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Safe eye care puts the wellbeing of staff members and patients first. INDIA
ARAVIND EYE CARE SYSTEM

Running a safe eye service for patients and personnel

Astrid Leck
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The safety of staff members and the patients they care for is fundamental to high quality eye care delivery.

Safety is of paramount importance when delivering health care. Not only is it vital to keep patients safe during their journey to seek and receive medical care, it is equally important to protect health care's most valuable resource, its personnel, or staff members.

Creating and maintaining a culture of safety within clinical settings should be a priority for health care leaders and managers; however, it is the responsibility of each and every member of a hospital or clinic's workforce to adopt and champion safe practices.

In this issue, we explore what safe practice means specifically for eye care service providers by applying the fundamentals of safe practice both inside our institutions (by improving risk management, infection control, waste management, and safe prescribing of medication) and outside them – by keeping staff and patients safe during service delivery to local communities.

Creating a sustained safety programme can be challenging. Our authors offer practical tips and advice towards achieving this goal, mindful of the resource limitations many of us face.

Safety is intrinsically linked with the provision of high quality eye care; it should be an integral part of everything we do.

Continues overleaf ➤

About this issue

Safety is of paramount importance when delivering health care. Not only is it vital to keep patients safe during their journey to seek and receive medical care, but it is also equally important to protect health care's most valuable resource: staff members. In this issue, we explore what safe practice means specifically for eye care service providers by applying the fundamentals of safe practice both inside and outside our institutions.

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The role of management in providing safe eye care delivery

In order to deliver high quality, safe eye care to patients and ensure a positive, care-giving attitude among staff members, it is vital that leaders and managers recognise and prioritise patient and staff safety.

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The role of management in ensuring the safety of patients is critical, but it is often overlooked in safety programmes for eye care providers. Health care leadership and management are responsible for creating an environment that protects patients and staff members from avoidable harm and reduces errors in clinical settings.

An organisation that addresses safety (and any errors that may occur) in an open and transparent way demonstrates to staff members and the public

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that it values their wellbeing.[4] This encourages staff members to prioritise a culture of safety, knowing they have the support of their managers. It also makes the organisation more efficient and the care process more effective. With this in mind, Aravind Eye Hospitals has developed a systematic approach to providing safer eye care delivery by adopting the following principles.

How safe is eye care?

It may be tempting to think of eye care as relatively safe, compared to other medical specialties. However, a recent study of medical errors (adverse events) in US Veterans Health Administration (VHA) medical centres from 2010–2017 showed that the highest number of reported errors or adverse events occurred in ophthalmology (72) followed by dentistry (30) and anaesthesiology (28).[1] Reducing eye care related adverse events is a challenge. In many settings, patient volumes and time pressures are high. The most common eye procedure – cataract surgery – involves many steps, with many opportunities for error: starting with documenting several measurements using multiple equipment (during biometry), then sourcing a non-expired intraocular lens of the correct power, followed by carrying out safe surgery on the correct patient, in the correct eye.[2,3]

Defining safety goals. Safety goals must be defined at an organisational level and adapted to suit individual departments or settings. Initially, Aravind adopted the 2009 Joint commission (USA) hospital patient safety goals,[5] which staff members struggled to relate to their eye care work. Realising this, and based on the incidents that were reported, the authors adapted the Joint Commission (USA) objectives and developed patient safety goals (Figure 1) and department safety goals (Figure 2) specific to eye care.

Figure 1 Eye care safety goals: organisation level

Patient safety goals – Aravind Eye Care system (2021)	
Goal 1	Ensure that the correct patient is receiving the correct procedure in the correct eye
Goal 2	Ensure the correct implant power and correct implant design (for intraocular lenses) is being used
Goal 3	Prevent morbidity and mortality due to systemic conditions
Goal 4	Prevent postoperative & hospital-acquired infections
Goal 5	Eliminate sight-threatening complications
Goal 6	Eliminate medical or diagnostic errors
Goal 7	Ensure the patient receives the correct medication
Goal 8	Ensure the patient receives the correct spectacles
Goal 9	Ensure the physical safety of patients and staff members
Goal 10	Ensure that patients who are at risk of losing vision without intervention receive treatment & follow-up care

Creating systems that enhance patient safety is crucial as errors often happen due to failures in the system. The causes go beyond the individuals who may have made mistakes. Good safety systems ensure standardisation of procedures, specific steps to ensure safety protocols, appropriate delegation of work to the right personnel, and checklists at critical points in the patient's journey.

Standardising and improving work processes progressively reduces risk. Senior clinical staff and managers are responsible for creating standard operating procedures (SOPs) and risk assessments for routine clinical activities and administrative tasks (e.g.,

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Figure 2 Department-specific safety goals focusing on patient safety. E.g., *Counselling for cataract surgery*

Patient safety goals: Department for cataract surgery (2021)	
Goal 1	Ensure that the patient is correct
Goal 2	Ensure that the eye is correct
Goal 3	Ensure that the biometry measurements are correct
Goal 4	Ensure that the IOL design is correct
Goal 5	Ensure that the IOL power is correct
Goal 6	Ensure that the IOL needed is available
Goal 7	Ensure that pre-operative investigations are complete
Goal 8	Ensure that a physician has checked that patients with systemic conditions are healthy enough to undergo surgery
Goal 9	Obtain consent from the patient or those attending with the patient
Goal 10	Ensure that the correct documentation is available and completed and avoid transcription errors

booking follow-up appointments). Managers must also ensure that every member of staff is trained in these SOPs and competent to deliver them. SOPs and risk assessments should be made easily accessible to staff members in the form of posters or quick reference guides which are regularly reviewed and updated.

Choosing suitable equipment and ensuring all staff members are trained appropriately. Routine eye care involves the use of both basic and highly technical instruments and equipment. All staff members who use these should be appropriately trained beforehand, certified, and have access to supporting documentation (SOPs, user manuals, and risk assessments).

Building an organisational structure and process for safety. It is important to develop this structure, at both leadership and operational level. For example, staff members from different job levels can be appointed as 'safety champions' to model safe practices and behaviour. Another approach is to invite staff members and managers to share ideas and experiences to improve processes and share lessons learned in a supportive and positive way.

A culture of reporting errors and near misses is a core element of good clinical practice. Early reporting of errors improves staff and patient safety and makes it possible to investigate and address the root causes of the error.[6] Ideally, a reporting system should make it possible for staff members to report incidents anonymously. This allows others to learn from the situation without fear and enhances the commitment of staff members towards safer care.[7] Create a simple form to record essential details such as time and place, people involved, description of the error, and the possible circumstances that led to the error.

Supporting staff wellbeing. As a service sector, it is vital that leaders and managers recognise the importance of ensuring the wellbeing of staff members. Fatigue, inadequate training, and a stressful work environment can contribute to human errors and affect compliance with SOPs and risk assessments.

One of the factors that contribute to employee stress is unfair treatment or harassment. Managers must establish a culture of respect and dignity in the workplace by demonstrating a respectful attitude to all and getting to knows staff members well.

Ongoing education programmes for staff members and managers that focus on safety are essential, as are **constant monitoring and review** of incidents, safety protocols, and SOPs, so that lessons can be learned in a supportive environment.

Conclusion

Managers and leaders must demonstrate their commitment to safety in everything they do. Safety is not a destination, but a continuous process.

Developing a sustained safety programme is challenging; it must start with the commitment of managers and leaders. Leaders who are passionate about safety should establish the process for achieving the safety outcomes in both clinical and non-clinical areas, build local leadership to take ownership at operational level, foster a safety culture, prioritise safety through proper communication with their teams, and provide appropriate resources to build practices that enhance safety.

Incident reporting system

Aravind originally used a paper-based reporting system, with low reporting rates. A computer-based, online reporting system was set up 8 years ago, and since then more than 16,500 events have been reported. The authors believe this system to be more successful because it is now easier for anyone to report a safety-related incident or near miss anonymously.

The value of any reporting system lies in how useful it is in helping to avoid future incidents. Each incident reported using this system is therefore brought to the attention of the chief medical officer and quality manager instantly, via an automatic e-mail. These senior staff members, who are empowered to address the root causes of safety incidents, can also use the system to carry out detailed analyses and generate actionable reports.

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Infection control for safety and quality

Health care-associated infections can be painful, potentially blinding, and even life threatening. Infection prevention and control is therefore a vital part of caring for our patients.

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When a patient comes for medical treatment, they should not end up in a worse condition than when they arrived. Infection prevention and control (IPC) is the aspect of health care which aims to ensure that patients do not contract infections as a result of attending a health care facility for assessment, examination, or treatment. These are known as health care-associated infections. The basic principles of infection control have been known for centuries, but prevention of health care-associated infections is still a major challenge. Even though these infections are less common in eye care, they may result in vision loss and care should be taken to prevent them.

Health care-associated infections in eye health

In eye health, the main health care-associated infections are:

- Acute conjunctivitis
- Endophthalmitis
- Respiratory tract infection.

Acute conjunctivitis is frequently caused by adenovirus, which is highly transmissible and can be acquired from contaminated equipment, including trial lenses and frames, or health care workers' hands. Large outbreaks have been reported, and the impact can be very significant on eye services as health care workers may also be affected, resulting in sore eyes, blurred vision, and the need to take time off work.

