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Editorial

Mark Skues, Editor-in-Chief

This edition of the Journal has a couple of papers submitted by some of the leaders in the field of Ambulatory Surgery. While this should not detract from every valued contribution, it is pleasing that they should see fit to add their knowledge and insight to the evidence base contained in this Journal.

The first one, contributed to by two members of the Executive Committee of the International Association for Ambulatory Surgery, reviews staffing models in an Ambulatory Surgery Unit, and asks what is the optimum nurse to patient ratio? Consensus opinion suggested a ratio of three to four patients per nurse in Phase 2 Recovery, though it must be admitted that the data is somewhat weak.

The second paper is a review of the value of performance and quality indicators, written by two previous presidents of the IAAS. They helpfully break down the ambulatory pathway into pre-operative, peri-operative and post-operative phases, and describe the suggested key factors, compliance with which should aid overall performance.

The third paper reviews the status of robotic surgery across various Latin American countries. Whilst robotic surgery appears to be used more in inpatient surgery that ambulatory care, conversion of major surgical procedures to minimally invasive should result in faster recovery and subsequent discharge.

The final paper is a series of case reports describing the use of diluted intrathecal local anaesthetic agents for predominantly perineal surgery. The authors describe the dilution of the local anaesthetic and patient positioning, together with recovery times after surgery. Predictably, times to discharge were reduced from 310 minutes to approximately 130 minutes, with operating conditions deemed excellent in all patients by the surgeon.

In conclusion; enclosed are four papers covering a wide realm of ambulatory surgical principles and practice. The search for new submissions continues with the hope of another four papers to publish in December. Please consider contributing to keep the Journal productive.

Dr Mark Skues
Editor-in-Chief

Staffing models A Literature Review of Staffing Models in an Ambulatory Surgery Unit Responding to Varying flow, Volume and Acuity: Identifying the Need for Further Research

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Abstract

Purpose: To identify an optimal nursing staffing model for the ambulatory surgery unit that responds to varying flow, volume and acuity.
Design: A literature review.
Methods: In this study, a review of the literature was performed using the electronic databases Pubmed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Embase and Web of Science focused on literature published between January 2000 up to January 2022. Studies were included if they described nursing workload or nurse staffing in the ambulatory surgical units (ASU). Studies describing medical or surgical wards staffing for hospitalization and non-surgical day hospitals (e.g. oncological, internal) were excluded.

Findings: The search strategy identified 418 publications. Based on the inclusion and exclusion criteria, 19 publications were included. Checking the reference list of these 19 studies resulted in six additional publications. The full text of these 25 studies was examined. There is limited evidence for ambulatory surgery discussing the number of patients per nurse. Only one study stated that it was most common to have three to four patients per nurse in phase 2 recovery unit of an ASU.
Conclusions: Despite the fact that there is significant research on optimal nursing staffing models for surgical and inpatient wards, this remains uncharted ground for ASUs. With rapid expansion of ambulatory surgery, there is an urgent need for evidence based research assessing optimal level of nurse staffing for high quality and cost-effective care in ASUs.

Keywords: ambulatory surgical procedures, nurse staffing, unit (ward), nurse-patient ratios, skill-mix.

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Introduction

A large body of evidence based research shows the association between nurse staffing levels, skill mix in the nursing team, and patient and nurse outcomes in acute care settings and medical-surgical wards (1-4). Adverse events, fall rates, hospital-acquired infections, failure to rescue, missed nursing care and mortality are described as the patient outcomes due to inadequate nurse staffing. The impact on nurses caused by insufficient staffing are burn-out, job dissatisfaction and emotional exhaustion (5,6). Higher registered nurse (RN)-patient ratio is associated with superior patient outcomes and an increase in quality of care (5,6). The majority of the studies describing the impact of the nurse staffing models and skill mix are for hospitalized patients.

The rising costs of healthcare and advances in surgical, anesthetic and pain management techniques have caused a shift to day surgery (7,8). Day surgery is considered more cost-effective as it reduces the number of staff and avoids expensive shifts, especially at weekends, on public holidays and at night. Also, the patient makes less use of the "hotel facilities" (meals drinks, sheets, heating, etc.) of the hospital (1-5). However, the migration of medically complex patients undergoing more extensive surgical procedures to the ambulatory setting requires nurses to have multiple skills. Nurses working in an ambulatory surgery department are expected to have a broad knowledge of all the procedures performed in day surgery. They must care for many patients and simultaneously provide proactive care during the postoperative period, ensuring that they give accurate information and high-quality care at all times (9,10).

Recent move to more complicated procedures performed in day surgery and a greater number of patients with co-morbidities requires nurses to be vigilant and responsive to signals when post-operative complications occur. One of the quality indicators for ambulatory surgery is hospital readmission and unplanned admission after day surgery (11,12). The decreased length of stay, the high patient turnover and workload reduces the time available for nurses to thoroughly prepare the discharge of patients, which also compromises the quality of discharge management: patients who are not properly prepared for discharge are more likely to return to the hospital if there are postoperative problems (13). High quality care requires adequate staffing levels (14,15). However, nurse staffing and nursing models for day surgery units are uncharted ground. For instance, in Belgium, in a Royal Decree from 1997, nurse-patient ratios are described for day surgery as one RN for every 800 additional

patients per year on the day surgery unit. These measure of the volume of patients per year do not match the staffing ratio well because especially in a day surgery unit the high patient turnover underestimate nursing workload and overestimate nursing staffing levels (16). Twenty-five years later, this nurse-patient ratio is still not changed although the patient population in day surgery has changed a lot.

These considerations highlight the importance of exploring nurse staffing models for ambulatory surgery in an evidence-based approach. The maximum capacity of what can be performed in the allotted time appears to be reached. Consequently, some of the necessary care is not provided. This is not only dangerous and/or uncomfortable for the patient, but also contributes to increasing dissatisfaction among nursing staff, which in turn leads to increased absenteeism and turnover.

Purpose

The goal of this study was to investigate the current evidence for appropriate staffing models for day care surgery.

Design

A systematic search was carried out on the electronic databases Pubmed, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Embase, and Web of Science from 2000 up to January 2022. The following keywords (and synonyms) were used: ambulatory surgical procedures, nurse staffing, and unit (Appendices 1). Additional articles were identified through snowballing by checking the reference list of the remaining articles. Studies were excluded if they described medical or surgical wards for hospitalization. Non-surgical day hospitals (e.g. oncological, internal) were also not included. Studies were included if they described nursing workload or nurse staffing in the ASU. Because of the explorative character of the literature review and the aim to give an overview of the current evidence, study design and methodological quality were not used as a selection criterion.

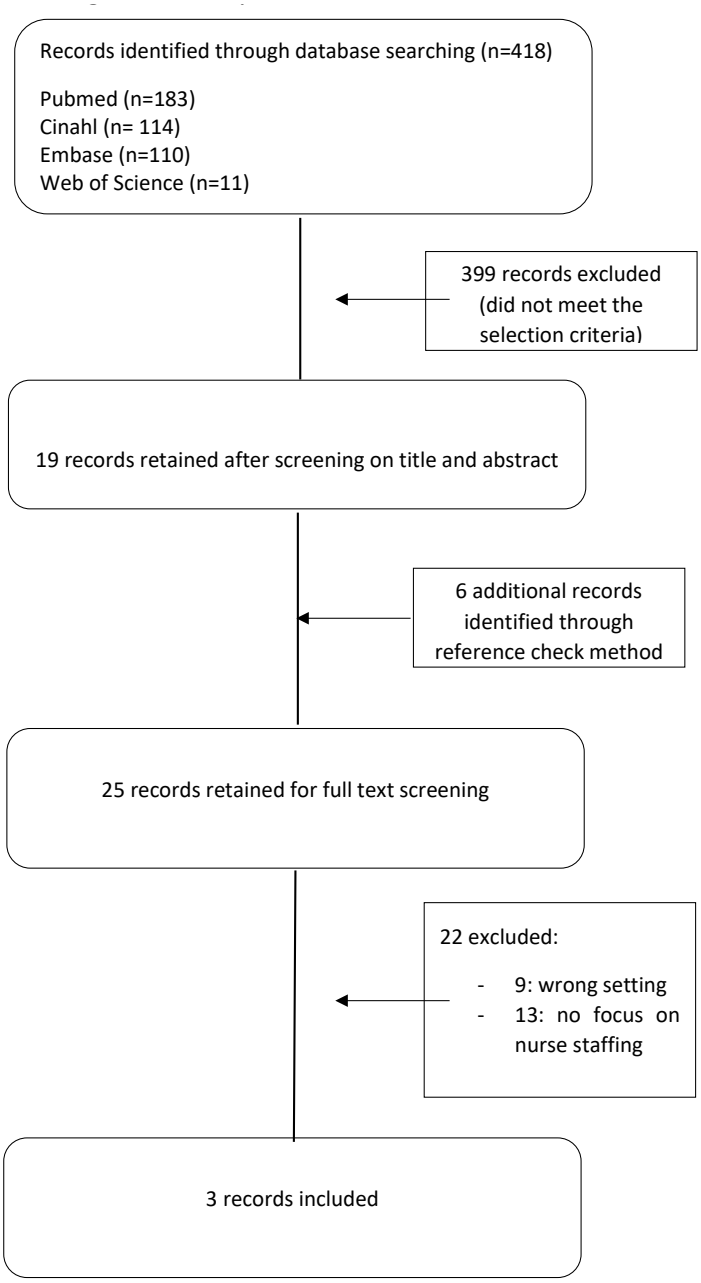

Figure 1. Flow diagram of study inclusion and exclusion.

