CLINICAL PRACTICE GUIDE

Eye care of the critically ill

JUNE 2024

NSW GOVERNMENT
AGENCY FOR CLINICAL INNOVATION
Intensive Care NSW

The information in this document should not replace a clinician's professional judgement.

Agency for Clinical Innovation

1 Reserve Road St Leonards NSW 2065
Locked Bag 2030, St Leonards NSW 1590

Phone: +61 2 9464 4666 | Email: aci-info@health.nsw.gov.au | Web: aci.health.nsw.gov.au

Further copies of this publication can be obtained from the Agency for Clinical Innovation website at aci.health.nsw.gov.au

Title	Eye care of the critically ill: Clinical Practice Guide		
Published	December 2021		
Revised	June 2024. Correction of spelling of 'ophthalmic' and 'lagophthalmos'.		
Next review	2028		
Produced by	The ACI Respiratory and Rehabilitation networks		
Preferred citation	*NSW Agency for Clinical Innovation. Eye care of the critically ill: Clinical Practice Guide. Sydney: ACI; 2024*		
Cover image credit	Shutterstock.com		
TRIM ACI/D21/1046	SHPN (ACI) 240399	ISBN 978-1-76023-863-6	ACI_3042 [06/24]

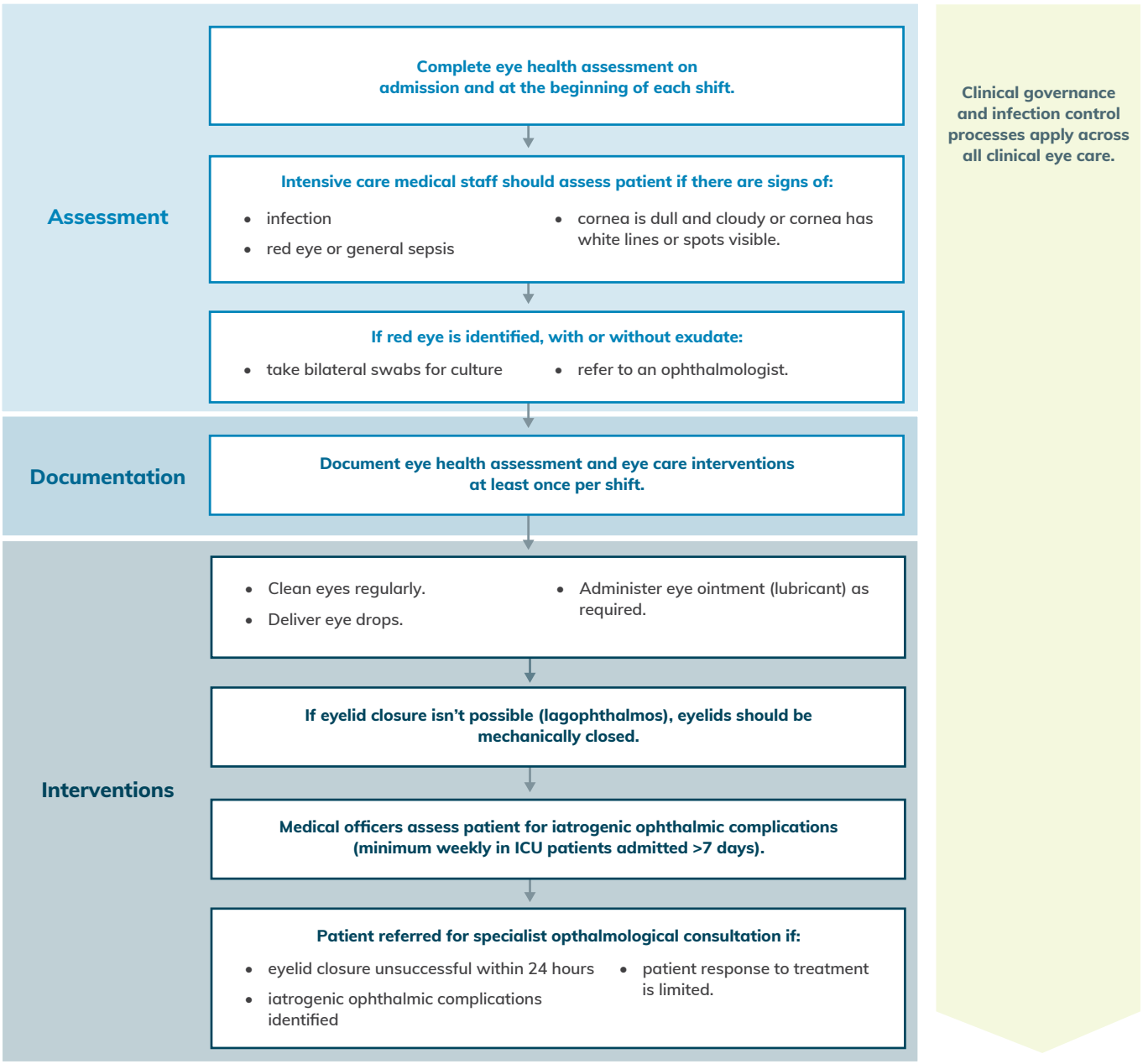
Contents

Eye care of the critically ill

Eye care of the critically ill – at a glance

Eye care is important for the effective clinical management of critically ill patients in intensive care. Regular eye care can prevent dryness, damage to the eye, complications and infection.

Delivering eye care for critically ill patients



Summary

Eye care is important for the effective clinical management of critically ill patients in intensive care.

Critically ill patients may have compromised ocular mechanisms.[1, 2] This can result in:

- dryness of the cornea
- disruption to the corneal epithelial surface lining
- complications of corneal abrasion, erosion, infection, ulceration, scarring, rupture or blindness.[2, 3]

Regular eye care can reduce the risk of eye complications and infection.

This clinical practice guide provides guidance to clinicians about how to maintain the eye health of adults and children in intensive care units (ICUs) in NSW.

The guide is a revision of *Eye Care Clinical Practice Guidelines*, first released in 2014.[4]

Potential for eye complications in critically ill patients

Critically ill patients are at increased risk of experiencing eye complications due to:

- compromised immune response
- environmental factors
- exposure to pathogens
- incomplete eye closure (lagophthalmos), leading to dryness, infection and damage to the eyes.[1, 5, 6]

Clinical management of eye care for critically ill patients

Clinical assessment and intervention on admission and at regular intervals is necessary for effective eye care for patients in ICU.

Recommendations for delivering evidence-based clinical eye care are outlined in this guide and summarised in 'Eye care of the critically ill – at a glance'.

Infection prevention

Clinicians should follow infection prevention processes when performing eye care, including:

- donning appropriate personal protective equipment (PPE)
- adhering to the five moments of hand hygiene
- storing eye care equipment separately from other patient hygiene equipment. Containers should be cleaned regularly.

Clinical governance

Clinical governance related to eye care should include:

- documentation processes for eye health and interventions
- competency assessment for ICU staff in the delivery of eye care
- review of adverse events and ICU consults and audits of practice to monitor delivery of eye care.

Introduction

Eye care is important for the effective clinical management of critically ill patients in intensive care, especially for those whose ocular protective mechanisms may be compromised.[1, 2]

Dryness of the cornea and disruption to the corneal epithelial surface lining may result in complications of corneal abrasion, erosion, infection, ulceration, scarring, rupture or blindness.[2, 3]

Critically ill patients are at increased risk for complications due to having a compromised immune response and being exposed to environmental factors and pathogens.[1, 5, 6] Additionally, for intensive care patients, incomplete eye closure (lagophthalmos) may make it more difficult to determine if a patient has developed iatrogenic ocular surface disease (OSD).[7]

Purpose

This clinical practice guide was developed to provide guidance to clinicians about the procedures used to maintain and optimise the eye health of paediatric and adult critically ill patients in ICUs in NSW.

