THEATRES

1.0 Introduction

Ophthalmic Surgery accounts for almost 7% of all NHS operations\(^1\). Typically 90% of ophthalmic procedures can be carried out in a standalone theatre without immediate anaesthetic support, though a resuscitation trolley and cardiac arrest team need to be available. The remainder of ophthalmic cases require general anaesthesia, or local anaesthesia with support from an anaesthetist.

Some eye surgery can be performed within the out-patient clinic environment. Minor procedures, such as chalazion surgery for example, can be undertaken in an appropriately equipped clinic room, whilst other procedures e.g. corneal suture removal, can be performed at the slit lamp. Basic provision in all areas should include facilities for hand hygiene (with the options of washing and alcohol gel), good source of illumination, sharps bin, and a supply of sterile equipment.

Intra-vitreal injections can also be performed with full sterile precautions outside the operating theatre environment in accordance with College Guidelines\(^2\). Decontamination and sterilisation should be undertaken by an appropriate hospital sterilisation and decontamination unit (HSDU). Where this is not available, disposables offer an easier alternative. If local decontamination and sterilisation has to be undertaken, compliance with extant guidance is essential.

Although intravenous access and cardiac monitoring is rarely needed for most minor ophthalmic operations, it is essential that staffs are familiar with resuscitation procedures and equipment. Ideally most eye surgery should be performed in theatres dedicated for ophthalmic use. In practice it is frequently necessary to share facilities, in which case it is important that contamination risk is kept to a minimum.

2.0 Equipment

2.1 Operating microscope

Essential features include co-axial illumination and foot pedal controls. The assistant’s microscope should have a stereoscopic view similar to the surgeon’s view.

Desirable features include:

- video camera (3 chip – or better), with recording facility (ideally digital)
- foot pedal control of light intensity
- vertically adjustable eyepieces
- A ceiling mounted microscope is desirable in a dedicated ophthalmic theatre.

2.2 Operating table/surgery trolley/chair:

The operating surface should be readily adjustable for height and tilt. The equipment used will depend on local arrangements, but should take into account each unit’s layout and individual surgeons’ ergonomic requirements.
It should be possible to break the table for the comfort of the patients and the headrest should be adjustable both vertically and with tilt. Rapid head down tilt should be possible for general anaesthesia cases.

Caution should be exercised to ensure that any controls cannot be inadvertently operated, particularly during surgery, especially with models with electric controls with "memory" positions.

2.3 Phacoemulsification:

Operating theatres in which cataract surgery is undertaken should be equipped with phaco emulsification machinery, which should be maintained and updated regularly.

Vitrectomy capability, for the management of complications, and a bipolar cautery system are essential. The equipment should be regularly maintained in strict compliance with manufacturers' instructions. Units relying on a single machine may consider that the potential hazards of a technical problem occurring justify the purchase of a “back-up” device.

The manufacturer’s requirements concerning the cleaning and sterilisation of the hand pieces should be followed. Single-use items such as phaco needles should not be re-used.

Sufficient handpieces should be available to allow full activity to continue until used items are returned from the hospital sterilising unit. Handpieces should be traceable. Options can be discussed with the hospital sterilising unit manager to ensure an appropriate risk-based system is adopted. This is particularly relevant where decontamination facilities are centralised and remote from the operating unit, especially when new contracts are being arranged between “Customers” and new Service Providers.

2.4 Other Operating Equipment

This should include a cryo-surgery system, bipolar cautery and an indirect ophthalmoscope. Additional equipment will be required depending on specialisation. Two examples are:

- Vitreo-retinal surgery: Vitrectomy machine, laser, gas/air/fluid exchange systems, silicone oil pump, image inverter for the operating microscope.
- Paediatric cases: Operating gonioscopes, Perkins tonometer, laser etc.