Methods

Selection of studies

As illustrated in Figure 1, a total of 418 articles were identified through the electronic databases of which 399 did not meet the selection criteria. Nineteen articles were retrieved for more detailed evaluation. Checking the reference list of those potentially useful publications resulted in six additional articles (Appendix 1) (Place Appendix 1 at the end of the paper). Two studies discussed the need for staff models in an ambulatory setting (17,18) and only one study (15) stated the number of patients per nurse for a day surgery unit

Description of the included studies

Pearson and colleagues (2004) highlighted the importance of an appropriate mix of staff as a response to the rapid expansion of day surgery (17). They note the lack of quantitative evidence on staffing models in day surgery to establish the relationship between skill mix, staffing levels, and the achievement of desired health outcomes in day surgery units. Gilmartin et al (2007) reported similar conclusions and criticized the lack of evidence on which to base staffing models in ambulatory surgery as a major deficit in the contemporary climate of rapid expansion (18). Shortages of staff and the resulting higher workload have led to concerns about the quality of patient health care, as confirmed by surveys of nurses and literature reviews (1,3,19).

Dahlberg et al (2021) described the education, competence, and role of perioperative nurses working in the postoperative care unit (PACU) in 11 high-income, developed countries having an established peri-anesthesia specialty nursing organization and membership on the International Collaboration of PeriAnesthesia Nurses (ICPAC). The researchers used a validated web survey (in English), consisting of 96 items covering education and training for nurses working in the PACU, other health care professions in the PACU, nurse-to-patient ratio, and job tasks performed. The perioperative nurses' area of work was phase 1 or phase 2 recovery. Phase 1 recovery is the early period of recovery from when the patient leaves the operating room until the patient is discharged from the PACU. Phase 2 recovery is the postoperative recovery time at the day surgery unit[20]. The participants completed the survey based on their country's routines and policies, but it is important to note that there were variations within each country, depending on the hospital and the patients treated there, as well on the procedures scheduled for day surgery. These in-countries variations were not analyzed in the study. Across the eleven countries, there were variations in nurse to patient ratios, but in phase 2 recovery it was most common to have up to three to four patients per nurse.

Discussion

While there is a clear drive to increase day surgery rates in the ambulatory setting, the existence of scientific literature for nursing staffing models is limited. In an ambulatory care of the phase 2 recovery setting, nurses are often the primary caregiver with a broad range of tasks (21). For example, communication before surgery is an important aspect of patient satisfaction (22). The type of information given may reduce anxiety and enable rapid home recovery. Delivery of correct and sufficient information is important. However this is time consuming and informing patients is hence often limited, rapid, and brief (10).

Also, indirect patient related tasks such as planning and coordination of care in interaction with the clinical system are time consuming part of the nurses job at the ambulatory centers. Nevertheless, their main focus are direct patient related tasks: the continuous and qualitative care of patients (2). The association of anesthetics and the British Association of Day Surgery published guidelines in 2019 for the organizational and clinical management of anesthesia for day-case surgery in adults and children. One of their recommendations is that staff levels of nurses, anesthetic, assistants and other ancillary staff levels will depend on the design of the facility, case mix, work load, local preferences and the individual units ability to conform to national guidelines (23). But this is no indication of the number of nurses required to provide safe and quality care.

Sir et al (2015) highlighted the important tactical staffing decision to ensure sufficient number of nurses are scheduled to care for patients (7). The ultimate aim of staffing levels for the management of a hospital is assign nurses to certain shifts to decrease healthcare staffing cost, negative patient outcomes and improve nurse satisfaction (7).

The National Institute for Health Care Excellence (NICE) developed guidelines in 2014 for safe staffing standards for adult inpatient units such as general surgery, internal medicine and obstetrics, but refrained from plans for other areas (24). However, the guideline did not set minimum nurse staffing levels, and did not include the ambulatory setting. The following paragraph from the NICE guidelines could be interpreted as an indicator of risk, but did not address patient-related outcomes. It was stated that the nurse/patient ratio of '1:8' is only a general guidance and not a requirement (8)' "there is evidence of increased risk of harm associated with a registered nurse caring for more than 8 patients during the day shifts. Therefore, if the available registered nurses for a particular ward (excluding the nurse in charge) are caring for more than 8 patients during the day shifts, the senior management and nursing managers or matrons should: closely monitor nursing red flag events; perform early analysis of safe nursing indicator results, take action to ensure staffing is adequate to meet the patients' nursing needs if indicated by the analysis of nursing red flag events and safe nursing indicators. In many cases, patients nursing needs, as determined by implementing the recommendations in this guideline, will require registered nurses to care for fewer than 8 patients." (25).

The application of inpatient nurse staffing models to ambulatory surgery is inappropriate because of differences in the nature and extend of specific tasks such as managing situations well in an unrestricted patient flow, ensuring patient safety in a short hospital stay setting and be able to respond appropriately to planned and unanticipated admissions (26,27). Ambulatory surgery units cover a wide range of surgical procedures such as ear, nose throat surgery, gynecology and orthopedic procedures, gastrointestinal and plastic surgery (17). Besides, in an ambulatory surgery setting one may find a mixed population: adults and children, which also requires more skills and know-how from the nurses.

Staffing patterns differ across nursing care units. This affects nursing intensity and the direct costs of the nursing care. The patient to nurse ratio determines the main hours of care delivered on the unit considering that patients may need more or less care. The degree of variability of nursing intensity determines the amounts of nursing staff needed to care for those patients. For example, surgical wards where patients have initially the same kind of operation, the same care needs, it is easier to predict there the staffing levels needed (28).

Given the nature of the complexity and the workload of an ambulatory surgery unit, the synergy model, developed by Dr Martha Curley in 1998 is a more reasonable way to approach nurse staffing in ambulatory surgery units. The model is based on the synergy between the needs of patients (including their families) and nursing competencies. The idea is to assign, through a standardized method, a nurse patient ratio that takes into account the complexity of the patient and the level of competencies of the nurse (29). This model was implemented in 2021 in the Hamilton Health Sciences and Grand River Regional Cancer Centre: a surgical oncology inpatient unit and in an ambulatory oncology unit. The main reason for reviewing the staffing was the oncology care team noted that the intensity of care was increasing and they asked for more staff to ensure that the quality of care would be maintained. The implementation of the synergy model allowed the team to approach care complexity in a standardized manner. There was an equal assignment of patients and care was more focused on the patients' needs. Moreover, after the implementation of the Synergy model, the team felt that excessive workload had decreased (29).

Another study of this model took place in a medical unit at St. Paul's Hospital in Saskatoon (Canada) (30). This study adds important evidence that nurse-patient ratios can be calculated by linking nursing knowledge and skills to patient care needs. In addition, it enabled nurses the opportunity to track changes in workload and available staffing, and use this information as a basis for staffing (30).

If care needs vary by a wide margin, staffing becomes much more difficult to predict, potentially leading to shifts of high workload. Patients' severity of illness and a high turnover (characteristic of ambulatory surgery center) are two additional contributing factors for an increased need for high quality studies exploring and quantifying the nursing staffing levels, skill-mix and any outcomes. the application of the synergy tool can be an approach in ambulatory surgery to consider patient care needs based on the unique characteristics presented by the patient and to build nursing decision-making and resource allocation in a health care system under financial pressure.

Hospitals are under pressure to control costs and at the same time increasing patient volume at a time when patient safety and quality are on the front lines of attention (15). From a hospital's perspective, increasing nurse staffing is expensive but if more nurses on the ward can avoid longer hospitalizations, complications after surgery and even mortality, these concerns can drive discussions and influence hospitals and policy makers about nurses' contributions to the improvement of quality of care for the ambulatory surgery unit.

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Conclusions

To conclude, there is a lack of high-quality data on the desired mix of skills and staffing models in day surgery units despite the growing importance of this type of care. Further expansion of day surgery is certainly possible, but this will also require evidence-based research to establish the relationship between nursing skill mix, staffing levels and the achievement of desired health outcomes in day surgery units. Appropriate and well considered nursing staffing models in ambulatory surgery are increasingly important with the shift of surgery from inpatient wards to ambulatory care units.

