

SESLHD PROCEDURE COVER SHEET



Health
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KEY TERMS	Surgical Plume, Electrosurgery
SUMMARY	<p>This document provides guidance to healthcare teams in managing surgical plume within perioperative and procedural areas.</p> <p>A bundle approach comprising of education, risk assessment and control measures aims to minimise exposure to potential health hazards for all consumers in these environments.</p>

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1. STATEMENT

[NSW Ministry of Health Guideline - GL2015 002 Work Health and Safety - Controlling Exposure to Surgical Plume](#) is a risk management approach for organisations and health care workers exposed to surgical plume.

[NSW Ministry of Health Guideline - GL2015 002 Work Health and Safety - Controlling Exposure to Surgical Plume](#) supports the universal literature on surgical plume in managing the risks associated with surgical plume exposure. The literature encourages¹⁻⁷

- Education and assessment
- Team collaboration
- Use of plume evacuation systems
- Organisational strategies and processes.

This procedure assists health care workers in operating theatres and procedural areas to identify risks and manage surgical plume in the workplace. Through increased awareness of surgical plume and familiarity of available control measures, the procedure aims to minimise exposure to surgical plume for health care workers and patients. A summary of the high and low risk factors of surgical plume exposure is attached as Appendix A.

2. BACKGROUND

Surgical plume presents a potential health hazard to all staff and patients who are exposed to surgical plume when energy based devices are in use.^{1-2, 4-7}

Surgical plume is generated into the environment when commonly used energy based devices e.g. electrosurgery (diathermy), harmonic scalpel and LASER are used during patient procedures.^{1, 2, 3, 5, 6} Staff working in operating theatres and procedural areas are exposed to surgical plume when one or multiple energy based devices are used for patient care.^{1-2, 4-7} Surgical plume is absorbed through the lungs and skin of staff³. Patients undergoing laparoscopic procedures are exposed to surgical plume trapped in their abdominal cavity³; this is absorbed into their bloodstream.^{3, 4, 6}

Over the previous two decades, the available literature continues to inform health care of the potential long term health hazards associated with exposure to surgical plume.^{1, 3, 4} Surgical plume consists of 95 percent water/steam and gas with 5 percent containing cellular matter.^{2, 3, 5} The cellular matter has been shown to contain chemicals, bacteria, viruses, and tissue particles.^{1, 2, 3, 5, 6} The chemicals include known carcinogenic agents.^{2, 4}

3. RESPONSIBILITIES

3.1 Nurses and Medical Staff⁵

Participate in local/guided training and assessment requirements related to hazards associated with surgical plume.^{4, 5}

- Assess the risk for generation of surgical plume^{1, 2} prior to each patient care episode
- Using a team approach⁷ decide on the appropriate plume evacuation system to be used^{1, 5}
- Where available access plume evacuation devices. [NSW Ministry of Health Guideline - GL2015_002 Work Health and Safety - Controlling Exposure to Surgical Plume](#) strongly encourages devices using Ultra-low Particulate Air (ULPA) filter technology
- Seek consultation with appropriate staff if ULPA filter technology is not compatible/available¹
- Communicate challenges of accessing and/or implementing ULPA filter technology¹ to the relevant operating suite/procedural area management team when plume evacuation device units are available but not used.

3.2 Clinical Nurse Educators/Nurse Educators

- Provide orientation and ongoing training to ensure nursing staff are aware of work health and safety risk assessment and control measures related to surgical plume²
- Relevant staff have the skills and knowledge to identify and manage daily equipment checks for safe use of plume evacuation equipment²
- Maintain unit based records for evidence of training.¹

3.3 Line Managers ensure

- New staff have access to relevant education^{1, 2, 7} during orientation
- Ensure availability of evacuation units using UPLA filter technology and capture devices^{1, 2}
- Support staff in the use of surgical plume evacuation equipment²
- Support unit specific resource person/s for auditing local compliance² and equipment maintenance¹
- Establish local workplace support utilising facility based infection control¹⁻² and Work Health Safety and Injury Management (WHS&IM) committees.¹⁻²

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3.4 District Managers/Service Managers

