SAFE USE OF ALCOHOL BASED SKIN PREPARATION SOLUTIONS IN THE OPERATING THEATRE ENVIRONMENT CHW

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- The World Health Organisation (WHO) recommends the use of alcohol-based solutions containing chlorhexidine gluconate for skin preparation for prevention of Surgical Site Infections (SSI)[1]
- The Australian College of Perioperative Nurses (ACORN) sites research supporting either chlorhexidine and alcohol or iodine and alcohol as the most effective antiseptic solution for the prevention of SSI[2]
- Alcohol Based Skin Preparation Solutions (ABSP) significantly reduce the incidence of SSI and a combination of chlorhexidine or povidone iodine with alcohol is more effective than aqueous solutions[3,4, 5]
- ABSPS are not suitable for all procedures. There is a need to consider the site and type of procedure, surgeon preference, patient allergies and contraindications to use[2]
- Antiseptic solutions must have an added colour for clear identification and to prevent unintentional injection[2]
- The surgeon / proceduralist or appropriate delegate e.g. registrar or instrument nurse is responsible for application of ABSPS and allowing sufficient drying time
- ABSPS are highly flammable and present a fire risk, particularly when laser, electrosurgical equipment or high concentration oxygen are in use and caution is required with the following measures to reduce risk[2, 5]
    - Prevent pooling of alcohol when preparing the skin for surgery

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st November 2025	**Review Period**: 3 years
Team Leader:	Clinical Nurse Educator	**Area/Dept**: Perioperative Service CHW

- Remove alcohol soaked linen or absorbable items following use of prep solution
- Ensure the solution is completely dry prior to draping (minimum 3 minutes)
- Electrosurgical equipment should be used on the lowest power possible
- Minimise oxygen concentration delivered to patient

- The use of ABSPS must be in accordance with ACORN standards, the relevant safety data sheets (SDS) for skin preparation solutions available in the operating theatre and the content of this guideline.

CHANGE SUMMARY

- New document

READ ACKNOWLEDGEMENT

- Training/Assessment Required
  - All clinical operating theatre staff must complete:
  - Annual fire training as per SCHN Mandatory Training and Chief Executive (CE) Directive Training Policy
  - Local in-service education on storage, handling and safe use of ABSPS provided by a clinical nurse educator
  - Perioperative nurses must complete the eLearning module 'Alcohol Based Skin Preparation in the Operating Room' accessible via My Health Learning (20 mins)
  - Knowledge and safe use of ABSPS solutions is assessed through completion of Perioperative Nurse assessment tools
- All Anaesthetists, Perioperative Nurses, Proceduralists and Surgeons must read and acknowledgement that they understand:
  - The content of this guideline and relevant safety data sheets (SDS) for skin preparation solutions available in the operating theatre. Refer to ChemAlert

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Introduction

Surgical site infections pose a significant risk to patients increasing morbidity, mortality, length of hospital stay and cost after surgical procedures. There is a growing body of evidence that alcohol-based skin preparations are superior to water-based skin preparations in reducing surgical site infections (SSI).[2,6]

Alcohol Based Skin Preparation Solutions (ABSPS) are one of the most effective and rapid acting skin antisepsis preparations, particularly in combination with chlorhexidine or povidine-iodine.[1,2,3,4,5] However, if used inappropriately, they are also flammable and can contribute to rare complications such as skin burns and the risk of fire in the operating theatre.

Fires can occur when fuel, an oxidiser and an ignition source come together.

All three of these elements are present in the operating theatre, for example alcohol-based skin preparation, oxygen rich environment and a heat source such as electrosurgical or laser equipment (see Figure 1).[2,7]

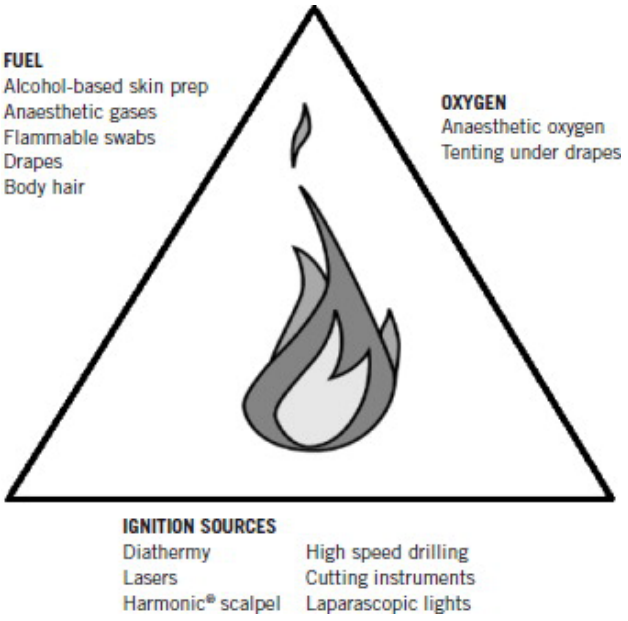

Figure 1: Fire Triangle of sources of fuel, ignition and oxygen in the operating theatre.

