Day surgery for children

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Abstract
Children requiring minor operations are increasingly managed in the ambulatory environment. This has the potential to provide high-quality care with minimal disruption to family life.

This article summarizes the inclusion criteria for paediatric day-case surgery that, in general, include minor operations on children of ASA (American Society of Anesthesiology) score 1–2 of more than 60 weeks post-menstrual age. Discharge criteria are also listed.

The emphasis on safe discharge includes the treatment and prevention of postoperative nausea/vomiting and pain as well as the avoidance of prolonged sedation or motor block.

Keywords Ambulatory surgery; day-case surgery; neonatal anaesthesia; paediatric anaesthesia; paediatric pain management

Introduction
Day-case surgery continues to increase in scope and frequency. In particular, the NHS plan has set a target of 75% of elective surgery to be performed as day cases and the European Charter of Children’s Rights states ‘Children should be admitted to hospital only if the care they require cannot be equally well provided at home or on a day basis’.

Children have been considered well suited to day-case management because they usually carry little comorbidity and are often having relatively minor procedures. Today, ever younger children, with increasingly complex medical problems, requiring an ever expanding repertoire of procedures are managed in the ambulatory setting.

Organization
Safe conduct of day-case surgery and anaesthesia is an organizational challenge that requires the coordinated efforts of a multi-disciplinary team. Thornes’s report remains the blueprint for developing services. The Children’s Surgical Forum 2007 report also considers the safeguards that should be in place for the safe conduct of day-case anaesthesia (Box 1).

Families should be provided with dedicated, age-appropriate facilities. Good preoperative information and orientation may significantly reduce anxiety for a child. Specialist paediatric nurses and play specialists are crucial to good-quality day-care management.

In specialist hospitals, to which patients may have to travel long distances, day-case management can be facilitated by the use of patient hotels. This allows children to be close to the hospital, but avoids using inpatient beds and resources.

Advantages and disadvantages of day-case care
Day-case management minimizes disruption to family routines and children’s education. Avoidance of inpatient stay may reduce patient anxiety and postoperative behavioural problems and reduces exposure to hospital-acquired infection.

Economic benefits are a major driving force behind expanded practice, but the focus must remain on patient safety and good-quality care.

The major disadvantage is the difficulty of responding adequately to symptoms of pain, nausea and other problems that

Learning objectives
After reading this article, you should:
- be aware of the inclusion and exclusion criteria for paediatric day cases
- have strategies for minimizing postoperative nausea and vomiting
- have strategies for minimizing postoperative pain, sedation and motor block.

Safeguards for day-case surgery
- Consultant surgeon responsible for care — though experienced trainee or career grade may be responsible for the conduct of day-case surgery
- An experienced paediatric trained consultant anaesthetist must be present
- Parents and carers should receive clear instructions on follow-up and written information on arrangement to deal with any postoperative emergency (including out-of-hours telephone numbers)
- Day-case sessions must be staffed by a children’s nurse
- Units must develop and implement a pain management policy that includes advice on pain assessment and management at home and the provision of ‘take-home’ analgesia.
- Play specialists should be available and the environment should be child and family friendly
- The pattern of day-case activity should be audited and regularly reviewed
- There is prior arrangement with a nearby hospital where critical care facilities are available for the transfer of patients should complications arise

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may become evident only after discharge. The responsibility is
passed to parents/carers who may not have the knowledge and
recourses to manage these issues. Good written and verbal
information and 24-hour support (such as a telephone contact)
are required to assist carers after discharge.

Inclusions and exclusions

An increasing number of children are managed as day cases for
surgical procedures and investigations. The inclusion criteria
(Box 2) are broad and importantly allow for clinical judgement to
be employed on a case by case basis. It is important to remember
that the practical issues for parents and families must be
considered as well as the clinical ones. Transport to and from
hospital, the ability to communicate with hospital when at home
and facilities at home must be taken into account.

A special case in paediatric practice is the neonate and the ex-
premature infant. They are at risk for apnoea in the first
24 hours postoperatively and this appears independent of the
method of anaesthesia employed (regional versus general).
Neonates <50 weeks post-menstrual age (time elapsed since date
of mother’s last menstrual period to birth added to post-
conceptional age) are at high risk and not suitable as day
cases. Those between 50 and 60 weeks post-menstrual age can be
considered, and an example of a decision algorithm is shown in
Figure 1. Those born extremely premature (<30 weeks post-
menstrual age) are also treated cautiously compared with those
born at later gestation. Surgery should be done early in the day,
and senior anaesthetic and surgical personnel involved
throughout. If apnoea occurs at any time during recovery,
admission must be arranged.

