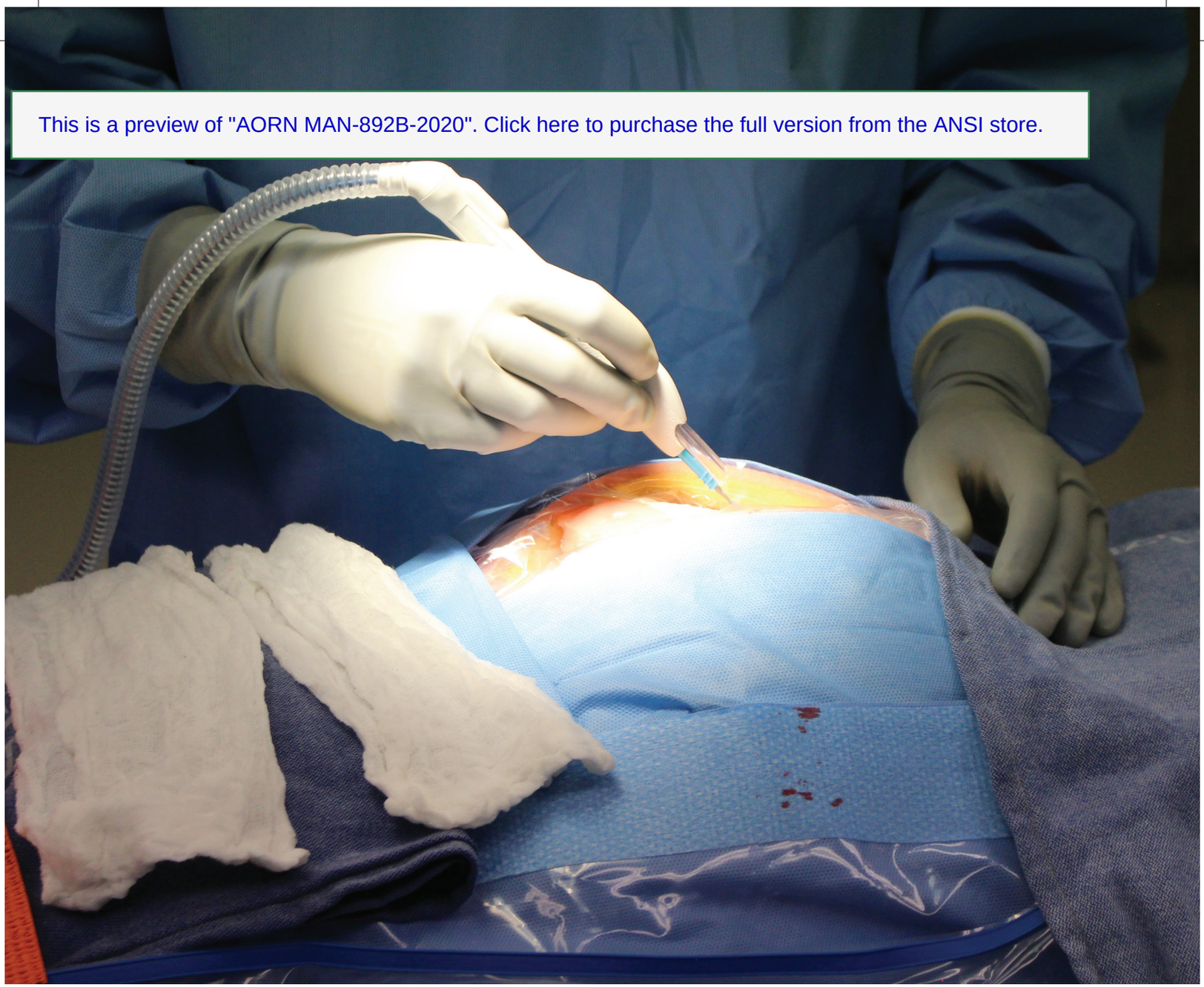

ENERGY-GENERATING DEVICES

AORN
SAFE SURGERY TOGETHER™

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P *indicates a recommendation or evidence relevant to pediatric care.*

MEDICAL ABBREVIATIONS & ACRONYMS

AEC – Argon-enhanced coagulation
ANSI – American National Standards Institute
CIED – Cardiac implanted electronic device
CO_2 – Carbon dioxide
EMI – Electromagnetic interference
ESU – Electrosurgical unit
ID – Identification
IED – Implanted electronic device
IFU – Instructions for use
LSO – Laser safety officer
LSS – Laser safety specialist
MAUDE – Manufacturer and User Facility Device Experience
OR – Operating room
SSEP – Somatosensory evoked potentials
W – Watts

