

## Ambulatory paediatric surgery

### The development of a day-care surgical centre

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Ambulatory surgery has become an important component in the provision of surgical care. In 1987 a day-case surgical unit was established at Red Cross War Memorial Children's Hospital, Cape Town. Experience over a 6-year period (1987 - 1992) is reviewed in relation to the nature and total number of surgical procedures, pre-operative preparation, daily utilisation of the facility, postoperative care and complications.

During this period 16 538 patients (mean age 3 years) were operated on in the unit. Nine surgical disciplines participated. Pre-operative assessment and preparation reduced the rate of cancellations on the day of surgery to less than 6%, with a 90% effective use of scheduled operating time. Scarce nursing resources were also maximally utilised.

Most procedures took less than 30 minutes and only 0,8% exceeded 1 hour. The average ward stay was 6 hours. No major complications were encountered and acceptance by patients and parents was excellent. Only 16 children who were not scheduled to do so needed to stay in hospital overnight. Recommendations to establish and improve day-stay surgical services are presented. It is concluded that a practical, efficient service can be established and that the authorities should be encouraged to expand appropriate facilities.

*S Afr Med J* 1994; 84: 829-833.

Ambulatory or day-stay surgery has become well established in the private medicine sector in this country because of its economic advantages. A flexible management structure in private hospitals and clinics, good facilities for communication between patients and their doctors and

clinics, and ease of access to transport enable this system to function well.

In the public sector, served in general by state and provincial hospitals and clinics, ambulatory surgery has been slow to develop. Rigid management structures, poor communication facilities and lack of transport all present obstacles to its successful implementation. However, with careful planning and patient selection these can be overcome.

This article presents our experience at Red Cross War Memorial Children's Hospital, Cape Town, since an ambulatory surgical unit was established in 1987. Paediatric ambulatory surgery embraces the cardinal principles of elective admission, treatment and discharge of a patient during the course of a working day. Minor operative procedures conducted in outpatient or accident and emergency departments are excluded.

Ambulatory surgery has become an important component in the provision of surgical care to the community. At least 50% of all elective surgical procedures can be managed in this way.<sup>1</sup> Nicoll's<sup>2</sup> report in 1909 showed that even in the relatively unsophisticated circumstances prevailing in Glasgow at the turn of the century, operations such as herniotomy, mastoidectomy, excision of neck glands, pyloric stenosis and various orthopaedic procedures could be performed successfully on an outpatient basis; nearly half these children were under the age of 3 years. Models of such a system have been developed and transferred in various forms to the less developed countries, but this is rarely commented upon and has by no means been universally adopted.<sup>3-8</sup>

Although day-stay surgery was introduced at Red Cross Children's Hospital in 1956, it was not until 1987 that a separate, fully staffed and well-equipped unit was established.

## Material and methods

We have reviewed our experience and have endeavoured to establish quality standards for paediatric day-stay surgery in the light of the social environment and surgical milieu in which diseases occur in the western Cape region. These are measured against the published guidelines for effective and safe day-stay surgery and reports on its economic advantages, minimal complications and high patient and parent acceptability.<sup>1,3-10</sup>

The unit consists of a 9-bed ward, supervised by 4 paediatric surgeons; it is staffed by a medical officer, 2 professional nurses and 5 auxiliary nurses. It has 2 fully equipped operating theatres, each staffed by a professional nurse and 5 auxiliary nurses. Each bed-space area (9,5 m<sup>2</sup> per patient) is equipped with suction facilities and resuscitation equipment. The ward is designed as a relaxed, child-orientated facility with an abundance of toys, and the children are allowed to play without restriction. Operations are performed 5 days a week from 08h00 to 17h00. The ward functions for 24 hours a day 6 days a week. All disciplines of paediatric surgery apart from neuro- and cardiac surgery utilise the facilities (Table I).