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Appendix 1. Search Strings.

PUBMED: ((“Ambulatory Surgical Procedures”[Mesh] OR outpatient surgery [tiab] OR ambulatory surgeries[tiab] OR office surgery [tiab] OR day surgery[tiab])) AND ((“nurse staffing”) OR (“nursing service”)) OR (“primary nursing”)) OR (“integrated care”)) OR (“centralized”)) OR (“decentralized”)) OR (“nurse-patient ratio”)) OR (“nursing model”)) OR (“total nursing”)) OR (“missed nursing care”)) OR (“team nursing”)) OR (“staffing models”)) OR (“work organization”)) OR (“patient-focused care”)) OR (“task-oriented”)) OR (“patient assignment”)) OR (“nursing models”)) OR (“nursing system”)) OR (“ward organization”)) OR (“patient allocation”)) OR (“nursing organization”)) OR (“unit organization”)) OR (“organizational models”)) OR (“model of care delivery”)) OR (“ward organization”)) OR (“devolved”)) OR (“total patient care”)) OR (“nursing systems”)) OR (“work organization”)) OR (“organizational model”)) OR (“nursing care process”)) OR (“revised nursing work index”)) OR (“nursing structure”)) OR (“decentralized nursing”)) OR (“functional nursing”)) OR (“organizational practice”)) OR (“two tier”)) OR (“two-tier”)) OR (“nursing organizational”)) OR (“nursing care processes”)) OR (“centralized nursing”)) OR (“group nursing”)) OR (“organizational practice”)) OR (“nursing care organization”)) OR (“task allocation”)) OR (“organizational practice”)) OR (“new team”)) OR (“unit organization”)) OR (“interdisciplinary patient care”)) OR (“nursing care delivery system”)) OR (“nursing care delivery model”)) OR (“modified primary”)) OR (“modular nursing”)) OR (“nursing care delivery systems”)) OR (“nursing service organization”)) OR (“integrated nursing care”)) OR (“hybrid nursing”)) OR (“nursing team organization”))

CINAHL: ((“Ambulatory Surgical Procedures” OR outpatient surgery OR ambulatory surgeries OR office surgery OR day surgery)) AND ((“nurse staffing”) OR (“nursing service”)) OR (“primary nursing”)) OR (“integrated care”)) OR (“centralized”)) OR (“decentralized”)) OR (“nurse-patient ratio”)) OR (“nursing model”)) OR (“total nursing”)) OR (“missed nursing care”)) OR (“team nursing”)) OR (“staffing models”)) OR (“work organization”)) OR (“patient-focused care”)) OR (“task-oriented”)) OR (“patient assignment”)) OR (“nursing models”)) OR (“nursing system”)) OR (“ward organization”)) OR (“patient allocation”)) OR (“nursing organization”)) OR (“unit organization”)) OR (“organizational models”)) OR (“model of care delivery”)) OR (“ward organization”)) OR (“devolved”)) OR (“total patient care”)) OR (“nursing systems”)) OR (“work organization”)) OR (“organizational model”)) OR (“nursing care process”)) OR (“revised nursing work index”)) OR (“nursing structure”)) OR (“decentralized nursing”)) OR (“functional nursing”)) OR (“organizational practice”)) OR (“two tier”)) OR (“two-tier”)) OR (“nursing organizational”)) OR (“nursing care processes”)) OR (“centralized nursing”)) OR (“group nursing”)) OR (“organizational practice”)) OR (“nursing care organization”)) OR (“task allocation”)) OR (“organizational practice”)) OR (“new team”)) OR (“unit organization”)) OR (“interdisciplinary patient care”)) OR (“nursing care delivery system”)) OR (“nursing care delivery model”)) OR (“modified primary”)) OR (“modular nursing”)) OR (“nursing care delivery systems”)) OR (“nursing service organization”)) OR (“integrated nursing care”)) OR (“hybrid nursing”)) OR (“nursing team organization”))

EMBASE: ((“Ambulatory Surgical Procedures” OR outpatient surgery OR ambulatory surgeries OR office surgery OR day surgery)) AND ((“nurse staffing”) OR (“nursing service”)) OR (“primary nursing”)) OR (“integrated care”)) OR (“centralized”)) OR (“decentralized”)) OR (“nurse-patient ratio”)) OR (“nursing model”)) OR (“total nursing”)) OR (“missed nursing care”)) OR (“team nursing”)) OR (“staffing models”)) OR (“work organization”)) OR (“patient-focused care”)) OR (“task-oriented”)) OR (“patient assignment”)) OR (“nursing models”)) OR (“nursing system”)) OR (“ward organization”)) OR (“patient allocation”)) OR (“nursing organization”)) OR (“unit organization”)) OR (“organizational models”)) OR (“model of care delivery”)) OR (“ward organization”)) OR (“devolved”)) OR (“total patient care”)) OR (“nursing systems”)) OR (“work organization”)) OR (“organizational model”)) OR (“nursing care process”)) OR (“revised nursing work index”)) OR (“nursing structure”)) OR (“decentralized nursing”)) OR (“functional nursing”)) OR (“organizational practice”)) OR (“two tier”)) OR (“two-tier”)) OR (“nursing organizational”)) OR (“nursing care processes”)) OR (“centralized nursing”)) OR (“group nursing”)) OR (“organizational practice”)) OR (“nursing care organization”)) OR (“task allocation”)) OR (“organizational practice”)) OR (“new team”)) OR (“unit organization”)) OR (“interdisciplinary patient care”)) OR (“nursing care delivery system”)) OR (“nursing care delivery model”)) OR (“modified primary”)) OR (“modular nursing”)) OR (“nursing care delivery systems”)) OR (“nursing service organization”)) OR (“integrated nursing care”)) OR (“hybrid nursing”)) OR (“nursing team organization”))

WEB OF SCIENCE: TS = (“Ambulatory Surgical Procedures*” OR “outpatient surgery*” OR “ambulatory surgeries*” OR “office surgery*” OR “day surgery*”) AND TS= (“nurse staffing” OR “nursing service” OR “primary nursing” OR “integrated care” OR “centralized” OR “decentralized” OR “nurse-patient ratio” OR “nursing model” OR “total nursing” OR “missed nursing care” OR “team nursing” OR “staffing models” OR “work organization” OR “patient-focused care” OR “task-oriented” OR “patient assignment” OR “nursing models” OR “nursing system” OR “ward organization” OR “patient allocation” OR “nursing organization” OR “unit organization” OR “organizational models” OR “model of care delivery” OR “ward organisation” OR “devolved” OR “total patient care” OR “nursing systems” OR “work organisation” OR “organisational model” OR “nursing care process” OR “revised nursing work index” OR “nursing structure” OR “decentralized nursing” OR “functional nursing” OR “organizational practice” OR “two tier” OR “two-tier” OR “nursing organizational” OR “nursing care processes” OR “centralized nursing” OR “group nursing” OR “organisational practice” OR “nursing care organization” OR “task allocation” OR “organizational practice” OR “new team” OR “unit organisation” OR “interdisciplinary patient care” OR “nursing care delivery system” OR “nursing care delivery model” OR “modified primary” OR “modular nursing” OR “nursing care delivery systems” OR “nursing service organization” OR “integrated nursing care” OR “hybrid nursing” OR “nursing team organization”)

The Value of Performance and Quality Indicators in the Ambulatory Surgery Unit

Douglas McWhinnie, Ian Jackson

Abstract

Ambulatory Surgery units require ongoing monitoring of Key Performance Indicators to maintain best practice and enhance patient safety. While there are many clinical indicators in use, ambulatory units can often be overwhelmed by the amount of data collected. There is little point in collecting data if it is not appropriately assessed and it is important to analyse data in context of the clinical situation before initiating change. All data should be assessed but a root cause analysis is only required when high level data shows deviation from normal. The selection of KPI's can allow focused collection of data, thereby reducing the resources required for monitoring.

Keywords: Key Performance Indicators, Ambulatory Surgery, Day Surgery.

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Introduction

The ambulatory patient pathway is a series of sequential steps to deliver safe and effective surgery for the day case patient. Patients and the public expect to receive high quality, safe care throughout the pathway. Clinicians and management therefore require monitoring of pathway to measure performance. Clinical indicators are measures of the management or outcome of each step of the pathway which can identify possible suboptimal performance or care. By definition, performance indicators measure quantitative data against expected standards while quality indicators represent non-numeric conformance to a standard and may include the interpretation of personal feelings, opinions or experiences. There is often considerable overlap in performance and quality indicators, but both can reflect issues of patient safety. They are usually collectively known as Key Performance Indicators (KPI's). There is often considerable overlap in performance and quality indicators, but both can reflect issues of patient safety. The interest in performance and quality measurement has been supported by the growing ability to measure and analyse quality of care, through advances in information technology and measurement methodology. However, this gives rise to an enormous amount of data, and without expert interpretation, may be meaningless or even provide incorrect conclusions.