Health care-associated endophthalmitis is usually due to bacterial infection, resulting from contaminated equipment or instruments, contaminated liquids such as eye drops or intravitreal injections, or poor surgical or clinical technique that introduces bacteria from the patient's own skin or from the hands of the health care worker, usually after cataract surgery or intravitreal injection. Although the frequency of endophthalmitis is low, it is potentially devastating for the patient.

Respiratory tract infections due to viruses such as influenza, rhinovirus, and coronavirus may be transmitted more commonly in eye health than in, say, general practice. This is because eye care equipment and instruments (such as slit lamps) come into close contact with the patient's face and can easily become contaminated with respiratory tract viruses that, in turn, may be transmitted to the next patient. Health care workers also work in very close proximity to patients when carrying out eye examinations or procedures and are therefore at risk of acquiring and transmitting these infections. This has become a more serious problem during the COVID-19 pandemic, and specific measures to reduce the risk of COVID-19 transmission in eye care were discussed in a previous issue of this journal.

An optometrist sterilizing the chair-unit after patient consultation.
INDIA

L V PRASAD EYE INSTITUTE

Reducing the risk to patients

Standard precautions relevant to reducing the risk of health care-associated infections in eye health are:

- Hand hygiene
- Environmental cleaning
- Safe reprocessing of reusable equipment and instruments
- Respiratory hygiene and cough etiquette
- Aseptic non-touch technique.

Hand hygiene can be achieved by washing with soap and water or, where water is not readily available, by using alcohol-based gels/sanitisers. Be aware that alcohol-based gels/sanitisers may be irritant to the eyes so, for contact procedures, soap and water is preferred.

Clinics and treatment rooms, including all surfaces, windows, doors, and fittings, should be **cleaned** regularly. Depending on the type of surface, alcohol wipes, alcohol solutions, or sodium hypochlorite solutions are generally recommended. Take extra care when cleaning surfaces which may be in contact with patients, such as chin and head rests or hand-held Snellen charts.

Reprocessing refers to the cleaning, disinfection, and/or sterilisation of reusable devices. The specific processes depend on the instruments and the manufacturer's instructions should be followed, as well as any local policies. If it is practical and affordable, use single-use instruments and equipment instead and dispose of them safely.

Respiratory hygiene and cough etiquette refers to the guidance given to patients and staff members about how to reduce the risk of viral transmission via coughs and sneezes.

An **aseptic non-touch technique** should be used for procedures where applicable. For operative procedures, good aseptic surgical technique, including the use of sterile drapes, gowns, and gloves, is particularly important for preventing infections introduced as a result of contamination by the patient's own skin flora. Reducing the use of multi-dose eye drop vials during examination – and using single-dose vials instead, where available – will also prevent transmission of infection between patients.

Continues overleaf ➤

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Infection control programmes

To improve the safety of patients and staff members, all health care facilities should have an infection prevention and control programme which takes account of the specific risks and infections that may occur.

Infection prevention and control programmes have multiple components (Figure 1), including:

- Systems to manage and monitor the prevention and control of infection
- A clean and safe environment
- Appropriate use of antimicrobials, including antibiotics
- Providing accurate information to patients and staff members
- Prompt identification of people who are at risk of developing an infection
- Competent staff (education and training)
- Adequate isolation
- Microbiology and laboratory support
- Adherence to guidelines and procedures
- Occupational health (including vaccination of staff members).

Figure 1 Infection prevention and control programmes have multiple components

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Reducing the risk to health care workers

Health care workers examining and treating eye diseases may be exposed to infectious agents via respiratory droplets, tears, or blood. Practising good infection prevention and control, such as hand hygiene, use of personal protective equipment (PPE), safe use and disposal of sharps, and correct waste management will also reduce the risk of exposure.

Hand hygiene protects staff members from eye and respiratory tract infections acquired from patients. This risk is also reduced by using **personal protective equipment** (PPE), such as gloves, masks, protective eye wear, and face shields. Use of respiratory protection (masks and face shields) has become especially important during the COVID-19 pandemic.

Sharps pose a direct risk to the health care worker, but they also pose a risk to other staff members, such as cleaners. They must be properly disposed of in a sharps container, such as a box or tin.

All health workers must be aware of the local protocol for needle stick injuries, including assessment for post-exposure prophylaxis and following up with occupational health. Other contaminated waste should also be disposed of safely, for everyone's protection.

Conclusion

Good infection prevention and control is vital for reducing health care-associated infections and improving patient outcomes. This is particularly important with the emergence of antimicrobial resistance, as health care-associated infections are more likely to be multi-drug resistant and therefore difficult to treat. The constant evolution of microorganisms means that perfect infection control and prevention is unlikely; however, it is an ideal we must strive for. Hopefully, one of the lessons that will come out of the COVID-19 pandemic will be to pay more heed to routine infection prevention and control hygiene measures.

The multidisciplinary nature of the infection control committee is an important reminder that everyone has a responsibility to reduce health care-associated infections and prevent harm to patients. The role of the infection prevention and control team is to help all staff members to achieve this.

Jan West
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The role of an infection prevention and control nurse

A nurse may be assigned overall responsibility for infection prevention and control in an eye hospital or clinic – a demanding role that is vital for ensuring the safety of patients.

Never has the role of infection prevention and control been more critical than during the current global COVID-19 pandemic.

Infection prevention and control involves many domains in the clinic or hospital setting, from patient management and staff health to environmental controls and building maintenance. The person assigned to lead infection prevention and control in an eye unit or hospital must therefore have a wide range of experience and may need to undertake additional training so they can give advice in a timely manner. There is also a need to be flexible and adapt guidelines to specific clinical situations. For example, the infection prevention and control nurse may be called upon to give decontamination advice on a new piece of equipment, so they must be able to review and evaluate evidence and critically appraise cleaning and disinfection products.

Quite often, there will be grey areas in infection prevention and control. The infection prevention and

control nurse will be basing their advice on risk assessments, founded on a knowledge of the microorganisms involved, transmission routes, and work flow in the specialism. The advice may depend on the situation and how much risk the hospital, as an organisation, is willing to take. For example, in the event of an outbreak, it is possible to close a ward or department completely to new admissions, potentially stop all planned surgery, tests, and investigations, and restrict visiting, etc. Unfortunately, a lockdown also has some undesirable consequences, including patients not receiving a prompt diagnosis and treatment. Isolating a patient may also have negative consequences for those with mental health issues, which may need to be taken into account. Individual ethnic and cultural differences and requirements will also need to be considered – one topical example of this is the matter of facial hair (often mandated by a person's religion or culture) and FFP3 mask fit testing.

Another essential attribute is to be both a good communicator and to be accessible, so that you can provide on-going support. There is no better way of becoming known, and to know what is *really* happening in clinical areas, than to visit and talk to people. It is surprising the conversations one may have about issues and queries that may never have been aired in a more formal setting.

There is also a need for a tenacious personality and honed negotiation skills – it can sometimes take months or years to persuade people to change their way of working, even when there is have good evidence to support a proposed measure.

The role suits people who are comfortable working with different people across a range of settings and are able to network and seek out expert opinion, whether by asking an appropriate individual or by carrying out internet and literature searches.

An ability to review and evaluate evidence and critically appraise products is also essential, as some products claim to work wonders, when in fact studies may not support this.

Working environment

Depending on the size and nature of the eye service, the infection prevention and control nurse may be working alone; if this is the case, she or he would need to have sufficient knowledge of, and training in, infection prevention and control so that they can work unsupervised. Ideally, if resources allow, the infection prevention and control nurse should be supported by a team (see pp. 7). Support can also come from 'clinical champions' – doctors or nurses with an interest in infection prevention and control who can act as role models by demonstrating good practice. These clinical champions can also disseminate information to others, provide feedback about the existing programme and new proposals, and inform the infection prevention and control nurse about any concerns in their area of work.

Further Reading

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Patient-centred hospital design to improve safety

The way hospitals are designed and used has a significant impact on efficiency and patient safety.

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People visit hospitals to get well. However, the potential for falls, accidents, cross-infection and exposure to hazards are high in hospitals due to the inherent complexity of hospital buildings, equipment, and procedures. Eye patients – especially those experiencing visual loss – may find it intimidating to come to a hospital, particularly for the first time.

Good hospital design should be people centric: it should put the needs of patients and staff members first. It should:

- Keep patients physically safe
- Reduce patients' anxiety
- Provide a comfortable and efficient working environment for staff members.

Building configuration and workflow

We need to recognise two important factors:

1 In an eye hospital, most patients tend to be visually impaired and elderly.
2 Some patients are likely to be the source of cross-infections due to other illnesses such as COVID-19.

The hospital should therefore be designed to avoid overcrowding and make the patient's journey through the physical space of the hospital as easy and safe as possible (see panel).

Good signage is important as it helps patients to know where they are, and where they need to go next. Some hospitals employ people, or use volunteers, to guide patients through the hospital; this can help to improve the safety of patients who have visual impairment.

It is important to position the various services in the same order that patients would need them (e.g., registration, followed by visual acuity testing, instilling eye drops, slit lamp examination, etc.).

Continues overleaf ➤

Further reading

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A good understanding of the workflow requirements in an eye department or hospital, together with an appreciation of patient needs, will help when designing an efficient and safe hospital or making changes to an existing facility.

The physical seating space allocated for people waiting to be seen at each of these stages should match the number of patients expected and include appropriate social distancing to avoid cross-infection. When this isn't done, it results in bottlenecks, increased travel distances, and back-and-forth movement of patients and staff members. The greater the movement, the greater is the likelihood of cross-infection and accidents. Efficiency will also be lower.