2.5 Surgical instruments

Suitable sets of surgical instruments must be available for each operating list. The number of sets required will depend on the service provided by the sterilisation unit, and to allow for repairs. Extra sterile instruments should be available for occasional use and back up as spares. Department of Health policy (National Decontamination Project) recommends that the use of singly-packed instruments should be avoided. The aim is to prevent migration of potentially contaminated instruments so supplementary instrument use should reduce tray-tray migration. All instrument trays must be labelled, so that they
can be subsequently traced in the event of post-operative problems occurring. The Department of Health recommends that manufacturers apply unique identifier codes for new instruments, with the eventual aim of making all instruments traceable. Older instruments can be etched using specialist techniques that prevent debris being harboured, and this is recommended for high-value items such as Phaco hand-pieces. Marking with adhesive coloured tape should be avoided.

For further information please refer to College guidance on decontamination: [http://www.rcophth.ac.uk/page.asp?section=169&sectionTitle=Decontamination+and+Creutzfeld-Jacob+Disease+%28CJD%29+Advice](http://www.rcophth.ac.uk/page.asp?section=169&sectionTitle=Decontamination+and+Creutzfeld-Jacob+Disease+%28CJD%29+Advice)

Only in exceptional circumstances should surgery proceed if there is no back-up set of surgical instruments.

Items marked as “single use only” should not be re-used, because the materials in their construction can be damaged by the decontamination/sterilization process, thus compromising safety.

The same recommendations for supply of sterile instruments and their decontamination also apply to procedures performed outside the operating theatre suite. Guidance on instrument sterilisation in the presence or suspected presence of CJD is available from the College[^1].

### 2.6 Miscellaneous Facilities

There should be ample provision of theatre chairs/stools. For the surgeon and assistant these should have hydraulic height adjustment. Armrests should be available as an option. There should be enough instrument trolleys to cater for the operating list. In practice this means, at least 3 trolleys. Other equipment should include x-ray viewing via a PACS system or a light box, clock with stop-watch facility, whiteboards, video viewing and recording system (ideally digital format) and, ideally, facilities for playing recorded music.

The suite should be adequately soundproofed to minimise intrusive external noise during surgery. The lighting should include high-intensity operating light units and fully variable background lighting.

The theatre should have signage and blackout facilities to comply with safety guidelines for laser treatments[^2]. The power supply should be adequate for the laser equipment to be used. Sufficient protective goggles should be available for all staff and observers, and should be appropriate for the light wavelength of the laser being used.

Facilities for recording operating details ideally should include an electronic format that will allow ready access for audit of procedures such as cataract surgery.
2.7 Anaesthetic equipment

Equipment for the administration of general anaesthesia is not required for theatres undertaking local anaesthesia cases only. However, oxygen and suction must be available, as must equipment for monitoring (pulse oximeter) and resuscitation. Appropriate equipment for the administration and monitoring of general anaesthesia is essential and is the responsibility of the anaesthetic department.

3.0 Drugs and Therapeutic agents

An ophthalmic theatre should have provision for storage of various drugs, both anaesthetic and ophthalmic. It should be remembered that drugs that are routinely administered in an eye theatre as standard practice may not be licensed for such use. The addition of adrenaline into intra-ocular irrigating solutions is one example. Other drugs, such as subconjunctival, intra-cameral or intravitreal antibiotics, are also used in a non-licensed manner. It is therefore advisable to collaborate with local pharmacy colleagues in producing local guidelines or policies for provision and administration of such antibiotics, anti-metabolites etc.

Ensure that if extra solutions or drugs are added to irrigating fluids that their effect on the pH is known. There is little evidence about this topic. Similarly administration of antibiotics must be via the correct route and follow recommended doses.

Be particularly aware of the potential danger of using preserved HPMC marked for “external use” during intraocular procedures.

4.0 Staffing

An effective and efficient surgical team is fundamental to the patient’s needs at the point of surgery. It is therefore essential for each unit to ensure that the scrub and circulating staff in the ophthalmic theatre have the competencies and skills required for the type of operation being performed, and ideally to be able to assist in the electronic recording of the procedure.