The recommendations are most relevant for patients at increased risk for iatrogenic ophthalmological complications due to a compromise in the level of consciousness or impaired ability to control eye opening and closure. It is assumed that readers possess a working knowledge of anatomy and physiology of the eye.

Target clinicians

This guide is for all intensive care clinicians who are responsible for the care of patients where the protection of the ocular surface cannot be achieved by independent complete eyelid closure. This guide is not intended to include the intensive care of neonatal patients.

Development of this guide

The guide is a revision of the *Eye Care Clinical Practice Guidelines*, published by the Agency for Clinical Innovation (ACI) in 2014.[4] A Guideline Development Network (GDN) was formed in October 2020 to review the original guideline, with the primary author undertaking a current literature review.

Provisional recommendations based on the available evidence were developed and revised by members of the GDN. The revised clinical practice guide was sent to the GDN members for review. The guide narrative was revised based on group feedback.

Recommendation agreement was achieved by GDN members assigning their level of agreement with each recommendation statement. The level of agreement is indicated in this guide for each recommendation. Further detail about this process is provided in Appendix 2.

More information about the author and membership of the GDN can be found in the acknowledgements section of this guide.

How to use this guide

This guide includes recommendations and a summary of relevant literature. The detailed evidence used to support statements can be found in the integrated evidence review (Appendix 3).

Clinical judgement should be exercised when applying the principles and procedures outlined in the guide. Where ophthalmic complications have occurred, the directions of the ophthalmologist should be adhered to over the recommendations outlined in this document.

Anatomy of the eye

Summary of normal anatomy and physiology of the anterior ocular surface

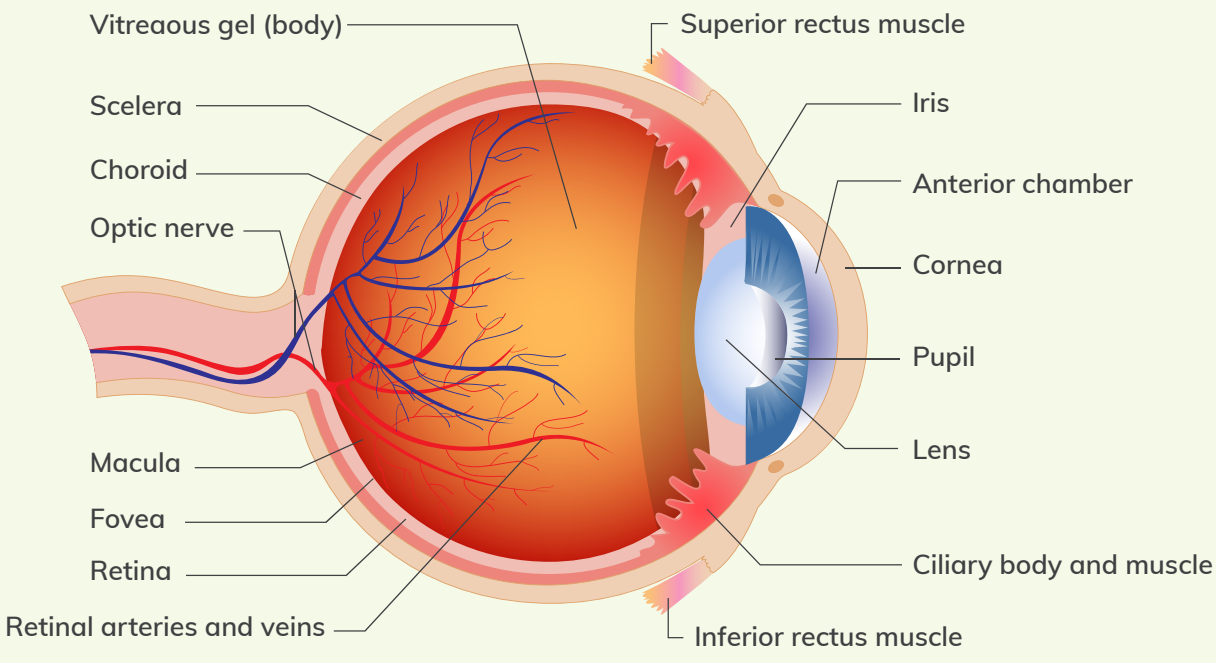
The ocular surface is protected from injury and infection by several structures, including the following (refer to Figure 1):

- Retractable eyelids have a mucous membrane covering that is continuous with the eyeball, and epithelium of the sclera, cornea and conjunctiva. Eyelids mechanically protect the eyes from dehydration and injury.[3]
- An opaque sclera ensures that light transmitted to the globe enters only through the transparent corneal covering of the pupil.[3]
- An avascular cornea functions to admit and refract light. If injured, it may be slow to heal. Five layers of corneal tissue (superficially epithelium, changing to deeper endothelial tissue) provide a protective barrier against abrasion and erosion, and provide a permeable barrier against eye pathogens.[6]

The conjunctival epithelium extends from the eyelid margins anteriorly, sharply turning on itself to cover the sclera, creating a moist sac. This sac is continuous with the epithelium that lines the tear ducts and plays a central role in the defence of ocular surface microbial injury. The conjunctiva has a rich blood supply and, if damaged, redness and swelling may be present. Tissues may protrude between the eyelids, exacerbating the effects of lagophthalmos and resulting in corneal opacity and vision loss.[6]

Functioning of the above structures and transparency of the cornea are essential requirements for eye surface protection and are vital for vision.[2] Under normal physiology, closure of the eyelids occurs, which is protective of the ocular surface – the blink reflex and tear production are present and the sclera and cornea appear bright and clear.[3]

Figure 1: Horizontal section of a schematic eye



Function of tears, blinking mechanism and frequency

Eyelid closure and blinking provide a mechanical barrier to ocular injury. This prevents drying out and desiccation of the corneal epithelium by distributing tear film across the exposed surface of the eye.[3, 6]

Lacrimal gland production of tear film is needed for healthy eye function.[8] Tear film contains bactericidal enzymes (lysozyme, lactoferrin) and proteins (IgA).[8] Tears help to provide a defence against microbial colonisation by providing a medium for transport of leukocytes in the event of eye injury or infection.[8] Any increase in irritation from the cornea or conjunctiva will trigger a lacrimal reflex, resulting in an increased tear volume for the eye.[9]

Blinking and tear production helps:

- smooth out corneal irregularities
- protect the air-corneal interface and refractive surface of the cornea
- clear metabolic waste via nasolacrimal drainage mechanisms enable oxygen delivery to the cells of an avascular cornea.[10]

Normal blink frequency in the daytime is typically 9-13 blinks per minute, increasing to 20-30 blinks per minute with abnormal sleep patterns (tiredness). This equates to typical interblink intervals of between 4-6 seconds and 2-3 seconds, respectively.[11]

During cataract surgery, the eyelids are held apart by an eyelid speculum. Surface drying is visible and evident from a change in the normal light reflection from the cornea where it becomes slightly hazy. Within about 20 seconds, the eye can be damaged when exposed or uncovered to air (refer to Figure 2).