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Allocate enough seating for waiting patients and allow for social distancing. INDIA

Planning for growth

As a hospital's reputation grows, so does the number of patients and staff members. New equipment and procedures also require additional space. In these circumstances, it is important that additional spaces for outpatient services and operating rooms are set up next to, or very near to, those that exist already. This would ensure that building layout continues to mirror the workflow. Without detailed planning, expansion can involve duplicate equipment, duplicate staffing, and more movement for patients. Insufficient allocation of space may also result in overcrowding and compromise patient safety.

Friendly design

Safety considerations in hospital buildings can go hand-in-hand with creating a friendly environment and an enjoyable experience for patients.

Courtyards, skylights, corridors leading towards points of visual interest or views, special niches or recesses for parking stretchers and equipment, and the use of colour and texture can serve functional needs and enhance patients' experience of the space. Natural light, plants, music, and art can also make the hospital environment more enjoyable for patients and staff members.

Case study: Designing a better patient journey

In a large eye hospital in a South East Asian country, patients had to walk a significant distance from the registration desk to the area where visual acuity was being measured. Patients then had to walk back to registration and continue an equal distance in the opposite direction to be seen by a junior doctor. Next, patients had to walk up a flight of stairs to get to the refraction area, and then up another flight of stairs to speak to the consultant. The laboratories were on yet another floor. With this layout, the hospital seemed congested as patients were walking back and forth, in different directions. The irony was that there was more than adequate space on the entry-level floor to accommodate each of these services.

To improve the situation, the space was reorganised so that all the services were positioned next to each other, in the same order that the patients would be visiting them. As a result, the outpatient flow was a lot more efficient, it took much less time for each patient to complete their visit, and the hospital seemed more spacious. It would have been even more efficient if such optimal flow was planned when the hospital was designed.

Keeping patients physically safe

It is all too easy to accept things as they are and simply work around issues that are potentially unsafe for patients. We therefore recommend carrying out periodic reviews (ideally carried out by an external person) to identify potential hazards and address them proactively.

The following could serve as a a checklist and/or guide.

Preventing falls, slips and trips

- Guard rails and barriers must be of sufficient height and strength in both interior and exterior spaces.
- Interior and exterior floor surfaces must have sufficient traction to prevent slips and falls.
- Ramps, stairs and corridors should be brightly lit and clearly visible.
- Avoid sudden changes in floor levels. Where this is unavoidable, put up a highly visible warning sign and mark the edges with high contrast tape or painted lines.
- Areas where water is used must have good drainage so that floors remain dry.

Preventing collisions

- All clear glass partitions must have visual barrier strips or designs to prevent anyone mistakenly trying to walk through them.
- Swing doors are preferable over sliding doors. It is easier to operate swing doors while pushing wheelchairs and trolleys.
- Doors need appropriate door furniture: handles if the door must be pulled, and a flat plate or a horizontal bar when a door has to be pushed open.
- Where two-directional movement is expected, there should be double swing doors with view panels.
- The speed and force of auto-close doors must be calibrated to avoid accidents.
- Avoid projections, such as low hanging sign boards, in areas used by people.
- Doors must not open directly onto stairs or ramps.

Occupational health and safety

- Task lighting shoud be appropriate for the task being carried out. Avoid glare on computer screens and work surfaces due to bright lights and windows.

Good lighting ensures that labels and reports can be read properly and reduces the risk of error.
- Keep noise at an acceptable level. A quiet environment enhances concentration and productivity. Communication between patient and provider is clearer, less ambiguous, and more effective. If echoing is an issue, use sound-absorbing materials like fabric or acoustic tiles.
- Staff members working with potentially hazardous equipment, like lasers, must have appropriate safety equipment.

Ventilation and indoor air quality
- Maximize natural and cross-ventilation. Courtyards can bring natural ventilation and light into hospital buildings. Courtyards also act as social and spill-over spaces, are a great reference point for navigation, and connect the outdoors with the indoors. Courtyards can also expand capacity during emergencies.
- Where natural ventilation is not feasible, plan to use mechanical ventilation in accordance with local standards and requirements.
- Hospital air conditioning needs are very specific and may not be met by domestic units; it is therefore advisable to consult experts suppliers. It is also important to have optimal relative humidity.
- Use materials and furnishings that are low emitters of indoor air contaminants and volatile organic compounds (VOCs).

Electrical safety
- All electrical installations should be done in strict accordance with the respective country's electrical safety codes.
- Good earthing increases safety as well as the life of sensitive electrical equipment.
- Integrate safety devices in the electrical system to prevent short circuits and overload.
- Label all electrical panels. Display circuit diagrams near panels for quick reference during emergencies.
- Use colour coding of switches and power outlets to identify UPS power, power with standby, and power without standby.
- Replace exposed or frayed cables immediately.
- While upgrading wiring or while planning new facilities, consider providing 25% more power outlets than the identified need.
- Plug type and voltage provision vary between countries. With imported equipment, check that the voltage is compatible and replace the plug if needed.
- Set up uninterrupted power supplies (UPS) and surge protectors in case of unexpected power surges or power cuts and extreme circumstances such as lightning strikes.

Hazardous materials and waste handling

Hospital processes may use and or generate hazardous materials.

- Identify possible hazardous materials that need to be handled. Set out clear guidelines or standard operating procedures (SOPs) to isolate, remove, and manage such materials.
- Plan separate holding/storage areas for hazardous materials, away from spaces used by the public.
- The waste generated in hospitals, including contaminated materials, sharps, etc., require careful handling. Put separate, colour-coded waste collection bins in every area where waste is generated, as well as posters to encourage staff members, patients and visitors to separate waste at source.
- Dispose of contaminated waste according to local regulations. In the absence of such regulations, follow the practices advocated by the World Health Organization.

Dangers, disasters, and security threats

It is vital that buildings are planned with these threats in mind and that periodic mock drills are carried out to ensure that precautionary measures are sufficient.

Fire protection
- In areas where there are wild fires, maintain an adequate fire-break around the hospital building to prevent the fire spreading to the building.
- Fire protection engineers must be involved in all aspects of the hospital building's design in order to ensure fire protection measures are in place.
- All building and fire regulations or codes must be adhered to.
- Exit paths should be clearly identified and kept clear of obstruction at all times.
- In multi-storey buildings, areas of refuge – a place to safely gather, before being rescued by fire personnel – should be designated and maintained.
- Fire detection, alarm, and suppression systems (such as sprinklers) should be installed.
- Emergency lighting and power systems should function and be kept in readiness at all times by carrying out regular checks and maintenance.
- It is important to have fire-related information and signs clearly displayed in local languages.
- Regular fire drills and training of staff members should be given priority.

Earthquakes
- Most national building codes specify the highest degree of earthquake resistance for hospital buildings. Hospitals not only have to be safe for their own patients and staff members, but should also be able to function fully to provide relief to injured people in the aftermath of an earthquake.
- If the hospital is built in an area where earthquakes can occur, experienced structural engineers must check the whether the building is able to withstand tremors.
- All large and heavy equipment should be properly anchored at all times to ensure that they do not cause damage during earthquakes.
- Emergency preparedness for earthquakes should be part of the safety protocol of hospitals.

Storms, heavy rain, snow, flooding, landslides, etc.
- Many natural and seasonal occurrences could create safety issues for hospitals.
- Selecting a good site – higher ground, away from flowing water bodies, well drained – will reduce the risk that extreme weather will affect the hospital building.
- One may not have the luxury of an ideal site. Good engineering design could greatly reduce the risk of damage from extreme weather.
- All equipment and systems that are meant to work during such eventualities, like storm drains, pumps, etc., must be kept in good in working condition at all times and located in areas that are unlikely to be affected by flooding and so on.

Security from human threats
- Security risks could range from pilferage and theft to vandalism and terrorist attacks. Hospitals are open to everyone, and this makes it vulnerable to threats. However, the number of entrances could be planned, balancing functional needs, efficiency, and security concerns.
- Surveillance systems should be planned without compromising privacy.
- The hospital can be designed so that patients and visitors are restricted to specific areas only.
- Quieter areas, such as parking garages and storage areas, should be closely monitored.

Safety during outreach activities in eye care

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There are many risks to consider when offering eye care services outside of established eye care facilities. Risk assessment and careful planning will help to keep patients, staff members, and community members as safe as possible.

L V PRASAD EYE INSTITUTE

Clinician changing into new PPE kit before surgery. INDIA

Outreach services are a popular means of providing eye care in remote and underserved communities. Due to their temporary and infrequent nature, and the need to adapt to changing local circumstances, outreach services may pose a greater risk to staff members and patients than services based at a health facility.

Organisations that are engaged in outreach activities such as mass drug administration (MDA) or surgical camps must carry out detailed assessments to identify risks, and then develop clear protocols and detailed safety guidelines to **mitigate** these risks; i.e., reduce the severity of their impact.

This article highlights what the likely safety issues are during outreach and how they can be addressed.

Planning

Planning an outreach visit must include carrying out a detailed risk assessment and putting together a risk mitigation plan for all the potential safety issues.

The organisation or hospital responsible for the outreach visit must ideally make one person, or a small team, responsible for carrying out the risk assessment, putting together a safety protocol for each activity that will take place during the visit, and providing training to every member of staff involved.

"A printed copy of the safety protocol should be kept with the outreach team at all times."

The outreach team must keep a printed copy of the safety protocol with them at all times, so that it can be referred to whenever the need arises.

