, all submitted abstracts will be published in this Journal.

Another welcome is due, this time, to Madhu Ahuja, who is taking on the role of Editor for this Journal. Madhu is a British Anaesthetist who was on Council of the British Association of Day Surgery, as well as contributing significantly to numerous booklets released by BADS as the Chair of Publications. My thanks go to Ian Jackson for holding the fort in the past, and wish him well in his ongoing role as Webmaster and organiser of all things digital on behalf of the IAAS.

And so to the papers. There are four in this quarter's edition, reviewing lumbar microdiscectomy as an ambulatory procedure, a comparison of ketamine versus ilioinguinal block in inguinal hernia surgery, a Guatemalan study confirming the benefits of daycase laparoscopic cholecystectomy and the influencers of patient satisfaction in ambulatory surgery.

Fabres and colleagues evaluated inpatient and daycase patients scheduled for lumbar disc surgery and microdiscectomy in their hospital. Ambulatory procedures are constrained by the availability of morning operating sessions, yet the authors were still able to compare data from the two groups. They found lower waiting times in the ambulatory group,

a non significant reduction in complications, and predictably, reduction in cost of treatment for the daycase cohort.

While I have hesitated from publishing more daycase laparoscopic cholecystectomy papers due to the uptake of the procedure in the ambulatory environment, a Guatemalan study demonstrates the ease with which less financially advantaged environments can achieve good results with standard planning. Post-operative emesis was reported by the authors to be higher than expected, but they report limitations in prescription due to the average purchasing capacity of the Guatemalan population.

Pajina and colleagues from Thailand report the results of a comparison of low dose iv ketamine (0.25mg/kg) and ilioinguinal block (IINB) for patients undergoing hernia repair under spinal anaesthesia. They found that analgesia, assessed by visual analogue scores and time to first supplementary analgesia and opioid requirement was significantly prolonged in the IINB group compared with either ketamine or placebo groups.

The final paper comes from Belgium and identifies the components that influence patient satisfaction in ambulatory surgery. They found that environment, technical and administrative influences, together with waiting times have significantly beneficial effects on satisfaction, and that maintaining these indices will ensure ongoing quality of care.

The next edition of this Journal, as previously mentioned, will host the submitted abstracts from the online meeting in April. The closing date for submission is 20th March, so time to put pen to paper...

Mark Skues
Editor-in-Chief

Outpatient Lumbar Microdiscectomy: Safe, High Patient Satisfaction and Lower Cost

A Fabres, N Escudero, R Schiappacasse, J Cerda, C Salazar, MT Silva, F Sfeir

Abstract

Since July 2007, the surgical treatment of lumbar herniated intervertebral disc's radiculopathy has been part of the Chilean system of explicit health guarantees. Thereafter this treatment became priority in every neurosurgical service of the country.

Objective: Compare retrospectively the results of two cohorts of patients with surgical indication for the treatment of lumbar disc prolapse selected by the protocol of outpatient lumbar microdiscectomy (OLM) of the Puerto Montt Hospital, performed under outpatient modality and as hospitalized patients.

Methods: Patients with indication for lumbar disc surgery and lumbar microdiscectomy (LM) performed between July 2015 and July 2017 were included. Two cohorts were analysed: outpatient and hospitalized. Pain relief, complication rates, length of stay, surgical waiting time in days, costs and patient satisfaction were compared retrospectively with the patients' records and a telephone survey.

Keywords: Outpatient, same-day, ambulatory, lumbar, discectomy, protocol.

Authors' Addresses: Puerto Montt Hospital Neurosurgery Service, Chile.

Corresponding Author: Alfonso Fabres Baez, Medical Doctor, Los Aromos 65, Puerto Montt, Chile. Neurosurgery and Neurology Service, Hospital Dr. Eduardo Schütz Schroeder. Email: alfonso.fabres@gmail.com

Results: A total of 299 LM were performed between July 2015 and July 2017; 164 were selected for OLM; 52 were outpatients and 112 were hospitalized. Of these only 138 could be contacted, 41 outpatients and 97 inpatients, so that the information of these was used. The complication rate was low in both groups, being impossible to calculate statistical difference. As for the waiting time for surgery, it tends to be lower for outpatients. A total of US\$5,980 (March 2017 value) was saved with OLM and 104 bed days were released. The patient's satisfaction experience was equally high in both groups.

Conclusions: OLM is safe and with a satisfactory experience for our patients. It decreased the bed day need, patients' waiting time for the procedure and the system's costs.

Introduction

Chronic lumbar pain is one of the most frequent causes of retirement in adults under 45 years old [1,2]. Lumbar disc herniation is the most common cause of lumbar radiculopathy in younger than 50. Its prevalence in European countries is 1-3% and in Chile it is estimated at 4-5% [1].

Disc herniation surgical treatment offers early labour reinsertion for patients with lumbar radiculopathy refractory to physical therapy and oral analgesia [4-8]. Many procedures have been described but the lumbar microdiscectomy has shown to have, over open laminectomy, less postoperative pain, intraoperative bleeding, complications and length of hospital stay [9-10]. Lumbar discectomy is traditionally performed as an inpatient procedure with an average 2.5-day stay. The global development of outpatient surgery has shown benefits for the patient, as well as for healthcare institutions. In the United States around 8% of lumbar discectomies are solved as outpatient cases, in Italy 9.5% and in Portugal 6.1%. However, in centres with outpatient protocols for lumbar discectomy, only 50% of the cases are solved as ambulatory cases. [11,12]

A protocol for the selection of candidates for outpatient lumbar microdiscectomy was implemented in July 2015 in Puerto Montt Hospital (PMH), Chile. Of the patients chosen by the protocol there was a group that was treated as outpatient and another group that, due to logistical and administrative hospital issues, was treated as inpatient.

We conducted a retrospective analysis of all lumbar discectomies that were selected for the PMH outpatient protocol. We categorized the information of the group of patients that were treated as outpatient and of those, chosen by the protocol, treated as inpatient. We compared the results in pain relief, complications, costs, surgical waiting time and patient satisfaction.

Materials and Methods

Population studied

The PMH database was searched for all patients with lumbar microdiscectomy between July 1st 2015 and July 31st 2017 that met the criteria for outpatient modality under PMH protocol. We defined outpatient as those that did not spend the night at the hospital. Not all patients chosen by the protocol could be treated as outpatients because there were not enough operating rooms available for neurosurgery outpatient cases in the morning. Patients with surgeries that were performed in the evening could not be discharged because it was not safe and had to stay overnight. Therefore, we have two study groups: patients treated as outpatient and patients that stayed at least one night.

Diagnosis, evaluation and follow-up

All members of the PMH neurosurgery team participate in the patients' evaluation. Lumbar microdiscectomy (LM) was indicated for all patients with symptomatology and physical refractory signs to physical therapy and oral analgesics with concordant lumbar spine imaging (computer tomography or magnetic resonance). The pre-surgical clinical evaluation and exams were performed according to our OLM protocol. The post-surgery evaluation was carried out by the main neurosurgeon of the case. The patients were followed up with a phone call. Lumbar back pain scale (1 to 10 points), radicular pain scale (1 to 10 points), Oswestry disability score (10 to 60 points) and the patient surgical procedure satisfaction questionnaire (1 to 7 points) of the Chilean Health Ministry (MINSAL) were applied to each patient.

Surgical technique

LM was performed by the 8 PMH neurosurgery team members. Patients were set over Wilson's frame in decubitus prone position. Surgical level was marked with fluoroscopy. A microsurgical

hemisemilaminectomy, flavotomy and a partial microdiscectomy were performed. All patients received 1 gram of Cefazolin as surgical antibiotic prophylaxis.

Costs and surgical waiting time

Cases' costs were estimated with data from the Chilean public health insurance system (Fondo Nacional de Salud or FONASA). Lumbar discectomy is part of a special program within our healthcare system, known as the explicit health guarantees (Garantias Explicitas de Salud or GES). The neurosurgeon indicating the procedure is required to notify this program as the program guarantees the patient to be treated within 45 days from the surgical indication. We use the notification date and surgery date to calculate the waiting time for surgery.

Statistical Analysis

Two retrospective cohorts were analysed: those selected by the protocol that were solved as ambulatory cases and those that were hospitalized. In order to analyse the information, descriptive statistics were used (averages, standard deviation, number of cases, percentages and standard error). Bar graphs with margins of error (standard error) were used to make comparisons between hospitalized and outpatients according to sex and type of treatment. The evaluation of the mean (or median) difference between hospitalized and outpatients with different variables was conducted by applying the nonparametric Mann Whitney test. The comparison of the proportions between the groups was carried out by applying the Z test for difference of proportions, with respect to the case of $np > 5$. The hypotheses were contrasted with one significance, $p < 0.05$.

The data was analysed with IBM® SPSS® Statistic 20.0 SPSS and Microsoft Office Professional Plus 2013 software.

Of total patients, 41 outpatients and 97 hospitalized patients replied, so that this information was used.

Results

In the period between July 2015 and July 2017, 299 HNP were performed at the PMH Neurosurgery Service. Of these patients, 164 were selected for MLA: 52 patients were effectively treated on an outpatient basis and 112 were hospitalized for at least one night in the hospital (Figure 1). Of these only 138 could be contacted, 41 outpatients and 97 inpatients, so that this information was used. The hospitalization of these patients was due to the fact that the availability of the operating rooms was during the afternoon, which meant that hospital release was possible between 9 and 10 pm. At this time the establishment does not have personnel available for evaluation prior to discharge, thus forcing hospitalization. The information collected indicated that there were no hospitalizations associated with intraoperative complications that required surveillance, nor decompensation of the underlying pathologies. The follow-up was 8-20 months, with a median of 12.7 months.

