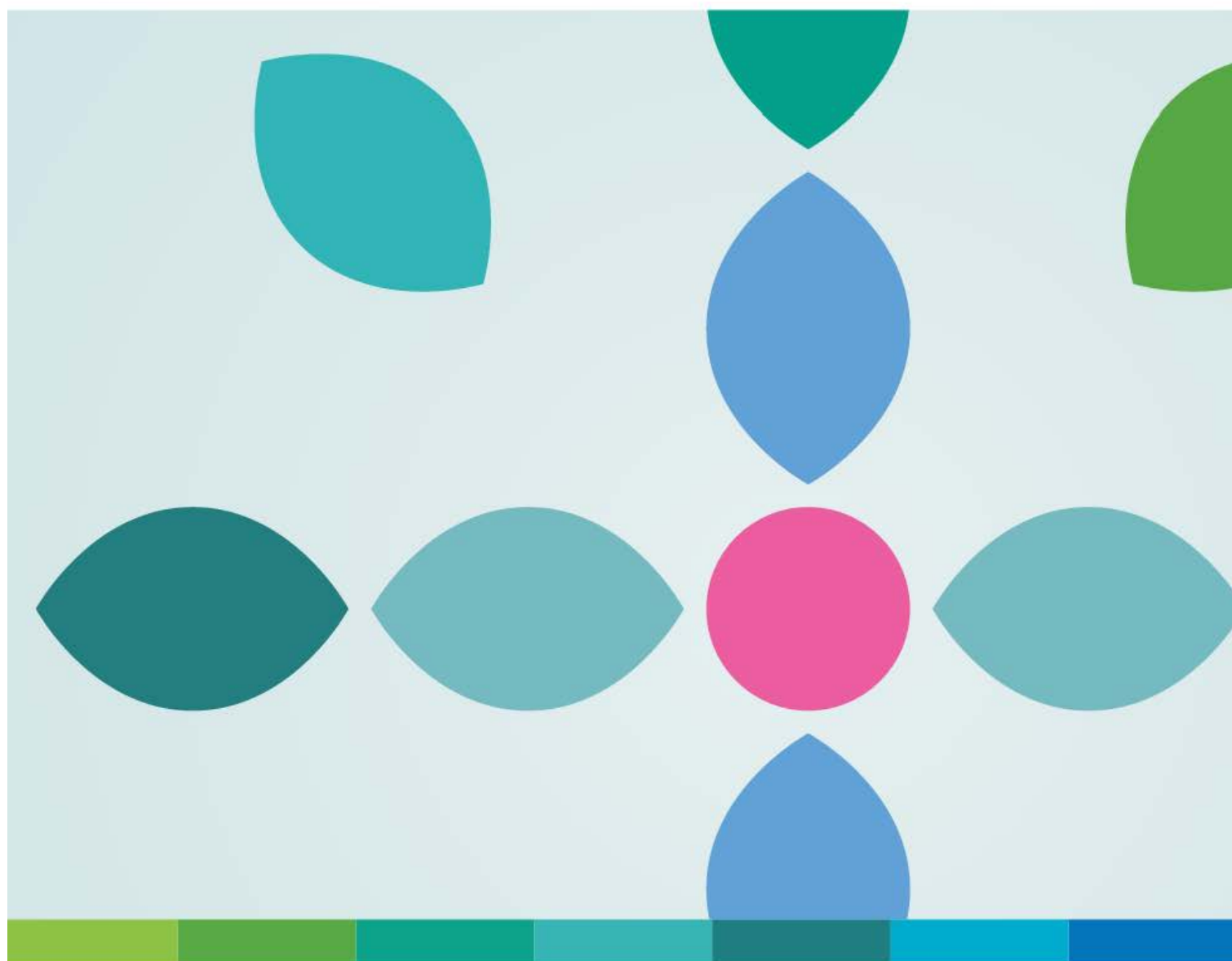


October 11, 2016



Standards for Perioperative Nursing in Australia

14th Edition



Surgical plume

Purpose

This Standard has been developed to give direction for managing surgical plume generated during clinical procedures when biological tissue is ablated or disrupted by means of energy-based devices such as electro-surgical (diathermy) equipment, radio frequency units, ultrasonic devices and lasers.