Staff member safety

Staff safety and wellbeing is paramount for successful outreach services.

Basic accommodation and catering facilities – including electricity, water, and toilets – may not be available in remote outreach settings. Planning ahead for access to such facilities by prior arrangement is essential. For example, staff members may have to drive to and from the nearest town where such facilities can be found or pack provisions such as food and water or equipment for sleeping and catering.

Food and water contamination can be a major challenge for staff members during outreach visits. This can be avoided by packing your own food and water. Put together a clear plan for managing food contamination-related illnesses with essential medications such as antibiotics and/or rehydration fluid, or where to refer severely ill staff members if needed. Nearby health facilities that may provide support for such occasions need to be identified in advance.

Adequate supplies of personal protective equipment (PPE) such as gloves, hand sanitisers, disinfectant solutions, and surgical masks and gowns must be available and transported to site. Provide specific guidance relating to infection control and precautions during clinical examination, including donning and doffing PPE, just as would be the case in a static clinical setting. Given the current COVID-19 pandemic, standard operating procedures aligned with national and local guidelines need to be prepared and followed, including protocols for identifying staff members who may have COVID-19 before setting off, and measures to be taken if a staff member is suspected of having COVID-19 during outreach.

Some outreach settings may pose unpredictable security risks. In areas where unrest or violence is a possibility, it may be advisable to delay an outreach visit until stability is restored. If not, the following should be considered at the planning stage:

- Have staff members received the necessary safety training?
- Is a paper copy of the safety protocol available and kept with the outreach team?
- Are there any local authority services (or offices) to oversee safety, e.g., a community policing service?
- Is there access to a telephone or mobile network? If not, how could a possible safety issue be

reported to the local authorities?
- How far is the outreach site from the nearest health facility that can provide emergency services?

Depending on the type of outreach, and the setting where it is being conducted, it is recommended that at least two team members work together at all times and that the outreach leader and the local security office/service are kept informed of their whereabouts and travel plans. This is particularly important if the outreach activity involves visiting community members in their homes. Pairing up male and female team members is advisable in areas where it is not safe or culturally acceptable for female team members to move around communities on their own (or in all-female pairs). Another reason to work in male-female pairs is that it will be easier for a male or female chaperone to be available when examining patients.

Patient safety

Outreach activities should ideally take place in a central location within the community, unless it is more appropriate to carry out home visits or door-to-door delivery of treatment. When selecting a location, it is important to consider the following:

- Who the outreach visit intends to serve
- The available space
- Safety and accessibility for elderly patients and people with disabilities.

A central location should help to reduce the potential safety risks if patients and their families have to travel long distances.

Choosing a location with lots of space indoors will reduce the risk of accidents or falls due to overcrowding. It will also minimise the spread of respiratory infections and make it easier for older people and those with disabilities to move around. In resource-limited settings, schools often have more space and infrastructure than health facilities. If there are multiple classrooms, there can be one activity station (vision assessment, history taking and triaging, refraction, intraocular pressure measurement, final diagnosis & treatment advice, counselling, optical sales, etc.) in each classroom. This will reduce crowding and can make movement safer for patients, staff members, and volunteers.

During outreach, one of the major challenges is crowd management if there has been a good response to community mobilisation. Overcrowding may pose safety risks for older people, women, children, and people with disabilities, and it facilitates the transmission of infections such as COVID-19. Conducting village-level screening programmes a few days before an outreach camp, and allocating different days for each village to come forward, can help to avoid unnecessary overcrowding and the associated health and safety risks.

In cataract surgical camps, some older patients may have hearing, cognitive, or orientation impairments. It is important to remember that some patients are in danger of accidentally harming themselves. A system to identify, prioritise and protect such patients needs to be in place. A detailed process and checklist to ensure that every patient is accounted for and gets the intervention she or he needs, in a safe way, should also be in place.

Outreach facilities are not usually clean enough to safely conduct clinically invasive procedures, as they present an infection risk to patients. If such procedures are planned:

- Allow enough time for cleaning and disinfection of the outreach location before accepting patients
- Provide equipment and facilities for equipment sterilisation
- Develop standard operating procedures for how and when equipment will be sterilised, and who will do it
- Develop a plan of action for managing expected and unexpected life-threatening complications.
- Prepare basic facilities and essential medicines in case patients need to be kept overnight; e.g., if they develop complications that need to be monitored.
- Provide safe transport for patients requiring referral and those with bilateral ocular shields/dressings after, for example, cataract surgery.

Community engagement and safety

Engaging with the community, and with local health care and political administrators, is an important step when organising a successful outreach visit. Such partnerships are needed in order to:

- Plan the outreach visit alongside the relevant stakeholders
- Address any safety issues
- Advertise the outreach service to the community.

> **"The purpose of the outreach visit must be clearly communicated in order to avoid, or directly address, any prior misinformation about the service."**

The purpose of the outreach visit must be clearly communicated in order to avoid, or directly address, any prior misinformation about the service. Limited awareness among the communities being reached, and lack of engagement by local authorities, may lead to a lack of trust in the service offered, which will reduce attendance. Local authorities and leaders need to be notified of the service to be delivered, the number and type of professionals involved, their contact numbers, and the dates and location(s) where the outreach team will be working. Community stakeholders, including community volunteers (where they are available), and local officials need to take centre stage in the planning to ensure that dates are selected which do not coincide with local community events or religious festivals.

Waste created during outreach activities may pose a major health and environmental safety risk to the community if correct disposal is not planned and carried out. Waste disposal needs to be well thought through and responsibility for correct disposal allocated to a dedicated member of the team.

Further reading

1 Organizing trichiasis surgical outreach – a preferred practice for program managers **https://www.trachomacoalition.org/TrichiasisOutreach**

2 Clinical Outreach: outreach reference manual **http://outreach-partners.org/clientportal/wp-content/uploads/2017/02/ORM_CO.pdf**

3 Outreach services as a strategy to increase access to health workers in remote and rural areas **http://digicollection.org/hss/documents/s19239en/s19239en.pdf**

4 WHO Community-Based Health Care in the context of COVID guidance **https://www.who.int/publications/i/item/WHO-2019-nCoV-Comm_health_care-2020.1**

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Safe management of ophthalmic health care waste

Health care waste must be collected, handled, stored and disposed of in such a way that it poses no risk to patients, personnel, or the public.

What is health care waste?

Health care waste is the term used to describe waste generated by health care practices (both within clinical settings and by health practitioners in the community).

Hazardous waste relevant to eye health includes:

- **Sharps waste.** Used or unused sharps (e.g., hypodermic, intravenous or other needles, scalpels, broken glass)
- **Infectious waste.** Waste that poses a risk of disease transmission, e.g., waste contaminated with blood and other bodily fluids, laboratory cultures, and other materials that have been in contact with infected patients.
- **Pathological waste.** Human tissues, organs, or fluids.
- **Pharmaceutical waste.** Medicines and items contaminated by medicines.
- **Chemical waste.** Disinfectants, solvents, batteries, broken thermometers or blood pressure gauges, and laboratory reagents.

Incorrect management of health care waste can result in harm to patients, staff members, and the community. It can result in the unintentional release of pathogens (including drug-resistant organisms), pharmaceutical drugs, and toxic pollutants) into the environment. Disposal of untreated waste in landfill sites may contaminate water sources if the landfill is poorly constructed. The release of effluent water containing chemical disinfectants or commonly used laboratory chemicals (such as staining reagents used in diagnostic microscopy) can also pollute drinking, surface, and ground water sources.

Incineration can be costly and polluting, and improper incineration practices can result in low temperature burning. Low temperature burning will not destroy sharps waste and may expose health care personnel and the community to toxic compounds released from burning plastic and expired medicines.

Additional hazards can occur if people are scavenging at waste disposal sites and during the handling and manual sorting of hazardous waste from health care facilities. Waste handlers are at immediate risk of needle-stick injuries and exposure to toxic or infectious materials. Waste collection and storage areas on health care premises must be secure and access by unauthorised persons prohibited.

Lack of awareness about the health hazards related to health care waste, inadequate training in proper waste management, an absence of waste management and disposal systems, insufficient financial and human resources and the low priority given to the topic are the most common problems. Many countries either do not have appropriate regulations, or do not enforce them.

How to manage waste

Good practice begins with minimising the volume of waste generated in the health care setting through careful selection of consumables and processes, in combination with safe handling and the segregation of waste where it is being generated. Equally important is raising awareness and working towards improving local practice to attain national and internationally recognised safety standards.

ARAVIND EYE CARE SYSTEMS

Figure 1 Bins for segregating waste must be clearly color coded and ideally hands-free, pedal operated and labelled. **INDIA**

Factors such as transportation, location and budget could influence how a health care facility will manage its waste. However, even in health care settings which have limited resources, it is essential that managing health care waste is viewed as a priority.

As a first step, it is important to determine if there are any national policies in place and, then based on this information, to create guidelines which are appropriate to both local facility and community needs and health care waste categories.

In larger hospitals, it is helpful to set up a waste disposal committee; in a smaller clinical setting a member of the infection control team will take on this responsibility in partnership with estates or clinic management. A survey or audit must be carried out to assess the both the volume and categories of waste generated by the eye care facility service before a waste management plan can be created and implemented by hospital/clinic management.