Figure 2: Visible corneal surface drying during cataract surgery

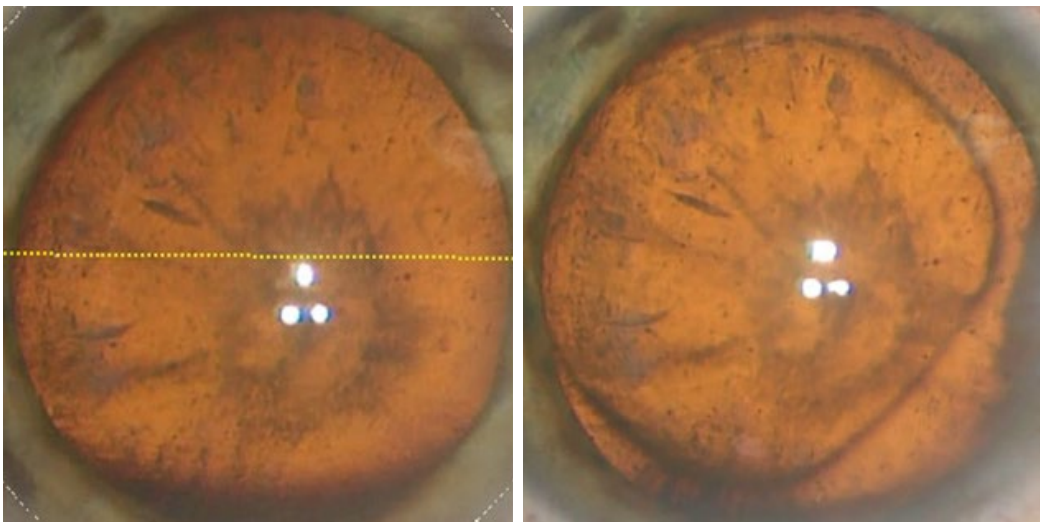


Image source: Taken by Dr Michael Hennessy, Ophthalmologist. Produced with his permission.

Eye care of the critically ill

Epidemiology of ocular complications in the critically ill

Iatrogenic eye complications cover a range of OSD that involve structures such as the cornea, sclera and conjunctiva. Pathologies may range from microepithelial corneal punctures (often associated with dry eye syndrome), to corneal abrasion, erosion, ulceration, infection and scarring.[3]

Superficial keratopathy (any breach of the ocular surface) in the ICU population has been found to predispose the patient to infection of the corneal epithelium (keratitis).[2, 3, 6] This infection may be microbial, bacterial or fungal in origin.[3] Keratitis in the presence of corneal exposure is a key factor in the development of OSD and has resulted in serious complications, such as vision loss, corneal rupture and the need for corneal transplantation.[1, 3]

Why critically ill patients are at increased risk of ocular surface disorders

There are several causes of impaired ocular defence mechanisms in critically ill patients. These include:

- An alteration in the level of consciousness, impacting on the blink reflex and incomplete eye closure (lagophthalmos) (see Appendix 1)
- Metabolic derangements
- Immunosuppression
- Mechanical ventilation
- Medications, such as sedatives and muscle relaxants
- Paralysis
- Respiratory pathogens from open suction technique
- Systemic disease
- Prone positioning[1, 3, 6]

The ICU is a pathogen-rich environment. This may contribute to the increased exposure of the ocular surface to microorganisms.[12] Multi-resistant organisms associated with microbial keratitis include pseudomonas aeruginosa, acinetobacter, staphylococcus epidermis, enterococcus, enterobacter proteus mirabilis and klebsiella pneumonae.[1, 3]

Eye care clinical practice

The provision of regular eye care as part of a care bundle has been found to prevent corneal abnormality, exposure keratopathy and infection in the critically ill population.[13-17] This has been found to be true in both the adult and paediatric populations.

When clinicians have received focused clinical education on eye care in the critically ill and are increasingly compliant with eye care guidelines, this has led to reduced exposure to keratopathy for patients.[14, 15, 17]

Anecdotally, however, it has been reported that practice varies greatly between ICUs regarding the frequency and method of eye care undertaken. Specific eye care practice has included the following:

- Regimens of cleaning the eyes with sterile water or normal saline every two to four hours, twice daily or daily[16, 18, 19]
- Installation of a lubricating liquid, such as methylcellulose eye drops[18, 20]
- Applying eye ointment for high-risk patients, or where evidence of eye injury may be apparent, such as when conjunctival oedema is present[5, 16, 19, 21-25]
- Polyethylene film with artificial tear drops has been shown to be more effective than polyethylene film on its own.[26]

For conditions of conjunctival or corneal exposure, methods such as passive eye closure, eye taping, padding with gel membranes, and creation of moisture closed chambers using polyethylene film or goggles have been described.[19, 21, 22, 25 16, 18, 19, 21-24]

Patient assessment

A comprehensive patient history and assessment should be completed on admission, and at regular intervals, such as at shift handover.[27, 28] Clinicians should be aware that critical illness, pre-existing conditions and intensive care treatment all contribute to an increased risk of iatrogenic eye complications.

Clinicians can do a corneal epithelial assessment using readily available practical methods. These methods can include:

- a magnified view using fluorescein stain and a blue light (see Figure 3 and 4)
- using a direct ophthalmoscope (blue light and magnification).

Clinicians should approach family members for information regarding the patient's medical and surgical history. This history should include ocular conditions and treatment in order to assess the risks and assist with early recognition of OSD.[27] The history should include:

- any previous eye injury or surgery
- the presence of an artificial lens
- a history of cataracts, glaucoma and other pre-existing eye treatment and medications, such as anticholinergic drops
- whether the patient is known to wear contact lenses, in which case a thorough eye examination to locate and remove lenses should be done to prevent corneal damage.[29, 30]

Early recognition of the signs and symptoms of OSD, as well as the early treatment, improves resolution of this condition.[3]

Figure 3: Dry eye closed

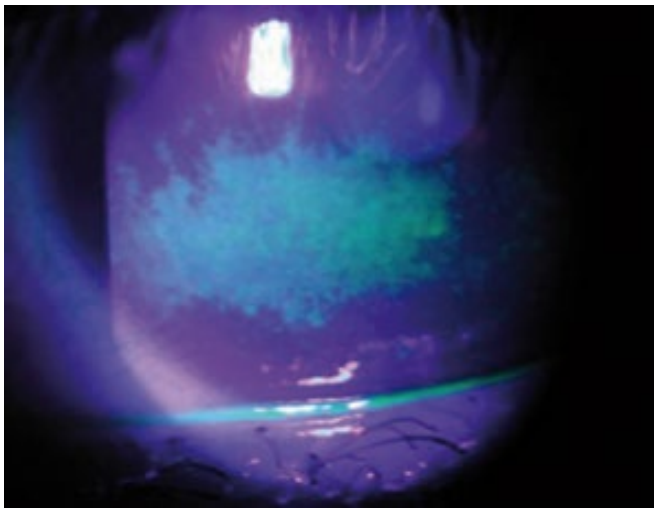


Figure 4: Dry eye open

Source: Eye Care Emergency Manual, Agency for Clinical Innovation [2009][12]

The following steps should take place as part of regular eye care for each critically ill patient:

1. Patient assessed for risk factors for OSD and the ability to maintain eyelid closure on admission, and routinely thereafter, such as at shift handover.
2. A bright light (using a pen torch) should be used for eye examination, looking for signs of infection or disease, conjunctival swelling, dullness, cloudiness, whiteness or spotting of the cornea. Signs of infection may include redness, pain or discharge, lid and conjunctival swelling with hyperaemia, lid margin crusting or corneal clouding.[1, 3] Any new findings or suspicion of infection should trigger a medical review.
3. If there is suspicion of infection, bilateral eye swabs should be obtained for culture, as well as medical consideration for ophthalmologic referral. The use of a broad-spectrum antibiotic, in addition to chloramphenicol, should be considered until the result of the swabs become available.[3]
4. If signs of infection do not improve within 48 hours, intensive care medical staff must be alerted, and ophthalmic opinion must be sought.[3]
5. Frequency of ocular assessment and eye care interventions should be documented in a care plan that is regularly reviewed and updated. Results of patient assessment and effectiveness of interventions should be documented at least once per shift.

Development of a red eye in a septic patient should be addressed as an ocular emergency. The patient's visual capacity may deteriorate within hours, and may depend on rapid intervention.[1, 3] Where red eye is found, with or without exudate, a swab and culture of both eyes should routinely be undertaken and a medical review completed. Examples of abnormal findings during eye assessment can be found in Appendix 1.