ABSPS are not suitable for all procedures. Alcohol and chlorhexidine solutions can be toxic to the ocular surface, and it is recommended they not be in contact with eyes, middle ears, brain, meninges, mucous membranes, nerve tissue, damaged skin, and newborns under 28 days of age.[3,8,9,10]

When considering the use of ABSPS in the operating theatre environment, there is a need to consider the type of procedure, surgeon preference, patient allergies and contraindications to use, balancing the risk of fire and patient harm with the risk of SSI.[2]

Aim

This document aims to facilitate the safe use of ABSPS as an antiseptic preoperative skin preparation for surgical and anaesthetic procedures, in operating theatre environments at The Children's Hospital at Westmead (CHW).

Responsibilities

- The decision on which skin antisepsis solution to use is the responsibility of the surgeon / proceduralist performing the procedure
- The surgeon / proceduralist or appropriate delegate e.g. registrar or instrument nurse is responsible for application of ABSPS and allowing sufficient drying time as per section 3.3 of this document
- The interdisciplinary team is responsible for preventing harm to patients from the use of antiseptic solutions including safe use and application of ABSPS. Precautions must be in place to minimise risks to the patient[2,4]
- The Clinical Nurse Educators and Nurse Educator will facilitate delivery of education and training on orientation to the perioperative service for nursing staff and operations assistants
- The Nurse Unit Manager will support time for education and training on use of ABSPS
- All staff must follow relevant NSW Health, SCHN policies, and safety data sheets for applicable solutions

Storage

ABSPS storage must be in accordance with the relevant Safety Data Sheet (SDS) available on ChemAlert and the SCHN Hazardous Chemicals Procedure[11]

Storage of **Chlorhexidine 2% in alcohol 70%** and **Povidone-Iodine solution (Alcoholic)**:[12, 13]

- Store in a cool, dry, well-ventilated area, removed from incompatible substances, heat or ignition sources and foodstuffs, below 25ºC
- Ensure containers are adequately labelled, protected from physical damage and sealed when not in use
- Check regularly for leaks or spills
- Large storage areas should have appropriate fire protection systems

To reduce the incidence of a bottle of alcohol-based skin preparation being mistaken for any other type of skin preparation, it must be stored separately. The antiseptic solution is to be

collected from the storage area for each individual set up and any unused quantity discarded in appropriate waste container.[5,6]

Procedure

1 Clinical Procedure Safety

The 'Team Brief' and 'Time Out' must include a review of hazards / risk of fire and skin burns associated with use of ABSPS during discussion of anticipated critical events.[14]

This includes appropriate action to protect patients and staff, a plan of action and roles in the unlikely event of a fire.

2 Product selection

Any ABSPS available for use within CHW operating suites must be approved by the Australian Therapeutic Goods Association.

The following ABSPS are available:

- Surgi-Prep C (red) 0.5% chlorhexidine gluconate with 70% isopropyl alcohol
- Surgi-Prep C+ (red) 2% chlorhexidine gluconate with 70% isopropyl alcohol
- BD Chloraprep (stick) 2% chlorhexidine gluconate with 70% isopropyl alcohol
- Povidone Iodine 10% with 70% isopropyl alcohol

Use of any strength of ABSPS must adhere to this guideline.

3 Use of Solution

3.1 Decanting and disposal

Before opening and decanting ABSPS refer to the surgeon/proceduralist/anaesthetist preference card and verbally confirm solution required.

Wear PPE when decanting and beware of possible ignition sources. Securely replace bottle cap after decanting.