Health care waste must be collected, handled, stored, and disposed of in such a way that it poses no risk to patients, staff members or the public. Waste management protocols are needed for the collection and safe storage of health care waste both at ward level and storage in other areas within the eye hospital, eye clinic or health care premises. At a minimum, hazardous waste must be contained and separated from general waste. The use of colour-coding of waste packaging to clearly identify and categorise the type of health care waste before disposal simplifies this process. Table 1 gives the colour, type of container and collection frequency recommended by the World Health Organization (WHO) for different types of waste.

Table 1 Colour coding, container type and collection frequency of waste recommended by the World Health Organization (WHO)

Waste categories	Colour of container and markings	Type of container	Collection frequency
Infectious waste	Yellow with biohazard symbol (highly infectious waste should be additionally marked **HIGHLY INFECTIOUS**	Leak-proof strong plastic bag placed in a container (bags for highly infectious waste should be capable of being autoclaved)	When three-quarters filled or at least once a day
Sharps waste	Yellow, marked **SHARPS** with biohazard symbol	Puncture-proof container	When filled to the line or three-quarters filled
Pathological waste	Yellow with biohazard symbol	Leak-proof strong plastic bag placed in a container	When three-quarters filled or at least once a day
Chemical and pharmaceutical waste	Brown, labelled with appropriate hazard symbol	Plastic bag or rigid container	On demand
Radioactive waste	Labelled with radiation symbol	Lead box	On demand
General health-care waste	Black	Plastic bag inside a container or container which is disinfected after use	When three-quarters filled or at least once a day

All staff members who come into contact with health care waste must be trained to know how to classify, handle and dispose of it safely and how to deal with any spillages. Anyone handling waste should have access to appropriate personal protective equipment (such as thick rubber gloves and aprons) that will help them to carry out their duties safely.

The WHO's standards for health care waste disposal include the use of incineration and protected pits.[1,2] On-site incineration is recommended for microbiological, pathological and anatomical waste. Laboratory waste known to contain pathogens should be autoclaved to render it safe before it is removed from the laboratory.

Alternative methods of waste disposal may be important in low-income settings that are unable to support high-temperature incineration practices. The use of **protected pits** is one example. These are deep, square pits within hospital premises that are topped by a reinforced concrete slab which is wider than the pit. The concrete slab has a smaller hole covered by a smaller piece of concrete which can be removed when filling the pit. Another option, recommended for sharps, is to insert a steel pipe (Figure 2) in the main concrete lid. Once the pit is full, the pipe (or the access hole) is permanently sealed.

Figure 2 A protected sharps pit

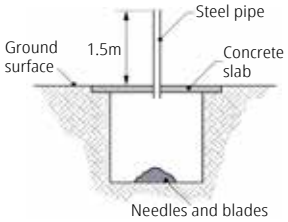

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Figure 3 Protected pits with concrete covers, Nepal

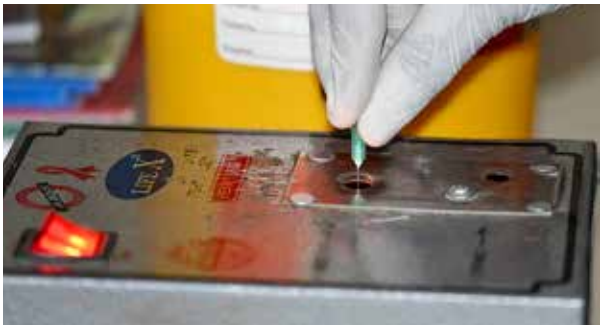
SANJAY KUMAR SINGH

Waste chemicals need to be safely stored until they can be collected by specialist disposal companies. If such a service is not available, there may be alternative options, for example, filtering reagents through charcoal to inactivate chemicals, after which the liquid can be poured away into a drain. Alternatively, liquid reagents can be poured into a leakproof container of highly absorbent clay or crystal pellets (for example, those used for domestic cat litter). Used charcoal filters and pellets are hazardous waste. If hazardous waste is to be buried, it must be contained within a leak-proof container prior to storage in a protected pit.

Microbiological waste and sharps pose the greatest infection risk. Sharps are any medical device contaminated with blood, bodily fluids, or tissue and which can cause lacerations or puncture wounds. Safe handling involves correctly using and then discarding sharp items – at point of use – in specialised, robust containers which can be sealed for collection and disposal. Sharps containers must only be filled up to the indicated line (three-quarters full) and never overfilled; protruding sharps will compromise safe closure of the container. Heavy duty gloves must be worn by anyone who handles or transports these containers.

If incineration is not available, a full sharps plastic container can be filled with plaster of Paris, or something similar, to encase the sharps waste within the container, creating a solid mass that can be disposed of safely or buried. Automated machines which destroy needles by burning or cutting them can be used to render needles unusable and prevent needlestick injury (Figure 4).

Figure 4 An electrically powered needle destroyer, Nepal



SANDIP DAS

Make your own sharps container

Commercially produced sharps containers are expensive. You can make a sharps container out of an old infusion bottle or a tough plastic laundry detergent bottle (Figure 5). It needs to have a screw top lid and must be clearly labelled as containing hazardous material. Once the container is three quarters full, it needs to be sealed with heavy-duty tape and either disposed of by incineration or buried in a protected pit.

Figure 5 Sharps containers can be created using everyday items such as sturdy plastic detergent bottles

JON SEIDMAN CC BY 2.0

Further reading

1 WHO factsheet 'Health care waste' **http://www.who.int/mediacentre/factsheets/fs253/en/**

2 WHO, Safe management of wastes from health-care activities. Ed. Chartier et al. 2014 **http://www.who.int/water_sanitation_health/publications/wastemanag/en/**

3 Royal College of Nursing, Sharps Safety, 2013. **https://www.gla.ac.uk/media/media_511552_en.pdf**

Transforming waste management in an eye hospital in Nepal

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A hospital in Nepal has transformed the way it manages waste and is now aiming for zero-waste status, thereby improving the safety of patients, staff members, and the community.

Health care waste management is a major challenge in all eye hospitals. Hazardous hospital waste has a negative impact on the health of patients, health workers, and the local community. It is believed that 80–85% of eye hospital waste is non-hazardous and, if segregated properly at source, can be treated safely under normal conditions. It is the remaining 15–20% of hazardous waste for which proper disposal is challenging.

Hazardous waste is produced in the course of health care activities such as patient examination, diagnosis, and treatment. Examples from an eye hospital setting include used cotton swabs, eye pads, body tissue and fluids from ocular surgery, and sharps (needles, scalpels, wires, etc.). Non-hazardous waste is generated during administrative work, in the canteen, during cleaning/housekeeping, during construction and demolition, and when carrying out routine maintenance of hospital infrastructures.

Here we share our experience at Biratnagar Eye Hospital regarding safe waste disposal practices in a busy eye hospital setting. Biratnagar Eye Hospital is a high-volume eye hospital providing high quality yet affordable eye care services in the eastern part of Nepal. In 2019, 300,262 patients visited the outpatient department and 70,550 operations were performed.

Waste bins are collected several times a day and transported to collection sites in closed bins. NEPAL

SANJAY KUMAR SINGH

Where we started

Prior to the implementation of safe handling and disposal practices at Biratnagar Eye Hospital, hospital waste was collected, without any segregation at source, by untrained staff members who were not protected with the appropriate PPE. This mixed waste was then transported, in an open rickshaw, to a holding area. Because the waste was not separated, the hazardous waste contaminated the non-hazardous waste, so that all the waste was now considered hazardous, and this meant that the overall volume of hazardous waste increased.

> "The lack of a safe waste disposal system increased the risk of infection and health related concerns."

The waste was incinerated at irregular intervals in the hospital incinerator, or was removed every 1–2 weeks by the municipality waste collection service. The local municipality does not segregate waste; waste collected from hospitals and clinics is mixed in with household and industrial waste collected from different sources. All waste is dumped at the same municipality site. The lack of a safe waste disposal system increased the risk of infection and health related concerns to housekeeping staff members, patients, and the general public/community.

An improved system

Recognising the need to change towards safe waste disposal at Biratnagar Eye Hospital, a policy of health care waste management and standard operating procedures was formulated, taking into consideration national[1] and international[2] guidelines. A plan was prepared with the help of a hospital waste management consultant. We wanted to move towards achieving "zero waste" and a commitment was made to ensure that no hazardous waste would be transported out of the hospital premises without proper sterilisation. The plan included guidelines or the segregation, storage, treatment, and disposal of waste.

Waste segregation

A colour coding system as per guidelines from WHO was introduced. Bins placed in areas accessed by patients and visitors were accompanied by posters explaining good waste segregation practice. Needle destroyer machines have been installed within each clinic, and the main hospital storage area has separate collection chambers to enable correct segregation.

Staff training
Hospital staff members have been trained in proper waste segregation and disposal. Housekeeping staff who handle waste receive training in the appropriate use of personal protective equipment (PPE) and the safe handling, transportation, and treatment of waste.

As per WHO recommendations, the following PPE is used:

- Heavy-duty utility gloves
- Reusable plastic aprons (cleaned with soap and water, and then decontaminated with 0.5% sodium hypochlorite solution after each use)
- Single-use gloves made of nitrile or latex
- Gowns, which are discarded as infectious waste after each use (and not reused).

Hand hygiene is performed before donning and following removal of PPE.

All housekeeping staff have been immunised against hepatitis B and tetanus.

Transportation of waste
Following segregation, hazardous waste and non-hazardous waste is collected and transported, in closed bins, to collection sites several times as day, as required.