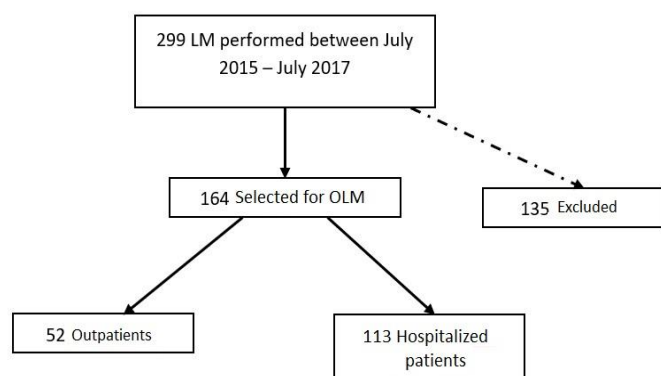


Figure 1 Patient outcomes.

When evaluating the homogeneity of both groups, no statistically significant differences were found regarding the characteristics of gender, age, time of follow-up and lumbar level operated. When evaluating the total number of patients with comorbidities, no significant differences were found, but in detail, the distribution per pathology showed a significantly higher frequency of patients with arterial hypertension in the outpatient group. The distribution was homogeneous for the rest of the comorbidities. The waiting time for the surgery from its indication on average for outpatient clinics was 24.5 days and for hospitalized patients 31.9 days, without significant difference ($p = 0.149$). (Table 1)

When evaluating the differences in the scale of radicular pain, the outpatient group presented on average a decrease of 5.88 points, while the hospitalized group 5.08 points. Regarding low back pain, the ambulatory group managed to reduce it by 5.24 points, while the hospitalized group 5.33 points. Regarding the postoperative Oswestry scale, the results for the outpatient group was 17.07 points on average and for the hospitalized group it was 16.49 points. There were no statistically significant differences between the two groups (Table 2 and Figure 2). A review of the literature was made, regarding the level of pain that allows functionality in daily life activities. The patients of both groups were divided into two categories: Mild-Moderate and High-Extreme, comparing a crossing of Odds Ratio.

According to the results, outpatients would have 1.21 and 3.57 times more risk of being in the High-Extreme category of lumbar and radicular pain, respectively, compared with hospitalized patients. However, the confidence interval reaches values lower than 1 in both cases, so the ORs are not significant. That said, outpatients do not present a higher risk of having high-extreme pain (Table 3). Due to the size of the groups and the low incidence of complications, a reliable statistical analysis could not be performed, so it was decided to only perform the description of these. The ambulatory group presented a total of 4.9% of surgical complications, consisting in persistence of radicular pain and seroma. The hospitalized group presented 16% of complications, where 7 were complications of the surgical wound and persistence of radicular pain in 7 patients; 3 of these cases were due to herniated disc recurrence (Table 4). The outpatient group did not present new hospitalizations in a period less than 30 days, unlike the hospitalized group where 3.5% readmission was evident in 30 days. None of the groups presented incidental durotomy, decompensation of the underlying pathologies or non-surgical complications.

When comparing the results of the user satisfaction survey, the ambulatory group presented an average of 6.88 points on a scale ranging from 1 to 7 points, while those who were hospitalized scored 6.86 points, without significant differences.

The estimated cost according to the FONASA values of the benefits

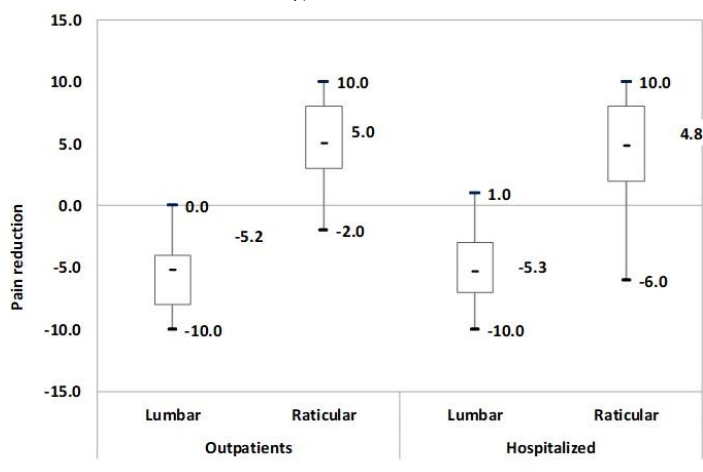


Figure 2 Pain reduction.

Table 1 Demographic characteristics. HTA: arterial hypertension; DM2: diabetes mellitus type 2; DLP: dyslipidemia; RA: Rheumatoid arthritis.

Characteristics	Outpatients (n=41)	Hospitalized (n=97)	p	
Sex (n [%])				
Women	16 [39.0]	40 [41.2]	0.412	ns
Men	25 [61.0]	57 [58.8]		
Age (mean ± SD)	45.7 ± 12.7	43.1 ± 13.6	0.125	ns
Days of stay (mean ± SD)	0	2.2 ± 0.9		
Months follow-up (mean ± SD)	12.7 ± 6.1	12.6 ± 6.0	0.174	ns
Days waiting for surgery (mean ± SD)	24.5 ± 17.5	31.9 ± 24.9	0.149	ns
Level of surgery (n [%])				
L3-L4	1 [2.4]	2 [2.1]	0.448	ns
L4-L5	22 [53.7]	45 [46.4]	0.217	ns
L5-S1	18 [43.9]	50 [51.5]	0.205	ns
Number of comorbidities (n [%])				
0	17 (41.5)	42 (43.3)	0.42	ns
1	13 (31.7)	32 (33.0)	0.25	ns
2	8 (19.5)	13 (13.4)	0.28	ns
3	-	6 (6.2)	-	-
4	1 (2.4)	2 (2.1)	-	-
5	2 (4.9)	2 (2.1)	-	-
Most frequent comorbidities (n [%])				
HTA	11 [26.8]	13 [13.4]	0.04	s
Smoking	10 [24.4]	26 [26.8]	0.38	s
Obesity	5 [12.2]	8 [8.2]	0.25	ns
Hypothyroidism	-	8 [8.2]		
DM2	4 [9.8]	5 [5.2]		
DLP	4 [9.8]	4 [4.1]		
RA	2 [4.9]	4 [4.1]		
Fibromyalgia	1 [2.4]	4 [4.1]		

Table 2 Pain characteristics.

Treatment	Outpatients	Hospitalized	p	
Pre-treatment (mean ± EE)				
Lumbar pain	8.68 ± 0.32	8.65 ± 0.20	0.913	ns
Radicular pain	8.44 ± 0.38	8.12 ± 0.26	0.712	ns
Post-treatment (mean ± EE)				
Lumbar pain	3.44 ± 0.4	3.32 ± 0.28	0.448	ns
Radicular pain	2.56 ± 0.4	3.04 ± 0.30	0.483	ns
Reduction (mean ± EE)				
Lumbar pain	-5.24 ± 0.43	-5.33 ± 0.30	0.757	ns
Radicular pain	-5.88 ± 0.48	-5.08 ± 0.34	0.232	ns

Table 3 Comparison of pain in two groups: mild-moderate and high-extreme. OR: Odds Ratio.

Characteristics	High-extreme	Mild-moderate	OR (95% I.C.)	p
Lumbar pain (n [%])				
Outpatients	36 [87.8]	5 [12.2]	1.21 (0.47 -3.63)	0.727
Hospitalized	83 [85.6]	14 [14.4]		
Radicular pain (n [%])				
Outpatients	39 [95.1]	2 [4.9]	3.57 (0.78 - 16.37)	0.084
Hospitalized	82 [84.5]	15 [15.5]		

Table 4 Complications of both groups.

Complications	Outpatients (n = 41)	Hospitalized (n = 97)
Wound dehiscence	1 (2.4)	1 (1.0)
Radicular pain	1 (2.4)	5 (5.2)
Granuloma	0	2 (2.1)
Wound Infection	0	2 (2.1)
HNP relapse		4 (4.1)
Seroma	0	2 (2.1)
Durotomy	1 (2.4)	1 (1.0)

was US\$1,126.52 (March 2017 value) for the outpatient group and US\$1,241.39 for hospitalized patients ($p < 0.01$). A saving of US\$114.87 per case was established.

Discussion

Throughout Chile many are the ambulatory procedures that are performed. Formal protocols in public hospitals started in 1998 [44,45]. Since then, the results of these groups have shown a significant benefit for patients as well as the public healthcare system.

Zahrawi et al. (1985) published the first worldwide case of lumbar disc herniation solved through ambulatory treatment [3]. The same team in 1994 published a series of 103 outpatient cases of lumbar disc discectomy with 88% patient satisfaction. After that publication many have been the centres around the world that have adopted this modality for their lumbar disc herniation cases. Asch, H. et al. (2002) described a prospective group of 212 cases of OLM with a two-year follow-up. They found 80% radicular pain improvement, 78% surgery satisfaction, 65% return to daily life activity and 70% return to work after a year [33]. These results were similar to what had been published until then for conventional inpatient lumbar discectomy. Best et al. (2006) presented a 1,377 LM retrospective series in which 98.3% were discharged from hospital as part of their protocol condition while 0.44% presented new hospital admissions [37]. The 4,310 lumbar discectomy prospective series of Pugely et al. (2013) found a 6.5% complication rate within 30 days in the inpatient group and 3.5% in outpatient cases without significant differences in the multivariate analysis [30]. They established independent risk factors such as age, surgical place previous infection, diabetes, blood transfusion, surgical time and whether the patient needed to remain admitted. In 2014, Bekelis et al. published a 27,174 retrospective series (6,954 OLM) in which 2.5% of the OLM and 6.9% of the

inpatient cases were readmitted. They discussed that this difference was due to the outpatient protocol selected patients being in better medical condition for this modality [35].

However, all OLM results have not been favourable. Lang, S-S. et al. (2014) evaluated retrospectively 1,011 patients before and after the OLM protocol. After the protocol had begun, 368 of the 1,011 were selected for OLM. In this series, 4.3% of OLM patients were readmitted in contrast with 2.3% of inpatients; 6% of the OLM and 4.3% of inpatients consulted in the emergency room within the first 30 days after surgery. The reherniation rate rose from 0.31% to 1.9% after protocol implementation [22]. The main causes of the new admissions were pain that could not be reduced with oral analgesics, base morbidities, decompensation and cerebrospinal fluid (CSF) leaks.

