# Burn Injuries From Warming Devices in the Operating Room

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*A healthy 40-year-old woman underwent a revision mammoplasty under general anesthesia. The anesthesiologist noted a decline in skin temperature from 37 to 35°C during the last hour of her four-hour general anesthetic and elected to place a Bair Hugger® hose under the patient's cotton blankets at the level of the ankle. The hose of the Bair Hugger® was not connected to the blanket attachment device, however, and hot air at 40 to 43°C was blown directly on to the patient's legs. In the recovery room, the patient complained of severe pain of her bilateral lower extremities. On further examination, the patient had sustained third-degree burns to the region of her calves on both extremities. Despite plastic surgery and skin grafting, severe permanent scarring occurred. The lawsuit against the anesthesiologist was settled for $250,000.*

**Maintaining normothermia has many benefits, including reducing recovery time and risk of surgical site infections.** Warming devices are typically utilized for patients in the perioperative period to maintain normal body temperature and/or treat hypothermia. Over 15 years ago, Cheney et al.[1] reported complications from the improper use of warming devices and heated materials, especially I.V. bags and bottles, from the ASA Closed Claims Project database. Even though the types of warming devices have changed dramatically since that report, thermal burn injuries caused by warming devices and heated materials in the operating room still occur.

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**Table 1: Prevention of Burn Injuries From Warming Devices[1-2]**

| Specific Recommendations |
|---|
| **Forced-Air Warming Devices**<br>• Never depart from the forced-air device's operating instructions.<br>• Never treat patients using the hose alone as the device is to be used as a system with both the hosing unit and the manufacturer's attachment blanket.<br>• If your patient might require active warming during surgery, apply the disposable warming blanket before surgical draping. The cost of a disposable blanket is minimal compared to the cost of treating a severe burn injury.<br>• In patients with compromised circulation such as peripheral vascular disease, low cardiac output, or poor/marginal cutaneous perfusion who require prolonged warming, periodically check the appearance of the skin (if accessible) under the blanket, even when forced-air warming device is used as instructed. |
| **IV Fluid Bags / Plastic Fluid Bottles**<br>• Heated IV fluid bags and bottles should be used for their original purpose of containing liquid.<br>• To avoid burn injury, do not use these heated materials for other purposes such as maintaining body position. |

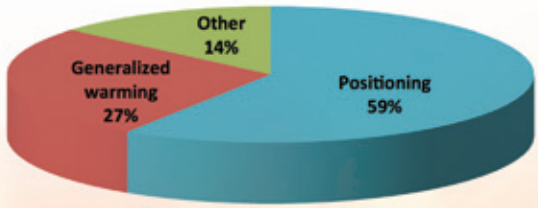
## Forced-air Warming Devices

Forced-air warming devices are routinely used in the perioperative period. The devices warm the patient through convection by circulating heated air across the patient's skin surface. These units consist of a thermostatically controlled heater with a blower with a hose and a disposable patient warming blanket attachment device that delivers air from the heater to the blanket.[2] When practitioners do not attach the hose to the appropriate blanket attachment device when warming a patient, the higher temperature airflow is concentrated on one area of the patient's body and "hosing" occurs.[2-6]

**Figure 1: Causes of Injuries From Forced-Air Warming Devices 1995-2010**


The most common locations of burns from forced air warming without an appropriate blanket attachment were the buttocks and lower extremities (n=11/12, 92%).

**Figure 2: 2ND- and 3RD-Degree Burns From Heated Materials 1995-2010**




The most common location of burns from positioning of I.V. fluid bags or bottles were on the trunk, including the axilla (n=11/13, 85%).

### Warming Device Trends From the ASA Closed Claims Project

We used the ASA Closed Claims database to review adverse complications from the use of warming devices in operating room fires.[7] Newer burn injuries (1995-2010, n=41) mostly resulted from the use of warming equipment or heated materials for patient warming (n=25, 61 percent) rather than non-warming uses (n=17, 41 percent; 1 claim involved both uses). Non-warming uses included patient positioning, treatment of I.V. infiltration and softening of a nasal-tracheal tube.

*Warming equipment:* Warming equipment devices were primarily used in the operating room for warming the patient to prevent hypothermia, and these included forced-air warming devices, warming blankets that do not use forced-air and warming lamps. The most common cause of burn injuries from forced-air warming devices was use of the hose without the appropriate blanket attachment (13 of 15, 87 percent), and the most common location of these injuries was the buttocks and lower extremities (11 of 12, 92 percent, Figure 1).

*Injuries from heated materials:* Heated materials that caused burns (21 warmed I.V. fluid bags/warm fluid bottles, 1 hot compress) were more commonly used for patient positioning (n=13) than warming (n=6) (Figure 2). These materials resulted in second- and third-degree burn injury to the patient, with the most common location at the patient's trunk, including the axilla (11 of 13, 85 percent).

### Prevention of Burns

Patients continue to suffer burn injuries from the misuse of forced-air warming devices.[3] Injuries can be prevented by ensuring proper attachment of the appropriate blanket device to the hose of the warming unit (Table 1).[2-6] The use of forced-air warming devices has a positive impact on patient outcomes and is considered safe when used properly, according to the manufacturer's instructions. Burn injuries from the misuse of heated material (I.V. fluid bags and bottles) continue to occur when these heated materials are used for generalized warming, patient positioning or other purposes. Avoiding these heated materials altogether for patient positioning will minimize the occurrence of burn injuries. Warming devices and heated materials should be utilized for their intended purpose as deviation may result in severe burn injury to the patient.

### References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