Treatment of waste
Infectious waste is sterilised in the waste storage area using an autoclave or sodium hypochlorite solution.

Biodegradable three-chamber pits were constructed for the storage and treatment of non-infectious biodegradable waste (such as food). After three months, biodegradable waste is converted into manure and is used as a compost for the plants in the hospital grounds.

Refresher training and regular monitoring
Newly recruited staff receive training as part of their induction and refresher training is provided for all staff as part of our regular hospital activities. Routine monitoring of the hospital waste management process is carried out daily by the HCW/HWM consultant. Reports are shared with the hospital waste management committee on a regular basis and improvements actioned as necessary.

Waste water and faecal waste management
Proper management of waste water (collected from different service) and faecal waste are significant challenges. Each day, around 100,000 litres of waste water and fecal waste are produced at Biratnagar Eye Hospital. We have established a Decentralized Waste Water Treatment System (DEWATS) which is designed to utilise environmental bacteria, plants, and gravity. DEWATS comprises different modules, ranging from settler to superior anaerobic systems such as baffle reactors, fixed-bed filters, and aerobic systems such as a planted gravel filter and collection chamber. When collected, DEWATS-processed water can be repurposed to irrigate farmland surrounding the hospital. Excess treated water is discharged into the public drainage system.

Bins are accompanied by posters explaining good waste segregation practices. NEPAL

How the new waste disposal system was planned and implemented

We took the following steps:

1 Forming a Hospital Waste Management Committee
2 Formulating policies and standard operating procedures for safe health care waste management
3 Training all staff members in health care waste management
4 Immunising all staff members
5 Purchasing new equipment and setting up storage areas as well as treatment and disposal facilities
6 Starting segregation, storage, treatment, and disposal activities
7 Monitoring the system and offering continuous support to achieve zero waste.

Environment-friendly equipment and instruments
Our hospital has adapted a policy of using environmentally friendly instruments and equipment wherever possible. For example, we have replaced mercury thermometers with digital thermometers, and replaced fluorescent tube lighting with long-lasting compact fluorescent light bulbs.

Zero waste and ISO accreditation
By the end of 2019, no hazardous waste was transported out of the hospital without proper treatment. During the year 2018 and 2019, a total of USD $1,889 was generated by the selling of sterilized waste (glass, bottles, and paper). In 2020, the hospital was accredited by ISO 14001:2015 in recognition of the organisation's Environment Management System.

Enabling factors in the implementation of a safe waste disposal system

- A change in the attitude of, and continuous commitment by, the management team
- Identification of a 'champion' – a staff member who is interested and can take a lead
- Staff member involvement in the planning and implementation process
- Continuous training and refresher training of staff members
- Strengthening of the monitoring and feedback mechanism

The implementation of an environmentally friendly and safe health care waste management system at Biratnagar Eye Hospital was made possible because of a change in attitude and commitment from the management team, supportive leadership, and the involvement of many staff members.

References

1 Nepal National Health Care Waste Management Guidelines.
2 World Health Organization, Safe management of wastes from health-care activities. Second edition, WHO 2014.0

Safety around medicines for eye care

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The medicine prescribing and dispensing process is complex, and errors are relatively common. This article looks at the various issues around prescribing and dispensing medicines for eye care and how patients can be kept safe.

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Pharmacists can protect patients by identifying and correcting prescription errors.

Many eye conditions are treated with some form of medicine, often requiring a prescription from an appropriately trained prescriber. The process is complex and errors can occur at any point along the pathway: from writing the prescription, to the patient instilling the correct eye drops, in the correct eye (as an example). Health care workers can and do make errors when writing prescriptions, and this has been well documented. One study in the UK showed that 7% of prescriptions contained errors.[1] The researchers found that more experienced doctors, including consultants, were just as likely to make prescribing errors as their more junior colleagues. The same study showed that pharmacists intervened before most of the prescribing errors could affect patients.

"The study found that more experienced doctors, including consultants, were just as likely to make prescribing errors as their more junior colleagues."

Prescribing errors

Common issues or errors involving prescribing eye medicines include:

- **Wrong patient details added to a prescription.** This may result in confusion, delays, and patients being treated for a condition that they do not have (with a medication that may be unsafe for them) while others are left untreated for a condition that they do have.
- **Prescription written for the wrong eye.** For example, a patient has had surgery in their right eye but the topical steroid prescription is written for the left eye, leaving the patient without treatment to the eye that requires it, and potentially damaging the other eye.
- **Eye medications prescribed which are not available locally** (including those which are not on an agreed local formulary). This could include antimicrobial eye drops prescribed for a patient with a severe eye infection. Treatment for such conditions should start as soon as possible, but if the medication is not available locally the patient will not be able to start treatment in time.
- **Patient not advised about the expiry date of the product once it has been opened.** This can lead to treatment failure or worsening of the condition as a result of the patient using the preparation beyond the in-use expiry date.
- **Patient not advised about how to store the product appropriately.** This can lead to treatment failure or worsening of the condition as a result of the patient using the preparation after it has been stored incorrectly. Some eye drops should be refrigerated or kept cool; for example, chloramphenicol eye drops and 'specials' for more serious eye infections, such as amikacin and amphotericin B eye drops.
- **Preserved formulation supplied instead of preservative-free.** This can result in damage to the ocular surface. In some cases, this can worsen the condition that the patient is being treated for.
- **Wrong strength or dose.** For example, the strength of timolol eye drops is not specified on the prescription.
- **Poor communication with handover of prescribing responsibility.** This may lead to harm if, for example, patients are not issued continued prescriptions for a long-term treatment; e.g., if a community prescriber (such as a family practitioner) has received no communication from the hospital prescriber , and a patient on long-term glaucoma medication doesn't receive their next bottle of eye drops after the one issued at the hospital runs out.

How to avoid prescribing errors

The majority of prescribing errors occur at the stage of writing the prescription. Prescribers can reduce the risk of these errors by checking and counter-checking each prescription before issuing it. A study from 2013 found that there were 4.7% (29/623) prescription errors

References

1 Lewis PJ, Dornan T, Taylor D, Tully MP, Wass V, Ashcroft DM. Prevalence, incidence and nature of prescribing errors in hospital inpatients: a systematic review. Drug Saf 2009;32:379-389.

2 Utman SA, Atkinson PL, Baig HM. Methods to reduce prescription errors in ophthalmic medication. Saudi J Ophthalmol 2013;27:267-269.

3 British National Formulary. **https://bnf.nice.org.uk**

4 Shaw M. How to administer eye drops and ointments. Nurs Times 2014;110:16-18.

5 Yellow Card reporting site in the UK. **https://yellowcard.mhra.gov.uk**

Prescription writing checklist

- Write legibly/clearly in ink so that the writing is indelible/permanent.
- Add the correct patient details, including the name, date of birth, and address.
- Include the prescriber details: name, signature, contact details, and medical registration (or equivalent).
- Include the date.
- Check any patient allergies.
- Use the generic name of the drug (unless there is a good reason to use a brand name, e.g., patient finds it easier to use the dispensing mechanism that comes with a particular brand).
- Include relevant medication information, including:
  - drug formulation, e.g., eye drop (bottle or single dose units), eye injection, tablets, etc.
  - dose, e.g., 1 drop.
  - frequency, e.g., four times a day.
- State which eye requires treatment, or if it is both.
- State the course duration or state that it must be used long-term.
- Follow locally approved formulary guidelines. This improves the patient's ability to quickly access medicines, which is particularly important if delays in treatment could result in further significant damage to vision (e.g., in the case of hourly antimicrobial eye drops for microbial keratitis.
- Avoid abbreviations to help prevent delays and errors from misinterpretation, including the use of Latin and drug name abbreviations.

during a one-month audit period. Following a process of counter-checking, this was reduced to just 0.77% (5/651).[2]

Therefore, prescribers should consider using a simple **prescription writing checklist** (see panel). These should meet at least the minimum legal requirements as well as other safety features, such as those recommended by the British National Formulary:[3]

Dispensing and administering medicines

Nurses and pharmacists have very important roles to play in preventing harm from prescription errors and ensuring that eye medications, including eye drops, are given correctly, so that patients gain the maximum therapeutic effect and avoid harm.

Pharmacists are the final point of contact in the community, before patients take their medicines home, and nurses are the final point of contact before patients are administered their medicines in hospitals.
They therefore need adequate knowledge and understanding of the relevant guidelines so they can identify potential errors and help patients to avoid them.