Hersht, M. et al. performed the only qualitative study found with 28 patients treated with OLM [32]. Most of the patients of this study had the perception that outpatient modality improved the experience for their families, healthcare providers and for them. 90% of the patients would choose the OLM modality again because they believe their family care is better, in their house, bed and privacy. Patients that established they would prefer to stay a night in hospital were those who presented pain and nausea. It was relevant for the patients to receive the help given by outpatient unit nurses clarifying doubts and worries before the procedure, to have the same surgeon check on them before performing the procedure and that it was difficult to retain much information.

The present study has the methodological advantage of using two homogenous cohorts, as all patients were selected through the OLM protocol (divided into those that were treated as outpatient and those as inpatient). Earlier publications compared patients before

the implementation of an outpatient protocol and patients after the implementation, having the limitation of comparing an entire population of lumbar discectomy patients with a selected group created by their protocols [22-48]. This singular scenario in PMH is because ambulatory operating rooms are limited and the Chilean healthcare system is pushed to solve these cases within 45 days. Patients with surgeries performed in the afternoon could not be sent home due to transportation and safety issues at the time of the night they would be released. OLM protocol waiting list patients were randomly treated either in the ambulatory operating room (OR) or during inpatient time.

Thanks to strict discharge requirements, close follow-ups and a low complication rate (4.9%) in the outpatient group, there were no new admissions within the first 30 days after surgery.

OLM is safe in our population with an outpatient complication rate that tends to be lower than the inpatient group, but with no statistical difference as the size and incidence of the groups is too low to be calculated. Lumbar and radicular pain improvement was similar in both groups as was the Oswestry disability score, without significant differences between groups. Thus OLM is an effective treatment for lumbar disc herniation cases with surgical indication in PMH.

The waiting time for surgery tends to be lower in the ambulatory group, but without significant difference. The average waiting time for OLM cases was 7 days less than for inpatients, probably increasing the number of patients studied; this difference could be verified statistically. As mentioned earlier, the Chilean healthcare system is legally obligated to solve these cases in less than 45 days so that the reduction in surgical waiting time has relevant administrative and legal implications for our system. In our study, the total ambulatory rate was 33% and we have the potential to increase it to 50-65%, so that it is possible to reduce even more our population waiting time for lumbar disc surgery.

The cost analysis observed a reduction in the OLM modality with an average saving of US\$ 115. This would mean a US\$ 5,980 saving for the 52 cases. In any case, this is just an initial approach to the economic analysis of OLM benefits. The cost values of the procedure were taken from the PMH cost centre and they obtain the values from FONASA. The public health insurance significantly underestimated the operational costs. The cost values are just an approximation of the differences; it does not give us the real economic impact. Nevertheless, there is another variable not considered in the costs that has an economic impact, which is the release of 104 bed days. Bed-days release opens up the opportunity for other patients to be treated and reduces their healthcare problem resolution time. As we already mentioned, in our healthcare system waiting time reduction is mandatory because of GES pathologies. Many times the public insurance needs to ask services from private institutions to solve healthcare problems, at a much higher cost, in order to meet the time established by law. A. Magee evaluated the cost reduction between 21 outpatient LM and 41 inpatient LM [47]. They used the PowerPerformance Manager system to calculate the cost of each case in detail as well as the related indirect costs. They found significant statistical differences between the groups, being smaller in outpatients. The main reduction in the cost was in the healthcare givers rather than in other items.

Many are the variables to be taken into account in a real economic analysis in order to achieve the number of cost savings of the implementation of this modality, but it is possible to say that OLM brings about a significant cost reduction.

Patients' experience satisfaction was high for both groups and without significant difference. This finding is supported by the patient experience of lumbar microdiscectomy in our hospital, which has a

high satisfaction perception by the patient. The cultural context of the southern part of Chile is quite particular, with a lot of countryside areas, fishing communities and some urban areas. In this population it is possible to provide healthcare services with a high user satisfaction. Even when the modality was changed to OLM the perception in the community was still high, with the same quality standard.

We have not been able to implement the OLM programme in the way that we would like to. We have faced the difficulty of not having access to morning outpatient operating rooms. As we explained above, patients with surgery performed in the afternoon need to stay overnight in the hospital for safety reasons. The pressure that our healthcare system puts on quick case resolution leads to many of the cases having to be solved during afternoon surgical time. The solution for this setback would be to allow over 50% of patients with indication for lumbar disc surgery to be solved as OLM.

Study's limitations

Our study is a retrospective cohort study and that is its main limitation. There could be some bias in the data collection. Both the pain scale information was collected and patient satisfaction questionnaire was conducted over the phone and it was not possible to contact all patients. The cost analysis of the healthcare services was carried out with the cost references given by our national health insurance office (FONASA). This value underestimated the real cost of the total healthcare.

Conclusions

It is possible to say that the OLM modality with a well-regulated protocol is safe for the patient, maintaining an excellent user satisfaction. It brings improvement in the access time to the surgery and lower operational costs. It also helps other patients of the system by releasing hospital bed days.

Disclosures

This project did not receive funding of any kind; it was driven only by the motivation to generate knowledge. None of the authors present conflicts of interest in this regard.

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Day Surgery Laparoscopic Cholecystectomy: Evaluation of the Clinical Outcomes and Patient Satisfaction in a Guatemalan Day Surgery Centre

PF Corona¹, S Garcia², R Estrada³, S Rivera⁴, A Parada⁴

Abstract

The present study aims to evaluate the feasibility of day-surgery laparoscopic cholecystectomy, in terms of patient satisfaction, pain management, nausea and vomiting in the postoperative period and after discharge. A total of 150 consecutive patients with ascertained cholelithiasis who underwent laparoscopic cholecystectomy were enrolled in the study. The results of the study suggest that laparoscopic

cholecystectomy in day-surgery can be effectively and safely performed, achieving high rates of patients' satisfaction; this might have a positive impact on reducing waiting times, patient turnover and health care costs. Further, well-designed studies on large cohorts are necessary to confirm our findings.

Keywords: Gallbladder, Cholelithiasis, cholecystectomy, day-surgery, laparoscopy.

Authors' Addresses: ¹Unit of General Surgery, Madonna del Rimedio Clinic, Oristano, Italy. ²General Surgery, CAMIP Barranquilla, Guatemala City, Guatemala.

³General Surgery Service, IGSS General Hospital, Quetzaltenango, Guatemala. ⁴Day Hospital, Roosevelt Hospital, Guatemala City, Guatemala.

Corresponding Author: Dr. Paolo Corona, MD, Unit of General Surgery, Madonna del Rimedio Clinic, Via Giotto 6, 09170, Oristano, Italy.

Email: paolofedericocorona@gmail.com

Introduction

Gallbladder lithiasis affects approximately 10–15% of the general adult population in Western countries [1–5]. Each year, 1–4% of the sufferers become symptomatic as they develop acute cholecystitis due to the obstruction of the bile ducts [2, 5]. The gold standard in the management of symptomatic cholelithiasis is the surgical removal of the gallbladder, better known as “cholecystectomy”.

The first open cholecystectomy was performed in 1882 by Langenbach and it took more than 100 years for Mühe (1985) to perform the first laparoscopic cholecystectomy (LC); Mühe had performed 94 procedures by 1987 when Mouret performed his first one in France [6, 7]. Today, this procedure is one of the most common surgical operations worldwide and its introduction represents a monumental scientific achievement, such as the discovery of anesthesia, asepsis, antibiotics and extracorporeal circulation [8]. The great diffusion of the technique and the technical improvements made over time, together with the progress in the patient's perioperative management, have meant that today it can also be performed in a day-surgery regimen.

Day surgery was born in Glasgow thanks to James Nicoll who described 9000 “day case procedures” in 1909 [9]. He was prompted by the limited availability of beds and the need to reduce the rate of in-hospital infections. Today, there is still some confusion around the term day-surgery in the scientific literature. The IAAS (International Association for Ambulatory Surgery) which includes 22 national societies, considers the term day-surgery as a synonym of ambulatory surgery and same-day surgery. These terms refer to those surgical procedures that can be performed in equipped institutions allowing patients to be discharged during the same working day.

The “Day Surgery: an overview” report, published in France in 2012, provides a valid framework on the spread of day-surgery practice at a global level [10]. According to this report, 80% of surgical procedures could be treated in day-surgery. Laparoscopic cholecystectomy is one of them, as it is now mainly performed in day-surgery in various countries all over the world, such as Norway, Denmark, the

United States and others [10–14]. Nevertheless, in other countries, LC in day-surgery is seen with mistrust, mainly because of the possibility of post-surgical complications harming the patient and, as a consequence, the doctor. For this reason, scientific research is warranted to validate this treatment method.

The present prospective study performed in 150 patients aims to evaluate the feasibility of day-surgery LC, in terms of patient satisfaction, pain management, nausea and vomiting in the postoperative period and after discharge.

Methods

From March to June 2017, a total of 167 consecutive patients with ascertained cholelithiasis and candidates for LC were enrolled in the study, at the Roosevelt Hospital in Guatemala City. The exclusion criteria were: prolonged hospital stay due to additional intraoperative complications (bile duct choledocholithiasis or conversion to open cholecystectomy) and errors of data recollecting in the questionnaire.

All patients were hospitalized at 7 am on the day of the planned surgery. As a prerequisite, all patients were asked to fast from midnight and be accompanied by someone who could assist them the first hours after surgery. Preoperative anesthesia evaluation was performed the day before surgery; only ASA 1, 2 and 3 patients (if physiologically compensated) were admitted for LC. No preoperative anti-thrombotic neither antibiotic prophylaxis were prescribed. All interventions were performed under general anesthesia, with intubation and controlled ventilation. Propofol was used for induction, Atracurium besylate for muscle relaxation, Fentanyl as analgesic and Desflurane or Isoflurane for the maintenance of anesthesia during surgery. Infiltrations with 0.5% Levobupivacaine were performed in the trocar positioning sites before incisions. Dexketoprofen 50 mg (or Metamizole 1g), and Dimenhydrinate 50mg intravenously were administered before the end of the procedure to prevent postoperative morbidity (pain, nausea, and vomiting).