Background

Surgical plume contains smoke, tissue particles, carbon debris, hazardous chemicals, bacteria and viral particulates which are released into the environment and can be breathed in by unprotected personnel. Surgical plume presents a potential hazard to patients and health care personnel, similar to the risk presented by smoke from cigarettes¹⁻⁷.

Various chemicals emitted in the plume during tissue vaporisation are known to be carcinogenic^{2,8}. Viral DNA and intact cells have been recovered from surgical plume². Therefore, plume must be evacuated from the surgical site and not be allowed to become airborne^{2,8}. Surgical plume evacuation is viewed as a solution to the problem^{2,5,9-11}.

This Standard shall be used in conjunction with:

- ACORN standard 'Electrosurgical equipment'
- ACORN standard 'Laser safety'
- Standards Australia and New Zealand Standards AS/NZS 4173:2004 'Guide to the safe use of lasers in health care'
- Standards Australia and New Zealand Standards AS/NZS 4187:2003 'Cleaning, disinfecting, and sterilising re-usable medical and surgical instruments, and equipment and maintenance of associated environments in healthcare facilities'

Principle

Exposure to surgical plume is a workplace health and safety hazard and must be mitigated by methods appropriate to the procedure and instrumentation.

Standard statement 1

Personnel have a duty to use appropriate equipment and procedures to prevent exposure to surgical plume.

Rationale

Preventing airborne contaminants found in surgical plume from reaching the breathing zones of persons in the operating room or treatment room, by means of appropriate evacuation equipment, is the most effective means of controlling exposure to the hazards present.

Criteria

Personnel have a duty to:

- 1.1 use plume evacuation systems with ultra low penetrating air (ULPA) filters with efficiency rating of not less than 99.999 per cent^{5,9,12,13}
- 1.2 place in-line filters between the wall outlet and the suction canister to prevent contamination of the central vacuum system (wall suction)⁷
- 1.3 make the decision to use wall suction with in-line filters based on a risk assessment to include volume of plume, duration of procedure and instrumentation⁶
- 1.4 not use 0.1 micron filtration masks as first line of protection against exposure to surgical plume; however, these masks can be used as secondary protection^{10,12,14-16}.

Standard statement 2

Surgical plume shall be confined and contained at the time it is being generated.

Rationale

Eliminating surgical plume from the clinical environment as it is being generated will minimise staff exposure to this hazard. Plume should be eliminated by appropriate evacuation systems and capture devices and by following biohazard disposal practices.

Standard Surgical plume

Criteria

Personnel have a duty to:

- 2.1 position plume evacuation system in the operating theatre or treatment room for all procedures that will include the use of any energy-based device⁹
- 2.2 test the equipment to ensure it is working properly and assemble required capture devices prior to beginning a clinical procedure
- 2.3 use capture devices (diathermy plume pencil, open tubing, instrument port, etc.) appropriate to the procedure and positioned as close as practicable without interfering with the proceduralists visual field. (Recommended not more than 2 cm from point of generation of plume)^{7,17–19}
- 2.4 vent all surgical plume created during laparoscopy, or other minimally invasive surgical procedures, through a closed loop filtration system^{5,10,12,20}
 - 2.4.1 that is either an active (powered) or a passive (not powered) system
- 2.5 use and change filters of a plume evacuation system in accordance with the manufacturer's instruction^{5,12}
 - 2.5.1 dispose of plume evacuation accessories and supplies (filters, tubing, connectors, adapters, etc.) in accordance with standard precautions policy and standards related to handling of blood-borne pathogens^{5,10,12,16}.
- 3.3 provide personnel with appropriate education in the hazards of plume and the use of the plume evacuation equipment^{5,7,9,10,21}
- 3.4 assess the competence of personnel in the use of plume evacuation equipment^{5,8,9}
- 3.5 develop current policies and procedures to provide staff with guidance for limiting exposure to the hazard of surgical plume
 - 3.5.1 align policies and procedures with occupational health and safety laws²², health service organisation risk management, national and international standards, professional standards and guidelines, and infection control requirements
- 3.6 provide tools for risk assessment, training, competency validation^{21,23,24}
- 3.7 monitor compliance through a routine and periodic compliance audit process, designed to identify areas of deficiency, and provide recommendations to improve practice with regard to keeping the clinical workplace free of the hazards of surgical plume.

