

## Technology for surgery

# Is that patient's postoperative skin injury really a burn?

**A** patient has a skin injury after surgery. Could it be a burn? Don't jump to conclusions. A wide variety of causes need to be considered in a root cause analysis.

"The investigation shouldn't start by pointing fingers at any one technology or group of users of a technology," says Mark Bruley of ECRI, Plymouth Meeting, Pa, a nonprofit organization that researches health care technology and services.

"We're still seeing accidental skin injuries during surgery, but the reasons are different than for the majority we saw in the past," says Bruley, ECRI's vice president of accident and forensic investigation.

There is not good recent data on the incidence of accidental skin injuries in surgery.

"It's fairly rare that we see an electrosurgical burn these days, though they are still occurring. Electrosurgery is a much safer technology than 25 or 30 years ago," Bruley says.

Also less common is pressure necrosis from surgery.

"We're seeing very few pressure injuries from long-duration surgery. I attribute that to the more common use of full-length silicone gel pads," he says, estimating ECRI receives 1 such report every 4 to 5 months. ECRI has advocated use of silicone gel pads since the 1980s.

Heated IV fluid bags also are a less frequent cause of injury. Bruley says many facilities seem to have heeded ECRI's advice not to use IV bags as positioning devices and to limit warming-cabinet temperature settings to 110°F (43°C). (See *OR Manager*, October 2005, p 32.)

As unlikely as it seems, patients still are being burned by over-heated cotton blankets. Many physicians and nurses want their patients to have warm blankets as a comfort measure. It isn't practical or cost-effective to use forced-air warming blankets for all patients.

"Some clinicians say the cotton blankets don't feel warm and toasty enough to make their patients feel comfortable," Bruley says. "But it is a patient safety hazard to place a blanket on a patient that is warmer than 110°F." Though the blankets themselves don't hold a lot of heat, if they're at a high temperature such as 150°F and folded, they can burn a patient who is insensitive to pain.

"We've seen this happen quite a few times," Bruley says.

In a root cause analysis of skin injuries, ECRI recommends considering 7 major potential etiologies (sidebar). A detailed process and questionnaire for conducting an investigation are in the December 2005 *Health Devices*.

### Building blocks for an investigation

Here is advice from ECRI about building a good foundation in case an investigation of a skin injury is needed.

#### For all surgical procedures

**Be prepared.** Steps before a procedure can aid investigation of any skin injury that develops afterward. For example, a preoperative skin check, in which the staff thoroughly examines the patient's skin and notes any unusual conditions, allows the staff to identify changes that might have occurred during or after the procedure

**Perform a postoperative skin check.** As soon as possible after surgery, the staff

should examine the patient's skin and record any observed changes or abnormalities. In some cases, the patient's condition may not permit an immediate and thorough skin check, but accessible areas (eg, the buttocks, heels, thighs, elbows, head, and electrode sites) should be checked. Other areas should be checked as soon as possible.

### **If an injury is discovered**

**Preserve and document evidence.** When a suspected device-related lesion is discovered:

- Preserve and thoroughly document the evidence, especially all disposables and packaging. Contaminated disposables or other instruments should be stored in appropriate biohazard containers.
- When practicable, take color photos immediately after discovery and 24 to 48 hours afterward. (Permission from the patient and family may be necessary.) Photos should indicate the scale of the lesion (eg, using a coin or ruler).
- If possible, do not move or disconnect the equipment except as necessary to care for the patient or prevent injury to the patient or damage to equipment. When this is not possible, record the scene with photos or sketches. Take photos of devices that may be damaged when examined, such as a dispersive electro-surgical electrode.
- Ensure materials or devices involved in the incident are not released to the manufacturer until the internal investigation is complete or approval has been given by risk management or the administration.

Facilities in the US may be required to submit a timely report to the manufacturer to comply with Food and Drug Administration regulations.

**Complete an incident report.** The nurse manager should fill out an incident report and record the immediate observations of all involved personnel. Include only facts, not speculation or supposition. For example:

- *Incorrect:* "Patient received electro-surgical burns on right buttock and heel."
- *Correct:* "Postoperative skin check revealed lesions on the patient's right buttock and heel."

The nurse manager should make sure all personnel involved in the incident complete incident reports as well.

**Discuss the incident honestly but cautiously.** Discussion with the patient and family about the incident should be honest and diplomatic. The actual cause probably will not be known before the incident is disclosed to the patient. Offering theories can be misleading and provoke litigation.

For example, if a patient develops a palm-sized lesion over the sacrum after a lengthy cardiovascular procedure, pressure necrosis is the probable cause. Yet staff or physicians may tell the patient, "The electro-surgical machine accidentally burned you during surgery." Before long, the patient is on the phone to a lawyer. A more productive and factual approach is to tell the patient there is "an injury" or "area of skin breakdown" that will be treated. In some cases, it may be appropriate to say the cause is being investigated. ♦

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### **Reference**

Guidance article: Investigating device-related "burns." *Health Devices*. December 2005;34:393-413.

Information about ECRI is at [www.ecri.org](http://www.ecri.org).

## ***Etiologies of accidental skin injuries***

### **Electrical**

- Radiofrequency (RF)—electrosurgery, magnetic resonance imaging (MRI) RF coils
- DC—batteries, circuit continuity monitors, pacemakers, nerve and muscle stimulators
- AC—60 Hz line voltage

### **Thermal**

- Direct contact—Heating pads, electrocautery, diathermy, heated irrigation solution bag, excessively heated cotton blanket, unlubricated surgical drill shank, flash-sterilized surgical instruments, heated probes
- Irradiant—radiant warmers, exam and operating lights, fiberoptic light cables, lasers
- Exothermic chemical reaction—merthiolate on aluminum electrode

### **Chemical**

- Povidone-iodine prep solutions—problems with lot-specific formulation, solution pooled under a patient that reacts with other solutions or with residual laundry chemicals in linens, mixing with alcohol or hydrogen peroxide
- Ethylene oxide (EO)—improper aeration of EO-sterilized devices
- Improper electrode plating components reacting with conductive paste

### **Mechanical**

- Constant high pressure in excess of 2 to 3 hours (eg, caused by positioning contours, supports, straps, pinching); time required may be shorter with very high pressure
- Pneumatic tourniquets
- Tenacious electrode adhesive

### **Radiation**

- Diagnostic imaging
- Therapeutic treatment

### **Pharmacologic**

- Warfarin therapy (eg, Coumadin)
- Intra-arterial injection of Bicillin (penicillin G)
- Drug infiltration at a catheterization site
- High-dose barbiturates injected in subcutaneous or fat layer

### **Physiologic/medical**

- Allergic reaction (eg, to adhesives, electrode gel, ointment, or skin prep solution)
- Aplasia cutis (neonates)
- Chronic chilblain (pernio)
- Ecthyma gangrenosum
- DIC (disseminated intravascular coagulopathy)
- Lesions secondary to lupus erythematosus or Hodgkin's disease
- Lichen sclerosus et atrophicus
- Livedo reticularis (including idiopathica)
- Purpura fulminans
- Necrotizing fasciitis ("flesh-eating bacteria")
- Ischemic lesions resulting from:
  - peripheral vascular disease
  - venous stasis

- diabetes mellitus
- cryoglobulinemia
- arterial emboli of atherosclerotic plaque (blue toe syndrome), iatrogenic, intraoperative, or otherwise
- anterior compartment syndrome.

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