Surgeries started generally at 7.30-11.30 in the morning. All the LCs were performed with the “American” technique, consisting in umbilical trocar positioning with the Hasson technique, induction of the pneumoperitoneum with carbon dioxide up to 12–15 mmHg, and the positioning of other three trocars in the subxiphoid and right subcostal region (middle clavicular line and anterior axillary line respectively) with laparoscopic vision. The patients were placed in anti-Trendelenburg position and on their left side. Surgeons performed the procedure according to the Strasberg technique (Figure 1) (near here) [15]. The gallbladder was removed via the subxiphoid incision (a bag was used only in case of perforation or fragility of the specimen).

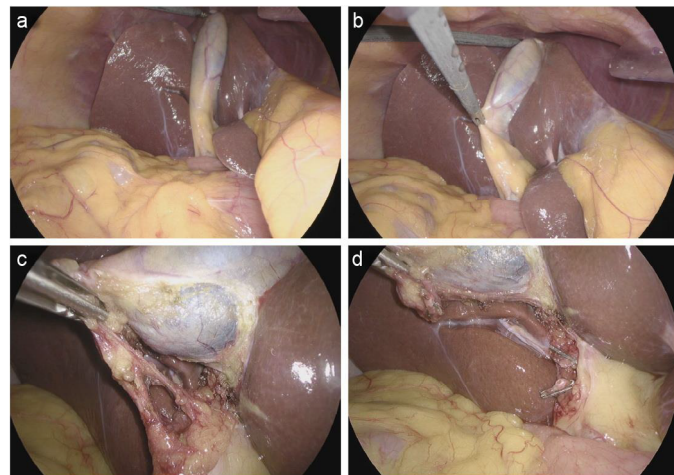


Figure 1 Laparoscopic cholecystectomy according to the Strasberg technique.

- a) Cephalad traction of the fundus and exposure of the gallbladder fossa;
 b) Lateral traction of the infundibulum and exposure of the gallbladder hilum;
 c) Complete incision of the serosa in the medial aspect of the infundibulum;
 d) Section of the cystic duct and cystic artery between metal clips.

After the postoperative recovery, the patients were transferred to a short hospitalization area and early mobilized with the assistance of a family member before discharge. All patients were prescribed oral home therapy with Dexametoprolol 25 mg every 8 hours for 3–5 days, and Dimenhydrinate 50 mg only in case of nausea and vomiting. In some cases, oral antibiotic therapy was also prescribed.

One week after surgery, during the outpatient check-up visit, the patients were invited to answer a questionnaire concerning: a) intensity of pain. The test was performed showing the patient a numerical/visual scale (NRS/Wong-Baker FACES® Pain Rating Scale), going from 0 to 10 (0 corresponds to the absence of pain and 10 to maximum pain); b) nausea and vomiting; c) degree of patient satisfaction. They were asked to express an overall judgment of the medical assistance received (using a scale from 1 to 10) and an evaluation (excellent/good/sufficient/poor) about clarity of information received respect the home's conduct instructions.

All patients signed informed consent for surgery and for the use of their clinical data for scientific research purposes. The study was carried out in accordance with the Helsinki declaration.

Results

Among the 167 patients enrolled had been selected 150 patients respecting the exclusion criteria: there were 16 males and 134 females (11% and 89%, respectively). The mean age was 41 (18–80) years old on average). The mean duration of general anesthesia was 1 hour and 21 minutes while the average observation time before discharge was 2 hours and 43 minutes. In 67 cases (44%) oral antibiotic therapy was prescribed at the discretion of the surgeon. In 10 patients (7%) drainage tubes were placed; the tubes were removed in all cases on the second postoperative day. In 4 cases (2.7%) surgical site infection eradicated with oral antibiotics was reported (Supplementary Table 1).

The average pain at the time of discharge was 2.6 against 3.5 reported in the evening after the operation (Table 1). Ninety-two patients (61.3%) reported good management of their symptoms with Dexametoprolol; 31 (21%) reported pain greater than 6 just the evening after surgery, and 9 (6%) failed to adequately manage it with the prescribed analgesics. Among the surgical incisions discomfort or pain was caused mainly by the subxiphoid access (42%) followed by the umbilical and the subcostal ones (34% and 19%, respectively). In 12% of cases the pain was reported as widespread in the abdomen area and not localized in one of the specific trocar sites.

Globally 54% of the patients had neither nausea nor vomiting, 23% only nausea and the remaining 23% nausea and vomiting combined (Table 2). Among the symptomatic patients 54% did not consider it necessary to take dimenhydrinate given the mildness and short duration of symptoms, a further 30% of them controlled the symptoms with the drug while the remaining 16% (11 patients) failed to control nausea or/and vomiting. The evening after the intervention 64% of the patients reported being able to eat light food, 33% having only liquids and the remaining 3% having ingested neither liquids nor solids till the day after.

The mean evaluation score of the medical assistance received was 9.7 out of 10 (Table 3). The medical information received was evaluated as excellent by 68% of the patients, good, sufficient and poor by 27%, 3% and 2% of them, respectively. The observation time before discharge was judged as satisfactory by 66% of the patients, 34% of them would have preferred to stay a few hours longer and 14% (21 cases) would have remained hospitalized for one more day.

Discussion

Although laparoscopy allows a faster postoperative recovery, pain management after cholecystectomy is still a major problem in the scientific literature [16]. The patients included in our study achieved overall a good pain control at home. However, in 9 cases (6%), the

Table 1 Evaluation of postoperative pain in our cohort.

VAS scale	0	1	2	3	4	5	6	7	8	9	10
Pain intensity at discharge	72 48.0%	4 2.7%	8 5.3%	12 8.0%	11 7.3%	12 8.0%	7 4.7%	12 8.0%	6 4.0%	2 1.3%	4 2.7%
Pain the evening after discharge	40 26.7%	20 13.3%	9 6.0%	8 5.3%	18 12.0%	8 5.3%	16 10.7%	12 8.0%	7 4.7%	6 4.0%	6 4.0%
Pain control with dexametoprolol at home	Yes 138 92%	No 12 8%	Pain site	<i>Umbilical</i> 44 29%	<i>Subxiphoid</i> 55 37%	<i>Subcostal</i> 25 17%	<i>Diffused</i> 16 11%				

Table 2 Evaluation of nausea and vomiting in our cohort.

Symptoms	Anything	Nausea	Nausea and vomiting
	54%	23%	23%
Dimenidrinat controlling efficacy	Unnecessary 25%	Controlled 14%	Not controlled 7%
Diet	Neither liquids nor solids 3%	Only liquids 33%	Light food diet 64%

Table 3 Evaluation of patient expectations in our cohort.

Patients who would preferred to stay hospitalized:	Yes				No	
More time		34%				66%
One more day		14%				86%
Global evaluation	1-6	7	8	9	10	
	0	3	6	27	114	
	0%	2%	4%	18%	76%	
Information evaluation	Poor		Sufficient	Good	Excellent	
		2%		3%	27%	68%

pain was not adequately controlled with the prescribed medication. The reason might be a decrease in Desketoprofen effectiveness in these patients. This suggests that the prescription of an alternative drug or an association of drugs may be necessary in some cases. Interestingly the overall satisfaction of these 9 patients was 10/10 and only one of them would have preferred to be discharged the day after the operation. This may be due to the fact that visual pain scales are somehow subjective and influenced by the patient's personal sensitivity threshold.

The subxiphoid incision was found to be one of the most frequent sites of discomfort and pain; this can be caused by surgical manipulation and dilation of the access during gallbladder extraction. A randomized study conducted in Pakistan in 2012 compared 60 patients in whom the gallbladder was extracted through the umbilical access and 60 patients in whom the epigastric access was used. The pain was significantly milder in the case of umbilical extraction ($p < 0.001$) and this site was recommended by the authors for specimen extraction [17].

With regard to postoperative nausea and vomiting 46% of the patients were found to be symptomatic after getting home: half of them had only nausea, while the other half had both nausea and vomiting. However, 54% of the symptomatic patients did not consider necessary any drug, 30% managed the symptoms with Dimenhydrinate and only in the remaining 16% (11 cases) the drug didn't controlled the symptoms.

Nausea and vomiting after general anesthesia and, specifically, after laparoscopic cholecystectomy, is a hot topic in the surgical literature. Recent studies have shown encouraging results with preoperative prophylactic administration of Ondansetron or Metoclopramide and intraoperative administration of Cyclizine and Dexamethasone [18]. In our practice, Dimenhydrinate is indicated as an antiemetic to be taken when necessary because it is cheap and it fits better the average purchasing capacity of the Guatemalan population.

The economic aspects regarding the prevention and treatment of postoperative pain, nausea and vomiting have been evaluated in a recent Dutch study [19]. Questionnaires were administered in the pre- and post-operative phase to 808 patients who underwent operations under general anesthesia. These questionnaires assessed the money they would have been willing to spend to completely avoid pain, nausea and postoperative vomiting. After surgery, the patients assessed they would have spent more money to avoid the pain, while there was no difference in what they said about nausea and vomiting [19].

In our study the overall satisfaction of the 11 patients who suffered nausea and vomiting despite Dimenhydrinate, was similar to that of the remaining cohort (9.6 and 9.7 respectively). This finding, together with the results of the Dutch study, suggests that nausea and vomiting are symptoms that do not generate excessive postoperative concern in patients.

Adequate pre and postoperative information are essential to ensure that the patient conscientiously and safely accepts day-surgery. The patients in our study were instructed on how to behave at home after discharge through verbal communication (in presence of an accompanying person) and through a written memorandum. In 98% of the cases this approach was considered to be enough, good or excellent and the mean overall satisfaction rate was 9.7/10.