Table 1: Recommendation summary table – patient assessment

Recommendation	Source
Eye health assessment should be part of routine patient assessment practice and performed on admission, as well as at the beginning of each shift.	GDN consensus
Admission and ongoing assessment should include, but is not limited to the following: • Risk factors for OSD • Ability for patient to maintain complete eyelid closure • Evaluation of eye and eyelid cleanliness • Corneal dryness or discolouration • Eye care interventions • Effectiveness of eye care interventions	GDN consensus
An assessment by intensive care medical staff should be undertaken when the following are found: • Signs of infection • Red eye or general sepsis • Cornea that is dull and cloudy, or with white lines or spots visible	GDN consensus
Where red eye is identified, with or without exudate, bilateral swabs for culture should be taken and an ophthalmologist referral completed.	GDN consensus

Interventions

Patients with incomplete eye closure (lagophthalmos) are more likely to develop iatrogenic OSD.[7, 15, 22, 28, 29, 31, 32] Critically ill patients may develop lagophthalmos due to:

- reduced level of consciousness
- tracheal intubation
- prolonged sedation
- paralysis
- prolonged mechanical ventilation
- positive end expiratory pressure (PEEP)
- medical conditions with significant metabolic derangement and positive fluid balances.[5, 6, 18, 22, 33-35]

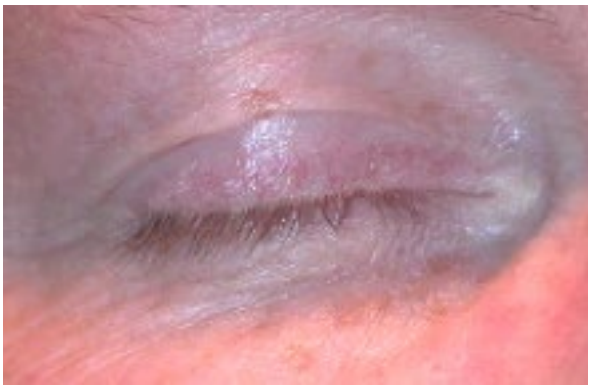
Lagophthalmos exposes a patient's eyes which can lead to:

- drying of the conjunctival and corneal epithelium
- infection
- corneal erosion
- permanent corneal scarring
- vision loss.[1, 3]

Medical staff should identify and treat the causes of lagophthalmos early through regular eyelid assessment (Figure 5). If the eyes are unable to be closed passively, then mechanically close the eyelids to protect the eyes.

Figure 5: Grading lagopthalmos

Grade 1: Eyes completely closed



Grade 2: Eyes open – Sclera or conjunctiva visible

Grade 3: Eyes open – Cornea visible

Source: *Eye Emergency Manual*[12]

Covering the eye to maintain corneal moisture

Interventions to cover the eye and maintain corneal moisture appear to reduce the incidence of eye complications in the adult population.[2, 5, 16, 19] These interventions include the use of either passive or mechanical means to obtain complete lid closure.[2, 7, 36] There is limited evidence of effectiveness of these interventions in the paediatric population.

Mechanical eye covers have been advocated as a strategy to minimise the risk of eye infection in cases of respiratory infection where open tracheal suction techniques may be in use, and when patients require prone positioning.[6] These covers have been advocated for use in combination with eye ointment, paraffin gauze, dressing and tape.[16, 26, 36]

Tape

It is important to ensure that the eyelids are opposed correctly so that the eye lashes are not able to scratch the eye (Figure 6a).[3] Note that when removing the tape placed on the eye, it is important to pull the tape off medial to lateral, as the medial ligaments are the strongest and are likely to suffer less lid trauma than pulling lateral to medially or superiorly to inferiorly. There is a risk of causing levator aponeurosis dehiscence and subsequent ptosis from pulling the tape off superior to inferior, particularly if the tape is being applied and removed on a regular basis.

Polyethylene Eye Covers

As with tape, polyethylene eye covers should be placed over eyelids that are correctly opposed (Figure 6b).

Figure 6a Method of eyelid taping

Figure 6b Polyethylene eye covers

Source: Figure 6a image courtesy *Ophthalmic services guidance eye care in the intensive care unit*.[3] Figure 6b image courtesy of Amy Parkinson.

Cleaning and treatment of the eyes

Available evidence supports routine eye hygiene for all patients and eyelid cleansing if lids are unclean.[1, 3, 6] Eye cleaning with saline-soaked gauze every two to four hours to remove exudate, debris or dried ocular medications should occur in the critically ill population.[7, 24, 37]

The use of normal saline over sterile water is debated.[7, 16, 19] However, agreement exists on the need to promote patient comfort and healing by frequently cleaning the eyes.

When delivering treatment, if more than one product is required, they should be applied in the following order:

1. Provide eye hygiene.
2. Deliver eye drops.
3. Administer eye ointment (lubricant), if required, as it is water repellent and will prevent drops from being absorbed. If lagophthalmos is present, gently close the eyes manually to spread treatment over the eye surface.[1]

If administration of more than one type of eye drop is required, it is recommended these are spaced out as one drop may wash out another. Ideally, five minutes should be allowed between drops.[1]

Protective barriers and moisture for the corneal surface

Various methods have been used to provide protective barriers and moisture to the corneal surface. However, evidence supporting practice has been inconsistent due to variations in the definitions and methodologies used and should be viewed with caution.

The use of lubricants is supported in all unconscious or heavily sedated patients, as lubricants decrease the risk of corneal dehydration.[7, 37] The use of lubricants in the adult population has been supported to provide longer lasting eye moisture and require less frequent installation.[8, 25] Lubricants are recommended for use in the paediatric population for sedated ventilated children.[13, 15]

Lubricants are more effective than passive eyelid closure in reducing the incidence of corneal erosion.[23, 25] However, lubricants are less effective than mechanical eye covers (except hydrogel eye pads) in reducing corneal breakdown.[21, 22] Polyethylene cover moisture chambers have shown to be effective in reducing the incidence of exposure keratopathy.[16, 19, 23]

Combination use of 1.27cm lubricant ointment with polyethylene covers has been shown to result in a low incidence of OSD (5.3%-6.8%).[16, 25] A soft adherent tape edging has also been used with polyethylene covers to create a better seal in the adult population.[16, 19] Extreme care should be taken to prevent injury because the tissues surrounding the eyes are delicate and inadvertent application of tape to the cornea may cause damage.[1]

Table 2: Recommendation summary table – interventions

Recommendation	Source
Eyelid closure should be used to protect the eyes of critically ill patients who are unable to independently maintain complete lid closure.	GDN consensus
All patients should receive regular eye cleaning to remove debris, secretions, dried ointment and other ocular medications.	GDN consensus
For all patients with, or at risk of, lagophthalmos, second hourly eye care must be undertaken to prevent drying of ocular epithelial surfaces and reduce the risk of infection.	GDN consensus
If eyelid closure cannot be maintained passively then mechanical taping methods should be used to close the eye.	GDN consensus
If eye infection is suspected, consideration should be given to commencing broad-spectrum topical antibiotic treatment until the result of swabs are available.	GDN consensus
Clinicians should ensure that patient's eyes are not exposed to aerosols generated during tracheal or oropharyngeal suction procedures.	GDN consensus
Medical officers should assess the patient for iatrogenic ophthalmologic complications (at the microepithelial level) at least weekly in intensive care patients with a length of stay greater than seven days, using readily available practical methods.	GDN consensus
Patients should be referred for specialist ophthalmological consultation when any of the below occur: • Clinical practices fail to achieve sustained eyelid closure within 24 hours • Iatrogenic ophthalmologic complications are identified • Patient response to treatment is limited	GDN consensus

Infection prevention

The Australian Guidelines for the Prevention and Control of Infection in Health Care and the NSW Infection Control Policy (PD2017_013) state that all procedures which generate, or have the potential to generate, secretions require either a face shield or a mask with protective goggles to be worn.[38-39]

The use of personal protective equipment (PPE) to prevent mucosal or conjunctival splash injury is mandatory while using open or closed suction of a patient. This must include goggles or face shield, gloves, and gown or apron.