Standard statement 3

Policies and procedures shall be developed and implemented in a health health service organisation that uses energy-based devices.

Rationale

Development and implementation of appropriate policies and procedures by the health service organisation will minimise exposure to surgical plume.

Criteria

The health service organisation has a duty to:

- 3.1 maintain a high level of commitment to minimise exposure to surgical plume^{3,15}
- 3.2 provide appropriate plume evacuation equipment to meet procedural requirements and enable staff compliance^{5,9,11,20}

Recommendations

ACORN believes that patients and personnel must be protected from exposure to the hazards of surgical plume through the development of appropriate standards, facility policies and procedures and a quality assurance system to monitor compliance.

Approval statement

This Standard was authorised by the ACORN Board on 16 November 2012.

First compiled 1998. Revised 2012.

References

1. Buffalo Filter. Hazards: Surgical smoke Buffalo Filter; 2006. Available at: www.buffalofilter.com/PDF/... Accessed Nov 2012.
2. Andersen E. Surgical smoke-is there a fire? AAOHN 2005;53(3):103–4.
3. Scott E, Beswick A, Wakefield K. The hazards of diathermy plume part 1: the literature search. Br J Perioper Nurs 2004;14(9):409–14. [C]

4. Scott E, Beswick A, Wakefield K. The hazards of diathermy plume part 2: producing quantified data. *Br J Perioper Nurs* 2004;14(10):452–6. [C]
5. Ulmer BC. Valleylab institute of clinical education: electrosurgical education. Boulder: Valleylab; 2004. Available at: www.valleylabeducation.org. Accessed Nov 2012.
6. Ott D. Laser smoke and hemoglobin oxidation in laparoscopy. *Lasers Surg Med* 1994;6(Supp):17.
7. Steris Corporation. The hazards of surgical smoke: study guide #007.
8. Al Sharaf OS, Veg Carrascal I, Cunningham FO, McGrath JP, Bloomfield FJ. Chemical composition of smoke produced by high frequency electrosurgery. *Ir J Med Sci* 2007; DOI 10.1007 / g1 1845-007-0068-0.
9. Bigony L. Risks associated with exposure to surgical smoke plume: a review of the literature. *AORN J* 2007;86(6):1013–24.
10. Smalley P. Laser hazards, risks and control measures: A perioperative perspective on standards and safety management. *ACORN J* 1999;12(1):30–37.
11. Ulmer BC. The hazards of surgical smoke. *AORN J* 2008;87(4):721–34.
12. IFPN. IFPN guideline on surgical plume. IFPN 2009;1–2.
13. Ott D. Proposal for a standard for laser plume filter technology. *J Laser Appl* 1994;6(2):108–110.
14. Surgin Inc. Surgical smoke. Available at: www.surgin.com/PDF%20articles/whitepaper_surgin_clearflow.pdf. Accessed Nov 2012.
15. Roark J. Dangers of surgical smoke still persist despite awareness campaign. ICT online access; 2006.
16. Healthcare Epidemiology Policies and Procedures 1.11. Evacuation of laser plume. UTMB online documentation; 2006.
17. International Electrotechnical Commission IEC 60825-8.
18. ERCI Surgical smoke evacuation systems. *Operating Room Risk Management* 2000;7(2):1–7.
19. Alp E, Bijl D, Bleichrodt R, Hansson B, Voss A. Surgical smoke and Infection control. *J Hosp Infect* 2006;62:1–5.
20. Barrett WL, Garber SM. Surgical Smoke – A Review of the Literature. *Surg Endoscopy* 2003;17:979–87.
21. Joint Commission on Accreditation of Healthcare Organisations (JCAHO). Reducing the danger of surgical smoke exposure to healthcare workers. *Environment of Care News* 2007;10(9):4–10.
22. Work Health and Safety Act 2011, NSW [PDF] The Work Health and Safety Act 2011 (NSW) NSW Legislation www.legislation.nsw.gov.au/inforcepdf/2011-10.pdf?id.a335. Accessed Nov 2012.
23. Ott D. Smoke and particulate hazards during laparoscopic procedures. *Surgical Services Management* 1997;3(3):11–13.
24. Examination 3.0. The hazards of surgical smoke. *AORN J* 2008;87(4):735–8.