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**Table I. Procedures performed in the paediatric day surgery unit**

General surgery:	Inguinal herniotomy, orchidopexy, circumcision, EUA, endoscopy, abscesses
Otorhinolaryngology:	Insertion of grommets, tonsillectomy, myringotomy, EUA, tympanoplasty, polypectomy
Ophthalmology:	Squint repair, probing and syringing nasolacrimal duct, removal corneal sutures, foreign bodies, EUA
Plastic surgery:	Removal extra digits and skin appendages, release of tongue tie, minor scar revisions
Urology:	Circumcision, cystoscopy, meatotomy
Dental surgery:	Extraction/filling of teeth under general anaesthetic in children with medical problems, e.g. cerebral palsy
Thoracic surgery:	Bronchoscopy
Gynaecology:	EUA
Dermatology:	Skin biopsies

EUA = examination under anaesthesia.

### Patient selection

Selection of patients for ambulatory surgery is based on accepted guidelines, although almost any procedure not involving the cranium, thorax and abdomen is to be considered<sup>1,7,11</sup> (Table I). Most patients come from the greater metropolitan area of Cape Town. All are over 6 months of age (except children requiring abscess drainage, which is done from the age of 1 month) and classified as American Society of Anesthesiology (ASA) status I or II (status I — healthy children with a localised disorder and no systemic disturbance; status II — children with a minor systemic illness not interfering with normal activity or a well-controlled medical condition). Exclusion criteria for day-stay surgery are listed in Table II. Anaesthetic requirements are less stringent for surgery performed under local anaesthesia. Consent is obtained from a parent or a legal guardian before or on the day of the operation.

**Table II. Exclusion criteria for day-case surgery**

Health status ASA III, IV, E*
Age less than 6 months
Anticipated anaesthetic problems
Asthmatics
Bleeding disorders
Cardiac disease
Medications that could interfere with surgery and anaesthesia
Inadequate home care
Inadequate transport
Complicated or repeat surgical procedures

\*ASA physical status classification: I — normal healthy patient; II — patient with a mild systemic disease; III — patient with a severe systemic disease; IV — patient with a severe systemic disease which is life-threatening; V — patient who is not expected to survive for longer than 24 hours; E — emergency.

Patients scheduled for day-stay surgery are interviewed and examined by the surgeon or advanced paediatric clinical nurse (APCN) pre-operatively. Minor ailments, skin sepsis, intercurrent infections, anaemia and heart murmurs are investigated and treated and surgery is rescheduled as indicated. Children with 'runny noses' require particular consideration and general guidelines are followed. Upper respiratory tract infections during the past month are specifically enquired about. If there is any doubt regarding resolution of an infection a chest radiograph is taken, and if it shows any abnormality the operation is postponed.<sup>12</sup>

Parents are provided with verbal and written instructions (Table III). When necessary, interpreters are used to convey essential information.

**Table III. Pre-operative information**

OPERATION: ..... DATE..... TIME.....

1. Please be in . . . Ward/Clinic at \*7.00 a.m./\*9.30 a.m.
2. If you cannot bring your child, please telephone to make a new appointment.
3. If your child has a cold, sores or 'pimples', please do not come for the operation. Take the child to a doctor for treatment, and telephone for a new appointment for the operation.
4. Your child must be bathed and his/her hair washed the evening before admission.
5. Your child must not have anything to eat or drink after \*midnight/\*7.00 a.m. N.B. It is very dangerous to give an anaesthetic if a child eats and drinks after the time stated.
6. Either father or mother must come to give written consent for the operation and to give details of your child's health. (Delete if consent and medical history taken at booking.)
7. It will not be possible to prepare your child in time for the operation if you come late, and the operation will have to be cancelled.
8. \* Your child will go home on the day of the operation.  
\* Your child will go home the day after the operation.  
\* Your child will be admitted the day before the operation and discharged the day after. He may eat normally on the day of admission.
9. Please be prepared to spend several hours at the hospital.
10. If your child takes regular medicines for asthma or epilepsy (or any other illness), please give them before 7.00 a.m. on the morning of admission, even if you are asked not to give anything after midnight.
11. Bring all your child's medicines with you when you come to the hospital as well as your child's card.
12. Please do not give your child medicines containing aspirin for 2 weeks before surgery. Paracetamol (e.g. Panado) may be used.
13. Please dress your child in loose-fitting clothes, e.g. a track-suit.