Inclusion criteria for day-case management

Non-clinical
- Parent/carer agrees to day-care surgery
- Parent/carer can stay with child on journey to and from
  hospital, and throughout admission
- Parent/carer is able to follow preoperative instructions and can
  care for the child at home (with the support of community
  services as appropriate)
- Parent/carer can contact the hospital from home (mobile/
  landline)

Clinical
- Post-menstrual age > 60 weeks (50–60 weeks considered on
  an individual basis — see Figure 1)
- Elective surgery or investigation
- Surgery not associated with excessive blood loss or fluid shifts
- Surgery not associated with excessive postoperative pain
- The child is
  (i) healthy
  or (ii) has mild systemic disease
  or (iii) has severe systemic disease but is stable
- Preoperative assessment is completed (may be by telephone)
- Body mass index < 35 kg/m²

Box 2

Management of ex-premature infants between 50 and 60 weeks post-menstrual age (PMA) following minor surgery

Is this patient an ex-premature infant of between 50 and 60
weeks PMA?

Yes

Does the patient have any of the following: anaemia, a
history of ongoing apnoeas, or neurological disease?

Yes

Not suitable for
day-case care

No

Are the senior anaesthetist
and senior surgeon
responsible for this patient
happy to consider day-case
care?

Yes

Discharge later on same day as surgery if:

- Senior anaesthetist has seen patient after
  surgery e.g. in recovery and agrees that
  later discharge is appropriate following

- 6-hour postoperative period of observation –
  postoperative progress must be uneventful
  and suitability for discharge must be confirmed
  by a senior member of the surgical team

Figure 1

Absolute exclusion criteria are reducing over time. Clearly,
they must reflect local experience and practice but, in high-
volume specialist centres, an increasing number of issues
can be dealt with in the day-case setting. Parents of children
with complex problems (for example nocturnal continuous
positive airway pressure) are often well placed to meet these
needs at home.

Anaesthesia

Preoperative assessment and preparation

Most children undergoing day-case procedures have little
comorbidity. Preoperative preparation and confirmation of suit-
ability for day-case management can often be completed over the
telephone. However, a visit to the hospital may have the
advantage of orientating the child and family to the day-case
environment and thus reduce anxiety on the day of surgery.
Written information should be given to reinforce verbal
instructions about arrival times, starvation guidelines and other
essential practical issues. Other tools such as video resources are
used in some centres.
Complex investigations are rarely indicated and if they are then suitability as a day case may need to be questioned. Sickle cell status should be established in high-risk groups such as Afro-Caribbean children, although this is now routinely screened as part of the neonatal bloodspot screening programme (formerly the Guthrie test) in the UK.

Pre-medication
Sedative pre-medication is not widely used as routine in the UK. In selected patients, it can be very useful in reducing anxiety and distress at induction and it is not contraindicated in the day-case environment; although it inevitably increases postoperative drownsiness, it rarely delays discharge.

The most commonly used agent is midazolam, available as an oral suspension at a dose of 0.5 mg/kg up to a maximum 15 mg. Clonidine (an α2-agonist) is associated with increased drowsiness in the recovery phase when compared with midazolam. Clonidine does have the additional benefit of an analgesic effect and may reduce shivering and agitation in recovery.

Oral analgesia (such as paracetamol solution and non-steroidal anti-inflammatory drugs (NSAIDs)) can be given preoperatively, if time allows, as the bioavailability by this route takes 45 minutes and EMLA 60 minutes to provide adequate analgesia for cannulation.

Induction
The choice of gaseous versus intravenous induction remains down to the preference of the practitioner in consultation with the child and carers. Neither has a proven benefit over the other in the day-case environment in terms of recovery profile or side-effects.

Maintenance
Sevoflurane and desflurane have gained popularity because of their relatively low blood:gas solubility coefficients. This enhances the speed of recovery (compared with isoflurane) in terms of surrogate markers such as spontaneous eye opening or response to commands, but neither has been shown to significantly influence meaningful outcomes such as time to discharge. They are relatively expensive and have yet to make a convincing economic case.

Total intravenous anaesthesia (TIVA) with propofol is gaining in popularity. It is associated with reduced postoperative nausea and vomiting (PONV) and a lower incidence of emergence agitation than sevoflurane. Although recovery times are prolonged compared to sevoflurane, discharge is not, and the smoother recovery profile of propofol is preferred by parents.

Paediatric models now exist for accurate plasma target concentrations to be achieved.