Clinical indicators in surgery are available for most aspects of the patient journey, and although there are fewer directly applicable to Ambulatory Surgery, the data collected can still be vast and difficult to manage and interpret. Commonly used performance and quality indicators in Ambulatory Surgery in the 3 domains of the patient pathway are shown in Figure 1.

Data for clinical indicators is routinely collected in most Ambulatory Units. Where possible, data should be collected on all indicators to provide a comprehensive overview of the day unit's performance. Unfortunately, data analysis can be cumbersome and time-consuming if not collected electronically and is useful only if collected contemporaneously. Out of date data is of limited value and may be misleading. If a deviation from the expected norm is identified, action to rectify the problem may then be taken. This may require a root cause analysis, requiring further sub-analysis of the data. After initiating a solution to the deviation from expected, the process of data collection then resumes. It is important to interpret raw data within its clinical context and it may be pertinent to assess more than a single data point before taking action.

In many ambulatory units, resources to gather KPI's are often limited. If resources are finite, can a smaller number of clinical indicators, covering as much of the pathway as possible still deliver an accurate reflection of performance?

Overall Day Surgery Performance

The most generic measure of pathway performance is the overall day case rate for the ambulatory facility. Many authorities have suggested targets or expectations for rates of ambulatory surgery when compared to inpatient stay (1). While overall day surgery percentages

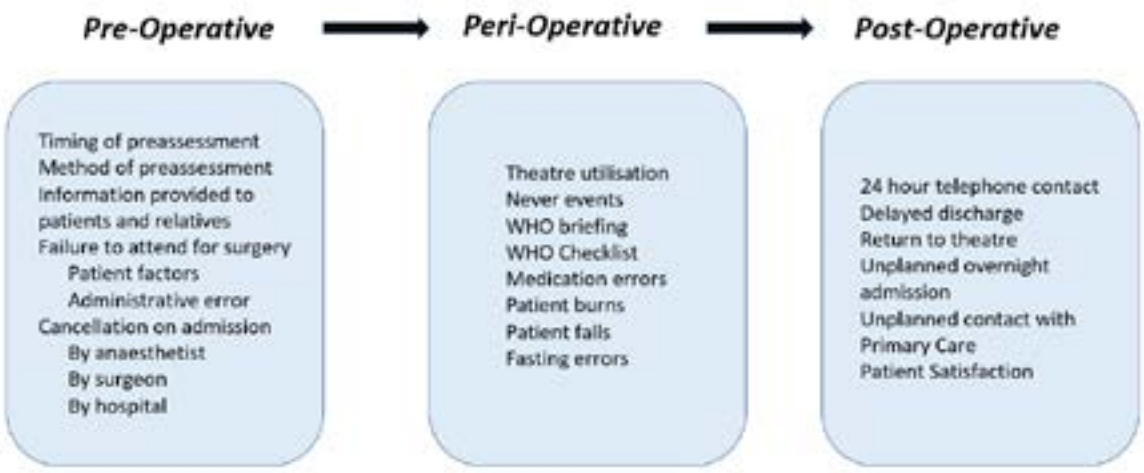

Figure 1 The Ambulatory Pathway.

provide convenient headlines, identifying specific issues contributing to the overall figure is often difficult. Furthermore, achievable targets depend on the day surgery case mix, the facilities available and the day unit's 'default to day surgery' policy. Accepting that every case is a day case until proven otherwise by preassessment or procedure policy will undoubtedly maximise day surgery numbers at the expense of unplanned overnight admissions. In contrast, targeting only the fittest for day surgery will minimise unplanned admissions but disadvantage many who might have been suitable for ambulatory care had they been clinically optimised beforehand. The ambulatory surgery facility available will dictate the spectrum of procedures performed with stand-alone units necessarily having stricter admission criteria to minimise unplanned admissions. Facilities focussing on minor procedures only consider an unplanned overnight admission rate of 1% appropriate while a mixed procedure facility would target 3% as acceptable (2). When considering procedure-specific rates of acceptable unplanned admissions, then target is dependent on the expected day case rate with low expectations accepting higher unplanned admissions and vice versa as shown in Figure 2. (2)

Expected Day Case Rate	Unplanned Admission Rate
>75%	<2%
50-75%	<5%
<50%	<10%

Figure 2 Targets for acceptable unplanned overnight admissions following Ambulatory Surgery.

The Pre-Operative Pathway

The preoperative segment of the pathway is designed to triage elective surgery patients to determine:

- Suitability for day surgery in terms of procedure and co-morbidities
- Optimisation of health before day surgery
- Scheduling attendance for day surgery at the appointed time, appropriately fasted

The timing of preoperative assessment is critical in patient optimisation before surgery. Too early and the patients' health status may change, but too late and there may not be adequate time to achieve health optimisation as in patients with hypertension. Failure of any aspect of preoperative assessment will be reflected in the patient failing to attend or being cancelled on arrival. The continuous monitoring these patients who fail to receive their procedure is both a sensitive and surrogate measure of preoperative performance. Only if there is variation in expected figures, is a root cause analysis required (Figure 3).

Failure to attend can be patient decision, through an unexpected illness or by a positive action not to proceed with their procedure on the day. Hospital errors through incorrect instructions to the patient regarding date or time of the procedure or incorrect fasting instructions can also lead to attendance failure, although patient fasting errors are not uncommon. The patient may be cancelled on arrival primarily due to health issues which should have been identified at preassessment or as a result of surgical error regarding the necessity of intervention or less likely, resource issues through lack of equipment or surgeon. Cancellation due to lack of hospital resources is a more common scenario in in-patient surgery where lack of in-patient beds may be an issue. Most causes of last-minute procedure cancellations can be traced back to inadequate counselling at preassessment or inaccurate information given regarding their fasting instructions and date/time of admission for their procedure. Therefore, recording procedure cancellations offers an excellent proxy measure of the efficiency and safety of the preoperative pathway.

The Peri-Operative Pathway

The relevant KPI's in the perioperative pathway are related to operational efficiency or operational safety. Patient safety in the operating theatre can be monitored by the incidence of 'never events' and the quality of the WHO Briefing and Checklist. The term, 'never event' originated in 2001 from the National Quality Forum in the USA whose role is to ensure patient safety and healthcare quality through measurement and public reporting (3). Never Events are serious, largely preventable safety incidents that should not occur if the available preventative measures such as guidelines, protocols and checks are implemented. Health agencies throughout the world have their own lists of 'never events' but most are focussed in and around the operating theatre on the day of surgery:

- Wrong site surgery
- Wrong implant / prosthesis
- Retained foreign object

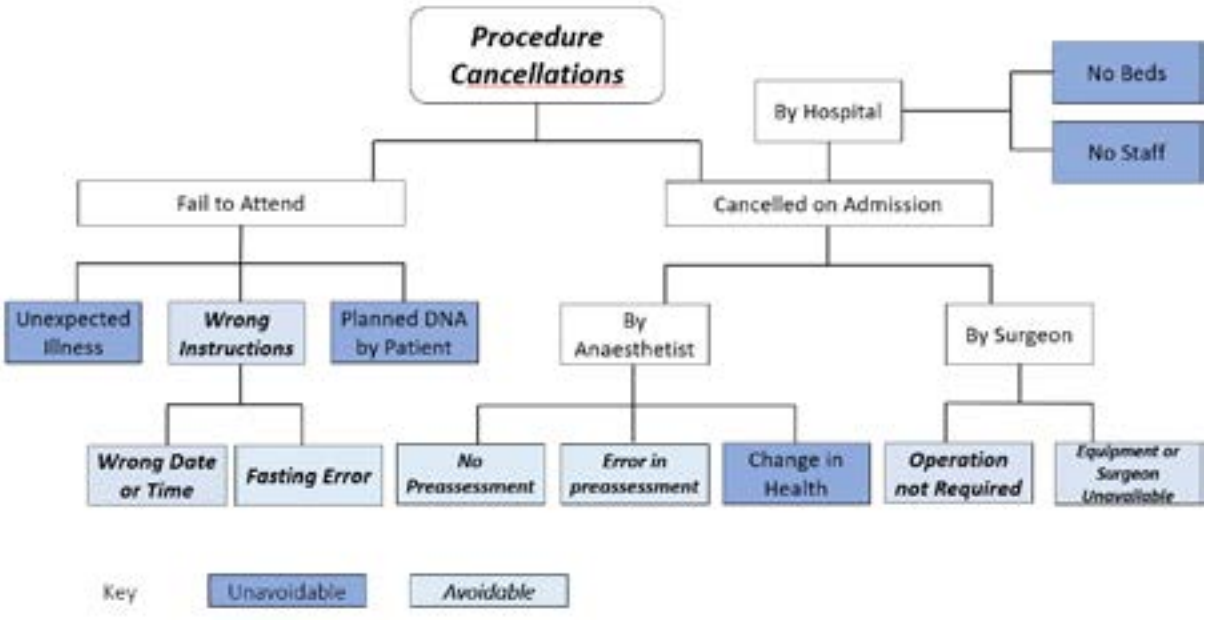

Figure 3 Root cause analysis of procedure cancellations.

