

Kressin KA: Burn Injury in the Operating Room: A Closed Claims Analysis. *ASA Newsletter* 68(6): 9-11, 2004.

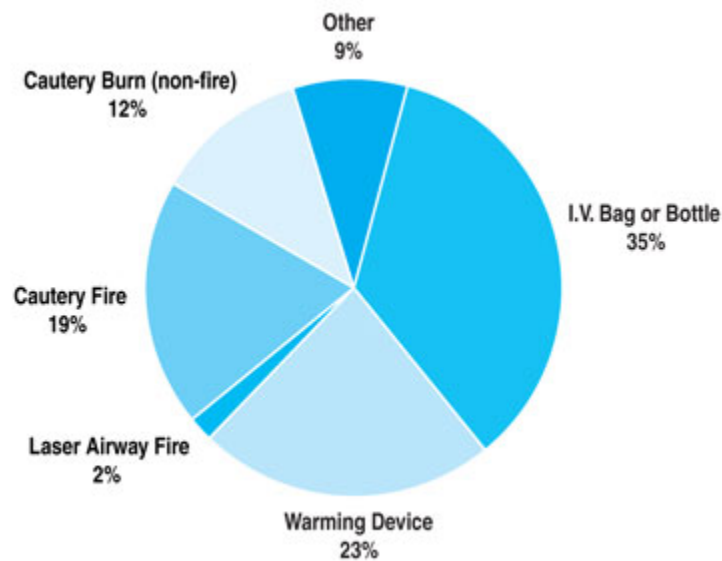
## **Full Text**

Burns to patients in the operating room (O.R.) can occur from dramatic events such as fire or relatively benign activities such as maintenance of normothermia. Burn injury in the O.R. is a significant source of morbidity for patients and a source of liability for anesthesiologists. The ASA Closed Claims Project database was analyzed to identify recurrent patterns of burn injury associated with anesthesia. The Closed Claims Project database consists of standardized summary data on anesthesia malpractice claims collected from 35 professional liability carriers that insure about half of the practicing anesthesiologists in the United States. Claims for dental damage are excluded from the database. There are currently 145 claims (2.2 percent) for burn injury among the 6,449 total claims in the ASA Closed Claims Project database.

## **Mechanism of Injury**

The most common devices causing burns in the O.R. were intravenous (I.V.) bags or bottles (35 percent, n = 51) [Figure 1]. Another 23 percent of burns (n = 33) were associated with warming devices such as heating pads (n = 11), heating blankets (n = 16), warming lights (n = 4) and hot compresses (n = 4). Cautery fires (n = 27) made up 19 percent of the burn claims. Cautery burns (12 percent, n = 18) included direct burning from the cautery or burns secondary to a faulty grounding pad. Other devices causing burns included lasers in the patient airway (n = 3), magnetic resonance imaging (MRI) (n = 3), retractors (n = 2), defibrillator paddles (n = 2) and electrocardiogram leads (n = 1). The MRI burns all occurred at the site of pulse oximeter probes.

**Figure 1: Device Causing Burn**

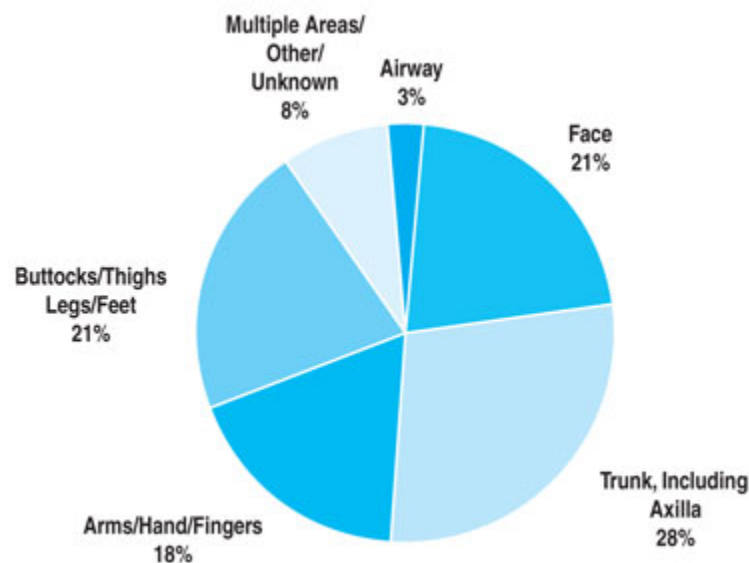


*Most burns (58 percent) were from devices used to warm the patient, including intravenous bags (n=51) and warming devices (n=33). Cautery devices caused burns either from grounding pads (n=18) or by causing a fire (n=27). Miscellaneous devices associated with burns included magnetic resonance imaging, retractors, defibrillator paddles and electrocardiogram leads.*

**General Location of Burn**

The most common location of burns was the trunk or axilla (28 percent) [Figure 2], commonly caused by I.V. bags (80 percent from this device). Burns to the buttocks/thighs/legs/feet (21 percent) were most often caused by warming devices (61 percent). There also was a trend of vascular cases in this category, although this trend was not significant statistically. Burns on the face (21 percent) were caused most frequently by cautery fires (64 percent).