Eye care equipment should be kept in containers separate from other hygiene equipment. Additionally, medications including eye lubricants must be for single patient use only and be stored and disposed of as indicated by the manufacturer.

Table 3: Recommendation summary table – infection prevention

Recommendation	Source
Clinicians caring for a patient should don appropriate PPE, as per NSW Infection Control Policy.	Clinical Excellence Commission, 2017[38]
Clinicians are to adhere to the five moments of hand hygiene.	Clinical Excellence Commission, 2017[38]
Equipment for eye care must be kept in its own container separate from other patient hygiene equipment. These containers should be passed through ward cleaning procedures on a regular basis.	GDN consensus

Clinical governance

Eye care interventions should be included in a comprehensive patient care plan that is regularly reviewed and updated. This approach facilitates awareness of changes to the patient's condition, eye care treatment and recorded outcomes.[7] Standing orders may be useful in ensuring timely intervention, such as the initiation of ocular antibiotics where infection is suspected.

Contemporaneous documentation of patient eye status (and treatment) – recorded each shift as a minimum – may be aided by using a tick box checklist tool for attachment to either a paper flow chart or electronic medical record entry.

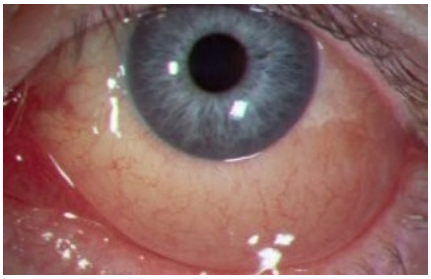
Table 4: Recommendation summary table – clinical governance

Recommendation	Source
All clinical staff should maintain contemporaneous documentation of eye health and interventions.	GDN consensus
All ICUs should ensure clinical staff are competent in the delivery of appropriate eye care.	GDN consensus
All ICUs should monitor the effectiveness of eye care delivered by monitoring for iatrogenic ophthalmological complications, through review of adverse events, audit of practice and review of ICU eye consults attended.	GDN consensus

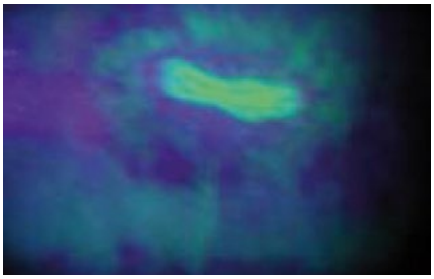
Appendix 1: Identifying ophthalmic abnormalities

Ophthalmic abnormalities

a. Chemosis



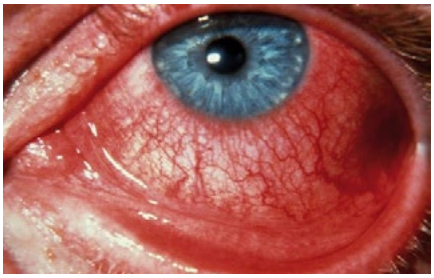
b. Corneal abrasion



c. Allergic conjunctivitis

d. Marginal keratitis

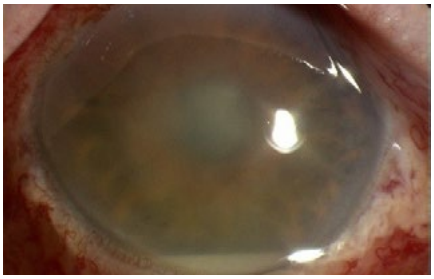
e. Viral conjunctivitis



f. Bacterial ulcer

g. Bacterial conjunctivitis

h. Red eye in septic patient



Source: a - g from *Eye Emergency Manual.*[12] h from *Ophthalmic services guidance eye care in the intensive care unit.*[3]

Appendix 2: Evidence review

Introduction

In 2020, a search for literature to inform this guideline update and review was undertaken within the context of the 2014 *Eye Care Clinical Practice Guideline*. Initially, a bibliography citation search was conducted using keywords: "eyes" and "adult intensive care patients". Animal, burns and trauma studies were excluded. Following this, a structured search of databases was conducted and outlined below. Paediatric studies and review articles were considered in this review.

Results of search strategies

Structured research questions:		
1. What is the incidence of iatrogenic ophthalmological complications in the ICU population?		
2. What clinical practices are effective in preventing ophthalmological complications?		
P	Population (of interest)	All ICU patients with subgroup of patients at most risk
I	Intervention	
C	Control (group)	N/A
O	Outcome (measured)	

Search strategy

Databases:	PubMed, Medline, Cochrane		
Key words:	All ICU patients with subgroup of patients at most risk		
Publication years:	2015-2020		
Other search filters:	Meshing of terms, and combined searches included in strategy		
English language only			
Adult	28	Paediatric	2

Studies reviewed for the development of this guide have been organised according to the above research questions. As few studies have been conducted after the 2014 guideline was published, evidence that is still current from the 2014 guideline has also been considered.

No new studies have been found identifying the risk factors for ophthalmological injury in the critically ill population. As such, the risk factors identified have been extracted from narrative literature reviews identifying the aforementioned risk factors.

The Cochrane Database was also searched with the above strategy with nil findings.

Evidence review process

Each article was reviewed using a data extraction tool.

For this evidence review of clinical practice pertaining to ocular surface disease in critically ill patients, considerable variation in definitions and practice within studies provided challenges in assessing relevance to clinical practice.

Guideline development process

Members of the Guideline Development Network received the literature review and a draft guideline. Recommendation agreement was achieved by sending the draft guideline document to GDN members with a recommendation agreement form. They were then asked to assign their level of agreement (Likert 1-9) with the recommendation statement. A median score of 7 was set for consensus to be reached.

Recommendation statement	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Median score	9	9	9	7	8	9	9	7	8	7	8	8	8	9	8	9	9	9	8
Range	8-9	7-9	7-9	3-9	6-9	9	8-9	5-9	5-9	5-9	8-9	8-9	7-9	9	7-9	9	8-9	8-9	6-9

Appendix 3: Evidence summary table

Study	Method	Sample size	Intervention	Outcomes and recommendations	Country
Kuruvilla S, et al. 2015.Journal of Critical Care[40]	Prospective cohort study	301	Daily eye exam	13.2% developed new onset keratopathy.	India
Hearne B, et al. 2018.Journal of the Intensive Care Society[1]	Narrative review		Review of risk factors for ocular surface disease (OSD)	Adherence to a correctly performed eye care guideline prevents the majority of corneal disorders encountered in the ICU setting.	England
Boal C, et al, 2019. Nursing Children and Young People[13]	Narrative review		• Explores the significance of evidence related to eye care of a ventilated child. • Considers the role of the children's nurse as an agent for change in developing an eye care protocol for use in the paediatric intensive care unit (PICU).	• Early detection is vital to a good patient outcome and should be included in teaching programs for children's nursing students and ICU nurses. • It is essential for each PICU to have evidence-based eye care protocols in place to prevent and detect ocular complications and minimise variations in practice.	Ireland
Demirel S. et al. 2014.Intensive and Critical Care Nursing[14]	Comparative interrupted time series	300 ICU staff	Staff education program on OSD	After training decrease in incidence of exposure keratopathy was found to be highly significant.	Turkey
Khousha O, et al. 2018.Critical Care[17]	Two phase prospective cohort study	371	• Phase 1 observation • Phase 2 introduction of eye care protocol	Introduction of an eye care protocol reduced the rate of exposure keratopathy from 21% to 2.6%.	England
Zhou Y, et al. 2014. Cornea[2]	Meta-analysis	7 trials included	Effect of moisture chamber vs lubrication	The use of moisture chambers is associated with more effective corneal protection compared with lubrication.	China