- Misplaced naso- or oro-gastric tube
- Medication administered by the wrong route
- Transfusion of ABO incompatible blood components or organs
- Mis-selection of midazolam during conscious sedation

The implementation worldwide of the WHO Surgical Safety Checklist (4) has undoubtedly highlighted 'never events' and has improved safety in theatre by the implementation of the briefing, where each patient is discussed in terms of resources required and the optimum order of the list finalised.

From the hospital's viewpoint, the central focus of perioperative performance is operating theatre efficiency. However, the costs in running an operating theatre will vary as operation costs are difficult to assess as costs vary according to location, staffing, procedure and consumables. However, the basic operating theatre cost in UK has been estimated at 1200 Euro/hour (5) and although this may vary by country, it is clear running costs are significantly high regardless of location.

Defining and measuring the performance of an operating theatre are complicated by many factors and a simple crude metric alone cannot encapsulate the complexity involved. Basic metrics are shown in Table I and can be described merely as an audit of utilisation with no insight as to the causes of inefficiency.

Table I Basic theatre metrics for efficiency.

Sessions scheduled (number)	Operations per list
Sessions held (number)	Patient preparation time (Mins)
Session utilisation (%)	Start time
Operating time available (mins)	Gap time (mins)
Operating time used (mins)	Early finishes (mins)
Operating time utilisation (%)	Over runs (mins)

To determine with any accuracy the causes of theatre inefficiency, a root cause analysis of the causes of loss of theatre time is required and the most sensitive index of performance is the actual usage time of the operating facility (5). This is most accurately assessed by recording the time the operating theatre is in use (touchtime) and the time the theatre lies empty (downtime). The theatre may be unused due to late starts, early finishes and change-over time between patients (Figure 4). In Day Surgery, gap time can be a critical loss of resource due to the high number of procedures on an operating list. By routinely monitoring the touchtime/downtime ratio in individual theatres, service specialties or the entire theatre complex, root cause analysis may be performed if there is a deviation from expected.

Unfortunately, actual operating time in the working day may only be around 60% of available theatre time (6).

The Post-Operative Pathway

An important quality outcome of poor peri-operative care is an unplanned overnight admission. It has a negative effect on patient experience, and it creates pressure on inpatient beds with increased costs to the hospital. Reasons for failure to return home on the day are often multiple and can be related to the patient's condition, issues related to anaesthesia or issues related to the surgery. (Figure 5).

Patient Factors	***Hospital Factors***
Post-operative uncontrolled pain	Late return from theatre
Postoperative nausea and vomiting	Surgical drain
Urinary retention	Social reasons
Clinical observation	No protocol for discharge
Postoperative bleeding	Surgeon choice

Figure 5 Reasons for delayed discharge.

Protocols to deal with clinical issues may reduce the incidence of unplanned admissions. Algorithms to deal with pain, nausea and vomiting, and urinary retention are well-recognised are frequently utilised (7). Many of the hospital factors are avoidable. Late returns from theatre may be the result of unexpected surgical or anaesthetic problems but more commonly are related to poor scheduling. The basic principle of the ambulatory operating list is to schedule patients with co-morbidities and larger procedures early in the day and to adhere to an afternoon cut-off time for commencement of the last case. The value of surgical drains remains debatable, with insufficient evidence to support their use in the type of procedure performed on an ambulatory basis (8). It could be argued that the surgical drain is inserted to reassure the surgeon rather than offer any safety to the patient. Protocol-based discharge offers safe and efficient discharge for the patient without requiring surgical input and avoids unnecessary delays in discharge if a surgical opinion is unavailable. Failure or delay to discharge due to social reasons may reflect a failure of preassessment, but it is well-recognised that patients may be ambiguous when determining the availability of a responsible adult to escort them home after surgery (9).

Return to theatre should be extremely rare and so each case should be individually reviewed to ensure that lessons are learned.

Readmission after day surgery is an uncommon but serious complication reflecting both the quality of perioperative care and the discharge process. Every readmission should be investigated by root

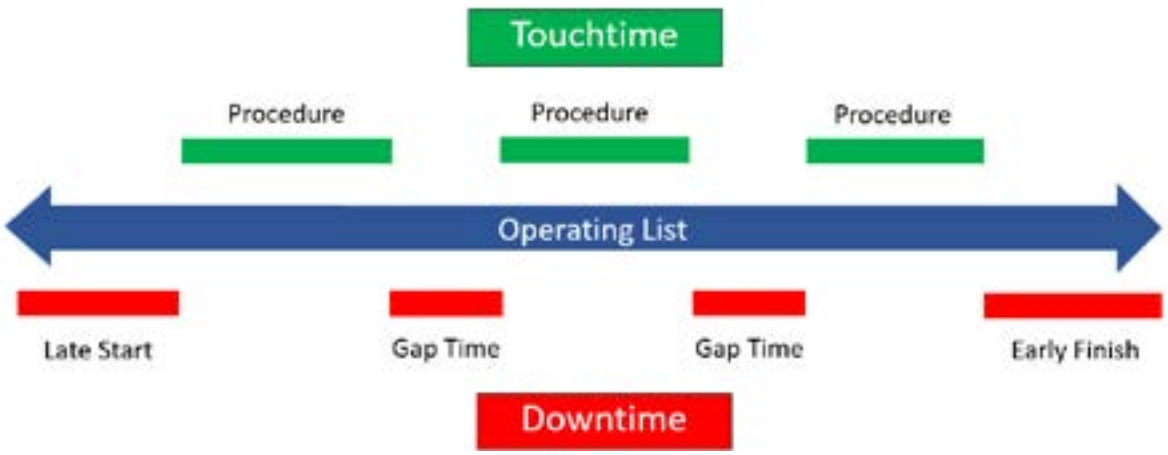

Figure 4 Theatre utilisation overview.

cause analysis to identify, in each case, the source of the problem. Discharge protocols if conducted properly at the appropriate time are a useful safety screen to ensure the patient is safe to return home. Deterioration after leaving hospital is uncommon. When a readmission does occur, the most frequent causes are pain and wound-related issues. It is important the patient receives good instruction regarding analgesic usage before leaving the day unit as often the pain is the result of inadequate analgesia. Wound problems include haematoma and less commonly frank bleeding from the wound and patients are often readmitted for reassurance rather than active treatment. Readmissions can therefore be considered a relevant proxy measure of the perioperative and discharge processes.

The completion of a telephone follow up call using a structured questionnaire can yield useful information about the service (Figure 6). It provides valuable information about the recovery of your patient and the effectiveness of your policies on pain control and management of nausea and vomiting. There is evidence that using a daily reporting tool as an App or web portal significantly increases patient satisfaction and impression of their recovery (10).

Conclusions

The measurement and assessment of performance and quality in the ambulatory unit provides essential monitoring data to maintain or improve the patient experience. While there are many KPI's available, data collection can be oner-ous and requires interpretation. While all data should be monitored, it is only when a deviation from normal is detected that a root cause analysis is required. Even then, it is clear that some KPI's are more illuminating as to performance than others. Ambulatory units require monitoring of performance and KPI's should be selected according to usefulness and resource-effectiveness.

1	Have you felt nauseous (sick)	Mild/Moderate/Severe/Vomited
2	Have you had a sore throat?	Mild/Moderate/Severe
3	Have you felt dizzy?	Mild/Moderate/Severe
4	Have you felt muscular aches?	Mild/Moderate/Severe
5	How much pain have you experienced in last 24hrs?	No pain (0) – Worst pain imaginable (10)
6	How would you rate your current level of pain?	No pain (0) – Worst pain imaginable (10)
7	Have you been able to control the pain?	Yes/No
8	Did you use the pain killers we supplied/recommended?	Yes/No
9	Are you satisfied with the pain relief provided?	Yes/No
10	What does the wound look like?	Normal/Redness/Secretion/Pus/Swelling/Do not know

Figure 6 Simple questionnaire for telephone follow up.