GUIDELINE FOR SAFE USE OF ENERGY-GENERATING DEVICES

The Guideline for Safe Use of Energy-Generating Devices was approved by the AORN Guidelines Advisory Board and became effective September 1, 2016. It was presented as a proposed guideline for comments by members and others. The recommendations in the guideline are intended to be achievable and represent what is believed to be an optimal level of practice. Policies and procedures will reflect variations in practice settings and/or clinical situations that determine the degree to which the guideline can be implemented. AORN recognizes the many diverse settings in which perioperative nurses practice; therefore, this guideline is adaptable to all areas where operative or other invasive procedures may be performed.

Purpose

This document provides guidance to the perioperative team for the safe use and maintenance of energy-generating devices. The types of energy addressed in this document include electricity delivered as radio-frequency waves, ultrasound, and **laser**.[1,2] The devices that generate the energy include **electrosurgical units** (ESUs), electrocauteries, ultrasonic instruments, and lasers. The energy produced is transferred to the patient by various methods, including monopolar, bipolar, advanced bipolar (eg, vessel-sealing),[3] and **tripolar** (eg, plasma knife) devices[4]; **class 3** and **class 4 lasers**; and ultrasound (eg, ultrasonic tissue ablation system, phacoemulsification) and argon-enhanced coagulation modalities.

Electrosurgery, which uses high-frequency (ie, radio-frequency) electrical **current**, is routinely used to cut, coagulate, dissect, ablate, and shrink tissue. Ultrasonic dissectors fragment tissue by vibration. **Vessel-sealing** or bipolar ligating-cutting devices use a combination of pressure and heat to permanently fuse vessels and tissue.[5] In the literature, the terms *electrosurgery, electrocautery*, and *diathermy* are often used interchangeably. This guideline addresses precautions to be taken during the use of each of these technologies and does not endorse any specific products. Proper care and handling of all energy-generating devices is essential to patient and personnel safety.

This document provides guidance for some elements of surgical fires and electrical safety related to energy-generating devices. For additional guidance on these topics, refer to the AORN Guideline for a Safe Environment of Care.[6] The following subjects are outside the scope of this guideline:

- surgical smoke safety,
- endoscopic distention fluid (See the AORN Guideline for Minimally Invasive Surgery),[7]
- procedure-related decisions (eg, the amount of time the tissue is exposed to the energy-generating device active electrode),
- therapeutic diathermy,
- use of electrical dental equipment (eg, battery-operated curing lights, ultrasonic baths, ultrasonic scalers, electric pulp testers, electric toothbrushes), and
- selection of electrosurgical devices.

Evidence Review

A medical librarian conducted a systematic search of the databases MEDLINE®, CINAHL®, and Scopus® and the Cochrane Database of Systematic Reviews in October 2015. Results were limited to literature published in English from January 2009 through October 2015. The medical librarian also established alerts at the time of the initial search. During the development of the guideline, the lead author requested supplementary searches and additional articles that either did not fit the original search criteria or were discovered during the evidence appraisal process. The results of alerts were considered until February 2016.

The search terms included subject headings and keywords that address precautions and injuries related to the use of electrosurgical and laser devices. Terms for procedures included *electrosurgery, ultrasonic therapy, ultrasonic surgical procedures, diathermy, argon plasma coagulation, electrocoagulation, high-intensity focused ultrasound ablation, endometrial ablation techniques,* and *laser therapy.* Subject headings and keywords related to precautions included *adverse effects, accident prevention, patient safety, equipment contamination, equipment safety, equipment failure,* and *risk management.* Special attention was paid to terms that would retrieve literature addressing the potential causes and effects of equipment failure and injuries. Such terms included *burns, fires, implantable electronic devices* (eg, *artificial pacemaker, implanted electrodes, electromagnetic fields*), and *power sources and settings* (eg, *electric power supplies, grounding, capacitive coupling, electric wiring*). Subject headings and keywords for types of personal protective equipment and occupational hazards also were included.

Excluded were non-peer-reviewed publications, evidence from other disciplines when evidence from the perioperative setting was available, and case reports that did not provide recommendations for preventing injuries related to the use of electrosurgical devices. Editorials, news items, and other brief items were excluded. Lower-level or lower-quality evidence was excluded when higher-level or higher-quality evidence was available **(Figure 1)**.