**Figure 2: Location of Burn (n=145)**



*The most common area of burn was the trunk (including the axilla). Most lower-extremity burns were caused by warming devices. Burns to the face were most frequently caused by cautery fires.*

## **Severity of Injury**

Burn injuries were less severe than other injuries in the database [Table 1, page 11]. Most (93 percent) burn injuries were temporary or nondisabling. Only 6 percent of the burn injuries were permanent or disabling, and there was only one death. The death occurred in the case of an airway fire during laser vaporization of tracheal stenosis (100 percent oxygen was being used). The nine cases that involved permanent or disabling injuries included two burns in children. One involved an airway fire during a tonsillectomy; the second was a child who sustained an abdominal burn from a warming blanket and subsequently had a cardiac arrest. There were two airway fires causing permanent disabling injuries, both involving prolonged intubation in the intensive care unit and lifelong disability. There were four permanent, disabling burns attributed to warming blankets. The location of these burns included the abdomen, buttocks, legs and feet. Three of these severe warming blanket burns occurred during vascular surgeries.

## **Payment**

Payment was more often made in the burn claims (72 percent) than in other claims in the database [Table 1]. The size of payments in burn claims was smaller than other claims in the database, reflecting the lower severity of injury in most burn claims [Table 1]. Payments varied by the device that caused the burn. Payment was made for 100 percent of the airway fires, and this group had the highest median

payment. A payment was made in 82 percent of warming device claims and 80 percent of claims involving I.V. bags or bottles. Payments were least often made for cautery burns and other nonwarming devices. The largest payments (adjusted to 1999 dollar amounts) were for airway fires (median \$167,500) followed by cautery burns (\$80,375) and cautery fires (\$71,375).

Table 1: Claims for Burns vs. Other Injury		
	Burn Claims (n=145)	All Other Claims (n=6,304)
Temporary/ Nondisabling	135 (93%)	3,158 (50%)*
Less Than Appropriate	72 (50%)	2,250 (36%)*
Payment Made	104 (72%)	3,280 (52%)*
Median Payment (1999 dollars)	\$48,260	\$175,800*

\*p≤0.01 burn claims vs. all other claims

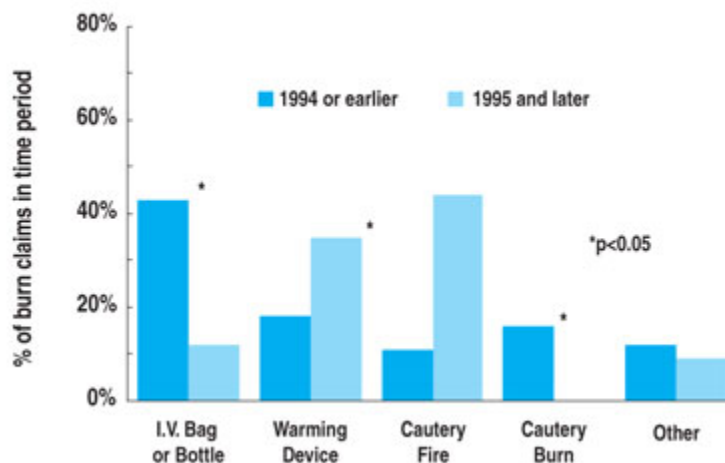
## Discussion

Burns continue to have significance in current anesthesia practices. As this database shows, although they tend to occur infrequently, they still can result in significant morbidity for the patient and result in financial liability on the part of the anesthesiologist.

A previous analysis of burns in the Closed Claims Project database by Cheney et al.<sup>1</sup> found 54 of 3,000 total claims (1.8 percent) attributed to burn injury. In that analysis, 64 percent of the burns from devices used to warm patients were due to I.V. bags or bottles. The current database has now accumulated 6,449 claims with the majority of burns that were sustained from I.V. bags occurring before 1994. Since 1994 only 12 percent of burn claims in the database were associated with I.V. bags or bottles. In contrast the proportion of burn claims from cautery fires has increased since 1994: 44 percent of burn claims since 1994 were associated with cautery fires compared to 11 percent of earlier claims [Figure 3]. The majority of cautery fires occurred during plastic surgery cases under monitored anesthesia care.

Most cautery fire burns occurred on the face or in the airway (85 percent), and the use of supplemental oxygen was most often listed as an inciting event. In some cases, the use of an alcohol-based preparation solution also was thought to contribute to the fire. The “fire triad” has three components that must come together to ignite a fire: 1) heat or an ignition source, 2) fuel and 3) an oxidizer.<sup>2,3</sup> Selective use of supplemental oxygen and open-face draping has therefore been recommended.<sup>4,</sup>

**Figure 3: Trends in Burn Claims Over Time**



*Burns from intravenous bags or bottles used as warming devices were more common prior to the 1994 publication warning of their risks and were less common among recent claims. Cautery fires and burns from warming devices were more common since 1995.*

Laser airway fire is another area that has had a small but important presence in the Closed Claims Project files. The claims may involve severe injury and high payments, and in the database, these cases received payment 100 percent of the time. The components of the fire triad also apply to these cases.<sup>2,5,6</sup>

## Conclusion

Burn injuries in the Closed Claims Project database continue to occur primarily from cautery, warming devices and airway fires. Burns from I.V. bags have declined since 1994 after publication of hazards associated with their use as warming devices.<sup>2</sup> Burns from cautery fires, especially to the face, have increased in the 1990s. Regulated warming devices continued to cause burns, primarily of the lower extremities.

## References

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