Any Raytec swabs used to apply the ABSPS must remain in the operating theatre until the completion of the procedure and the final count. Raytecs and decanted solution should not be stored near inhalation gas delivery systems, electrical devices or power supplies. [2,5,12,13,15]

Where possible, commercially prepared swabs or swab sticks are recommended for skin preparation before administering epidural, intrathecal or other perineural injections, and before inserting central venous lines. If liquid is used it must be dark tinted and removed from

the sterile field following skin prep to prevent contamination of the sterile setup with disinfectant solutions and cross-contamination of solutions intended for neuraxial injection with disinfectant preparations.[16,17]

3.2 Quantity of solution, application, run off and pooling

The quantity of ABSPS used to prepare the patient's skin will be kept to a minimum to **avoid run-off and pooling** either on or around:

- The patient, hair, skin folds/umbilicus, in between digits
- Electrodes, electrosurgical dispersive pads, beneath pneumatic tourniquets
- Endotracheal tube ties, tape[2]

Only self-contained, single use and pre-measured containers will be available for use.

Solutions **must contain an added colour** to remain obvious when applied on the skin and to reduce the risk of the solution drawn up as injectable drug. Use of excessive quantities with associated pooling is less likely when the colour indicates site of application.2,6

Any solution run off that occurs will be contained by absorbent disposable plastic-backed sheets that are placed around the patient and **must be removed before the drapes are applied.** [2]

If staff attire / Personal Protective Equipment (PPE) become soaked in ABSPS, staff should leave the area and change into clean attire / PPE immediately or prior to further tasks.[5,6]

3.3 Drying and evaporation time

The ABSPS **must be allowed sufficient time to evaporate / dry completely** prior to draping the patient and activating any electrosurgical or laser equipment. At a minimum three minutes, however drying time can take up to five minutes and varies based on the surface area prepped and product used.[2,4,5,6]

Check the ABSPS has not pooled under the patient prior to draping.

3.4 Electrosurgical equipment

Electro surgical equipment is the prime ignition source in 68% of surgical fires.[2,15]

Equipment must be inspected prior to use to ensure it is undamaged. Fluids are not to be stored in contact with the device.[2]

It is advised electrosurgical equipment should be used on the lowest possible power setting to minimise the risk of sparking and excessive temperatures. Care should be taken to ensure that electrosurgical equipment is not inadvertently activated and when not in use, the electrode must be placed in a holster / quiver.[2]

3.5 Oxygen rich atmosphere

Oxygen concentrations greater than 30% increase the chance of fuel ignition, the intensity and spread of a fire.[17] **Minimise the oxygen concentration** delivered to the patient and where possible, **avoid high concentrations** and accumulation of oxygen under drapes with

closed system oxygen delivery and careful positioning of drapes over nasal cannula or oxygen masks.[2,18]

3.6 Management of spills

Spills in operating theatre practice are likely to be small. Ensure appropriate PPE is in use, contain and soak up the spill with non-combustible material and dispose of in general waste.[5] Refer to the SCHN Hazardous Chemicals Procedure for further information.

3.7 Post procedure

On completion of the procedure, any excess solution remaining in a bottle or decanted gallipot must be removed from the operating theatre, flushed down the sink and the gallipot rinsed prior to disposal in the general or plastic waste bin.[5]

Routine practice post procedure includes ensuring the skin surrounding the surgical site is cleaned, washing off any remaining ABSPS. However, chlorhexidine gluconate solutions should remain on the skin for 6 hours postoperatively to benefit from its continuing antiseptic properties.[2]

4 In the event of a fire

- Follow SCHN protocols, call 2222 to activate CODE RED, and call the Floor Manager
- Remove burning material off the patient
- Extinguish the fire with water
- Turn off sources of ignition and oxygen
- Assess patient requirements and prioritise care
- Application of first aid will depend on the size and site of the burn and under the direction of the proceduralist. This may include placing and frequently replacing surgical sponges moistened with sterile water on burnt tissue or continuous irrigation of sterile water on burn site for 20 minutes to minimise injury.

5 Education

All clinical operating theatre staff:

- Need to be trained and supported in the correct and safe use of alcohol-based agent solutions
- Must participate in designated local education and nursing staff complete the eLearning module ‘Alcohol Based Skin Preparation in the Operating Room’ accessible via My Health Learning (20 mins).

Managers are responsible for ensuring their staff who participate in procedures involving alcohol-based skin preparations have completed the designated training.