The surgeon needs to be supported by a team that assists and complements his or her skills. Some consistency in the team is desirable. Currently all nurses and health care assistants are expected to be trained in basic life support. For theatres without immediate anaesthetic support, it is desirable for all staff nurses involved to be trained in intermediate life support. Further information is available in LA guidelines jointly issued by the Royal Colleges of Ophthalmologists and Anaesthetists.

For each list the nursing team should comprise:

4.1 Two Scrub Nurses: One for the current case and the other preparing the instruments for the next case. These should be theatre trained, and have ophthalmic experience.
4.2 **A Runner;** whose role is to supply the scrub nurse with the necessary requirements, set up the phaco machinery etc., help position the patient and microscope, adjust the lights and other essential duties. This person does not have to be highly qualified and healthcare assistants are often employed in this role. This role is very important in ensuring efficient running of the list.

4.3 **A Patient Monitor;** However, for a standalone local anaesthetic list, all staff have a responsibility to keep a check on the oximeter and bring any concerns to the surgeon, either directly or via the scrub nurse.

4.4 **Outside the theatre,** additional staff are required for pre-operative patient preparation and post-operative recovery. These members of staff should be well-qualified nurses. In practice a busy list can be supported efficiently by a team of three:
   1. One for the pre-operative preparation.
   2. The second assisting with local anaesthesia, if needed. This person may accompany the patient into theatre and act as the patient monitor.
   3. A third person receives the patient from the theatre, supervises the recovery period and communicates the post-operative instructions.

Patients find it reassuring if the same person sees them through each phase of the procedure, and nursing staff usually prefer to be involved in continuity of care.

General anaesthesia requires the assistance of a trained anaesthetic technician/or anaesthetic nurse. In addition there should be trained recovery staff.

5.0 **Workload**

There are many factors which affect patient throughput including:
- Nursing support
- Technical support (hospital sterilising unit for example)
- Anaesthetic Type
- Teaching
- Case-mix and sub-specialisation
- Ergonomic design of theatre suite
- Complexity of procedure
- Duration of theatre session

The number of cataract cases treated during a theatre list can be two cases per hour for a non-teaching list. Units that specialise in high volume cataract surgery may increase throughput significantly (2½ or more patients per hour).

Teaching is an essential duty for most ophthalmic units, with most demand on theatre time (and surgeons) being associated with cataract surgery. This can be handled by individual units in various ways; some surgeons preferring to concentrate on “modular” teaching of particular stages of cataract surgery, whilst others prefer to allocate a specific time on certain lists for teaching surgery. It can be helpful to separate “service” cataract
lists from teaching lists to some degree, where the latter can be planned with fewer, but non-complex, cases. The requirements of individual trainees are also varied, however, and some flexibility in planning lists is beneficial in providing a variety of training opportunities for trainee surgeons whilst maintaining an efficient and safe procedure for patients.

It is not possible to specify workload for other types of surgery as lists may have a varied content. All operating lists should be realistically planned to finish within the allocated session time. Lists which constantly overrun can adversely affect staff morale.

6.0 Emergency Access

Ophthalmic teams should have access to emergency theatre when on-call. If this is not feasible within certain units, locally agreed arrangements should exist for “out of hours” referral of emergency patients to where theatre facilities exist.

An out of hours theatre should be equipped with operating microscope and the equipment and instruments to allow intraocular and extraocular surgery, including cataract, corneal and squint surgery. Emergency ophthalmic surgery should be performed out of hours only by medical staff sufficiently experienced to manage the case, who should be assisted by supporting theatre staff with ophthalmic training and expertise. Surgery should be carried out within regular theatre hours, unless there is a compelling clinical reason for operating out of hours, and it is considered safe to do so.

7.0 Theatre design

The type of surgery undertaken and the type of anaesthesia used will dictate the level of theatre provision. Good design makes a positive contribution to staff morale and allows surgical procedures to be carried out efficiently under conditions that maximise the safety and comfort of the patients.

