Paediatric Day Surgery: Revisiting the University Hospital of the West Indies Experience

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ABSTRACT

Day surgery is cheaper and allows for less time delay. In developing countries with limited health budgets, these factors lead to higher patient turnover and shortened waiting lists. The decreased psychological trauma for both parents and children is significant. Paediatric day surgery (PDS) has been done at the University Hospital of the West Indies (UHWI) for over 40 years. A total of 975 paediatric general surgical (PGS) procedures were performed on 963 patients at the UHWI during the four-year period, January 2001 to December 2004. Paediatric day surgery numbered 727 (74.6%). Males outnumbered females 2:1, the age range was 2 weeks to 15 years, with an average age of 4 years. Ninety-seven (13.3%) of these patients were less than six months old, including eight neonates. One hundred and forty-five (20%) had more than one surgical procedure. Most children, 314 (43.2%) had inguinal hernia repair. Umbilical/supra-umbilical/epigastric herniorrhaphy (20.1%) was the next most frequently performed procedure, followed by circumcision (13.3%) and orchidopexy (5.9%). Ninety per cent of these patients were discharged home within 2–4 hours after surgery. Unplanned admissions were 2.1% of the cases. These were due to age, unplanned extensive surgical procedure, drug reaction and fever. There was no mortality in this study population. This review showed that the number of PDS has increased from 60% in 1984 to 75%. These procedures were performed safely with a low complication rate. Further expansion of the service is recommended.

Cirugía Pediátrica Ambulatoria: Retomando la Experiencia del Hospital Universitario de West Indies

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RESUMEN

La cirugía ambulatoria o cirugía de día es más barata, y permite su ejecución sin demora y en menos tiempo. En los países en vías de desarrollo, donde los presupuestos de salud son limitados, estos factores conducen a la atención de un número mayor de pacientes, así como a la reducción de las listas de espera. La disminución del trauma psicológico tanto para los padres como para los niños es significativa. La cirugía pediátrica ambulatoria (CPA) se ha practicado en el Hospital Universitario de West Indies (HUWI) por más de 40 años. Un total de 975 procedimientos quirúrgicos pediátricos generales (PGS) se realizaron a 963 pacientes en el HUWI por un periodo de cuatro años – de enero de 2001 a diciembre de 2004. La cirugía pediátrica ambulatoria alcanzó la cifra de 727 (74.6%). Los varones excedieron en número a las hembras 2:1, el rango de edad fue de 2 semanas a 15 años, con una edad promedio de 4 años. Noventa y siete (13.3%) de estos pacientes tenían menos de seis meses de nacidos, incluyendo ocho neonatos. Ciento cuarenta y cinco (20%) tuvo más de un procedimiento quirúrgico. La mayoría de los niños, 314 (43.2%), tuvo reparación de hernia inguinal. La herniorrafía

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umbilical/supra-umbilical/epigástrica (20.1%) fue el procedimiento más frecuentemente realizado, seguido por la circuncisión (13.3%), y la orquidopexia (5.9%). El noventa por ciento de estos pacientes fue dado de alta en un plazo de 2–4 horas después de la cirugía. Los ingresos no planificados fueron el 2.1% de los casos. Éstos se debieron a la edad, procedimientos quirúrgicos extensivos no planificados, reacción alérgica a los medicamentos, y fiebre. No hubo mortalidad en esta población bajo estudio.

INTRODUCTION

The terms day surgery, ambulatory surgery and outpatient surgery are used interchangeably to describe non-emergency surgery performed on carefully selected patients who are discharged home after recovery from anaesthesia on the same day (1–2).

The specialty of anaesthesia grew out of an outpatient office setting in the 1840s and was later adopted on a wider scale for both in-hospital and day surgery (1). One early landmark review of paediatric day surgery (PDS) is traced to Nicoll, who documented 8988 outpatient operations over a 10-year period at the Glasgow Royal hospital for Children in 1909 (3). In his report, Nicoll made the plea that outpatient surgery be increased in paediatric hospitals because children fared better at home and it would reduce them being confined to wards where they became "*noisy and malodorous*".

At least 60 per cent of paediatric operations are done as day surgery internationally (1, 4–7). This is advantageous because of lower costs, reduced psychological trauma to both parents and children and rapid patient recuperation (4–6). Paediatric day surgery has been practised at the University Hospital of the West Indies (UHWI) since 1965 (8) and represented 60% of paediatric general surgical (PGS) procedures performed in 1984 (9). Wider drug availability over the past two decades along with changing anaesthetic and surgical techniques have led to a transformation of PDS practices at the UHWI. The outline of the history as well as recent developments in PDS at the UHWI is herein presented.