Consider the benefits of written information, in the form of patient information leaflets, to help with patient understanding. Where available, give these to patients when prescribing medications such as systemic steroids, as they can have severe and profound adverse effects which patients should be made aware of. Patients should also be given information about how to put in eye drops as this is something many patients find difficult. A previous article in this journal included a patient information leaflet on how to instil one's own eye drops: **https://www.cehjournal.org/article/instilling-your-own-eye-drops/**

- Use a similar checklist to the one for prescribers (see panel) to help screen prescriptions for safety and appropriateness.
- As a safety precaution, two people should ideally check a medication before it is dispensed.
- If you are unsure what a medicine is being used for, what the correct dose is, or have any other concerns, then look it up in your local or national formulary and/or ask a colleague. If no local or national formulary is available, then a recognised standard can be used such as the British National Formulary (available online or in hard copy).[2]
- Develop the confidence to challenge prescribing decisions. Your ability to do this effectively could prevent patient harm. It may also help you to build mutual trust and productive working relationships with prescribing colleagues.
- Explain to the patient how they should put in their eye drops (or check that they know how to do this) and give them an instruction leaflet as a reminder (remember that some patients may not be able to read).
- Develop an effective mechanism for ensuring that the medicines you have in stock have adequate expiry dates. Arrange your stock according to expiry date and dispense those with the shortest expiry dates first. You can use paper- or computer-based spreadsheets to highlight when pre-packed kits such as crash boxes are about to expire.
- Eye drops, eye ointments, and eye gels have reduced expiry dates once opened, with many 'specials' having in-use expiry dates (expiry once opened) as short as 24 hours. Familiarise yourself with in-use expiry dates. This will also enable you to advise patients so that they can gain maximum benefit from the prescribed treatment.
- Become familiar with storage requirements of the medicines you work with to ensure that the integrity of stocked medicines is not compromised and that you are able to counsel the patient on the storage requirements.
- Hospital and non-hospital settings should be considered when administering topical eye medications.[4] For instance, eye drops should be discarded after seven days and replaced if treatment continues in hospital settings. In non-hospital settings, eye drop bottles should be replaced every 28 days (or as directed by the information sheet).
- Nurses should ensure that the correct formulation of eye drops or eye ointment is administered at the correct time and strength, via the correct route, to the correct person, and into the correct eye.
- Nurses should advise patients against driving or operating machinery until their vision has cleared and/or their eyes have stopped stinging after administration of eye drops or ointment. This is particularly relevant when drops for pupil dilation are being instilled, as these can result in the vision being blurred for several hours.
- Nurses administering topical medication must keep careful record of topical drugs administration. Make accurate entries in the patients notes, as appropriate, in accordance with local and national guidance, e.g. those offered by the relevant professional body.
- Side effects and adverse reactions to medications should be documented in the patient's notes and reported to the local/national reporting system, such as the Yellow Card scheme in the UK.[5]

Keeping staff members safe

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Without staff members, we do not have a health care service. Keeping staff members safe is therefore of utmost importance if we want to provide safe eye care to our patients.

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By taking time to listen to one another's concerns, colleagues can be an important source of support. NEPAL

On World Patient Safety Day 2020, the World Health Organization (WHO) reminded governments that they have a legal and moral responsibility to ensure the health, safety and wellbeing of health workers and announced a Health Safety Charter (**bit.ly/safeWHO**).[1]

The importance of staff health cannot be overemphasised. Health and safety risks to health workers can lead to risks for patients, including patient harm and adverse patient outcomes. Commenting on the role of health workers during the COVID-19 pandemic, WHO Director-General Tedros Adhanom Ghebreyesus said: "No country, hospital or clinic can keep its patients safe unless it keeps its health workers safe." In this article we consider how this can be done at the facility or hospital level.

Clinical and non-clinical members of staff have daily contact with patients and/or infectious material, and health care workers are considered to be at significant risk of acquiring or transmitting hepatitis B, influenza, measles, mumps, rubella, and varicella. Immunisation of all staff members protects them against these diseases, and also prevents staff members from infecting patients. Vaccination is therefore an essential part of infection prevention and control programmes.[2]

Personal protective equipment

It is the responsibility of the eye hospital or clinic, as the employer, to provide personal protective equipment (PPE) for staff members whenever there is a risk to their health or safety which cannot be controlled by other means. Always ensure that there is enough PPE available, that it fits well, and that the type and quality is suitable for the work being done.

Making adaptation

Staff members may have underlying health conditions for which adaptations must be made. For example, health workers who are pregnant must be protected from hazards and risks in the workplace and offered suitable alternative work if it is not possible to carry out their normal duties safely.

Injury prevention

Injury within the workplace can take many forms. Prevention of sharps injuries (including needle-stick injuries) is a specific priority announced at World Patient Safety Day in 2020. Because of the risk of infection, these injuries can cause significant worry and stress, so make sure health workers have access to post-exposure prophylaxis as per the local clinical guidelines, as well as testing, advice, and counselling.

Another significant cause of injury in health care settings is associated with manual handling, i.e., lifting and moving patients, equipment, laundry, supplies, and waste. Where feasible, use ergonomically designed ophthalmic equipment and furniture to prevent eye injury, repetitive strain injury, and musculoskeletal injury. Equipment should only be used if it is functioning optimally and well maintained. In the office environment, keep all screens at eye level when seated.

Protecting health workers from violence

Staff security is also an important issue, especially when responsibilities require lone working, as is the case for night shift workers and community health workers visiting patients in their homes. Consider how staff members can travel to and from home safely at night, as road traffic accidents may be more frequent during this period. It is advisable to provide safe transport where security is a concern.

Do not tolerate violence at work, including bullying and harassment. Create policies and strategies to prevent and effectively manage concerns and events relating to any of these issues, for example, by setting up a supportive and confidential reporting system.

Aggression towards staff members by patients and members of the public should not be accepted. Set out standards of conduct for staff members as well as patients, relatives, and visitors to the hospital or clinic. Promote a culture of zero tolerance towards violence or aggression against health care workers, for example, by using posters to convey this message.

Mental health and psychological wellbeing

Work-related stress and burnout are ongoing challenges for health care workers; this has been

References

1 WHO. 17 September 2020. Keep health workers safe to keep patients safe. **https://www.who.int/news/item/17-09-2020-keep-health-workers-safe-to-keep-patients-safe-who**

2 Centres for Disease Control. Morbidity and Mortality Weekly Report 1997;46(RR-18):1-42. **bit.ly/CDCimm**

intensified by the additional pressures of caring for those affected by the COVID-19 pandemic and the disruption it causes to routine patient services. There are several things you can do to mitigate this.

1 Encourage and support staff members. Be aware that staff members may face all sort of stresses outside the workplace; reassure them that this is normal and that they are supported. It may be helpful to offer staff members access to counselling or other forms of psychological support.
2 Optimise staff scheduling. Plan the length of shifts and the composition of the eye team to optimise workload and task sharing so staff members can take regular rest breaks and have time off work.
3 Establish a culture of learning instead of blaming. Develop a process whereby all staff members can confidentially report adverse safety events or near misses without fear of repercussions.
4 Set up a confidential reporting system where staff members can report any form of bullying or harassment that they experience in the work place.

Setting up good systems for safety

Good safety systems, backed up by documentation, play a vital role. Strive to adopt international and national occupational health and safety standards and keep up to date with local legislation.

Managers are responsible for creating documentation for all activities. The aim of **risk assessments** is to eliminate, reduce or control the risk to patients and staff members associated with a procedure or activity. **Standard operating procedures (SOPs)** document safe systems of work.

As new infectious diseases emerge, SOPs must be revised to look for activities that can pose a risk to patients and health workers; SOPs should be reviewed and audited regularly.

Managers are also responsible for creating robust systems that are well documented (e.g., posters in the staff room or in corridors) so that everyone knows how to respond to situations such as needle-stick injuries, exposure to harmful chemicals, and health care associated infections.

Injury and incident reporting is time sensitive and often requires immediate action, so staff members must know where and how to report these. It is also the responsibility of management to ensure there is mechanism in place for prevention (e.g., availability of safety boxes for disposal of sharps in every section of the facility) and compensation in case injuries occur, as per the local guidelines.

Training

Offer regular training for staff members on how they can keep themselves safe. Take care to train all staff members, not just health care workers. For example, cleaning personnel and external contractors also need to be familiar with how infection spreads, how they may need to protect themselves, and what they should report. Recruiting staff champions to model good practice is a recognised approach to encourage uptake and compliance.

Cleaning the operating theatre

Cleaning the operating theatre is an essential part of keeping patients and staff members safe. Here is how.

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Cleaning the operating theatre and its immediate environment minimises patients' and health care workers' exposure to potentially infectious microorganisms.

Cleaning happens at various times:

- When preparing a new operating theatre
- Every day, before surgery begins
- Between patients
- After the last operation of the day (known as terminal cleaning)
- Deeper cleans are carried out once a week and/or once a month.

All areas must be cleaned: unrestricted, semi-restricted and restricted areas. Start in the operating theatre before moving to the scrub areas, anaesthetic and recovery rooms, and then the sterilising area. The toilet should be cleaned last.

Equipment

Cleaning equipment must be in plentiful supply. These should be a set for each for the operating theatre, the toilet, and ancillary rooms. Sets should be stored separately. Each set should contain the following:

- Mops and buckets
- Hard scrubbing brush
- Rubber pusher to remove excess water
- Disinfectant. Select disinfecting solutions with broad-spectrum microbicidal activity, which are appropriate for use on each type of surface that must be disinfected
- Absorbent dry and wet cleaning cloths
- Oil for lubricating equipment wheels.

The person doing the cleaning should change into a clean gown, cap, mask, and clean utility gloves.

Daily cleaning and disinfection

Before the day's surgery begins

Clean and disinfect the operating theatre every morning, irrespective of whether it will be used or not. Use warm, soapy water to clean, then wipe with a cloth soaked in clean water to move any soap (or detergent)residue. Finally, wipe with the disinfectant solution.
Clean and disinfect the following:

- All flat surfaces (wipe from top to bottom, then from the centre outwards).
- The patient bed and its attachments, positioning devices, and patient transfer devices.

Continues overleaf ➤

ARAVIND EYE CARE SYSTEM

Dedicated cleaning and disinfection of surfaces in the surgical areas. INDIA

- Containers for sterile instruments, antiseptic bottles, and the trays in which these are kept.
- Scrub basins, taps, and walls. Check for any leaks.
- The soap and antiseptic solution bottles at the scrub basin.