- Minor Surgery (e.g. Minor eyelid surgery), and sterile procedures such as intra-vitreal injections do not necessarily require a dedicated operating theatre. A suitably equipped procedure room should suffice. This should be approved by the hospital microbiology department.
- All other surgery should be undertaken in a dedicated operating theatre. If the theatre has to be shared with other specialties, risk of contamination is minimised by sharing with “clean” specialties such as orthopaedics, and by resting the theatre for at least 20 minutes after a dirty case.
- The type of surgery undertaken and the method of anaesthesia used will dictate the level of theatre provision required.
- Day surgery requires the same level of theatre provision. If local anaesthesia is used there is no need to provide the same level of recovery facilities.
- Ophthalmic surgery under general anaesthesia requires the usual facilities for the administration of anaesthesia and post-operative recovery.
7.1 Minimising Risk of Contamination - The overall concept of theatre design

7.1.1 Where possible, all eye surgery should be performed in a dedicated ophthalmic theatre so that the preparation of surgical instruments, and the surgery itself, takes place in the cleanest areas, while minimising contamination from previous cases. Multi-use theatres are a potential source of infection and if they are used, microbiological advice should be sought regarding the sterility of the theatre and its air.

7.1.2 The overall concept is for a designated theatre space separated from the anaesthetic, scrub, and preparation rooms. It is essential that sterilised instruments and drapes are kept separate from used drapes and instruments. The standard of the theatre finish must be high and conform to current hospital building notes and the walls and ceilings must be in good condition. Flaked door frames, walls and ceilings are a source of infection and are difficult to clean.

7.1.3 The main source of airborne contaminants is microscopic skin fragments given off by theatre staff. Overall dispersion is increased by staff movement and numbers. Other sources are less significant and include improperly filtered outdoor air, contaminated fabrics worn by staff and air backtracking from contaminated air from outside theatre. Airborne micro-organisms enter surgical wounds either directly or via instruments. Although airborne sources are a potential source of contamination, the patient's skin is the usual source of bacterial intra-ocular infection (endophthalmitis\(^7\)-\(^9\)).

7.1.4 The use of face-masks during surgery has not been conclusively demonstrated to reduce infection rates, but there is some evidence that their use reduces contamination of the operating site, and that such contamination is more likely to occur as a result of the surgeon speaking\(^10\)-\(^14\). The wearing of a mask by the surgeon should therefore be considered, especially in teaching cases and also in “open” cases such as corneal transplantation.

7.1.5 The wearing of gloves should be mandatory for all cases. Double glove use should be considered if the patient is “high-risk” for blood-borne infection e.g. hepatitis B or C, especially if the surgery involves use of needles as in squint, orbital or oculo-plastic procedures. This approach may also be considered if the surgeon has small pre-existing hand wounds. Double glove wear can also be appropriate sometimes where the surgeon is the potential source of blood-borne infection to reduce risk of doctor to patient transmission, but usually only if the procedure is “Non-Exposure Prone”.

7.2 Ventilation and Control of the environment

Good ventilation is vital to prevent infection, and to allow comfortable working conditions. This must be through positive pressure ventilation of filtered air, and should include the following principles:-

a) **Dilution of airborne contamination.** Ventilation must counteract the effects of convection, personnel movement and turbulence from door closing. Bacterial contamination of the air is highest during patient entrance and exit; therefore sterile trays
should not be opened until the previous patient has left theatre. Sterile trays should not be left uncovered until the onset of the operation and should not be laid up in theatre, but in an adjacent preparation room. Limiting personnel movement reduces air turbulence and the introduction of infectious material, so that there should be restricted access to the operative zone, which includes the operating theatre and preparation area.

b) **Temperature and humidity control of the environment** - typically between 16°C to 25°C, and humidity between 50-60 RH.

c) **Waste anaesthetic gases** dilution and removal.

**8.0 Patient Safety** It is vital to aspire to make surgery as safe as possible. The use of team briefs or team huddles at the start of every list are strongly recommended to try to reduce human errors by improved communication amongst staff. Any unusual points can be highlighted. This is in addition to the use of preoperative checklists for each patient. The College has provided a bespoke checklist for cataract surgery and guidance on patient safety in ophthalmology.

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**10.0 References**

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