\* Delete what does not apply.

### Pre- and intra-operative period

On the day of surgery children are admitted and re-examined about an hour before the scheduled procedure. Parents are encouraged to stay with their children until premedication has taken effect. Some older children require preparation for theatre with a teddy bear model. Routine admission procedures are performed and advice regarding postoperative expectations and requirements is restated. The presence of a parent during induction of anaesthesia is encouraged, but is not always possible.<sup>13</sup> Premedication with midazolam is used in most cases (0,5 - 0,7 mg/kg orally, given 30 minutes before the operation).<sup>14</sup> Children who are to stay overnight, e.g. those having adenotonsillectomies, are usually given trimeprazine (3 mg/kg) and droperidol (0,2 mg/kg) orally. Specific anaesthetic techniques are used to promote rapid recovery and minimise postoperative complications.<sup>11,14-16</sup> Face or laryngeal masks are preferred to endotracheal intubation, which is reserved for oral and upper airway surgery.

Complementary local anaesthesia with bupivacaine (2 mg/kg) is achieved by regional nerve block, wound irrigation or wound infiltration. Caudal anaesthesia is not routinely used. Operations are performed by an experienced surgeon or a surgical trainee under supervision, using established surgical principles. Wounds are closed with subcuticular sutures and covered with transparent, easily removable dressings.

## Postoperative care

Postoperatively children spend a brief period in the recovery room, where they are observed for evidence of respiratory complications, bleeding, excessive drowsiness or vomiting. They are then transferred to the general ward where parents are in attendance until discharge. Children are considered ready for discharge when they are awake with normal vital signs, have tolerated fluids by mouth, are ambulant consistent with developmental/age level and have voided. Patients are not given intravenous fluid and the aim is for all patients to have left the ward by 17h00 (patients undergoing adenoidectomy and tonsillectomy are electively observed overnight). All children, irrespective of age, are required to have an escort home. An information brochure detailing postoperative care is explained to the parents before discharge (Table IV).

**Table IV. Postoperative instructions**

Diet:	Give your child small, light meals for the next 24 hours. Build up slowly to a normal diet.
Vomiting:	If your child starts vomiting, stop feeding him. Give small sips of water for 2 - 3 hours. After that, continue as above.
Wound (operation):	The wound will be painful for 2 to 3 days.
Pain:	Give your child Panado . . . ml every 6 hours, or Brufen . . . ml/tablets if needed.
Swelling:	There will be a little swelling around the wound for 2 - 3 days.
Redness / blood:	There will be a little redness and dried blood around the wound.
Stitches:	The stitches do not need to be taken out. They will be absorbed.
Dressings:	Your child has a small, paper-like dressing over the wound. After 2 days, your child may bath normally. The dressing will loosen after a few days. (Do not apply talcum powder.)
Stiffness:	Your child will feel a little stiffness around the wound for 3 - 4 weeks.
Activity:	Your child may move around as much as he wants, but should not run, jump or ride a bicycle for at least 2 weeks. He may go back to school after 1 week, but no rough play in the playground.

**When to go to doctor:**

- Pain which is not relieved by Panado.
- Fever over 38°C.
- Bleeding from the wound.
- Increased redness or swelling around the wound.
- Any pus or unpleasant smell from the wound.
- Vomiting which does not settle.
- If your child will not drink.

Telephone: . . .

Please telephone if you need more information, or are worried.

Postoperative analgesia commences as soon as the child is awake and able to swallow. Diclophenac sodium 2 - 3 mg/kg orally or rectally in 2 - 3 divided doses is commenced immediately on return to the ward; it is not given pre-operatively or to asthmatics. Paracetamol 10 mg/kg 6-hourly or ibuprofen 20 mg/kg/d (3 divided doses) is prescribed for 3 days. Local anaesthetic jelly (2% lignocaine) is prescribed for circumcised children. A telephone number is provided for immediate contact, should advice be needed. Follow-up by the family doctor or a community day clinic is preferred to hospital follow-up in most cases.