Study	Method	Sample size	Intervention	Outcomes and recommendations	Country
Bendavid I, et al. 2017. Critical Care Medicine[31]	Single centre, prospective, randomised pilot study	104	Ocular lubricants versus bandage contact lenses versus punctal plugs	Bandage contact lenses and punctal plugs are more effective in limiting keratopathy than standard care.	Israel
Sansome S. 2020. British Journal of Hospital Medicine[6]	Narrative review		Risk factors for COVID-19 patients in developing OSD	COVID-19 patients are exposed to therapies that increase their risk of OSD including ventilation and prone positioning.	England
Lightman S, et al. 2017.Ophthalmic Services Guidance[3]	Clinical practice guide		Questions: 1. How to protect the eye in vulnerable patients thus preventing ICU-related eye complications. 2. Identify diseases affecting the eye in intensive treatment unit patients and which may need ophthalmology referral. 3. How to deliver treatment to the eye when it is prescribed.	Having a clear protocol for assessment and intervention which is followed rigorously will prevent the majority of corneal problems.	England
Alansari M, 2015. Journal of Intensive Care Medicine[8]	Narrative review		Literature review to identify the best available evidence in provision of eye care to prevent exposure keratopathy	This narrative review found application of polyethylene covers to be the most effective method in reducing exposure keratopathy. Early diagnosis and effective treatment will help prevent microbial keratitis and visual loss.	

Study	Method	Sample size	Intervention	Outcomes and recommendations	Country
Marin T. 2020 Joanna Briggs Institute- Evidence Summary[36]	Narrative review	1 x systematic review 2 x randomised controlled trials (RCT)	Question: What is the best available evidence regarding the effectiveness of eye care to prevent dry eye in patients in intensive care units?	• Eye care in the ICU should involve multidisciplinary teams for the prevention and treatment of eye injury. • Patients should receive eye care regime every two hours. • Where a polyethylene cover is possible this should be used in conjunction with tear gel. • Risk factors for dry eyes should be identified at the earliest opportunity.	
McCall K, et al. 2016 Archives of Disease in Childhood[15]	Comparative interrupted time series	28 patients	Introduction of an eye care bundle and addition of eye care lubricants to an admission prescribing set for ventilated, sedated children with limited blink reflex and/or on neuromuscular blocking drugs. A multifaceted training program was implemented with the introduction of the bundle.	• Following implementation 96% of patients had formal eye care documented compared with 19% pre-implementation of the eye care bundle. • Significantly fewer patients had corneal epithelial deficits post implementation 11% versus 39% pre. $p<0.05$. • Eye closure did not improve with implementation of the new guideline (32% vs 31%). However only 33% of patients with incompletely closed eyelids developed deficits compared with 100% pre implementation ($p<0.01$).	Scotland

Study	Method	Sample size	Intervention	Outcomes and recommendations	Country
Nikseresht T, et al. 2019. Clinical Ophthalmology[26]	RCT	208 patients	Patients were randomly assigned to two groups, one group had polyethylene covers only and the other had polyethylene covers with artificial tear drops. One eye was the intervention eye and one eye was the control eye which received standard care of eye hygiene with distilled water.	• Significant difference between control and intervention with 88% of control developing dry eyes by day four of the study (P<0.001). • On day four of the study there was a statistically significant difference between polyethylene cover and polyethylene cover with tear drops being more effective in reducing dry eye (p=<0.001) but not statistically significant on the other days.	Iran

Evidence summary for iatrogenic ophthalmological complications

Short reference	Design/method	Sample description	Outcomes/findings
Kuruvilla S, et al. 2015. Journal of Critical Care[40]	• Prospective cohort study of 301 consecutive patients admitted to a medical ICU over 3.5 months. • Daily eye assessment by ophthalmologist.	N=301 Variability of age (mean 43, SD 16.9 years) 49 participants had exposure keratopathy on admission 35 participants developed keratopathy after ICU admission	• Severe exposure keratopathy is infrequent in a protocolised ICU setting. • Eyelid position and duration of ventilation are associated with exposure keratopathy.
Kalhori R, et al. 2016. Journal of Health Science[41]	• Randomised controlled trial of 96 patients. • Nurses trained in all three interventions and control. • Initial fluorescein test to determine inclusion eligibility. • Patients randomised to routine care in one eye and one of the interventions either: polyethylene cover, liposoic ointment or artificial eye drops for a duration of five days.	N=96 patients N=32 liposoic ointment N=32 polyethylene cover N=32 artificial tear drops Fairly homogenous groups.	Use of polyethylene cover (0.59+_0.665) was significantly more effective in prevention of keratopathy than other methods (P=0.001).

Short reference	Design/method	Sample description	Outcomes/findings
Demirel S. 2014. Intensive and Critical Care Nursing[14]	• Comparative interrupted time series. • 300 staff trained on eye care regime staff for ICU patients. • Pre training period was two months, post training period was one year.	N=762 Group one (pre) N=6,196 Group two (post) No significant differences between pre and post groups.	After training decrease in incidence of exposure keratopathy was found to be highly significant. (p<0.001).
Kousha O, et al. 2018. Critical Care[17]	• Two phase prospective cohort study. • Phase one observational. • Phase two post introduction of eye care protocol.	N=371 Phase 1: 257 Phase 2: 114 Pre and post groups homogenous.	• Phase one overall rate of exposure keratitis was 21%. • Phase two overall rate of exposure keratitis reduced to 2.6 % (p<0.001). • Implementation of an eye care protocol effective in reducing exposure keratitis.
Zhou Y, et al. 2014. Clinical Science[2]	Seven RCTs included for pooled meta-analysis to determine whether moisture chamber vs lubrication is more effective for corneal protection	Seven RCT's using *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) guidelines and Cochrane bias tool. Quality of evidence was ascertained using GRADE approach.	Pooled analysis showed use of moisture chambers resulted in reduction of incidence of corneal damage (p<0.005).
Bendavid I, et al. 2017. Critical Care medicine[31]	• Single centre prospective randomised pilot study. • Comparison of eye care with ocular lubricants vs bandage contact lenses vs punctal plugs.	N=104 N=38 ocular lubricants N=33 bandage contact lenses N=33 punctal plugs Groups homogenous.	Compared with ocular lubrication bandage, contact lenses and punctal plugs are more effective in limiting keratopathy.

Clinical practice effective in preventing iatrogenic ophthalmological complications

Short reference	Design/method	Sample description	Outcomes/findings
Kalhori R, et al. 2016. Journal of Health Science[41]	• RCT • Polyethylene cover vs liposic ointment vs artificial teardrop	N=96 N=32 Liposoic ointment N=32 Polyethylene cover N=32 artificial tear drops Homogenous groups.	• Use of polyethylene cover (0.59+_0.665) was significantly more effective in prevention of keratopathy than other methods (P=0.001).
Demirel S. 2014. Intensive and Critical Care Nursing[14]	• Comparative interrupted time series. • 300 staff trained on eye care regime staff for ICU patients. • Pre training period was two months, post training period was one year.	N=762 group 1 (pre) N=6,196 group 2 (post) No significant differences in heterogeneity between pre and post groups.	Exposure keratopathy was identified in eight eyes of six patients in pre training and five eyes of three patients post training. Decrease in incidence of exposure keratopathy was found to be highly significant.
Kousha O, et al. 2018. Critical Care[17]	• Two phase prospective cohort study • Phase one observational • Phase two post introduction of eye care protocol	N=371 Phase one: 257 Phase two: 114 Phase one and phase two groups homogenous	• Phase one overall rate of exposure keratitis was 21%. • Phase two overall rate of exposure keratitis reduced to 2.6 % (p<0.001). • Implementation of an eye care protocol effective in reducing exposure keratitis.
Kuruvilla S, et al. 2015. Journal of Critical Care[40]	• Prospective cohort study of 301 consecutive patients admitted to a medical ICU over 3.5 months. • Daily eye assessment by ophthalmologist.	N=301 Variability of age (mean 43, SD; 16.9 Years) 49 participants had exposure keratopathy on admission 35 participants developed keratopathy after ICU admission	• Severe exposure keratopathy is infrequent in a protocolised ICU setting. • Eyelid position and duration of ventilation are associated with exposure keratopathy.
Zhou Y, et al. 2014. Clinical Science[2]	• Meta-analysis. Sources searched were PubMed, Embase and the Cochrane library up to 31 May 2014. • Seven RCTs identified to determine if moisture chambers are more effective in preventing corneal abrasion than lubrication.	Seven RCT using PRISMA guidelines and Cochrane bias tool. Quality of evidence was ascertained using GRADE approach.	Pooled analysis showed use of moisture chambers resulted in reduction of incidence of corneal damage (p<0.005).