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Innovation in Motion: Robotic Surgery's status in Latin America

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Abstract

This study aims to describe the present status of robotic surgery (RS) in Latin America. A cross-sectional study was conducted, collecting data from 10 robotic programs in 6 Latin American countries through surveys of surgical specialists and heads of surgical services. The utilization of RS in Latin America exhibits significant variability depending on the specific country and healthcare facilities. This variability encompasses factors such as the annual volume of surgeries, the types of institutions involved, and the primary medical specialties employing this technology. Concerted efforts within the region to augment scientific research output about robotic procedures are imperative.

Keywords: Robotic Surgical Procedures, Latin America.

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Introduction

Medicine has been revolutionized by Robotic surgery (RS), a type of minimally invasive surgery that uses advanced robotic technology to assist surgeons with performing highly complex surgical procedures. This cutting-edge technology allows for greater precision, ease, control, and flexibility during surgery, resulting in less pain, scarring, and faster recovery times for patients (1).

The first RS was performed in 1985 when an arm-robot was used to perform a neurosurgical biopsy. In the 1990s, however, this technology began to gain popularity. In 2000, the da Vinci Surgical System was approved by the FDA for use in laparoscopic surgeries. Since then, it has continued to evolve and is now used in a wide range of surgical specialties and procedures (2).

The da Vinci Surgical System, which is the most widely used RS system in the world, has been used for prostatectomies, hysterectomies, coronary arteries bypass, mitral valve replacement, and colorectal surgeries, among others. The system consists of four robotic arms, one of which holds a camera, while the other three hold surgical instruments. And during surgery, the physician controls the arms from a console, which provides a 3D view of the operating site (3).

The robotic arms used in the surgery can move in ways that are not possible with human hands, allowing for more accurate incisions and sutures. This results in less trauma to the patient's body and faster recovery times and reduced procedural complications. In addition to its medical benefits, RS has economic benefits. Because it is a minimally invasive procedure, patients can return to work and other activities more quickly than with traditional surgeries. This can result in lower healthcare costs and increased productivity (4).

In Latin America, the use of RS began in 2005 in Argentina, where surgery was performed on a patient suffering from achalasia. It was followed by Brazil, Mexico, Argentina, Colombia and Venezuela. Since then, it has become increasingly popular in the region, and nowadays the former has more than 100 robotic surgical units in the nation (5).

However, despite its potential, compared with developed countries the use of this technology and research in its field is not widely spread in Latin America. This knowledge gap not only limits the adoption of this technology but also hinders the development of best practices and guidelines specific to the region. Therefore, by conducting a study in this demographic area, we can gain a better understanding of the current situation and uses of RS, identify any barriers to its implementation, and develop strategies to overcome them.

Methodology

A cross-sectional study was carried out to characterize the current situation of RS in Latin America. The information was collected through surveys of surgical specialists and heads of surgical services of private and public health centers which count with the technology. Data from 10 robotic programs in 6 countries were finally gathered in May 2023. Previous studies were considered as a reference for the design of the survey used, which requested information regarding the start of the programs, the number and kind of robots used as well as their durability, the number and kind of surgeries done, the use of the robots for educational programs, and robotic program interruptions and reasons. Furthermore, an exploratory analysis was performed to compare total surgeries, percentage of urologic surgeries, and total months of operation between private vs. public center programs using the U-Mann-Whitney test.

Results

The general characteristics of the programs studied are summarized in Table 1. These programs correspond to only some of the centers with such technology within their respective country; only in the case of Panama was it possible to collect data from all the centers with surgical robots existing in the country. In the case of the Dominican Republic, the country only had two programs, the one described in Table 1 and one in the "Abreu Clinic", a private medical center that will begin interventions with one da Vinci robot in June 2023. Also, it is important to notice that six of the ten programs were from Panama and Venezuela.

The distribution of the use of RS for the different specialties was heterogeneous in this sample, as shown in Figure 1. The National Cancer Institute of Brazil was the only one to use RS in specialties of thoracic and head and neck surgery. Meanwhile, only the Ecuadorian center performed robotic interventions for pediatrics, and Venezuelan centers performed exclusively urology procedures.

Type of institutions

Six of the programs studied correspond to private health centers and four to public institutions. It was found that in private institutions the percentage of urological surgeries was higher with a statistically significant difference (p 0.016). Two-thirds of the total procedures recorded in this study were performed in private health centers and the median number of months that the programs were functioning was higher in public hospitals.

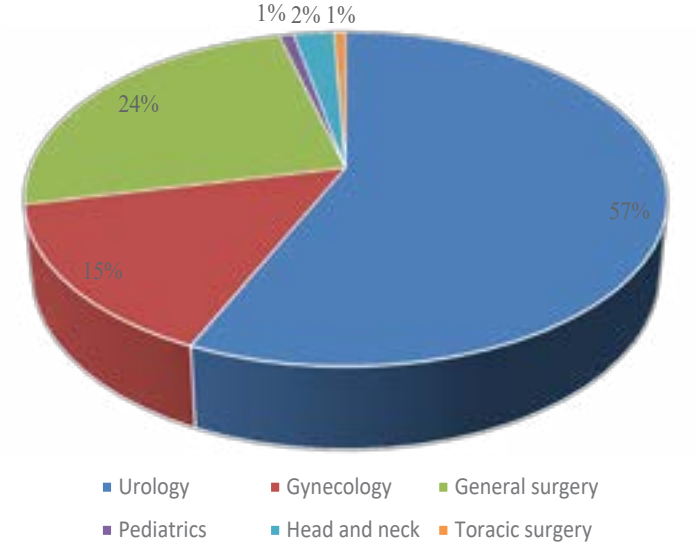

Figure 1 Percentage of Procedures by Speciality.

Table 1 Characteristics of robotic surgical programs in Latin America.

Country	Brazil	Venezuela	Venezuela	Mexico	Panama	Panama	Panama	Panama	Dominican Republic	Ecuador
Name of the center	National Cancer Institute	Instituto Medico La Floresta	Centro Médico Docente "La Trinidad"	Hospital Del Prado	Hospital Pacifica Salud	Hospital Nacional	Ciudad de la Salud	The Panama Clinic	Hospital Metro-politano de Santiago	Hospital Carlos Andrade Marín
Type of health center	Public hospital	Private clinic	Private clinic	Private clinic	Public hospital	Private clinic	Public hospital	Private clinic	Private clinic	Public hospital
Starting year of the program	2012	2009	2021	2014	2021	2012	2023	2020	2014	2015
Number of robots	1	1	1	1	1	1	2	1	1	2
Number of surgeries performed by specialty	**1384**	**784**	**101**	**289a**	**316**	**1750**	**7**	**360**	**5200**	**2568**
Urology	425	784	101	126	88	700	1	188	4300	516
Gynecology	318	-	-	24	218	150	2	71	200	914
General surgery	300	-	-	139	10	900	4	101	700	968
Pediatrics	-	-	-	-	-	-	-	-	-	112
Head and neck	310	-	-	-	-	-	-	-	-	-
Thoracic surgery	31	-	-	-	-	-	-	-	-	58
Years of functioning	9,75	10	2	9	2	11	0	2,58	9	7
Number of cases per year	141,9	78,4	50,5	32,1	158,0	159,1	7,0	139,4	577,8	366,9
% Urology cases	30,7	100,0	100,0	43,6	27,8	40,0	14,3	52,2	82,7	20,1

a The cases correspond only to those carried out during 2023

b It was calculated, excluding the number of months that the programs were interrupted.

Program interruptions

Interruptions were recorded in 5 of the 10 programs studied. In two cases, it was due to the pandemic and mandatory isolation due to COVID-19, such are the cases of the private hospital "The Panama Clinic" and the public hospital "Carlos Andrade Marín" for 5 and 12 months, respectively. The remaining centers, the lack of equipment materials, and the failure in their operation have been the main reasons for suspension. The National Cancer Institute of Brazil temporarily ceased its program for 15 months due to the lack of material for its equipment, as well as the private hospital "Del Prado" of Mexico for an unspecified time. In the case of the private hospital "Instituto Médico La Floresta" of Venezuela, the temporary suspension of the program was due to the complete failure of the equipment for 48 months.

Equipment functioning

Only 2 of the institutions had 2 operating robots, both institutions were public. All the centers used the da Vinci system except for 2 centers in Panama that used the Hugo Ras system. In three of the centers, new robots have been added, 2 to replace the previous non-functional ones and 1 to add additional equipment. The number of robots did not correlate to the number of procedures. Although the public hospital "Carlos Andrade Marín" of Ecuador had two Da Vinci robots, it presents a lower number of procedures (2566) concerning other institutions such as the private hospital "Metropolitano de Santiago" of the Dominican Republic that had one Da Vinci robot and has performed 5200 procedures so far.

Upcoming projects in Latin America

Other countries, such as Chile, Argentina, and Uruguay, that have RS programs could not be contacted to obtain information from their programs for this study.