Provision for overnight stay is made if there has been difficulty with the anaesthetic, if surgery has been more extensive than anticipated, if pain or vomiting is severe, or if urine has not been voided. Metoclopramide (0,1 mg/kg/d) is prescribed for persistent vomiting.

## Management, audit and quality control

The aims and policies of the unit have been reviewed and revised regularly to accommodate changes in practice. An annual report facilitates audit and quality control. The day-to-day running of the unit is supervised by the APCN, who also collates information and monitors efficacy.

One hundred parents were interviewed with a structured questionnaire to evaluate their perception of day-stay surgery, and a further sample of 37 were subsequently contacted to ascertain whether any problems had been experienced after returning home.

## Results

During the 6-year period 1987 - 1992, 15 473 surgical procedures were performed (average 2 756 per year) (Table V).

**Table V. Procedures performed in the day surgery unit, 1987 - 1992 (N = 15 473)**

	1987	1988	1989	1990	1991	1992
Ophthalmology	210	240	221	200	294	296
Dental	115	129	168	129	91	80
Gynaecology	12	25	15	5	6	2
Plastic/hands	318	340	309	192	281	271
General/urology/ thoracic	343	437	477	423	498	478
Otorhinolaryngology	591	638	425	361	502	636
Abscesses	775	916	1 032	969	1 016	1 007
Total	2 364	2 725	2 647	2 279	2 688	2 770

The mean age of the patients was 3 years (range 1 month - 13 years), with 57,8% under 5 years of age. Boys predominated. The range of surgical disciplines and the number of operations each year are depicted in Table V. Most procedures took less than 30 minutes and only 0,8% exceeded 60 minutes (Fig. 1). Excluding ENT patients, the average ward stay was 6 hours (range 2 - 13 hours).

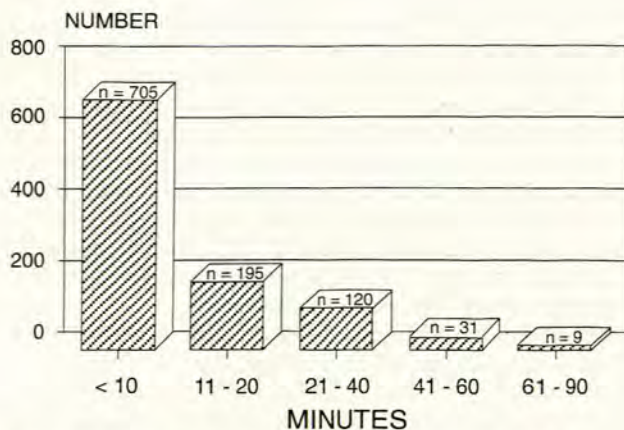


Fig. 1. Relationship between operating time and number of patients over a 5-month period (August - December 1991).

When the waiting list was over 4 months, the introduction of a pre-anaesthetic clinic, although necessitating an extra visit to the hospital, markedly reduced the incidence of cancellation on the day of surgery (from 50% to 6%). This resulted in 90% effective use of scheduled operating time. Cancellations were predominantly because of intercurrent infections, recent intake by mouth and failure to arrive in time; occasionally there had been an incorrect diagnosis by the referring doctor. A high incidence (30%) of cancellations was noted among patients who had been on the waiting list for longer than 6 weeks. During the period of review the hospital waiting list for general surgical patients was reduced from 6 - 9 months to less than 6 weeks. Once the waiting time was reduced the need for a pre-anaesthetic clinic visit fell away.

No major complications were encountered. Only 16 children were hospitalised because of severe pain (6), excessive vomiting (8) or postoperative bleeding (2). None required intravenous fluid.