Past Experience

Published reports on PDS at the UHWI date back to 1982 when Nelson outlined advantages of low morbidity, high patient turnover and negligible infection rate among 82 patients reviewed over a 17-month period (8). In 1984, hernia repairs, circumcisions and orchidopexies in that order of frequency were the predominant PDS procedures performed (9). Venugopal reported on surgery of 299 herniae and hydrocoeles in 271 children managed over a 5-year period ending in 1984. The wound infection rate was 0.7%, recurrence rate was 0.4% and overnight admission/in-patient management was 14.0% (10).

During the early period and up to the year 2000, patients were seen in the UHWI paediatric surgical outpatient clinic (PSOPC). Those assessed to be fit for surgery were scheduled after obtaining informed consent. Patients with acute illnesses were deferred and a special note was made of those who were atopic, asthmatic or had known allergies. The final pre-anaesthetic assessment was made on the morning of surgery. The PDS procedures were performed by or under the supervision of the consultant surgeon to ensure both speed and safety.

Control of post-operative pain has always been an important concern. Local anaesthetic (lignocaine) infiltration was then employed only as penile ring blocks after circumcisions. The need for more caudal and local anaesthetic blocks in herniotomies and other procedures was recognized (8, 9). Venugopal and Carpenter found that 64% of parents highlighted pain as the most significant problem post surgery with 12% reporting that home management of the child was difficult (9). Despite this, parent's satisfaction with day surgery was high with 96% stating that they would subject the same or another child to day surgery at this institution.

The cost advantages of day surgery to Jamaican parents with limited means have been recognized. In Venugopal's report, both parents were unemployed in 25% of cases while for 44% of them both parents were employed (9). The majority of those employed were white-collar workers. Although there are no objective data on present employment figures for parents of PDS patients, national employment figures would suggest a similar or worse employment situation presently.

PRESENT EXPERIENCE

Patient Profile

During the 4-year period, January 1, 2001 to December 31, 2004, a total of 975 PGS procedures were performed on 963 children at the UHWI. Paediatric day surgery numbered 727 (74.6%), males outnumbered females 2:1 and the age range was 2 weeks to 15 years with an average of 4 years. There were 171 (23.5%) children under one year old. Of these, 8 (1.1%) were neonates, 89 (12.2%) were between one and six months old and 74 (10.2%) were over six months. There were 46.2% of patients in the over one- to five-year group, 26% in the 6–10 year group and 4.3% in the 11–15 year group.

Three hundred and fourteen children (43.2%) underwent inguinal hernia repair. This occurred more commonly in males and on the right side. Umbilical/supra-umbilical/ epigastric herniorrhaphy (20.1%) was the next most frequently performed group of procedures, followed by circumcision (13.3%) and orchidopexy (5.9%). One hundred and twenty seven (17.5%) had other operations including excision/ biopsy of lump/tumour/lymph node, frenulectomy, examina-

tion under anaesthesia, cystoscopy and meatoplasty (Table 1). Twenty per cent of PDS patients had two surgical procedures.

Table 1:   Types and quantity of day surgical procedures performed

Type of surgical procedure	Number	(%)
Inguinal hernia repair	314	(43.2)
Umbilical/supra-umbilical/epigastric herniorrhaphy	146	(20.1)
Circumcision	97	(13.3)
Excision/biopsy of lumps, bumps, extra digit and lymph nodes	54	(7.4)
Orchidopexy/exploration of testis	43	(5.9)
Frenulectomy	25	(3.4)
Examination under anaesthesia	23	(3.2)
Cystoscopy	10	(1.4)
Others*	15	(2.1)
Total	**727**	
In-patient surgical procedures	248	(25.0)
Ambulatory surgical procedures	727	(75.0)
Grand total	**975**	

*Others include hydrocoelectomy and urethral meatotomy/calibration and dilatation

Most patients (90%) were discharged within 2–4 hours of their return to the ward. Unplanned overnight admissions were in 2.1% of cases. These were triggered by ventilatory concerns among infants, unplanned extensive surgical procedures, drug reaction and fever. Nausea, vomiting, pain and bleeding were not causative factors. The complication rate and unplanned admissions were less than some centres (11), similar to others (5, 6) and less than previous years (8–10). There was no mortality in this study population and wound infection was less than 1%.

Anaesthesia
Pre-operative Care
Presently, the lead-up to paediatric day surgery remains the same, except that problematic patients are now assessed in the anaesthetic clinic before the scheduled day of surgery. This clinic was opened at UHWI in 2000 and serves both adults and children. Pre-operative assessment and investigations are done only by doctors, unlike some centres where trained nurses also perform these functions (12, 13). The gross shortage of nurses at UHWI precludes them being so deployed.