References

1. World Health Organization (WHO). Preoperative period - surgical site infection prevention recommendations [Internet]. 2018 May 4 [cited 2025 July 15]. Available from https://www.who.int/publications/m/item/preoperative-period---surgical-site-infection-prevention-recommendations
2. Australian College of Perioperative Nurses (ACORN). The New Standards for Perioperative Nursing. [Internet]. March 2023 [cited 2025 July 9]. Available from https://www.acorn.org.au/view-acorn-
3. Badia J.M, Perez I.R, Manuel A, Mermbrilla E, Ruiz-Tovar J, Murioz-Casares C, Arias-Diaz J, Jimeno J, Guirao X, Balibrea A.M. Surgical Site Infection Prevention Measures in General Surgery: Position Statement by the Surgical Infections Division of the Spanish Association of Surgery. Cirugia Espabola. 2020 April; 98:187–203
4. Clinical Excellence Commission. Infection prevention and control practice handbook [Internet] 2020 January [cited 2022 January 19]. Available from https://www.cec.health.nsw.gov.au/keep-patients-safe/infection-prevention-and-control/resources/handbook
5. NSW Health SESLHD Prince of Wales Hospital and Community Services. Alcohol based Skin Preparation Solutions in the Operating Theatre Environment – Safe use of POWHCLIN084. 2022 June
6. NSW Health SLHD Operating Suites: Safe Use of Alcohol Based Skin Preparations SLHD_PCP2024_063. 2024 October
7. Rocos B, Donaldson L.J. Alcohol Skin Preparation Causes Surgical Fires. Annals of the Royal College of Surgeons of England. 2012; 94(2)
8. Liu J-L, Chu H-S, Wei Y-H, Cheng C-Y, Tsui M-C, Wu J-H, Huang W-L, Liu H-Y, Hou Y-C, Wang I-J, Hu F-R, Chen W-L. Review, analysis, and education of antiseptic related ocular injury in the surgical settings. The Ocular Surface 2021July;60-71
9. World Health Organization. Global guidelines for the prevention of surgical site infection [Internet]. 2018 [cited 2025 July 15]. Available from https://www.who.in t/publications/i/item/global-guidelines-for-the-prevention-of-surgical-site-infe ction-2nd-ed
10. World Health Organisation. Surgical Site Infection Prevention Key facts on surgical site skin preparation [Internet]. 2016 [cited 2025 July 31]. Available from https://cdn.who.int/media/docs/default-source/integrated-health-services-(ihs)/ssi/fact-sheet-skin-web.pdf?sfvrsn=ead06f37_2
11. SCHN. Hazardous Chemicals Procedure 2016-9032 v3 [Internet] 2023 [cited 2025 August 13]. Available from https://webapps.schn.health.nsw.gov.au/epolicy/policy/6076
12. ChemAlert. Chlorhexidine 2% in 70% Ethanol Tinted Pink. [Internet] n.d. [cited 2025 July 17]. Available from https://chemalert.rmt.com.au/nswhealthv5/#/
13. ChemAlert. Povidone-iodine solution (alcoholic). [Internet] n.d. [cited 2025 July 17]. Available from https://chemalert.rmt.com.au/nswhealthv5/#/
14. NSW Health. Clinical procedure Safety PD2025_006 [Internet] 2025 [cited 2025 July 17]. Available from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2025_006.pdf
15. NSW Health. Accountable Items used in Surgery and Other Procedures PD2023_002 [Internet] 2023 [cited 2025 July 18]. Available from https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2023_002.pdf
16. Australian Commission on Safety and Quality in Healthcare, and Australia New Zealand College of Anaesthetists (ANZCA). Joint Safety Statement. Topical application of chlorhexidine and the risks of accidental injection in regional anaesthesia and vascular access procedures [Internet]. 2018 [cited 2025 August 7]. Available from https://www.safetyandquality.gov.au/sites/default/files/migrated/ANZCA-and-Commission-joint-statement-on-Chlorhexidine-second-edition-Nov-2018.pdf
17. ANZCA PG28 Guideline on infection prevention and control in anaesthesia [Internet] 2025 [cited 2025 August 13]. Available from https://www.anzca.edu.au/getContentAsset/41b75be4-4c78-4318-8ac4-3d0dd2ca8f8f/80feb437-d24d-46b8-a858-4a2a28b9b970/PG28-Infection-prevention-and-control-2025-PILOT.pdf?language=en
18. Cowles CE Jr, Culp WC Jr. Prevention of and response to surgical fires. BJA Educ. [Internet]. 2019 [cited 2025 July 18]; Aug;19(8):261-266. Available from https://pmc.ncbi.nlm.nih.gov/articles/PMC7807838/