Regarding the in-hospital duration of the post-operative recovery, 14% of the patients claimed that they would have preferred to remain hospitalized and be discharged the day after (one-day surgery). The results concerning the presence of nausea and vomiting, pain at the time of discharge, the average time of observation and anesthesia, and the satisfaction rate were re-examined in these patients.

Some parameters (vomiting and pain mainly) were found to be a bit higher than the average results coming from the entire cohort, but the differences were not significant. At a final verbal survey some of these

patients explained that their preference for one-day hospitalization was linked to the fact that they would feel “safer” in the hospital. Probably, the propensity towards an overnight hospital stay is to be attributed mostly to psychological factors, than to real complications.

Our study has some limitations, like the small number of patients included and the restricted types of drugs used for pain, nausea and vomiting control. Nevertheless, the standardized scheme and surgical procedure, the accurate follow-up and the use of validated scales to assess some of the outcomes are some of the advantages of our approach.

In conclusion, our data suggest that LC in day-surgery can be effectively and safely performed, achieving high rates of patients’ satisfaction; this might have a positive impact on reducing waiting times, patient turnover and health care costs. Further, well-designed studies on large cohorts are necessary to confirm our findings.

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Comparison of Low Dose Ketamine versus Ilioinguinal-Iliohypogastric Nerve Block for Post-Operative Pain Relief in Inguinal Hernia Repair Surgery: A Randomized Controlled Trial

B Pajina¹, W Tiyaprasertkul², S Thawillarp³, K Wisedkarn¹, P Pokawinpudisnun¹

Abstract

Introduction: Lately ketamine has gained acceptance with studies showing its analgesic benefit in a low-dose form in various surgical operations. Our goal was to compare the post-operative analgesic effect of intravenous low-dose ketamine (IV ketamine) versus ilioinguinal-iliohypogastric nerve block (IINB) in inguinal hernia repair surgery.

Method: This was a prospective randomized clinical trial of 75 patients who were randomly allocated into three groups and received either intravenous normal saline solution (placebo group) (N=25); IV ketamine 0.25 mg/kg (N=25); or IINB (N=25) using 0.25% bupivacaine 20 ml under ultrasound (US) guidance, after having their inguinal hernia surgically repaired. Visual Analog Scale (VAS) scores were recorded at 0, 2, 6, 12, and 24 hours post-operatively. The time-first analgesic request, total opioid consumption, and post-operative complications were also evaluated.

Keywords: Ketamine; ilioinguinal/iliohypogastric nerve; hernia; analgesic.

Authors' Addresses: ¹Kokha Hospital, Lampang, Thailand. ²Bangkok Hospital Chiang Mai International, Chiang Mai, Thailand. ³Department of Health Policy and Management, Johns Hopkins University, USA.

Corresponding Author: Email: b_pajina@yahoo.com

Result: VAS scores were significantly lower in the IV ketamine and IINB groups compared to the placebo group at the 6th, 12th, and 24th hour of the post-operative period. Total opioid consumption was lower in the IINB group (56%) and the IV ketamine group (34%) compared to the placebo group. There was no significant difference among the three groups relating to time- first analgesic requirement, and no post-operative complications.

Conclusion: Both low-dose IV ketamine, and IINB, given provide effective pain control after inguinal hernia repair surgery, but IV ketamine showed inferior analgesia reflected by greater opioid consumption compared to IINB.

Introduction

Ketamine is a dominant NMDA (N-methyl-D-aspartate) receptor antagonist playing an important role in the pain processing phenomenon. Intravenous (IV) ketamine is considered a good alternative to opioids for acute pain management. Multiple trials have shown that IV ketamine provides effective post-operative analgesia [1]. IV ketamine is simple, safe and cost-effective yet it has some related adverse effects [2].

Ilioinguinal-Iliohypogastric nerve block (IINB) has been successfully used for post-operative pain management in herniorrhaphy providing effective pain relief and prolonged analgesic effect. However, several complications have been reported [3–5].

Previous studies have shown that low-dose ketamine provides effective analgesia by reducing the rate of opioid consumption, similar to IINB, especially in cesarean section [6-7]. Unfortunately, no trials have been carried out to investigate this approach within herniorrhaphy.

Therefore, our objectives were to assess the efficacy of IV ketamine compared to IINB in achieving adequate pain control and reducing opioid consumption in herniorrhaphy.

Materials and Methods

This randomized control trial was conducted at our hospital, during January 2020 to March 2020, after obtaining approval from the Ethics Committee of Health Center [EC.81/62] and was registered with Thai clinical trial registry [Approval number: T CTR20200409010]. The study was a randomized and double blind design. Before the

study began, 75 opaque envelopes were prepared and coded by a nurse anesthesiologist, not involved in the study. Seventy-five patients undergoing inguinal hernia repair surgery gave their informed consent to participate in this study. Patients in American Society Anesthesia classification I – III, between the ages of 18 – 80 years old were included. Exclusion criteria were if patient had any of the following: 1) obstructed/strangulated inguinal hernia; 2) contraindication to spinal anesthesia; 3) treatment with other NMDA receptor antagonists; 4) allergy to any of the study medication; and 5) severe psychological disorders.

The enrolled patients were randomized into 3 groups, with 25 patients in each group: 1) Normal saline solution (placebo), 2) intravenous ketamine group (IV ketamine), 3) Ilioinguinal - Iliohypogastric nerve block group (IINB). Standard monitors were applied to record heart rate (HR) and rhythm (ECG), arterial blood pressure (BP), and oxygen saturation values (O2). All patients received spinal anesthesia with hyperbaric bupivacaine 12.5 mg from the anesthesiologist who did not know to which group the patient was allocated. The block level was assessed using cold sensation and controlled within T6. Before skin incision, the intervention as shown in Figure 1 was given.

Patients received either: 1) normal saline volume 10 ml (placebo); 2) low dose ketamine intravenous 0.25 mg/kg diluted with normal saline in 10 ml (IV ketamine); or 3) ultrasound-guided ilioinguinal-iliohypogastric nerve block that contained 0.25% bupivacaine 20 ml (IINB). All the study agents were prepared by a nurse anesthesiologist whom not participating in this study.

After transferring patients to the ward, the Visual Analog Scale (VAS) score was used to assess the patient's severity of pain within the first

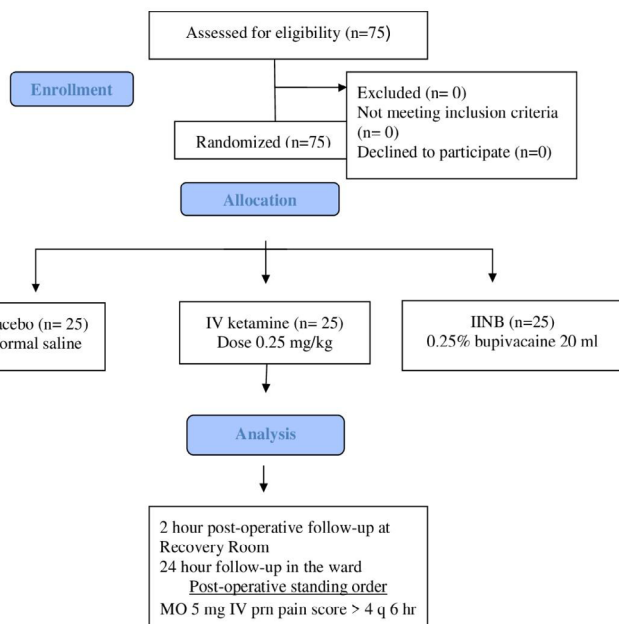


Figure 1 Study diagram.

24 hours by a ward nurse not participating in this study. The VAS score was assessed from the time of intervention administration. Supplementary morphine 5 mg intravenous was administered when patients reported their VAS > 4.

The primary outcome was the VAS score which was evaluated in the post-operative period at 0, 2, 6, 12 and 24 hours. T0 was time zero at post anesthetic care unit. Secondary outcomes were the duration of time from T0 to first analgesic pain requirement, total opioid consumption, the number of patients who needed analgesic medication, and adverse effects.

The sample size was calculated using the difference between VAS scores (Delta) of 1.1 and the S.D. of 1.2 and 1.3 for the treatment and control group, respectively. Using the power of 80% and significance level of 0.05, as used in the study carried out by Ismail et al., a sample size of 21 patients per group was generated. We recruited an additional 4 patients per group to account for a 20% dropout, hence the sample size was increased to 25 patients per group.

The VAS scores were analyzed using mean and standard deviation (SD). One-way ANOVA and post-hoc pairwise t-tests with Bonferroni-correction were used to compare the VAS scores across the intervention groups at each time point. The level of significance was $P < 0.05$. The statistical analyses were conducted using Microsoft R Open 3.5.3 software.

Results

A total 75 patients were enrolled in this study, 25 patients in each group were analyzed. There was no significant difference between groups in terms of age, body weight, ASA classification, and operating time [Table 1].

The VAS scores were the lowest in the IINB group at all time points compared to the other two groups, and significantly lower at the 6th, 12th and 24th hour compared to the placebo group, but there was no significant difference between the IINB group and the IV ketamine group [Tables 2, 4, 5]. The VAS scores were lower in the IV ketamine group compared with the placebo group at the 6th, 12th and 24th hour, but only significantly different at the 6th hour [Tables 2, 4, 5]. At 0 and 2 hours, there was no statistically significant difference between the three groups.

Table 1 Evaluation of patient expectations in our cohort.

Characteristics	Placebo	IV ketamine	IINB	P value
Age (yr)	63.52±9.00	60.12±16.10	64.28±11.85	0.47
Weight (kg)	57.04±10.26	59.44±9.09	56.40±12.09	0.56
Body mass index (kg/m ²)	21.02±2.49	21.97±2.96	20.84±3.09	0.33
ASA physical status (I/II/III)	10/12/3	12/13/0	5/19/1	
Operating time (min)	48.56±12.61	47.40±12.82	47.80±11.44	0.94

Table 2 Comparison of VAS score at movement.