- Support staff in maintaining a safe workplace ¹ by the ongoing purchasing of equipment as required
- Review audit processes annually for compliance with training ^{1, 2} and maintenance of plume evacuation devices ¹
- Support surgical plume as a standing item on SESLHD and site specific Infection Control and WHS&IM Committees. ^{1, 2}

4. RISK MANAGEMENT

For all plume evacuation devices used; establish within each department ^{2, 7}

- Maintenance programs ¹
- Safe operating procedures ¹

[NSW Ministry of Health Guideline - GL2015 002 Work Health and Safety - Controlling Exposure to Surgical Plume](#) advocates for ULPA filter technology to be utilised for surgical plume evacuation. All other literature ²⁻⁸ recommends implementation of routine surgical plume evacuation in clinical practice.

For a checklist in determining appropriate plume evacuation see Appendix D [NSW Ministry of Health Guideline - GL2015 002 Work Health and Safety - Controlling Exposure to Surgical Plume](#).

Routine suction devices are used for plume evacuation, operating suite and procedural areas are advised to perform a risk assessment of the evacuation system. ^{1, 6} Facility based maintenance departments will be able to provide advice to each operating suite and procedural area. Information required includes: ^{1, 6, 8}

- Filtration systems in place
- Maintenance schedule of filtration systems
- Venting of air (surgical plume waste).

5. PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE) provides some protection^{1, 5} to health care workers from exposure to surgical plume particles generated in the environment.

Regular face masks provide minimal protection and are not to be relied on as a means of full protection from aerosols ^{1, 2, 5}

High efficiency face masks ⁵ changed at regular intervals to maximise efficiency of the mask.

Eye protection to minimise irritation to eyes. ^{1, 5}

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For departments utilising simultaneous LASER and electro cautery N95 surgical masks are recommended. ⁵ Ensure correct fit where worn.

6. PROCEDURE**6.1 Pre Procedure/Surgical List**

The procedural team assess the risk for generation of surgical plume prior to each patient care episode. ¹

Decide on the appropriate plume evacuation system ² to be used for procedure/s.

Inspect the system for:

- Routine maintenance requirements (electrical and filters) as appropriate ²
- Assembled correctly ²
- Correct functioning ²
- Availability of sterile capture devices if required.

6.2 ULPA Filter Technology (powered devices)

This technology is highly recommended by the literature. ¹⁻⁷

Position evacuation unit within the operating room in preparation for surgical procedures in which energy devices are to be used. ²

At the commencement of the surgical procedure ensure the capture devices (plume pencil, open tubing, laparoscopic instrument port) are attached ² to the evacuation unit and settings adjusted according to surgical procedure being performed ^{1, 5} i.e. laparoscopic, closed procedures, amount of plume generated.

6.3 Suction (medical, local, central)

Refer to appendix A of [NSW Ministry of Health Guideline - GL2015_002 Work Health and Safety - Controlling Exposure to Surgical Plume](#) for definitions of these routine suction systems and specific requirements of the filters recommended to be used.

Filters must be used. ^{1, 5, 6} The filter is to be placed between the suction collection canister and the vacuum or wall outlet. ^{1, 2, 6}

Capture device ^{2, 3, 4 (p110)} is to be within two centimetres from the point of plume generation. ^{1, 2, 4}

Suction canister liners are to be disposed of at the completion of each procedure. ⁶

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The filter between the suction canister and wall outlet is recommended to be changed at the end of the surgical list. ^{2, 6}

6.4 Post Procedure/Surgical List

At the conclusion of the procedure/surgical list:

Appropriately dispose of any single patient use capture devices and accessories in accordance with [CEC Infection Prevention and Control Practice Handbook](#). ^{1, 6}

Clean the external surface of the evacuation unit in accordance with the NSW Health Environmental cleaning policy [NSW Ministry of Health Policy - PD2020_022 Cleaning of the Healthcare Environment](#).

In each environment establish an agreed practice for routine.