Bibliography

Association of periOperative Registered Nurses (AORN), Connecting the Dots: Surgical Plume – From Awareness to Action, Continuing Education Activity sponsored by Pfiedler Enterprises, and Buffalo Filter, J Kneeder, P Smalley, March 2012.

Australian Government. Infection control guidelines for the prevention of transmission of infectious diseases in the health care setting. Canberra: Dept of Health and Ageing; 2004. Available at: www.health.gov.au/internet/wcms/publishing.nsf/content/icg-guidelines-index.htm. Accessed Nov 2012. [G].

Baggish M, Polesz, Joret D, Williamson P, Rafal A. The presence of the human immunodeficiency virus DNA in laser smoke. In: *Lasers, Surgery and Medicine* 1991;197–203. [B].

Cubitt J, Davies M, Smalley PJ, No Smoking in Surgery... Working Towards a Healthier Workplace, ACORN presentation, Darwin, May, 2012.

Edwards BF, Reiman RE. Results of a survey on current surgical smoke control practices. *AORN J* 2008;87(4):739–49.

HETA 2001-0030-3020. NIOSH health hazard evaluation report. 2006.

Hill DS, O'Neill JK, Powell RJ, Oliver DW. A Health hazard in the operating theatre. A study to quantify exposure and a survey of the use of smoke evacuator systems in UK plastic surgery units. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2012 DOI:10.1016/i.bips 2012.02.012.

JCAHO. News release: agreement focuses on reducing exposure to biological and airborne hazards in healthcare. JCAHO; 2004.

Standard **Surgical plume**

Nduka C, Poland N, Kennedy J, Dye J, Darzi A. Does the ultrasonically activated scalpel release viable airborne cancer cells? *Surg Endosc* 1998;12:1031-4. [B].

Rothrock J. Alexander's care of the surgical patient. 13th ed. St Louis: Mosby Elsevier; 2007. [T].

Smalley PJ. Update on regulation of surgical smoke and its management. *Surgical Services Management* 1997;3(3):31-2,34-5. [D].

Standards Australia/New Zealand Standards. AS/NZS 4173:2004 Guide to the safe use of lasers in health care. Sydney: Standards Australia; 2004. [S].

Standards Australia/New Zealand Standards AS/NZS 4187:2003 Cleaning, disinfecting, and sterilising re-usable medical and surgical instruments, and equipment and maintenance of associated environments in healthcare facilities. Sydney: Standards Australia; 2003. [S].

Taylor S. Are you still smoking in a non-designated area? PowerPoint Presentation: 2007.

Tomita T, Mihashi S, Nagata K, Neda S, Fujikim M, Hiranom T. Mutagenicity of smoke condensates induced by CO2 Laser Irradiation and Electrocauterization. *Mutation Research* 1981:89-145.

Walker B. Using high efficiency filtration removes hazards from laser and electrosurgery. Washington: Walker Filtration; 2005.

Watson DS. ACORN, Perth, 2010, Surgical smoke: what do we know? Reproduced with permission from Covidien; 2009.

Weintraub S. Principles of preoperative and operative surgery. 17th ed. Philadelphia: Saunders; 2004.



T +613 9550 1819
M + 61 409 865 105
E Info@Endovision.com.au
W Endovision.com.au



@ACORN_Standards



facebook.com/ACORNCompany



acorn.org.au/standards