VAS (at movement)	Placebo	IV ketamine	IINB
0 hour	0.00 ±0.00	0.08 ±0.40	0.00±0.00
2nd hour	2.64±2.23	3.12±2.11	2.12±1.62
6th hour	5.48±1.50	4.28±1.74	4.08±1.75
12th hour	5.20±1.53	4.40±1.63	3.68±1.31
24th hour	3.24±1.39	2.44±1.04	2.36±1.08

Table 3 Analgesic requirements and complications.

	Placebo	IV ketamine	IINB	P
Time to first analgesia (min)	279.76±211.03	273.64±168.00	344.71±172.89	0.31
Total opioid requirement (mg)	8.80±3.31	5.80±3.44	3.80±2.98	0.00*
No. post-operative analgesia	1.80±0.71	1.16±0.69	0.76±0.60	0.00*
Complications	1	1	2	

Table 4 One-way ANOVA.

VAS score	Df	Sum Square	F-value	P-value
0 hour	2	0.11	1.00	0.37
2nd hour	2	12.51	1.56	0.22
6th hour	2	28.67	5.13	0.01*
12th hour	2	28.91	6.45	0.00*
24th hour	2	11.84	4.24	0.02*
Analgesic requirement	Df	Sum Square	F-value	P-value
Time to first analgesia (min)	2	57,848	0.83	0.44
Total opioid requirement (mg)	2	31,667	14.96	0.01*
No. patient who request analgesia	2	13.76	6.88	0.01*

Table 5 Post-hoc ANOVA.

VAS	P-value	Placebo	IV ketamine
VAS at 6th hour	IV ketamine	0.04*	-
	IINB	0.01*	1.00
VAS at 12th hour	IV ketamine	0.19	-
	IINB	0.001*	0.28
VAS at 24th hour	IV ketamine	0.06	-
	IINB	0.03*	1.00
Analgesic requirement			
Total opioid requirement (mg)	IV ketamine	0.01*	-
	IINB	0.001*	0.01*
No. patients who requested analgesic	IV ketamine	0.01*	-
	IINB	0.01*	0.11

Our result showed that total opioid consumption was significantly lower in the IINB group (3.80 ± 2.98 mg) compared to the IV ketamine group (5.80 ± 3.44 mg) and the placebo group (8.80 ± 3.31 mg). The total opioid consumption in the IV ketamine group (5.8 ± 3.44 mg) was significantly lower than the placebo group (8.80 ± 3.31 mg) [Tables 3–5]. (near here) Even after adjusting the p-value using Bonferroni's p-value correction, the difference in opioid consumption between the IV ketamine group and placebo group remained statistically significant [Tables 4–5]. The IINB group and IV ketamine group produced opioid sparing effects of 56% and 34% respectively compared to the placebo group during the first 24 hours.

A lower number of patients requested analgesic medication in the IINB group compared to the other groups, but only significantly different to the placebo group. The number of patients who requested analgesic medication was also significantly less in the IV ketamine group compared to the placebo group [Tables 3–5].

The time to first opioid request was 344.70 min in the IINB group, 273.64 min in the IV ketamine group, and 279.76 min in placebo group, with no statistically significant difference between the 3 groups. There was not a significant number of patients requesting analgesia, nor who had adverse effects [Table 3].

Discussion

Inguinal hernia repair surgery continues to be one of the most common operations causing moderate to severe pain particularly within the first 24 hour period. Adequate pain control can provide patient satisfaction, early ambulation and a shortened hospital stay.

Ketamine is a dominant NMDA receptor antagonist as well as a Mu receptor, GABA, and dopaminergic receptor agonist. NMDA receptor antagonist medication, inhibiting central sensitization induced by noxious stimuli, has played an important role in both acute and chronic pain management [8].

Inguinal hernia repair is the surgical incision of the T11-12 dermatomes which are innervated by the ilioinguinal-iliohypogastric nerve. Therefore, ultrasound-guided IINB has become a useful and common procedure for providing effective post-operative analgesia [9].

In recent years, IV ketamine has been of interest for use in treating acute moderate to severe pain as well as chronic pain. The use of ultrasound-guided IINB or IV ketamine are both attractive techniques because of their simplicity and safety.

The present study is the first randomized control trial to evaluate the efficacy of ultrasound-guided IINB and IV ketamine for post-operative pain control in patients undergoing elective inguinal hernia repair surgery.

In the present study, the VAS scores were similar between the placebo, ketamine and IINB groups within the first 2 hours due to

the prolonged analgesic effect of spinal anesthesia. However, the VAS scores were lower in the IINB group at all time points compared to the IV ketamine and placebo groups. The VAS scores in the IINB group were also lower than the placebo group in other studies [10-12]. Sakali et al., for example, showed that the mean VAS scores were lower in the IINB group compared with the placebo group at the 6th, 8th, 12th and 24th hour in patients undergoing elective cesarean section under general anesthesia. [12]

The present study VAS scores were also lower in the IV ketamine group when compared with the placebo group at the 6th, 12th and 24th hour post-operatively. This is similar to the findings in others trials that demonstrated lower VAS scores using low-dose ketamine [13-15]. A similar trial in 2017, using low-dose ketamine 0.25 mg/kg and a placebo, compared pain scores in the first 24 hours of the post-operative period of patients undergoing cesarean section under spinal anesthesia. The pain scores were significantly lower in the ketamine group compared to the placebo group [15].

In the present study, the time to first opioid request was 344.70 min in the IINB group which was longer compared to the other groups. This might be due to the prolonged analgesic effect after peripheral nerve block. This result was in accordance with a trial carried out by Dorreya et al. in which 42 patients, undergoing herniorrhaphy using ultrasound-guided IINB (20 ml 0.25% bupivacaine), showed a prolonged duration until first dose of analgesic medication request compared with the placebo group. The present study also found that the duration of time to first opioid request was similar between IV ketamine and placebo groups. This is in contrast to a previous study which demonstrated that ketamine (0.25mg/kg) could significantly delay the time to first analgesic request compared with the placebo in patients undergoing cesarean section under spinal anesthesia [17].

Total opioid consumption within the first 24 hours post-operatively in the IINB group was significantly lower compared with the other two groups (a 56% opioid sparing effect). The IV ketamine group also showed significantly lower total opioid consumption than the placebo group (a 34% opioid sparing effect). Moreover, both the IINB and IV ketamine groups showed a lower number of patients who requested analgesic medication. These results were similar to the findings in a number of previous studies [11, 18, 19].

Currently, it is preferred to carry out inguinal hernia repair surgery as ambulatory surgery. Therefore, the selection of anesthetic techniques that can provide adequate post-operative pain control, as well as early ambulation and cost effectiveness, is essential. This study has demonstrated that the two simple techniques of IV ketamine and IINB, that do not require a lot of special equipment or technical skill, can provide better post-operative analgesia than a patient receiving only spinal anesthesia.

In summary, 0.25 mg/kg dose of intravenous ketamine or ultrasound-guided IINB given before surgery provides effective post-operative analgesia and reduces the VAS score within the first 24 hours after inguinal hernia repair surgery.

There are limitations of the current study. The VAS scores and level of opioid consumption were assessed only during the first 24 hours of the post-operative period. Other treatments, for example the combination of systemic analgesic drugs, have not been compared with IINB.

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Conflicts of interest There are no conflicts of interest.

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Low Service Experiences Reduce Patient Satisfaction in Ambulatory Surgery

Melissa De Regge^{a,b}, Els Van Caelenberg^c, Kelly Mouton^d, Kristof Eeckloo^{a,e}, Marc Coppens^{c,f}

Abstract

Since ambulatory surgery has significantly grown, attention for the impact of service quality on patient satisfaction in this specific setting is relevant. A survey was conducted including 291 patients in an ambulatory surgery center. Environmental quality ($p \leq 0.001$), technical quality ($p = 0.003$), administrative quality ($p \leq 0.001$) and waiting time ($p = 0.011$) have a significant effect on patient satisfaction. Patient satisfaction positively

influences patients' behavioral intentions ($p \leq 0.001$). Satisfied patients will intend to return to the hospital, so it is important to: provide enough tangible facilities such as physical equipment; streamline the administration procedure; prevent waiting times; and invest in skills of the health care providers.

Keywords: Service quality, patient satisfaction, behavioral intention, ambulatory surgery, waiting time.

Authors' Addresses: ^a Strategic Policy Cell, Ghent University Hospital, 10, Corneel Heymanslaan, 9000 Ghent, Belgium.

^b Department of Marketing, Innovation and Organisation, Faculty of Economics and Business Administration, Ghent University, 2, Tweekerkenstraat, 9000 Ghent, Belgium.

^c Ambulatory Surgery Centre, Ghent University Hospital, 10, Corneel Heymanslaan, 9000 Ghent, Belgium.

^d I-mens, 61, Tramstraat, 9052 Ghent, Belgium.

^e Department of Public Health and Primary Care, Faculty of Medicine and Health Sciences, Ghent University, 10, Corneel Heymanslaan, 9000 Ghent, Belgium.

^f Department of Basic and Applied Medical Sciences, Faculty of Medicine and Health Sciences, Ghent University, 10, Corneel Heymanslaan, 9000 Ghent, Belgium.

Corresponding Author: Melissa De Regge, Ghent University Hospital, 10, Corneel Heymanslaan, 9000 Ghent, Belgium

Email: Melissa.deregge@uzgent.be

Introduction

Hospitals are moving away from a supply-driven view towards a more patient-centered view with a focus on patient outcomes [1]. Service quality and patient satisfaction are key metrics in these efforts [2]. Results about the patients' expectations concerning service quality and patient satisfaction are becoming more and more publicly available. These results are not only useful for the patient to make informed choices in healthcare provider, capturing the voice of patients is also valuable to provide managers with data required to make well-informed decisions [3]. As such, failure of understanding the importance of the two concepts, namely service quality and patient satisfaction, could result in a possible loss of patients [4]. Previous research in several hospital settings suggested a positive impact of service quality on patient satisfaction [5,6]. In turn, receiving high levels of patient satisfaction turns out to be desirable as patient satisfaction appears to have a positive impact on behavioral intentions (such as patients' loyalty and word of mouth) [4,7]. For example, a disgruntled patient often tells others, leading to a negative effect on the organization as a whole [8].