Acceptance of the service by patients and parents was excellent. Of the 100 consecutive parents who responded to a questionnaire on their perception of day-stay surgery, 83 were satisfied with the concept and facilities, 74 had understood in principle the surgical procedure being performed on their child, and 67 stated that adequate opportunity had been given to them during the pre-operative period to discuss the procedure. All parents interviewed stated that they would utilise the same facility if further surgery was necessary. Postoperative analgesia was regarded as effective by all parents interviewed and no additional measures had been taken. Within this cohort of patients, no abnormal postoperative behaviour patterns were recorded by the parents.<sup>17</sup>

## Discussion

Many paediatric priorities in the developing world are markedly different from those of more developed regions. Developing countries are characterised by high population growth rates, adverse socio-economic circumstances and significant differences in the health status and disease patterns among the children of these regions. Rapid urbanisation and the need for basic housing, education and primary health care have seriously strained human and material resources and increasingly threaten their allocation

into areas of health delivery and practice. Rational decisions, particularly those concerning resource allocation and optimal utilisation of available facilities, must therefore be made. One such decision is to establish and expand ambulatory surgical facilities. Our experience supports the viewpoint, despite unique problems, that a safe and cost-effective ambulatory surgical unit can be established in a developing region as measured against accepted standards.<sup>1,3-7,9,10</sup> Current events within the health care delivery systems in America, Canada, Australia and England support the implementation of safe and cost-effective consumer-orientated programmes.<sup>5,10,17-19</sup>

Transport to and from hospital remains a major problem, since only about 10% of families have their own transport. Parents often have to make several changes at stations and bus stops before reaching their destination. Additional considerations are low socio-economic status and its associated disease patterns such as malnutrition, iron deficiency anaemia, tuberculosis, worm infestation and other childhood illness, necessitating treatment and postponement of surgery. In particular, children who have had an upper respiratory infection, tuberculosis, measles or hepatitis A require a long period of recovery before elective surgery can be performed.<sup>5,11</sup>

Because of these problems, which initially were collectively responsible for an up to 57% loss of operating time and hence a progressive accumulation of patients with a 6 - 9-month waiting list, a pre-surgical booking or assessment clinic was established. This reduced cancellations to less than 6%. It also enabled us to treat intercurrent infections and anaemia.<sup>11</sup> An unexpected benefit of the pre-assessment clinic was early cancellation of the operation in the case of a wrong diagnosis. Parents were also questioned about immunisations, which were given when necessary. Parents who can be contacted by telephone receive an additional reminder and instructions 24 - 48 hours before surgery.

Effective communication with parents was hampered by language barriers at times, although this was easily resolved by the use of interpreters and information brochures in the appropriate language. Illiteracy was not found to impede understanding of pre- and postoperative care, although careful and appropriate explanation of all procedures was required.<sup>5</sup>

The scope of surgical procedures performed encompassed nine major surgical disciplines and was determined by the physical health of the child, the surgical procedure *per se* and the adequacy of home care. The absence of major complications and the small number of children other than those undergoing ENT surgery who needed overnight observation endorse our choice of procedures. Procedures requiring endoscopy require overnight admission in most cases, but children who have had bronchoscopy do not stay overnight. The surgical needs of children with a physical handicap should preferably be met through mainstream services.

No major anaesthetic complications were encountered with the use of midazolam premedication, inhalational anaesthesia (without intubation), regional anaesthesia where indicated and oral postoperative analgesia. Diclofenac sodium proved to be a very effective analgesic agent with no short-term side-effects. Parents interviewed were virtually unanimous in their acceptance of the procedure. Ongoing practice audit highlighted deficiencies such as

uncomfortable chairs and limited reading matter for the parents, a limited range of toys for the children and the siting of pre- and postoperative children in the same geographical area. These shortcomings have since been rectified.