Medications for co-morbid conditions are administered on the day of surgery if no adverse effect with the anaesthetic agents is anticipated.

Children are allowed milk products up to six hours and clear fluids (2–3 ml/kg) up to two hours before induction of anaesthesia, if there are no risks of regurgitation and aspiration. Babies can be breast-fed up to four hours before induction. This liberalized protocol has been adopted from the American Society of Anaesthesiology and the Canadian

Table 2:   Factors determining patient selection for day anaesthesia and surgery in children

Anaesthetic factors
    Low likelihood of difficulty or complication/s related to airway management
    Invasive monitoring not needed

Surgical factors
    Predictable < 1 hour duration* < 4 hours**
    Low likelihood of serious surgical complication/s
    Negligible blood loss
    Easily controlled post-operative pain

Patient factors
    ASA I, II, medically stable ASA III
    Lower age limit of 6 months*
    At least 6 months old if general anaesthesia is to be administered in a freestanding facility**
    One month old if born at term**
    A post-conception age of 60 weeks for prematurely born infants (< 37 weeks gestation)*
    Pre-operative nil per os (NPO) – 4 hours for solids and breast milk and 2 hours for clear fluid
    No risk factors for aspiration
    Those with congenital heart disease who are discharged from regular follow-up or had a satisfactory evaluation report within one year
    Those with Down's Syndrome (Trisomy 21) who are older than one year and have no active cardiac disease or cervical spine instability
    Those with seizure disorders who are well controlled
    Those with cerebral palsy, myopathy and metabolic disorders who are stable. (These can undergo ambulatory surgery in hospital facility but not the freestanding facilities because of the risk of overnight admission)**
    Those with a ventriculo-peritoneal shunt, who have the approval of their attending neurosurgeon
    Those with stable oncological disease for procedures such as lumbar punctures and bone marrow aspiration**

ASA – American Society of Anesthesiologists, * United Kingdom (UK) standard (31)
** State of Pennsylvania standard (4)

Anaesthetists Society (14, 15) since 1999. The advantages of this change at the UHWI have been documented (16). These include reduced anxiety, thirst, hunger and increased patient cooperation at induction. Patients who must remain *nil per os* (NPO) are scheduled first on the surgical list, and if not practical to do so, receive intravenous fluid.

Midazolam as a syrup or tablet (0.5–1.0 mg/kg) has been the premedicant agent of choice for the past decade because of its anxiolytic and sedative properties. Administration is usually 30–60 minutes before induction of anaesthesia. It has been proven to be particularly helpful in the overly anxious child. Trimeprazine tartrate (Vallergan®) is no longer used because of its slow onset and prolonged duration of action (17). It was found in patients at UHWI to cause prolonged postoperative drowsiness which sometimes caused delayed hospital discharge. The practice of administering intramuscular injections of atropine and opioid which was routine in the 1980s (8) has been discontinued. That

practice caused unnecessary trauma, irritability and anxiety prior to induction when patient's cooperation was most required. The risk of postoperative hypersalivation (due to the omission of atropine) is perhaps overstated. We have had no negative sequelae due to hypersalivation.

Intra-operative Care

Parental presence in the operating theatre during induction of anaesthesia is not practised at the UHWI but centres allowing this have reported a calming effect and reduced separation anxiety for both children and parents (18–20).

Dillon and others have documented that the most significant variable that determines the time that is required to discharge a patient from the recovery room is the anaesthetic technique (1, 4–6, 11, 21). They found that monitored anaesthesia care, local anaesthesia and peripheral nerve blocks were associated with decreased postoperative nausea and vomiting (PONV) allowing earlier discharge of patients from hospital within four to six hours of discharge from the recovery room. These techniques are also employed at the UHWI with similar discharge times in most cases and even shorter times in a few cases.

Inhalational anaesthetic induction is generally employed and sevoflurane is used increasingly because of its safety and rapid predictable induction (4, 22, 23). Halothane, now considered obsolete, is still used by us because of its acceptable safety profile in children (24) and especially because halothane hepatitis has not been observed. Furthermore, its affordability assures its greater availability in developing countries. Desflurane, another quick induction anaesthetic agent, which provides fast emergence (1, 4) is not used at the UHWI because of its high cost. Intravenous (IV) anaesthetic agents such as thiopentone, propofol and ketamine are only used in patients who had an IV cannula placed pre-operatively.