The relationships between service quality, patient satisfaction and behavioral intentions are often addressed in literature. However, the evidence in ambulatory surgery remains limited. Although interesting as day surgery has steadily and significantly grown in countries with established stable economies in the last decades [9]. Undoubtedly, this setting becomes more and more important.

In today's fast-paced society, time is a valuable aspect for everyone, including the patient. According to Lovelock and Gummesson (2004) time plays a central role in most service processes, as such they recommend more research on how customers perceive time [10]. Studies in the healthcare sector have shown a significant negative correlation between waiting time and satisfaction: the longer the waiting time, the lower the patient satisfaction [11, 12]. In particular, long waits for scheduled procedures can be both frustrating and agonizing for patients [11]. The length of waiting time is the most frequently mentioned complaint of patients in surgical day care, with potential to induce additional stress for those patients already nervous [13].

In this perspective, the purpose of this study is twofold: (1) to propose a model showing the functional relationships among patient satisfaction and related variables based on past research combined with time-related patients' experiences; (2) to test this in a growing health care market segment, namely ambulatory surgery where research on this topic is limited.

Methods

Conceptual framework

In what follows we give a construction of the framework with references to the most important and relevant literature. The conceptual model integrates the hypothetic relationships, this between the service quality dimensions (namely interpersonal quality, technical quality, environmental quality, administrative quality and subjective waiting time) and patients' behavioral intentions regarding ambulatory surgery, with patient satisfaction as a mediator (Figure 1). Quality of life, gender and age were conversely included as control variables.

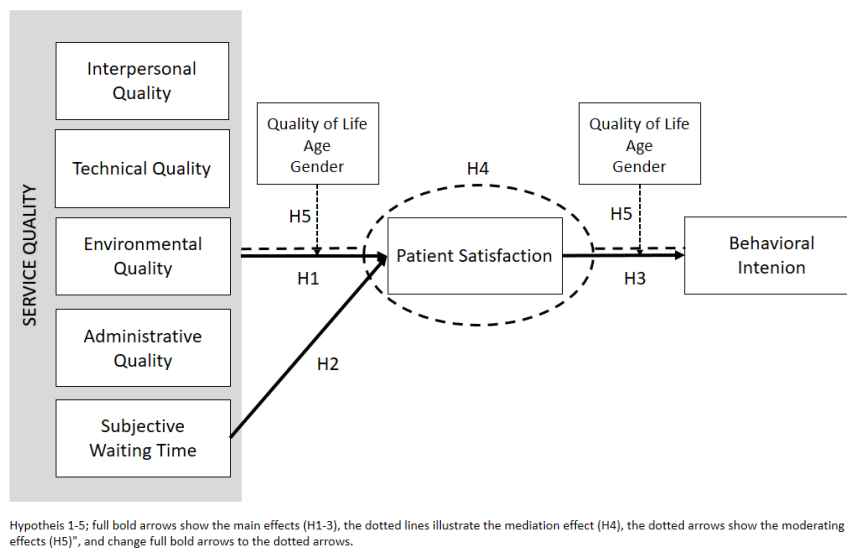
Service quality & patient satisfaction

Several studies have been carried out to gain insights in the relationship between service quality and patient satisfaction. A positive impact of service quality on patient satisfaction is suggested [5, 6]. As such, next hypothesis was consequently developed for ambulatory surgery:

Hypothesis 1: The main dimensions of service quality, being administrative quality, technical quality, interpersonal quality and environmental quality, influence patient satisfaction in ambulatory surgery.

Waiting time

Specific for the ambulatory surgery setting the waiting time considered in this study is the preoperative waiting time on the day of treatment in an ambulatory surgery unit, explicitly different from waiting time as the time between making the appointment for surgery



Hypothesis 1-5; full bold arrows show the main effects (H1-3), the dotted lines illustrate the mediation effect (H4), the dotted arrows show the moderating effects (H5)*, and change full bold arrows to the dotted arrows.

Figure 1 Conceptual framework with hypothesized relationships between the constructs.

and the actual date of operation. Patients perceive long waiting times as a barrier to actually obtaining services. Keeping patients waiting unnecessarily can be a cause of stress for both patient and physician [11], which leads to the following hypothesis.

Hypothesis 2: Waiting time influences patient satisfaction in ambulatory surgery.

Behavioral intentions

A significant impact of patient satisfaction on behavioral intentions is indicated in many studies [4, 7, 14]. In this research, the relationship between patient satisfaction and behavioral intentions will be reinvestigated in surgical day care with next hypothesis:

Hypothesis 3: Patient satisfaction affects patients' behavioral intentions in ambulatory surgery.

As previous healthcare research supports the hypothesis that service quality has a significant impact on satisfaction, and satisfaction on behavioral intentions, we follow the rational that patient satisfaction mediates the relationship between the service quality dimensions and behavioral intentions.

Hypothesis 4: Patient satisfaction mediates the relationship between the four main dimensions of service quality, being administrative quality, technical quality, interpersonal quality, environmental quality and waiting time, and behavioral intentions.

Quality of life, age and gender

Dagger et al. (2007) looked at the relationship between quality of life and both service quality and patient satisfaction, a positive relationship was found [15]. Also, several other studies were able to indicate a significant relationship between quality of life and patient satisfaction [16, 17].

Above that, previous research identified differences in patient satisfaction among several demographic variables [18]. Consequently, it is useful to determine if these relationships are also significant in ambulatory surgery and to explore if they strengthen the relationship between service quality and patient satisfaction or between patient satisfaction and behavioral intentions.

Hypothesis 5: The main relationships between will be influenced by quality of life, age and gender.

Procedure and participants

A cross-sectional study design was employed to investigate the predetermined hypotheses and patients were selected through convenience sampling. The paper version questionnaire was

distributed at the ambulatory surgery department of a large teaching hospital in the Flemish region of Belgium. The hospital has about 1,000 beds and more than 6,000 employees. Three hundred and seventeen patients filled out the questionnaire during February, March and April 2019 with a corresponding response rate of 91%. The 317 questionnaires were reduced to 291 valid responses due to the incompleteness of several surveys.

Several in- and exclusion criteria were applicable to participate in the study. A minimum age of 18 years was required. Participants had to be literate and they needed to master the Dutch language to complete the questionnaire. All kind of surgeries were accepted in the study. Patients who were not able to grant permission were excluded.

Measures

When not available in Dutch the original scales were translated using the forward and backward translation technique. Original scales were only translated in Dutch due to the location of the hospital in Flanders, Belgium. In addition to questions regarding demographics (age, gender, living status) the questionnaire involved six different constructs. Each construct was based upon previously validated instruments (see appendix). Construct validity and reliability were examined based on previous studies and were found to be adequate. Responses were provided using a seven-point Likert scale, with anchors ranging from 1 (strongly disagree) to 7 (strongly agree).

The measurement instrument was further tested to ensure that the items were relevant and representative of the target construct. Instrument re-validation was necessary, because its validity may not be persistent across different settings (such as ambulatory surgery). The instrument's reliability was evaluated using SPSS software (Version 24). The Cronbach's α values ranged from 0.83 to 0.95 indicating a satisfactory reliability level, exceeding the level commonly required for exploratory research [19] (see appendix).

Analytic approach

Structural Equation Modelling (SEM) with R Lavaan was used for parameter estimation and evaluation of the proposed model [20]. The choice of using SEM was adequate because of the exploratory nature of this study and because it allows for simultaneous estimation of the entire model. The P-values were reported as two-tailed with a significance level (α) of 0.05.

Ethical consideration

The study protocol was approved by a university-affiliated ethical institution (n B70201838168). Patients were free to participate and were informed before the informed consent was signed.

Results

Of the 291 patients, 43% (n= 124) were male and 57% (n=167) were female. Mean age was 49.3 (stdv 17.20). A summary of the demographics of the patients has been included. An overview of these descriptive statistics and correlations can be found in Table 1. We notice that in the service quality dimensions technical (mean 6.46) and interpersonal quality (mean 6.37) obtain the highest scores, followed by administrative (mean 6.05) and environmental quality (mean 5.62). The lowest score is of waiting time with 5.04. Patient satisfaction (mean 6.08) and behavioral intentions (5.95) achieve similar scores. Tests for multicollinearity indicated that a very low level of multicollinearity was present (VIF < 2 and tolerance > 0.2) [19].

Model fit

The model presented a satisfactory fit as shown by the goodness-of-fit statistics ($\chi^2/df = 1.94$) (criteria < 3), RMSEA = 0.062 (criteria < 0.1), SRMR = 0.049 (criteria < 0.08), CFI = 0.941 (criteria > 0.9) and TLI = 0.933 (criteria > 0.9) [19, 20].

Mediation analysis

The first analysis was performed on the basic model, which is the model that excluded all key moderators (age, gender and quality of life). This model was used to test hypotheses 1, 2, 3 and 4 and analysed the relationships between the major variables. To determine whether the variable 'patient satisfaction' was a full mediator (i.e., accounting for the entire effect between the variables preceding and succeeding the mediator) or a partial mediator (i.e., accounting for only a part of the effect between the preceding and succeeding variables) mediation analysis following the guidelines developed by Zhao et al. (2010) [21], was performed. The results of the SEM analysis and mediation analysis are shown in Table 2. The results found support for all the hypotheses using the basic model (i.e., H1, H2, H3, and H4), except for the relationship between 'interpersonal quality' and 'patient satisfaction'. Strong relationships were noticed between the following constructs: 'environmental quality', 'administrative quality' and 'patient satisfaction', and between 'patient satisfaction' and 'behavioral intentions'. The link between the constructs 'technical quality', 'waiting time' and the construct 'patient satisfaction' was less strong but was still highly significant. With regards to the mediators in the basic model, we observed that 'patient satisfaction' acted as a full

mediator for the link between the constructs 'administrative quality', 'waiting time', and partial for the construct 'environmental quality' and the 'behavioral intentions' as dependent variable.