Prepare waste bins by inserting colour-coded waste collection bags.

Finally, clean and disinfect the floor. Remove excess dirt and dust using either a mop or a hospital-grade wet vacuum, mop with clean water to remove soap residue, then mop using disinfectant. Take care not to agitate the dust, which spreads it.

Once the operating theatre is cleaned and disinfected, keep the door closed for 10–15 minutes with ventilation equipment turned on.

In between each patient

- After each operation, clean and disinfect any soiled areas of the floor as described previously.
- Clean and disinfect any furniture or equipment that came in contact with the patient or may have become soiled or damp, including the operating table, surgical lights, blood pressure cuffs, and tourniquets.
- Clean and disinfect the floor around the operating table (up to 1.5 metres away from the table).
- Collect and remove waste from the kick bucket and remove all other waste; replace all bin liners.
- Remove waste from equipment such as suction machines and clean, disinfect, or sterilise them, as appropriate.

At the end of the day, after surgery

- Use a cloth and hot soapy water to wash all surfaces, including the tops of operating tables and all stools.
- Switch equipment off at the mains. Wipe down electrical cables carefully using a cloth dampened with a small amount of alcohol or other disinfectant (to ensure minimal usage of fluid).
- Clean the legs and wheels of trolleys and tables.
- Damp dust hanging lights and other items on the ceiling.
- Clean operating microscopes and operating lenses after each theatre session. Do not clean microscopes or lenses using soapy water, as soap residue can damage the lens. Use a soft, non-abrasive cloth for the lens and a cloth dampened with 70% alcohol or disinfectant for the microscope.
- Clean anaesthesia machines and carts, IV poles, and patient monitors.
- Change hand towels, patient sheets, and blankets in the theatre and toilet area.
- Clean the floor.

Other areas

- The toilets and changing rooms must be checked and cleaned throughout the day and separate cleaning equipment must be used for the toilets.
- Tea rooms and kitchens (and the recovery area, if food is given) must be cleaned and all leftover food and crumbs must be removed so that insects are not attracted to the area.

Cleaning tip

Have one mop for the clean rooms and operating theatre and a separate mop for the dirty areas. Change the water between each area.

Weekly cleaning

- Remove all articles from shelves and clean all surfaces thoroughly using hot, soapy water. **Note:** Do not get sterile items wet, as this will make the packaging permeable and the items will therefore no longer be sterile.
- Wash the floor and apply disinfectant.
- Wash and dry instrument trolleys, including the wheels and the rungs.
- Wipe all high surfaces, such as the tops of cupboards and windowsills, with a damp cloth.

Monthly cleaning

- Move furniture such as cupboards or shelves away from the walls and clean the areas behind and underneath them. Clean the tops and the inside of cupboards, drawers and lockers. To prevent damage, remove all articles when doing so.
- Check expiry dates and rotate stock so that items with expiry dates in the near future are at the front.
- Wash curtains, if used in recovery areas, at least every three months.

Other considerations

- **Pest control**. Liaise with the administrator and the maintenance team to schedule regular pest inspections and/or control measures to prevent pests. Any control measures need to be carried out when the operating theatre is not in use. For example, schedule this to take place a day before the weekend or a festival. This allows time for the operating theatre to settle and for any issues to be rectified before it is needed again.
- **Air conditioning units and filters**. Ensure these are checked and cleaned. Change the filters as required.

The 'three-bucket' system

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Disinfectants can be inactivated by the presence of any dirt or biological material (known as 'soil') on a surface. They may also interact with soap or detergent residues. For optimal results, it is important that a surface is visibly clean before applying disinfectant.

1. First, mop the floor (or wipe the surface) using a detergent and water solution (in bucket 1) to get rid of any dirt or grime.
2. Second, mop the floor (or wipe the surface) using plain water (in bucket 2) to remove soap residue.
3. Third, once the floor is dry, mop it using disinfectant solution (in bucket 3); for example, 1% sodium hypochlorite solution.

When mopping, start from the corner of the room and work towards the door. Back away from the cleaned area.

Rhino-orbital mucormycosis following severe COVID-19 infection

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Figure 1

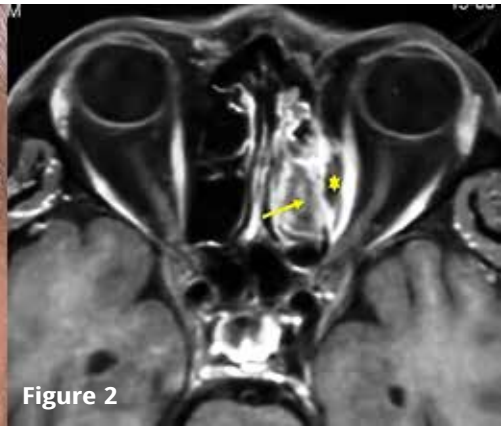

Figure 2

LV PRASAD

A 49-year-old man presented with complaints of left-sided nasal stuffiness, peri-orbital pain and double vision. He did not have any other systemic complaints and was non-pyretic. He was known to have hypertension and diabetes, for which he had been taking oral medication for nine years, controlled based on random blood sugar testing at home with a glucometer (range of 140 to 200 mg/dl).

The man had recovered from COVID-19 just three weeks earlier; he had developed pulmonary involvement due to COVID-19. His inflammatory markers were also raised. He was treated with intravenous methylprednisolone 40 mg daily for 5 days, followed by oral prednisolone in tapering doses for 15 days, for moderate to severe COVID-19 disease. During this phase of treatment with IV steroids, the patient's blood sugar values were uncontrolled and he was prescribed insulin to improve blood sugar control. One week after completing the course of steroids, he presented to the ophthalmology clinic complaining of double vision.

On examination, the patient had mild proptosis of the left eye (Figure 1) and a diagnostic nasal endoscopy was suggestive of an eschar in the nostril over the middle turbinate. A contrast-enhanced MRI of the paranasal sinuses and the brain (Figure 2) demonstrated left ethmoid sinusitis (**arrow**) with a medial orbital abscess that was not taking up contrast (*). A diagnosis of post COVID-19 invasive fungal sinusitis with orbital involvement, presumed rhino-orbital mucormycosis, was made.

Question 1
What are the risk factors for invasive fungal sinusitis in this patient?

a. Recently recovered from COVID-19
b. Known hypertensive
c. Treated with IV steroids for COVID-19
d. Options a and c
e. All of the above

Question 2
Which tests and procedures would you perform next?

a. Complete ophthalmic examination
b. Fasting and postprandial blood sugar with HbA1C
c. Endoscopic endonasal sinus debridement with medial wall decompression and drainage of the medial orbital abscess
d. Send pus from the involved areas for microbiology and tissue specimens for histology
e. All of the above

Question 3
MRI imaging (Figure 2) is suggestive of ethmoid sinus haziness with a focal medial orbital abscess without contrast uptake. What would you do next?

a. Sinus debridement
b. Sinus and orbital debridement
c. Sinus and orbital debridement with local transcutaneous retrobulbar amphotericin B
d. Sinus and orbital debridement with local transcutaneous retrobulbar amphotericin B with intravenous liposomal amphotericin B (dose of 3-5 mg/kg body weight)

ANSWERS

1. (d) Uncontrolled blood sugar level is one of the most important risk factors for mucormycosis. Infection with the SARS-CoV2 virus leads to uncontrolled blood sugar levels, especially in those who already have diabetes. Use of intravenous steroids will also lead to increased blood sugar levels, predisposing to fungal infection. Hypertension is not a known risk factor for mucormycosis.

2. (e) All of the above-mentioned tests and procedures are required to make a complete diagnosis of rhino-orbital mucormycosis

3. (d) This patient has a rhino-orbital presentation of mucormycosis. Intravenous liposomal amphotericin B is the drug of choice for all patients with mucormycosis and can be initiated where there is a strong clinical suspicion, even before microbiology or histology results become available. Similarly, for all suspected cases, necrotic sinus tissue is debrided to reduce the disease load. This is done for two reasons: (i) the disease can spread to the brain quickly, and brain involvement is associated with high mortality (80%) and (ii) since the orbital involvement lacks contrast uptake, it suggests that there is angioinvasion in that area, requiring debridement and local retrobulbar amphotericin B injections.

Key community eye health messages

An organisation's role in ensuring safe eye care practices

ARAVIND EYE HOSPITAL / INDIA

- Defining safety goals specific to eye care
- Creating well-defined processes on standard operating procedures and risk assessments to achieve safety goals
- Setting up processes and systems to report errors and incidents
- Ensure that the correct documentation is available and completed

Hospital premises that enhance independant navigation for people with visual impairment including

ARAVIND EYE CARE SYSTEM

- A tactile tile guiding path connecting main entrance to different blocks of the hospital
- Well-placed, accessible, directional, and identification signages
- A ramp as an alternate route to the stairs
- The colour contrasting strip at the edge of the steps
- Handrails on both sides that are continuous on the landing

Precautions to avoid hostipal care-associated infections

ARAVIND EYE HOSPITAL / INDIA

- Regular cleaning and sanitisation of treatment rooms, including all surfaces that may come in contact with patients
- Using an aseptic non-touch technique for procedures where applicable
- Guiding patients and staff members on respiratory hygiene and cough etiquettes to prevent viral transmission via coughs and sneezes
- Safe disposal of contaminated waste