Short reference	Design/method	Sample description	Outcomes/findings
Bendavid I, et al. 2017. Critical Care Medicine[31]	• Single centre prospective randomised pilot study. • Comparison of eye care with ocular lubricants vs bandage contact lenses vs punctal plugs.	N=104 N=38 ocular lubricants N=33 bandage contact lenses N=33 punctal plugs Groups homogenous	Compared with ocular lubrication bandage contact lenses and punctal plugs are more effective in limiting keratopathy.
Nikseresht T, et al. 2020. Clinical Ophthalmology[26]	• Single blinded randomised controlled trial. • Comparison of polyethylene cover and standard care versus polyethylene cover and tear drop and standard care.	N= 104 N=52 polyethylene cover one eye, standard care other N=52 polyethylene cover with tear drop one eye, standard care other. No significant difference in demographic characteristics and confounder variables.	Polyethylene cover with tear drops was found to be more effective on day four of the study ($p<0.001$) but not statistically significant on the other days.

Clinical practice guide

Short reference	Design/method	Recommendations for practice
Lightman S, et al. 2017. Ophthalmic Services Guidance[3]	Eye care clinical practice guide intensive care patients	**Assessment** • Assessment of eyelid closure must be done at the onset of the care plan and regularly throughout the patients' stay. • Ointment is recommended as drops do not last long enough with treatment dependent on grade of exposure. • In patients nursed prone and unconscious, the eyes should be lubricated every four hours and taped shut. Where severe oedema is present medical staff should be contacted for review. **Identifying disease of the eye** • Intensive care staff should assess for a sticky eye which may be red. If the eye is very red but not sticky, staff must seek expert ophthalmological help. • If discharge and redness from conjunctivitis has not markedly improved within 48 hours, medical staff must be informed and ophthalmic help sought. • If the cornea becomes dull or a white patch appears, an urgent ophthalmological opinion must be sought. **Rare conditions in ICU** • Red eye in a septic patient requires immediate ophthalmic review as this is a sight-threatening emergency. • Development of bilateral acute glaucoma requires immediate ophthalmic treatment. **Grade of exposure and action required** • Grade 0: No action required. • Grade 1: Eyes need lubricating every four hours Always check corneal clarity with bright light. If not clear alert medical staff. • Grade 2: Eyes need lubricating and lids taping Always check corneal clarity with a bright light. If not clear, alert medical staff. **Systemic fungal infection and the eye for intensivists** • All patients with a positive blood culture or line tip for candida, aspergillus or any other fungal organism should be referred for urgent ophthalmological assessment. • If intraocular fungal disease is detected, treatment with an antifungal that penetrates the eye is needed. • If any patient complains of change of vision when they wake up in ICU, then intraocular infection should be considered in the differential diagnosis and urgent ophthalmological review organised.

References

1. Hearne BJ, Hearne EG, Montgomery H, et al. Eye care in the intensive care unit. J Intensive Care Soc. 2018;19(4):345-50.
2. Zhou Y, Liu J, Cui Y, et al. Moisture chamber versus lubrication for corneal protection in critically ill patients: A meta-analysis. Cornea. 2014 Nov;33(11):1179-85. DOI: 10.1097/ICO.0000000000000224
3. Lightman S, Montgomery H. Ophthalmic services guidance eye care in the intensive care unit (ICU) [Internet]. London: Royal College Of Ophthalmologists; 2017. Available from: https://www.rcophth.ac.uk/wp-content/uploads/2017/11/Intensive-Care-Unit.pdf
4. NSW Agency for Clinical Innovation. Eye care for critically ill adults: Clinical practice guideline. Sydney: ACI; 2014.
5. Rosenberg JB, Eisen LA. Eye care in the intensive care unit: narrative review and meta-analysis. Crit Care Med. 2008 Dec;36(12):3151-5. DOI: 10.1097/CCM.0b013e31818f0ee7
6. Sansome SG, Lin PF. Eye care in the intensive care unit during the COVID-19 pandemic. Br J Hosp Med (Lond). 2020 Jun 2;81(6):1-10. DOI: 10.12968/hmed.2020.0228
7. Marshall AP, Elliott R, Rolls K, et al. Eyecare in the critically ill: Clinical practice guideline. Aust Crit Care. 2008 May;21(2):97-109. DOI: 10.1016/j.aucc.2007.10.002
8. Alansari MA, Hijazi MH, Maghrabi KA. Making a difference in eye care of the critically ill patients. J Intensive Care Med. 2015 Sep;30(6):311-7. DOI: 10.1177/0885066613510674
9. Sandring S. The orbit and accessory visual apparatus. Grays Anatomy. 40th Ed. Edinburgh: Churchill Livingstone; 2008.
10. Mercieca F, Suresh P, Morton A, et al. Ocular surface disease in intensive care unit patients. Eye (Lond). 1999 Apr;13 (Pt 2):231-6. DOI: 10.1038/eye.1999.57
11. Wang Y, Toor SS, Gautam R, et al. Blink frequency and duration during perimetry and their relationship to test-retest threshold variability. Invest Ophthalmol Vis Sci. 2011 Jun 28;52(7):4546-50. DOI: 10.1167/iovs.10-6553
12. NSW Department of Health. Eye emergency manual. 2nd Ed. North Sydney, NSW: NSW Department of Health; 2009.
13. Boal C, Corkin D. The importance of protocol-based eye care in the paediatric intensive care unit. Nurs Child Young People. 2019 Jul 9;31(4):23-7. DOI: 10.7748/ncyp.2019.e1196
14. Demirel S, Cumurcu T, Firat P, et al. Effective management of exposure keratopathy developed in intensive care units: the impact of an evidence based eye care education programme. Intensive Crit Care Nurs. 2014 Feb;30(1):38-44. DOI: 10.1016/j.iccn.2013.08.001
15. McCall K, Hussin HM, Gregory ME, et al. A bundle improves eye care in PICU. Arch Dis Child. 2016 Sep;101(9):832-5. DOI: 10.1136/archdischild-2015-310410
16. So HM, Lee CC, Leung AK, et al. Comparing the effectiveness of polyethylene covers (Gladwrap) with lanolin (Duratears) eye ointment to prevent corneal abrasions in critically ill patients: A randomized controlled study. Int J Nurs Stud. 2008 Nov;45(11):1565-71. DOI: 10.1016/j.ijnurstu.2008.02.005
17. Kousha O, Kousha Z, Paddle J. Incidence, risk factors and impact of protocolised care on exposure keratopathy in critically ill adults: A two-phase prospective cohort study. Crit Care. 2018 Jan 16;22(1):5. DOI: 10.1186/s13054-017-1925-5

18. Kocaçal Güler E, Eşer İ, Eğrilmez S. Effectiveness of polyethylene covers versus carbomer drops (Viscotears®) to prevent dry eye syndrome in the critically ill. J Clin Nurs. 2011;20(13-14):1916-22.