Day-stay surgery has other major advantages. The integration of the hospital service with the community improves awareness of other aspects of health care and at the same time has resulted in an estimated annual cost saving of nearly R1,8 million. Total hospital expenditure per day-case patient treated was reduced from R1 025 to R325. This does not take into account the monetary value of resources that might be released from changing from inpatient to day surgery, or the additional costs which may be incurred by day-stay patients and their families. Furthermore, of great benefit to our hospital, with bed occupancy of 150%, has been the relief of pressure on the chronic shortage of beds, now more readily available for secondary and tertiary health care.<sup>5</sup> Transferred costs from hospital-based ambulatory day care surgery to the community may be significant and community-based services may have to deal with an increased workload.<sup>20</sup> This area was not evaluated. Hospital stay, absence from school and disruption of family life in general were reduced.

The effective utilisation of an already overburdened resource such as nursing staff is vital for the future of health systems in developing countries. With 2 professional nurses in the ward and 1 in each theatre, the ambulatory surgical unit attended to 25% of the surgical workload of our hospital, making it the most cost-effective unit in the hospital. It is our contention that the unit should have a dedicated nursing staff with flexibility to enable use of part-time staff and interchange of nursing activities between the ward, theatre and recovery area.<sup>21</sup> It must be remembered that the scope of practice of auxiliary nurses is limited and that they may only work under the close supervision of professional nurses.<sup>22</sup>

ENT surgery in the context of ambulatory surgery requires special consideration. Some operations, such as adenoidectomy and adenotonsillectomy, have the potential for reactionary haemorrhage into the upper aerodigestive tract with potential life-threatening consequences. Reactionary haemorrhage usually occurs within 4 - 6 hours but can occur up to 12 - 24 hours after surgery. Economic pressures in some countries are dictating early discharge even after such procedures. Surgery should then be undertaken in the morning with discharge late in the afternoon and instructions to parents to observe the child for signs of haemorrhage at regular intervals through the night and to return to the hospital if haemorrhage occurs. Where ENT medical staff are involved in busy outpatient clinics in the morning, ENT surgery is undertaken in the afternoon. It has therefore been necessary to extend the concept of ambulatory surgery to include an overnight observation period, requiring that the unit be staffed overnight on these days. Children who have had surgical procedures with a potential for postoperative haemorrhage are observed until the following morning before being discharged.

With the experience gained over 6 years and with our unique circumstances the following conclusions can be drawn, with the basic premise the provision of safe surgery for children: (i) the ambulatory unit has been established as a practical, efficient, cost-effective surgical service; (ii) it is ideal to have a self-contained ambulatory surgical unit with

its own admission suite, ward, theatre, recovery area, nursing and administration staff — less desirable is a day-stay ward with patients still being accommodated on main operating theatre lists (general ward facilities are not recommended); (iii) hospital waiting lists can be reduced significantly; (iv) ambulatory surgery substitutes for, and is additional to, current surgical practice; (v) the presence of parents is complementary and essential; (vi) pre- and postoperative children should preferably be separated from each other, because the uncontrollable postoperative awakening of a small child can be distressing to parents and children awaiting surgery; (vii) there may be hidden problems due to cultural differences and language barriers; and (viii) we believe it is the responsibility of health authorities to establish and to expand adequate facilities for ambulatory surgery.

To establish a safe and effective day surgical unit for children, the following are basic recommendations: (i) the unit should be dedicated, well accommodated, well equipped and well organised; (ii) skilled surgical, anaesthetic and nursing services should be provided and be appropriate for paediatrics; (iii) patient selection is crucial, with careful evaluation of the medical status and home circumstances; (iv) theatres should comply with all standard requirements for safe anaesthesia, resuscitation and recovery — ideally they should be close to the main theatre suite to economise further on staff; (v) overnight admission facilities should be available; (vi) parents should be encouraged to participate in pre- and postoperative care; and (vii) adequate home care or community-based facilities should be available to care for the children postoperatively.

We express our appreciation to Ms R. Albertyn for her survey, to Mrs Y. F. Toerien for her assistance in compiling the statistics, and to the nursing staff of the unit.

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Accepted 7 June 1993.