The administration of an opioid (pethidine, morphine or fentanyl) is usually restricted to the intra- and immediate postoperative period and is administered as intermittent boluses. Opioids are utilized to control intra-operative pain which sometimes manifests itself as unexplained tachycardia. Care is taken, especially in neonates, to prevent respiratory depression.

The short and intermediate acting muscle relaxants (atracurium, cis-atracurium and rocuronium) have made muscle paralysis for day surgery safer and less problematic, especially with regards to the resumption of spontaneous respiration at the end of surgery. Good judgement is always necessary in determining which infants to paralyse and ventilate for short procedures. The best practice in situations of doubt is to secure the airway by tracheal intubation particularly in neonates and small infants whose airway control may become difficult during surgery. In most children, the inhalational agents provide adequate muscle relaxation, thus making the use of a muscle relaxant unnecessary. The use of the laryngeal mask airway (LMA)

has been employed in smaller children (25–27). This device provides more reliable airway control than an oropharyngeal airway, can be placed without the need to paralyse the patient and is very useful in patients with difficult airways. It frees the anaesthetist's hands to facilitate other care to the patient. It is not without problems as clinically unrecognized mal-positioning of the classic LMA increases the risk of gastric insufflation especially with positive pressure ventilation (28). The ProSeal LMA is associated with less gastric air entry because of its modified cuff and the oesophageal drain tube which enables gastric suctioning. These features potentially reduce the risk of pulmonary aspiration and postoperative nausea and vomiting (PONV) (29, 30).

Pain management

Multi-modal pharmacologic therapy is routinely employed for pain relief. This includes Diclofenac (Voltaren® or Cataflam®), acetaminophen (paracetamol) and opioids in varying combinations. The advantages are effective pain relief (due to synergism) and decreased side effects, especially opioid-induced respiratory depression and NSAID-induced gastritis (17). Rectal paracetamol and diclofenac, though administered after induction, have maximal effect in the immediate and intermediate postoperative period when the child is too drowsy to take oral medication. Loading doses of 40–60 mg/kg rectally for paracetamol and 2 mg/kg (rectally or intramuscularly) for diclofenac have been found to be effective in our patient population. The availability of diclofenac, paracetamol and other analgesic agents as drops has made paediatric analgesic administration much easier and effective (31–33).

Wound infiltration and regional or peripheral nerve blockade (eg caudal and penile nerve blocks) are performed as appropriate and have resulted in reduced analgesic requirements postoperatively. There are controversies concerning the appropriate timing of wound infiltration. In some studies, pre-incision wound infiltration was found to reduce the need for postoperative analgesia more than post-incision (34). Other studies showed the converse (35, 36). Post-incision infiltration with lignocaine, bupivacaine or ropivacaine is the chosen option at the UHWI with good clinical effect.

Ketamine gives good analgesia in sub-anaesthetic doses, and is also used to provide sedation in children undergoing painful procedures eg dressing change, insertion of a porta-catheter and invasive radiological studies. Atropine is sometimes administered to reduce the ketamine-induced salivation, and midazolam to reduce the emergence dysphoria and agitation (17, 35).

Discharge Criteria

Readiness for discharge at the UHWI is usually an assessment made by trained nursing staff guided by an established protocol similar to that of other centres (4, 6). Tolerance of two portions of oral fluids 30 minutes apart and absence of pain are prerequisites for discharge. PONV be-

fore or after drinking are the main reasons for delays in patient discharge at UHWI as at other institutions (1, 4, 7, 11, 21, 38–40). The delay in patient discharge at UHWI is usually of the order of 60–120 minutes. Early discharge for patients with PONV and drowsiness is often authorized provided that parental supervision is reliable. These parents are instructed that the child should return to the ward if this state persists beyond six hours. Studies have shown that there is a higher incidence of PONV and delayed discharge if drinking is mandatory than if it is voluntary (38, 41). Kearney *et al* showed a reduction in PONV from 73% to 36% in patients who got opioids if drinking was not mandatory (42). This approach should be considered at the UHWI. Also, dexamethasone has been shown to decrease the incidence of PONV as well as analgesic requirements for patients undergoing tonsillectomy (43–46). This may be useful for PDS patients. Home-care teams are utilized in some centres to assist with pain management and other postoperative problems as well as support for caregivers (47, 48). This has not yet been instituted in Jamaica.

Conclusion

Paediatric day surgery is practised safely and cost effectively at the UHWI. Unplanned overnight admissions are low possibly because of effective pain control and improved measures against nausea and vomiting. This service, now forty-two years old should be further expanded possibly incorporating greater parent participation during induction and increased nursing involvement in the pre-operative assessment of patients.

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