19. Koroloff N, Boots R, Lipman J, et al. A randomised controlled study of the efficacy of hypromellose and Lacri-Lube combination versus polyethylene/Cling wrap to prevent corneal epithelial breakdown in the semiconscious intensive care patient. Intensive Care Med. 2004;30(6):1122-6.

20. Laight SE. The efficacy of eye care for ventilated patients: Outline of an experimental comparative research pilot study. Intensive Crit Care Nurs. 1996 Feb;12(1):16-26. DOI: 10.1016/s0964-3397(96)81623-5

21. Bates J, Dwyer R, O'Toole L, et al. Corneal protection in critically ill patients: A randomized controlled trial of three methods. Clinical Intensive Care. 2004;15(1):23-6.

22. Sivasankar S, Jasper S, Simon S, et al. Eye care in ICU. Indian J Crit Care Med. 2006;10(1):11-4.

23. Joyce N. Eye care for the intensive care patient. Adelaide: The Joanna Briggs Institute for Evidence Based Nursing and Midwifery; 2001.

24. Ezra DG, Chan MP, Solebo L, et al. Randomised trial comparing ocular lubricants and polyacrylamide hydrogel dressings in the prevention of exposure keratopathy in the critically ill. Intensive care med. 2009;35(3):455-61.

25. Lenart SB, Garrity JA. Eye care for patients receiving neuromuscular blocking agents or propofol during mechanical ventilation. Am J Crit Care. 2000 May;9(3):188-91.

26. Nikseresht T, Abdi A, Khatony A. Effectiveness of polyethylene cover versus polyethylene cover with artificial tear drop to prevent dry eye in critically ill patients: A randomized controlled clinical trial. Clin Ophthalmol. 2019;13:2203-10. DOI: 10.2147/OPTH.S233404

27. Konno R. Eye Care: (ICU): Clinician Information. Joanna Briggs Institute EBP Database, JBI@ Ovid. 2011.

28. Yim W. Evidence-based eye protocol for ICU patients with altered level of consciousness. Hong Kong: University of Hong Kong; 2009.

29. Ramírez F, Ibarra S, Varon J, et al. The neglected eye: Ophthalmological issues in the intensive care unit. Crit Care Shock. 2008;11(3):72-82.

30. Smith SB, Coffee T, Yowler C, et al. Risk factors for ophthalmic complications in patients with burns. J Burn Care Res. 2010 Nov-Dec;31(6):911-7. DOI: 10.1097/BCR.0b013e3181f93712

31. Bendavid I, Avisar I, Serov Volach I, et al. Prevention of exposure keratopathy in critically ill patients: A single-center, randomized, pilot trial comparing ocular lubrication with bandage contact lenses and punctal plugs. Crit Care Med. 2017;45(11):1880-6.

32. Oh EG, Lee WH, Yoo JS, et al. Factors related to incidence of eye disorders in Korean patients at intensive care units. J Clin Nurs. 2009;18(1):29-35.

33. Desalu I, Akinsola F, Adekola O, et al. Ocular surface disorders in intensive care unit patients in a Sub-Saharan teaching hospital. Internet J Emerg Intensive Care Med. 2008;11(1).

34. Mela E, Drimtzias E, Christofidou M, et al. Ocular surface bacterial colonisation in sedated intensive care unit patients. Anaesth Intensive Care. 2010;38(1):190-3.

35. Sorce LR, Hamilton SM, Gauvreau K, et al. Preventing corneal abrasions in critically ill children receiving neuromuscular blockade: A randomized, controlled trial. Pediatr Crit Care Med. 2009 Mar;10(2):171-5. DOI: 10.1097/PCC.0b013e3181956ccf

36. Marin T. Eye care: Prevention of dry eye in ICU - Evidence summary. Joanna Briggs Institute EBP Database, JBI@Ovid. 2020: JBI674

37. de Araujo DD, Silva DVA, Rodrigues CAO, et al. Effectiveness of nursing interventions to prevent dry eye in critically ill patients. Am J Crit Care. 2019 Jul;28(4):299-306. DOI: 10.4037/ajcc2019360

38. Clinical Excellence Commission. Infection prevention and control policy. PD2017_013. 2017 [Internet]. Sydney: NSW Health; 2017 [cited 20 November 2020]. Available from: https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_013.pdf

39. National Health and Medical Research Council. Australian Guidelines for the Prevention and Control of Infection in Healthcare. Canberra: NHMRC; 2019.

40. Kuruvilla S, Peter J, David S, et al. Incidence and risk factor evaluation of exposure keratopathy in critically ill patients: a cohort study. J Crit Care. 2015 Apr;30(2):400-4. DOI: 10.1016/j.jcrc.2014.10.009

41. Kalhori RP, Ehsani S, Daneshgar F, et al. Different nursing care methods for prevention of keratopathy among intensive care unit patients. Global journal of health science. 2016;8(7):212.

Acknowledgements

The ACI would like to acknowledge the following contributors to this guide.

The original 2014 Guideline Development Network

Intensive care

Anthony Altea

Kelvin Smith

Rand Butcher

Martin Boyle

Sarah Jones

Ophthalmology

Bev Latham

Jill Grasso

Dr Peter McCluskey

Dr Michael Hennessy

2020 Guideline Development Network

Intensive care

Alicia Montague

Deharne Style

Sarah Jones

Kate Leutert

Rand Butcher

Wencke Kverneland

Ophthalmology

Dr Michael Hennessy

Tae Park

Joanne McCullogh

Glossary

Bacterial keratitis	Inflammation of the cornea; secondary to bacterial infection.
Chemosis	Swelling of the conjunctiva, often preventing eyelid closure.
Corneal abrasions	Superficial disruption to corneal epithelial lining. Common conditions may be secondary to foreign body or contact lens use.
Corneal erosion	Small punctate or changes in the corneal epithelium, creating a breach in the defence mechanisms of the cornea, leaving it vulnerable to pathogenic organisms. Left untreated, corneal erosion may result in ulceration, scarring and compromised vision.
Dry eye	Lack of normal eye tear film and lubrication. Corneal defences are compromised due to lack of IgA and other immune mediators.
GDN	Guideline Development Network
ICU	Intensive care unit (includes all types of units designated in the role delineation in NSW)
IgA	Immunoglobulin A
Keratopathy	Ocular surface breach, predisposing to corneal infection, inclusive of any corneal disease, dysfunction or abnormality.
Lagophthalmos	The inability to close, or poor closure of, the eyelids.
Microbial keratitis	Percutaneous endoscopic gastrostomy
NHMRC	National Health and Medical Research Council
OSD	Ocular surface disease
Ocular surface disease	General term covering conditions of superficial corneal exposure. These may range from micro or punctuate lesions to larger geographical defects de-epitheliasing the cornea.
PEEP	Positive end expiratory pressure

The Agency for Clinical Innovation (ACI) is the lead agency for innovation in clinical care.

We bring consumers, clinicians and healthcare managers together to support the design, assessment and implementation of clinical innovations across the NSW public health system to change the way that care is delivered.

The ACI's clinical networks, institutes and taskforces are chaired by senior clinicians and consumers who have a keen interest and track record in innovative clinical care.

We also work closely with the Ministry of Health and the four other pillars of NSW Health to pilot, scale and spread solutions to healthcare system-wide challenges. We seek to improve the care and outcomes for patients by re-designing and transforming the NSW public health system.

Our innovations are:

- person-centred
- clinically-led
- evidence-based
- value-driven.

www.aci.health.nsw.gov.au

NSW GOVERNMENT

AGENCY FOR CLINICAL INNOVATION

Our vision is to create the future of healthcare, and healthier futures for the people of NSW.