As robotic surgery becomes more widely available, many hospitals and medical facilities in Latin America will continue to use it. However, depending on circumstances like the availability of qualified surgeons, the cost of the technology, and the overall healthcare infrastructure in each nation, it can affect how quickly this technology is adopted. For example, thanks to the CDD Global Group and Abreu Clinic, the Dominican Republic may incorporate an additional robot into the country, which will be available in the second half of 2023 (6).

Unfortunately, other countries, such as Chile, Argentina, and Uruguay, that have robotic surgery programs could not be contacted to obtain information from their programs for this study. For the rest of the nations including Costa Rica, Haiti, El Salvador, Bolivia, Paraguay, Guatemala, Nicaragua, and Honduras, there have been speculations, but no concrete plan has been implemented.

Discussion

The description of robotic surgical programs in this study complements the continent's efforts to expand the information available on RS. Few studies have described cases of RS interventions from several countries simultaneously, as was performed by Autorino et al, who gathered information of robotic simple prostatectomies from several centers in Europe and America, including Venezuela, Brazil, and Chile (7). Furthermore, even fewer studies have presented information regarding RS exclusively in Latin American a region with potential growth in this field. Moldes et al. gathered information through surveys, of all the robotic surgical programs from 4 countries (Brazil, Chile, Argentina, Uruguay), but center just in urology (8).

Similarly, Secin et al have focused on the description of cases from some programs within some countries. They described 10 RS programs from 6 countries (Brazil, Argentina, Uruguay, Venezuela, and Mexico). In our study, we were able to include additional information from centers in the Dominican Republic and Panama, which had not been described before (9).

Urology is the main field of application of robotic surgery since it was conceived. Today, nine out of ten urology departments use RS to varying degrees, and four university departments always perform robotic-assisted surgery as a starting point (10). Accordingly, in this study more than half of the interventions were in urology. However, in a series of 500 cases of RS interventions in a private center in Mexico in order of frequency according the specialty, the three most performed surgeries were radical prostatectomy (53.8%), followed by hysterectomy (12.8%) and inguinoplasty (6.6%) (11). Although in our study it was not specified the exact surgical intervention performed, the order of frequencies by specialties was similar but with more interventions of general surgery than gynecology.

It was also recorded the use of RS in other specialties such as thoracic surgery, little described in the region. While in our study less than 100 cases were identified, the study from Buitrago et al. reported in detail 220 cases of robotic-assisted video thoracoscopic surgery from 3 centers in Colombia (12).

Although, pediatric specialties are in the process of making and implementing robotic programs supported by the evident development in adult specialties. Nevertheless, due to the wide social, economic, and technological gap between hospitals in South America, it is hard to develop a proper pediatric RS program (8). As a sample, in this study pediatric represented only 4.4% of the total cases and all from one center. A similar situation was found by Secin et al. where only 2 of the 10 programs described interventions in pediatrics (9).

However, several studies focused specifically on this field. For example, Arellano et al. reported 147 pediatric patients that underwent robot-assisted laparoscopic and thoracoscopic surgery in Mexico (13). The setting is similar for head and neck surgery, where most of the studies published are case series (14).

Robotic technology has important implications in the field of surgical teaching and training. It allows to execution of procedures in virtual reality or simulated environments without risk or harm to patients. It also performs quantitative measurements on the learning curve, establishing objective parameters to specifically assess skills and abilities (15). In LA some studies have included the learning curves when using robotic equipment, reflecting the training effort in the region (16).

Although training in surgery depends entirely on the number of operable cases available at the time, the training time, and compromises patient safety. RS will become a new means to acquire the necessary skills to operate, thanks to the simulation of all the interventions that can be performed with the robot. Nowadays surgeons can use surgical robots to practice operations with three-dimensional virtual reality simulators, and soft tissue models that recreate the texture of human tissues through force feedback systems (touch or haptics technology refers to touch or tactile sensation) (17). In LA little has been mentioned regarding the use of this technology for training. Nonetheless, this purpose seems to be quite extensive as suggested by our sample where 7 of 10 programs were involved in postgraduate and subspecialty training formation.

Regarding the type of institutions, unlike the series of programs described by Secin et al, in this study most centers were private. Although, there is no systematic review that gathers information concerning the type of institutions with RS, most of the reports reviewed correspond to a series of private centers (11,12,18).

Program interruptions were also evaluated. Similar to Secin et al. study, where half of the institutions had their programs temporarily or definitively interrupted mainly due to the high costs of disposable

instruments, in this study the proportion was the same and the reasons also included the COVID-19 pandemic.

Only after Intuitive's (Intuitive Surgical, Sunnyvale, CA) patent ended in 2019 different brands and models of robotic platforms were released worldwide. In this scenario, RARP with HugoTM RAS System (Medtronic, Minneapolis, USA) was approved in 2021 by the Panama healthcare regulatory agency (Ministry of Health, Minsa) for clinical use in urologic procedures. This multiport platform has some modifications compared to the conventional da Vinci (Intuitive Surgical, Sunnyvale, CA) consoles. The arms are placed in separate karts for independent docking, while the console provides an open design with a 3D screen visualized by the 3D glasses used by the surgeon.

However, due to the recent release of HugoTM RAS in the market, the literature still lacks studies describing the performance of this robot in clinical settings. [19] Only 1 study was found on the use of the Hugo RAS system in cases in Latin America, specifically in Brazil where Alfano et al. report the clinical data of patients who underwent Robotic-assisted Radical Prostatectomy and concluded that safe and feasible procedures were performed with this system (20).

The utilization of robotic surgical procedures is currently prevalent across various Latin American countries; however, its implementation exhibits significant variability depending on the specific country and healthcare facilities. This variability encompasses factors such as the annual volume of surgeries, the types of institutions involved, and the primary medical specialties employing this technology. It is worth noting that there is a lack of national associations in the region responsible for systematically gathering data on robotic surgery within each country, and only a limited number of studies have sought to characterize the extent of its utilization on a national level. Consequently, concerted efforts within the region to augment scientific research output about robotic procedures are imperative. Establishing associations akin to a "Latin-American society of robotic surgery" would serve as an intriguing initial step towards spearheading these endeavors, following the example set by comparable organizations in the United States and Europe.

CONFLICTS OF INTEREST: The authors of this study do not report any conflict of interest.

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Spinal Fast track – Half dilution of intrathecal local anesthetics, a key for faster recovery after ambulatory day care surgeries – A Case Series

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Abstract

With the incorporation of enhanced recovery pathways into ambulatory day care surgeries, newer modalities for administration of subarachnoid blocks for provision of good anesthesia with rapid recovery and minimum post operative complications are emerging. In a tertiary care suburban hospital with limited resources and manpower, we describe a protocol for fast tracking recovery after subarachnoid blocks in selected cases posted for ambulatory day care laser surgeries.

Keywords: Enhanced recovery after surgery, Intrathecal local anesthetics, ambulatory anesthesia, saddle block.

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Introduction

With global acceptance of Enhanced Recovery After Surgery (ERAS) protocols resulting in improved patient turnover, reduced hospital stays, better resource utilization and improved outcomes after major surgeries, algorithms to optimize patient experience for day care ambulatory surgeries using evidence-based protocols are being evaluated(1). While day care surgeries are popular in metropolitan cities, the same cannot be said for suburban areas due to less tertiary care centers, scarcity of surgeons and dependence on freelance technicians for equipment transfer between hospitals. Since morning slots are taken up for major surgical procedures or high-risk patients, it is difficult to organize logistics, man power, pre anesthesia check-up and procure necessary investigations resulting in such cases to be taken up in late afternoon contrary to established day care surgical guidelines (2).

Saddle blocks are preferred over conventional subarachnoid blocks (SAB) for perineal surgeries due to lingering motor / sensory deficits but at the cost of patient discomfort due to positioning requiring some sedation to ease the patient. Resorting to Total Intravenous Anesthesia (TIVA) may not always be feasible, due to issues including Post operative nausea and vomiting (PONV), inadequate analgesia, dependence on opioids and requirement for monitoring in post anesthesia care units (PACU) till discharge criteria are met resulting in additional economic burden on patients (3).

Unlike other surgeries, Laser procedures cause repeated skin stimulation due to intermittent pulsed laser beams under mucosa and is always painful. Hence a single dose of opioid may not provide adequate analgesic coverage and may require deepening the plane of sedation if TIVA is used. Under neuraxial anesthesia, the perineal dermatomes are blocked preemptively and the pain due to contact heat decreases exponentially with time (and with ice application) leaving very little after effects, reducing the requirement of post operative opioids after 30-45 minutes.

We describe a series of four cases posted for laser perineal surgeries where intrathecal LA drugs were used to facilitate same day discharge. This study was approved by the institutional ethics committee and written informed consent was obtained from all the patients for the study. The manuscript adheres to applicable EQUATOR guidelines.