Moderation analysis and covariates

In the second analysis, the covariates were added to the model. These variables are tested as moderators between (1) the link between service quality and patient satisfaction and (2) between patient satisfaction and behavioural intentions. This analysis tested the remaining hypothesis 5.

The moderation analysis was conducted by adding each variable to the model as well as an interaction term which consists of the product between this variable and the main variable. The results of the moderation analysis are presented in Table 3. (Near here) The results found partial support for the hypothesis 5. For example higher perceived quality of life has a positive effect on the relationship between technical quality, waiting time and patient satisfaction.

Discussion

The aim of this study was to propose a model based on established relationships among four key constructs (service quality, patient satisfaction and behavioral intention), and to test this in ambulatory surgery. New in this study is the integration of waiting time as a dimension of service quality, as reduction of preoperative waiting times is a considerable challenge for improvement of quality of healthcare services.

The negative impact of waiting time and its effect on the overall satisfaction is related to patient's expectations [22]. However, waiting time, despite its importance to satisfaction, has largely been neglected as a stand-alone concept of service quality. As such, in our research, waiting time was disconnected from the administrative quality component within service quality. Thirteen years after the design of the four dimensional service quality framework by Dagger et al. (2007) -where timeliness is considered as a part of administrative quality- this is logical as health care has undergone many changes, such as outpatient care and ambulatory surgery [15]. Above that, patients are evolved with a shift in the concept of 'time'. The current patient takes a great deal of interest in his time, after which (s)he

Table 1 Overview of descriptive statistics and correlations.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1. Age	49.31	17.20	-	-	-	-	-	-	-	-	-
2. Gender	0.57	0.49	-0.48	-	-	-	-	-	-	-	-
3. Interpersonal Quality	6.37	0.77	-0.06	0.11	-	-	-	-	-	-	-
4. Technical Quality	6.46	0.67	-0.01	0.11	0.71**	-	-	-	-	-	-
5. Environmental Quality	5.62	0.91	0.17**	0.02	0.34**	0.37**	-	-	-	-	-
6. Administrative Quality	6.05	0.94	0.10	-0.02	0.24**	0.23**	0.48**	-	-	-	-
7. Waiting time	5.04	1.65	0.08	-0.01	0.18**	0.22**	0.13	0.23**	-	-	-
8. Patient satisfaction	6.08	0.79	0.06	0.01	0.39**	0.46**	0.41**	0.54**	0.29**	-	-
9. Behavioral intentions	5.95	0.92	0.08	-0.02	0.35**	0.24**	0.38**	0.52**	0.29**	0.66**	-
10. Quality of Life	5.38	1.20	-0.13*	-0.05	0.10	0.13*	0.10	0.28**	0.14*	0.25**	0.09

N= 291, *P ≤ .05, **P ≤ 0.001

Table 2 SEM and mediation analysis.

Moderators Variable	Direct effect		Interaction effect		Acceptance
	β	p	β	p	
Service quality => Patient satisfaction					
Interpersonal Quality					
Age	0.004	0.145	-0.002	0.335	None
Gender	-0.063	0.455	0.079	0.349	None
Quality of Life	0.131	≤ 0.001	-0.174	≤ 0.001	Covariate and moderator
Environmental quality					
Age	0.003	0.310	0.005	0.057	None
Gender	0.034	0.701	0.313	≤ 0.001	Moderator
Quality of life	0.161	≤ 0.001	-0.104	0.017	Covariate and moderator
Administrative quality					
Age	0.001	0.927	0.006	0.045	Moderator
Gender	0.001	0.999	0.018	0.874	None
Quality of life	0.073	0.103	-0.098	0.072	None
Technical Quality					
Age	0.003	0.159	-0.002	0.500	None
Gender	-0.037	0.654	0.249	0.007	Moderator
Quality of life	0.138	0.001	-0.038	0.211	Covariate
Waiting time					
Age	0.004	0.133	0.002	0.504	None
Gender	0.008	0.933	-0.128	0.192	None
Quality of life	0.122	0.002	-0.044	0.296	Covariate
Patient satisfaction => Behavioral attitudes					
Age	0.001	0.831	-0.003	0.353	None
Gender	-0.043	0.625	0.124	0.186	None
Quality of life	-0.033	0.371	0.036	0.369	None

doesn't want to spend it on waiting in the hospital. We demonstrate that waiting time influences patient satisfaction. However, waiting time is often hard to control in the ambulatory surgery unit due to the possibilities of changes in the surgery schedule; a surgeon can be delayed to start the day surgery program by emergencies, a surgery can last longer than planned, or several other external causes may lead to an increase in waiting times. Freestanding ambulatory surgery units (with operating rooms exclusively for day surgery) are less vulnerable for changes than hospitals with operating theatres where ambulatory patients are mixed with inpatients. The ambulatory surgery unit in this study makes use of mixed operating rooms, even on two campuses.

The proposed model was strongly supported by the collected data in the present context of ambulatory surgery. Interpersonal quality appeared to be the only quality dimension without a significant impact on patient satisfaction. This finding was not in line with previous research conducted in the healthcare literature, where a significant influence of distinct personnel dimensions was detected [23, 24]. A possible explanation could be that these studies did not always make a distinction between the interpersonal and technical

quality of the personnel and aggregated these dimensions into one dimension. However, the nonsignificant impact of interpersonal quality does not imply the unimportance of the staff in ambulatory surgery. This follows from the significant impact of the technical quality dimension on patient satisfaction. This finding indicates that good education, competence and qualification of the staff do significantly influence patient satisfaction positively. This implies for specific nurse training in ambulatory surgery.

Not only technical, but also environment quality and administrative quality were positive predictors of patient satisfaction. Bitner (1992) performed an investigation on the servicescapes in which the impact of physical surroundings on customers and employers was already emphasized in service processes [25]. This was confirmed by other authors for healthcare setting [26, 27]. This is now confirmed for specific the ambulatory surgery unit as well and explains the importance of the physical surroundings in this setting. For example, a high incidence of light, a large waiting room, spaces with few angles, walls covered by pictures of nature, attention to the comfort of the seats.

Table 3 Moderation analysis.

Moderators Variable	Direct effect		Interaction effect		Acceptance
	β	p	β	p	
Service quality => Patient satisfaction					
Interpersonal Quality					
Age	0.004	0.145	-0.002	0.335	None
Gender	-0.063	0.455	0.079	0.349	None
Quality of Life	0.131	≤ 0.001	-0.174	≤ 0.001	Covariate and moderator
Environmental quality					
Age	0.003	0.310	0.005	0.057	None
Gender	0.034	0.701	0.313	≤ 0.001	Moderator
Quality of life	0.161	≤ 0.001	-0.104	0.017	Covariate and moderator
Administrative quality					
Age	0.001	0.927	0.006	0.045	Moderator
Gender	0.001	0.999	0.018	0.874	None
Quality of life	0.073	0.103	-0.098	0.072	None
Technical Quality					
Age	0.003	0.159	-0.002	0.500	None
Gender	-0.037	0.654	0.249	0.007	Moderator
Quality of life	0.138	0.001	-0.038	0.211	Covariate
Waiting time					
Age	0.004	0.133	0.002	0.504	None
Gender	0.008	0.933	-0.128	0.192	None
Quality of life	0.122	0.002	-0.044	0.296	Covariate
Patient satisfaction => Behavioral attitudes					
Age	0.001	0.831	-0.003	0.353	None
Gender	-0.043	0.625	0.124	0.186	None
Quality of life	-0.033	0.371	0.036	0.369	None

The 3 covariates (Age, Gender, Quality of Life) are tested to be moderators of two relationships:
The relationship between service quality and patient satisfaction (first part of the table) and the relationship between patient satisfaction and behavioral intentions (second part of the table)

The administrative processes in the hospital involves both the processes and procedures during admission, residence and dismissal. Curry and Sinclair (2002) found that patients feel less bothered by their treatment when the care is easily accessible [28]. This emphasizes the need to pay attention to the flow in the administrative procedures.

The research findings displayed a significant and positive predictive value of patient satisfaction to predict behavioral intentions. Several investigations have already shown similar results [e.g. 4, 7]. Satisfied patients appeared to be more likely to continue using health services, comply with medical treatment and recommend the health services to others [29].

The relationship among service quality, patient satisfaction and behavioral intentions are multifaceted [30]. The mediating relationship indicates that the degree of satisfaction/ dissatisfaction with the service experience would change the extent to which previously observed service quality remains a good predictor of patient intentions [31].

Gender, age and quality of life were included as influencing variables in this empirical investigation as a majority of the studies in the health literature expose differences in demographic variables. Differences in patient satisfaction for age, education level, race, health status, marital status and monthly income were often identified in these studies [15, 32]. Nevertheless, this was not the case for all variables included in this investigation. A possible explanation might lay in the differences between the distinct research settings. The current research was the only one performed in the ambulatory surgical unit, other articles included inpatients as well [30] or were performed in countries other than the Western countries [18].

Although we included all surgical disciplines of the day surgery clinic, the study has some limitations. For example, the survey was conducted face to face as such patients might be biased toward answering better responses, despite the reassurance about the blinding of their responses. Also, the data collection was carried

out in a single general hospital. This could lead to one sighted data, future studies could focus on multiple organizations. Above that, the findings of the study cannot be generalized as there is not a sufficiently representation of the different sections of the population, e.g. vulnerable groups and non-natives Dutch speaking patients were not included in the study.

Conclusion

Our study confirms the importance of service quality and patient satisfaction on behavioral intentions in the ambulatory surgery setting. These findings can help health care providers and managers understand how perceived service quality can affect behavioral intentions. As our results show, satisfied patients will intent to return to the hospital, so it is important to provide enough tangible facilities such as physical equipment, to streamline the administration procedure, avoid waiting times and to invest in the skills of the health care providers. This will prevent patients to go to other hospitals.

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Mark Skues

Email: mkskues@gmail.com

Madhu Ahuja

Email: madhuahuja@nhs.net