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# Pediatric scalds: do cooking-related burns have a higher injury burden?



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## ABSTRACT

**Background:** Pediatric scald burns result in frequent emergency room visits and hospitalizations. We investigated whether cooking-related burns produce greater morbidity requiring more extensive care than noncooking burns.

**Methods:** We performed a 6-y review at our free-standing children's hospital. Children aged <18 y admitted for accidental scald burns were included. Demographics, injury pattern, treatment, and outcome (contractures and/or limited mobility and nonhealing and/or infected wounds) data were analyzed comparing cooking versus noncooking burns. The Mann–Whitney *U* test, a chi-square test, and the negative binomial were used to compare continuous, categorical, and count data between groups. Bivariate analysis was performed to identify risk factors among patients with adverse outcomes.

**Results:** We identified 308 patients; 262 (85%) cooking and 46 (15%) noncooking burns. Most patients were African–American males, with public insurance, and a median age of 2 y. Cooking burns preferentially occurred over the head, neck, and upper body; noncooking burns were distributed over the lower body ( $P < 0.02$ ). Median total body surface area was equal for both groups ( $P > 0.11$ ). In subgroup analysis, semisolid and grease burns resulted in increased rates of wound contractures and/or limited mobility when compared with noncooking burns ( $P = 0.05$  and  $P = 0.008$ , respectively). Patients with complications were more likely to have third degree burns and required more consults, longer hospitalization, and more surgical debridements and clinic visits.

**Conclusions:** Most accidental scald burns occurred in young children during food preparation. Greater long-term morbidity was found in patients with semisolid and grease burns. This subset of children has a higher injury burden and requires extensive care in the acute and long-term setting.

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## 1. Introduction

Fires and burns are the fourth leading cause of injury-related death in children aged <15 y in the United States [1,2]. In 2012, more than 136,000 children across the United States, including more than 67,000 children aged <5 y, were injured by a fire or burn and treated in emergency rooms [1,2]. Scald burns due to liquids or steam are more common than thermal burns and are more common in young children [3]. Scald injuries result in more than 50% of emergency room visits and result in more hospitalizations. Bathing-related scald burns have garnered attention; however, more scald burns are associated with food preparation.

Cooking-related scald burns have been found to be twice as common as thermal burns [3]. Common mechanisms involve a child pulling a pot off the stove or spilling a container onto him or herself [3–5]. Analysis of food cooling curves show varied rates of heat retention in semisolid or high-density liquids resulting in higher burn risk [4,6]. Instant noodle soups have been found to be the source of pediatric scald burns with greater frequency. Tall containers with narrow bases allow for greater tipping risk [7,8]. The combination of young children and greater access to liquids that stay hotter longer is a recipe for significant burn injury. We sought to determine whether cooking-related scald burns result in more significant injuries than noncooking scald burns and to assess whether these injuries produced greater morbidity and required more extensive care.

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## 2. Methods

### 2.1. Study design

On approval by our institutional internal review board, we identified all children aged <18 y who sustained scald burns and were admitted to our level 1 pediatric trauma center between 2007 and 2012. Our trauma registry database (NTRACS; Digital Innovation, Forest Hill, MD) was queried to identify children admitted with International Classification of Disease, Ninth Edition codes for burn injury (940–949). E code for burns with hot objects and/or substances 924 and 924.2 were also included in our query. Children with thermal or nonaccidental burns and children who were discharged home from the Emergency Department were excluded from the cohort. Medical records were then reviewed to extract basic demographic, injury pattern, extent of injury, treatment, and outcome data. Injury patterns were assessed by obtaining data on source of burn (e.g., liquids, grease) and mechanism of injury (e.g., pulled down from stove, bathtub). Likewise, extent of injury was determined by obtaining information regarding burn distribution, depth of injury, and total body surface area. Treatment data included need for consults, length of stay, number of surgical debridements, number of clinic visits, and readmissions. Outcome data included measurements of long-term complications, non-healing and infected wounds (NHIW), and wound contractures with limited mobility.

### 2.2. Definitions

Burns were categorized as cooking-related and noncooking scald burns. Noncooking scalds were mostly attributed to bathing injuries or injuries sustained while using hot water when braiding hair (a common practice among the African–American women in our region). Injuries sustained during food preparation or consumption were categorized as cooking-related scald burns. Cooking-related scalds were further classified into three subgroups according to food substance: liquids, semisolids, and grease. All cooking-related liquid burns were attributed to boiling water or hot drinks (e.g., coffee, tea). Scalds sustained due to broths with food substances or noodles were classified as cooking-related semisolid burns.

Long-term wound complications were grouped as follows: normal healing; NHIW were grouped together; and wound contractures and limited mobility (WCLM) were grouped together.

### 2.3. Patient care

At our institution, initial wound care, including gentle bedside debridement, is provided by the Emergency Department physicians. After primary assessment, patients' wounds are covered with silver-impregnated dressings and referred for follow up at surgery burn clinics within the same week of injury. Alternately, patients with significant injuries undergo additional evaluation by the trauma service and are commonly admitted for inpatient care. Surgical debridement is performed in a minor procedure room under monitored conscious sedation within the first hospital day. Extent and depth of injury is assessed during initial debridement (and is the measurement documented in this study). Discharge criteria include adequate caloric intake, pain control with oral analgesics, and wounds amenable for outpatient debridement at our burn clinics or same-day surgery. Thus, whenever clinically feasible, patients benefit from short hospital stays and serial surgical debridements with follow up in an outpatient setting.

### 2.4. Statistical analysis

Descriptive statistics were reported for both cooking-related and noncooking scald burn cohorts. Demographics, injury pattern, extent of injury, treatment, and outcome data were analyzed to compare cooking-related versus noncooking scald burns. The Mann–Whitney *U* test, a chi-square test, and the negative binomial were used to compare continuous, categorical, and count data between groups, respectively. Bivariate analysis was performed to identify associations between demographic, burn distribution, and extent of care factors, and the occurrence of a NHIW, as well as the development of WCLM. A Bonferroni correction was used for multiple testing. A *P* value <0.05 was considered to be statistically significant. Statistical analyses were performed using SAS software, version 9.3 (SAS Institute Inc, Cary, NC).

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## 3. Results

We identified 308 patients within the 6-y study period. Children with cooking-related liquid, cooking-related semisolid,

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