Case description

Case 1: An ASA I, 24-year-old male with grade III hemorrhoids was posted for laser hemorrhoidectomy. Under strict aseptic precautions, SAB was performed at L4-L5 with 2 mL 0.25% hyperbaric bupivacaine (1 ml hyperbaric 0.5% bupivacaine + 0.8 ml sterile distilled water for injection + 0.2 ml CSF aspirate on barbotage) using 27G Quincke spinal needle with bevel end directed caudally and patient in sitting position.

Case 2: A 75-year-old hypertensive and diabetic for 10 years with osteoarthritis of both knees was posted for laser hemorrhoidectomy for grade III hemorrhoids. Under strict aseptic precautions, with patient in lateral decubitus position, SAB was performed at L4-L5 with 27G Quincke spinal needle using 2 mL 0.375% hyperbaric ropivacaine (1 mL 0.75% hyperbaric ropivacaine + 0.8 mL sterile distilled water for injection + 0.2 mL CSF aspirate on barbotage) with bevel end directed caudally.

Case 3: A 65-year-old diabetic for 7 years with perineal fistula was posted for incision and drainage and laser fistulectomy. Under strict aseptic precautions, SAB was performed at L4-L5 with 2 mL 0.25 % hyperbaric levobupivacaine (1 mL 0.5% hyperbaric levobupivacaine + 0.8 mL sterile distilled water for injection + 0.2 mL CSF aspirate on barbotage) using 27G Quincke spinal needle with bevel end directed caudally.

Case 4: A 39-year-old patient without any comorbidities was posted for laser hemorrhoidectomy for grade III hemorrhoids. Under sterile precautions, SAB was performed at L4-L5 using 27G Quincke spinal needle using 1.6 mL 0.5% hyperbaric bupivacaine with bevel end directed caudally.

First three cases reported early recovery from sensory and motor block assessed by standard pin prick and modified Bromage scoring (4). None of the cases recorded any drop in systolic blood pressure < 20% of the baseline. This was anticipated as all the cases were placed in reverse Trendelenburg position at 30º for 5-10 mins before shifting to lithotomy position for surgery to prevent inadvertent cephalic spread beyond T10.

All the patients were started on intravenous paracetamol as soon as sensory regression started with 1mg/ Kg of intravenous tramadol given as rescue analgesic. No sedatives nor opioids were required intraoperatively. Table 1 compares the block characteristics between patients. With exception of the last case, there was significant return of motor function and better patient satisfaction scores (6-point questionnaire – Supplementary data file 1) within the first hour of PACU stay for first 3 cases having complete recovery within 2 hrs. Intravenous crystalloids were given at a dose of 10mL/Kg over thirty

Table 1. Comparison of sub arachnoid block characteristics between four patients.

Parameter	Half Bupivacaine	Half Levobupivacaine	Half Ropivacaine	Conventional Bupivacaine
Age of patient(yr)	24	65	75	39
Diagnosis	Gr III hemorrhoids	Peri anal fistula	Gr III hemorrhoids	Gr III hemorrhoids
Procedure	Laser hemorrhoidectomy	Laser fistulectomy	Laser hemorrhoidectomy	Laser hemorrhoidectomy
ASA class	I	III	III	I
Drug dose	5 mg	5 mg	5 mg	8 mg
Spinal needle	27 G Quincke	27 G Quincke	27 G Quincke	27 G Quincke
Position for SAB	Sitting	Lateral decubitus	Lateral Decubitus	Sitting
Time taken for sensory block to reach T 10**	5 mins	8 mins	5 mins	2 mins
Degree of motor block (Bromage)	3	3	3	4
Duration of procedure	25 mins	30 mins	35 mins	35 mins
Hemodynamic instability	No	No	No	No
Time for recovery for motor and sensory	110 mins	105 mins	95 mins	280 mins
Time for discharge from PACU**	110 mins	105 mins	95 mins	290 mins
Time for discharge from Hospital**	130 mins	130 mins	115 mins	310 mins
Post operative paracetamol administered (IV)	1gm	1gm	1gm	1gm
Post operative Tramadol administered.	0	0	0	0
Whether any post operative opioid used	No	No	No	No
Patient Satisfaction Score*	15/18	14/18	15/18	12/18
Surgeon Satisfaction	Excellent	Excellent	Excellent	Excellent

* Patient satisfaction score is calculated from subjective assessment from a 6-point questionnaire with responses graded as poor, Ok, good and excellent or numerically as 0, 1, 2 and 3 respectively.
** All time measurements are from time of administration of subarachnoid block.

minutes and then set at maintenance dose thereafter till complete recovery from block. All four patients were discharged from wards within 1 hour after shifting from PACU and reviewed after 2 weeks.

Discussion

Most laser perineal surgeries performed at our institute take less than 30 minutes and so we are developing protocols with emphasis on expeditious recovery time and cost savings. Saddle blocks, caudal anesthesia, local infiltration, and sedation techniques have all been described for such procedures with same day discharges (5). Each technique has its pros and cons (6).

However, this technique of providing half diluted intrathecal local anesthetics appear to satisfy both patient and surgeon expectations by providing a preemptive pain control with adequate sphincter and lower limb relaxation with ultrashort duration of action without major hemodynamic changes and PONV. These include surgeries for perineal regions including hemorrhoidectomies, fistulectomies and even minor genito-urinary surgeries where TIVA or nerve blocks might be unsatisfactory for providing adequate sphincter relaxation. Saddle blocks can be considered beneficial due to specific spread of hyperbaric drugs around L5, S1 and S2. But even then, the patients complain of pain or discomfort during positioning due to the lower limb sparing preventing adequate relaxation to position for lithotomy.

In our set up, only bupivacaine, levobupivacaine and ropivacaine are available for intrathecal use. All are hyperbaric medications with a predictable dermatomal spread. We don't prefer using isobaric preparations due to following:

1) These isobaric preparations have densities measured at room temperature (20-25°C) but since they are administered in the subarachnoid space at 37°C, they are likely to behave as hypobaric preparations (7).

2) Most perineal surgeries require dense blockade at L5 to S2 dermatomal levels which may be hard to achieve if there is less diffusion of drugs from L3-L4 space.

3) Most isobaric LA drugs come in 20 mL vials or ampoules which result in a wastage of significant quantity of medication adding to increased cost for the patient.

4) Several studies have shown greater hemodynamic instability with isobaric compared to hyperbaric preparations which may be an indirect consequence of temperature dependent hypobaricity described earlier (8).

Based on available evidence on the action of neuraxial LA, the duration of analgesia and relaxation is dose dependent, whereas

degree of blockade is dictated by volume as far as hyperbaric preparations are involved. This may be partly due to differing LA concentrations at various levels due to different rates of diffusion and movement of drug based on gradient in baricity. The same may not be true for isobaric drugs as they may have lesser spread to other dermatomes and hence greater drug concentrations available around the level of dural puncture. Table 2 shows block characteristics with other short acting intrathecal local anesthetic drugs from literature.

The rationale for diluting hyperbaric LA with sterile distilled water was so that the resulting solution would still be hyperbaric. This was confirmed by measurement of specific gravity by refractometer in biochemistry lab. The average value from all 8 samples was 1.019. This is still hyperbaric compared to estimated CSF specific gravity of 1.004-1.006 (9).

Using different intrathecal LA drugs allowed for a rough comparison regarding speed of recovery between different drugs. In general, 5 mg of bupivacaine and levobupivacaine and 3.75 mg of ropivacaine had similar duration of action with complete recovery within 120 mins compared to 280 mins for 8 mg of bupivacaine for the last patient. Due to reduced dosage, both duration and degree of block was reduced with patients experiencing sensory block > motor block > blockade of autonomic nervous system. This explains the absence of any major decline in systolic blood pressure in any of the cases (10).

All the cases were administered spinal anesthetic using 27G Quincke spinal needle (as pencil point Whitacre needles were unavailable via local purchase) to minimize the chances of PDPH as far as possible. Whitacre needles of same / smaller calibre would reduce the risk even further (11). Early ambulation followed by early intake of food encouraged faster discharge from wards as criteria was met earlier.

Although it is premature to draw conclusions from a few cases, a properly designed randomized controlled trial comparing different drugs, doses, and adjuvants with different subsets of surgeries will be able to provide a valid conclusion as to the duration, level of blockade, recovery time and hemodynamic changes.

Table 2 Block characteristics with other short acting intrathecal local anesthetics.

Drug	Dosage (intrathecal)	Recovery from motor block (median)	Recovery from sensory block (median)	Complications
Mepivacaine	40 mg		170	• TNS
Prilocaine	40 mg	92	100	•TNS •Urinary retention
Articaine	60 mg	135	165	
Chloroprocaine	40 mg	75	105	

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