Airway
The laryngeal mask airway (LMA) revolutionized airway management in ambulatory practice. Most commercially available laryngeal masks are not specifically designed to mirror the paediatric airway but are simply smaller versions of the adult device. This means that adequate placement and securing can be difficult especially with the smaller masks (sizes 1, 1.5 and 2). They should be used with caution for patients under 1 year old and infrequently with those <6 months, where they are more difficult to accurately place and where airway complications (laryngospasm, obstruction etc.) may be more common. Meticulous head positioning, for example with a head ring, can improve success especially with the smaller masks.

Fluids
Where preoperative starvation has not been excessive intravenous fluid is rarely required for short procedures, although fasting deficits should be replaced after longer periods of starvation. If early oral intake is not quickly established, then fluids should be considered postoperatively.

Analgesia
Excellent analgesia is an essential part of anaesthesia in the day-case environment. Regional techniques are an excellent solution where appropriate. Intraoperatively, they can reduce anaesthetic and opioid requirements.

Caudal epidurals with a single shot of local anaesthetic (for example 1 ml/kg levobupivicaine 2.5 mg/ml) are long established in paediatric practice for lower limb and pelvic/lower abdominal procedures. Potential problems are urine retention and lower limb weakness, which can delay or prevent discharge, but both are rare.

Additives have been extensively investigated and may prolong the analgesic effect of caudals by 4–12 hours. Concerns about neurotoxicity with S-ketamine and drowsiness with clonidine limit their use and many practitioners prefer not to use caudal additives in the day-case setting for fear of prolonged analgesia and delayed motor recovery.

The application of ultrasound has popularized alternatives. The ilioinguinal and iliohypogastric nerves can be reliably located with ultrasound and it has been shown to improve the efficacy of this block for procedures in the groin and perineum. Upper limb and lower limb blocks are also amenable to ultrasound guidance and this may allow reduced volumes of local anaesthetic to be used.

In terms of systemic analgesia, long-acting opioids are generally avoided. Fentanyl 1–2 μg/kg can be used intraoperatively.

Paracetamol can be administered by a variety of techniques. Oral pre-medication appears safe and suppositories are also effective, although bioavailability varies via this route. The new intravenous preparation is relatively expensive, but is convenient and 100% bioavailable. Dosage guidelines are available (see Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI) guidelines in Further reading).

NSAIDs are also safe and effective. The UK licence limits their use to children over 3 months of age.

Codeine is to be used with caution because of its unpredictable pharmacokinetics, its metabolism to morphine being dependent upon the pharmacogenetically determined enzyme CYP-2D6. This enzyme is absent in a large proportion of the paediatic population, thus rendering codeine ineffective in these individuals. If rescue analgesia is required, oral morphine is most commonly used (<5 kg 100 μg/kg, >5 kg 200 μg/kg), ensuring a reasonable period (for example 4 hours) of observation after administration.
Postoperative nausea and vomiting

PONV is a perennial cause of unexpected admission after day-case surgery. Recent guidelines exist to aid risk stratification (see Further reading).

Where one risk factor is present, such as previous PONV or a history of motion sickness, children should be considered ‘at risk’ and ondansetron (0.15 mg/kg intravenously (IV)) administered as prophylaxis. Patients with a combination of factors or any child undergoing strabismus surgery or adenotonsillectomy should be considered ‘high risk’ and should receive dexamethasone (0.15 mg/kg IV) and ondansetron (0.05 mg/kg IV). Note the lower dose of ondansetron used when coadministered with dexamethasone. Additionally, TIVA and non-opioid analgesic techniques should be considered in the highest risk cases.

Discharge criteria

An example of discharge criteria is shown in Box 3. Surgical team and anaesthetist may prefer to review the child prior to discharge, but this is not always necessary. Certainly where complications have occurred, review is crucial and a low threshold should exist for arranging admission.

Postoperative instructions and analgesia

To prevent unnecessary anxiety and confusion, clear instructions must be given to parents or carers prior to discharge. These should be verbal and written, and include information about wound care and dressings, analgesia requirements and follow-up plans.

By definition, day-case operations should require only simple analgesia. Paracetamol (15 mg/kg 6 hourly, orally) ± ibuprofen (5 mg/kg 6 hourly, orally, in children over 3 months of age) is usually adequate.

Follow-up and audit

Next-day telephone follow-up can be used to deal with ongoing symptoms and to provide advice and reassurance. This is especially important when establishing new procedures or dealing with unusual medical issues.

Unexpected admission rates are inevitable and the acceptable level is unclear (1–2% is sometimes quoted, but it may be higher as the scope of day-case care is extended). It should be remembered that readmissions to other hospitals may be missed and pain issues dealt with by community services, so attempts to audit these issues are central to quality control.

REFERENCES


FURTHER READING