- Replacement of the filter between the suction canister and wall outlet ⁶
- Cleaning and/or replacement of suction tubing ⁶
- Regular inspection and maintenance is carried out according to manufacturer's instructions for powered devices and their accessory filters. ^{1, 2, 6}

7. AUDIT

Australian College of Operating Room Nurses (ACORN) Standards (2016) recommend monitoring for compliance should occur every four months. Results of the audit should identify any deficiencies and recommend strategies to improve compliance. ²

8. DOCUMENTATION

- eMR documentation of evacuation devices used
- Auditing (see audit tool; section 3.4, page 8) [NSW Ministry of Health Guideline - GL2015_002 Work Health and Safety - Controlling Exposure to Surgical Plume](#)
- Training records
- SESLHD and Local Facility Infection Control and WHS&IM Committees agenda items and minutes.

9. REFERENCES

- 1) [NSW Ministry of Health Guideline - GL2015_002 Work Health and Safety - Controlling Exposure to Surgical Plume](#)
- 2) Australian College of Operating Room Nurses (ACORN) Standard for Perioperative Nursing, 14th Ed (2016). Surgical Plume
- 3) Rahman, M.A. (2015). Surgical Plume: Containing Hazards and Health Risks. The Joanna Briggs Institute: Accessed online 9th June 2016

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- 4) Shultz, L. (2014) An Analysis of Surgical Smoke Plume Components, Capture, and Evacuation. AORN. 99 (2) 289-298
- 5) Rahman, M.A. (2015).Surgical Plume: Prevention. The Joanna Briggs Institute: Accessed online 9 June 2016
- 6) Rahman, M.A. (2015). Surgical Plume: Management. The Joanna Briggs Institute: Accessed online 9 June 2016
- 7) Long Khanh Dao, L. (2016). Electrosurgical Equipment in the Perioperative Setting: Safe Use. The Joanna Briggs Institute: Accessed online 9 June 2016
- 8) Shultz, L. (2015). Can Efficient Smoke Evacuation Limit Aerosolization of Bacteria. AORN. 102 (1) 7-14.
- 9) [NSW Ministry of Health Policy Directive PD2020_022 - Cleaning of the Healthcare Environment](#)

10. REVISION AND APPROVAL HISTORY

Date	Revision No.	Author and Approval
September 2013	0	Developed by Menna Davies, CNC
February 2014	1	Menna Davies, CNC Dr Gregory Keogh, Director Surgery, Perioperative and Anaesthetics Clinical Stream
February 2014	1	Re-formatted by Scarlette Acevedo, District Policy Officer
April 2014	1	Approved by District Clinical and Quality Council
April 2014	1	Approved by SESLHD Surgery, Anaesthetic and Perioperative Stream
June 2016	2	Clinical Nurse Consultant Randwick Campus Operating Suite
September 2016	2	Draft for Comment
November 2016	2	Updates endorsed by Executive Sponsor
August 2019	3	Reviewed by SESLHD OS Nurse Managers
August 2019	3	Endorsed by SESLHD Surgical Stream Committee
August 2019	3	Minor review with no changes endorsed by Executive Sponsor.
September 2019	3	Processed by Executive Services including updates to hyperlinks and published.
October 2021	4	Minor review with no changes endorsed by Executive Sponsor.

Appendix A: Risk assessment for staff exposure to surgical plume

Low risk ¹⁻⁸	High risk ¹⁻⁸
Small wound e.g. release of carpal tunnel	Known infectious risk of patient
Short procedure - minimal volume of plume expected	Long procedure – increased volume of plume
Records of maintenance for all plume evacuation devices are according to recommended practice and/or manufacturer’s instructions	Nil maintenance records of: Plume evacuation devices Operating room airflows Suction outlets (pendants and wall)
Energy device to be used diathermy V’s laser	Evacuation device to the site of surgery is greater than two centimetres
Positive knowledge and collaborative practice of clinicians exposed to surgical plume	Smell of surgical plume – inefficient plume evacuation device
Education of staff	No opportunity for a resource person in each work area
PPE is available and worn (masks and eye protection) appropriately	Nil maintenance of air conditioning and suction
Collaboration with maintenance department	Indifference of medical and nursing staff towards plume evacuation