Pediatric burns: Kids' Inpatient Database vs the National Burn Repository

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ABSTRACT

Objective: Burn injuries are one of the leading causes of morbidity and mortality in young children. The Kids' Inpatient Database (KID) and National Burn Repository (NBR) are two large national databases that can be used to evaluate outcomes and help quality improvement in burn care. Differences in the design of the KID and NBR could lead to differing results affecting resultant conclusions and quality improvement programs. This study was designed to validate the use of KID for burn epidemiologic studies, as an adjunct to the NBR.

Methods: Using the KID (2003, 2006, and 2009), a total of 17,300 nonelective burn patients younger than 20 y old were identified. Data from 13,828 similar patients were collected from the NBR. Outcome variables were compared between the two databases.

Results: Comparisons revealed similar patient distribution by gender, race, and burn size. Inhalation injury was more common among the NBR patients and was associated with increased mortality. The rates of respiratory failure, wound infection, cellulitis, sepsis, and urinary tract infection were higher in the KID. Multiple regression analysis adjusting for potential confounders demonstrated similar mortality rate but significantly longer length of stay for patients in the NBR.

Conclusions: Despite differences in the design and sampling of the KID and NBR, the overall demographic and mortality results are similar. The differences in complication rate and length of stay should be explored by further studies to clarify underlying causes. Investigations into these differences should also better inform strategies to improve burn prevention and treatment.

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1. Introduction

Burn injuries are one of the leading causes of morbidity and mortality in the pediatric population. As such, they place a heavy burden on national health-care economics [1]. Epidemiologic studies focused on this population have an opportunity to identify, analyze, and help mitigate injury and improve outcomes. Two commonly used types of databases in outcomes research are disease repositories and administrative databases. Disease repositories contain data collected for a specific health condition usually with the intention of health-care quality improvement. Administrative databases, on the other hand, have data collected by organizations primarily for administrative and record-keeping purposes. Despite differences in objectives and sampling designs, many of these large databases have been extensively used in

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epidemiologic and outcome studies. Although each of these database types has advantages, researchers should be aware of the disadvantages of any queried database. Several previous studies have evaluated the validity of different administrative databases in various clinical settings by comparing their results with the results obtained from clinical data or other available databases [2—4]. Although there are clinically relevant differences, administrative databases can provide useful adjunct information that is unable to be gleaned from disease-specific repositories.

The National Burn Repository (NBR), developed by American Burn Association (ABA), is a disease registry constructed with the objective of providing data for research, quality improvement, and prevention in burn care [5]. The ABA annually publishes an NBR report summarizing demographic and outcome data of patients submitted to the NBR by burn care centers, including records of inpatient cases treated at these facilities over time. According to the ABA, these reports help quality improvement programs in burn care, as burn centers will be able to compare their performance with these national data. As a disease repository, the NBR provides substantial data regarding extent of injury and outcomes. However, the demographic data are limited to age, gender, race, primary payer, and occupation. The primary payer information is missing in over 20% of patients, and the occupation is not a practical measure in a pediatric population.

An administrative database that contains a similar population set as the NBR is the Kids' Inpatient Database (KID) [6]. It is the largest US all-payer inpatient pediatric database that provides more in-depth demographic information. Information in the KID that is unavailable in the NBR includes urban—rural classification for patient location and median household income quartile for the patient's zip code. The KID includes pediatric discharges from all US hospitals participating in the Healthcare Cost and Utilization Project, consisting of more than 4100 hospitals. These hospitals are burn and non-burn institutions.

An area of interest in injury prevention and treatment is socioeconomic status (SES) as an independent variable modifying injury. Several previous studies have shown an association between poverty, living in destitute areas, and injury severity with subsequent emergency department visits and hospitalization [7—9]. No studies exist correlating burn injuries with SES in large US databases. The reason for this is that the NBR does not provide these data without a significant number of missing values.

The goal of this study was to provide preliminary data as to the correlation of SES and severity of burn injury in the pediatric population. Similarity between these two databases would further expand the potential variables that could be studied in a complementary fashion between the KID and the NBR.

2.   Methods

The most recent NBR database includes data from 2001 to 2013. The KID database has been available every 3 y from 1997 to 2009 at the time of data gathering. Only those years during which both databases were available were chosen; hence, data from years 2003, 2006, and 2009 were included in this study.

Using the KID database, 19,422 inpatient pediatric burn records younger than 20 years of age were identified by the Major Diagnostic Code 22 for burn. To create a sample population comparable to the NBR, only nonelective burn cases were included. All the data were appropriately weighted to create national estimates. The final KID sample included 17,300 patients. The most recent NBR database was acquired. This database contains data for over 170,000 burn patients discharged from burn centers from 2002 to 2011. A total of 13,828 patients, aged younger than 20 y discharged in 2003, 2006, or 2009 were identified in the NBR.

Demographic data including age, gender, and race were obtained. Clinical data for extent of burn, reported as decile of total body surface area (TBSA), extent of full-thickness burn, burn etiology, complications, inhalation injury, mortality, length of stay (LOS), and transfer status were also collected. LOS was defined as the length of hospital stay in days. Data in the KID were extracted using International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes. Burn extent data were extracted using ICD-9 diagnosis codes 948.00-948.99. Etiology of burn was identified using the ICD-9 external causes of injury codes (E codes). Inhalation injury was recognized by ICD-9 codes 506.0, 947.0, 947.1, and 987.9.

Similar to the NBR report, patients were categorized into five age groups including birth to 0.9, 1—1.9, 2—4.9, 5—15.9, and 16—20 y. According to the NBR report, these groupings are based on the correlation of certain ages to pattern of burn injury [5].

The demographic and clinical conditions were compared between the KID and NBR using chi-square testing for categorical variables and t-test for numerical variables with the level of significance set at $P < 0.05$. Differences in mortality and LOS between the two databases were assessed using logistic regression and multiple regression by adjusting for potential confounders. Finally, using logistic regression and linear regression, the predictors of complication and LOS were identified using the available information in each database. In this study, log-transformed LOS data were used. All data analyses were performed using SAS 9.3 (SAS Institute Inc, Cary, NC).

3.   Results

Comparison between variables in the KID and NBR shows the availability of select variables in each database with its corresponding rate of missing data (Table 1). As can be seen, administrative and disease-specific repositories focus on different variables and have different rates of absent values. The KID uniquely possesses values for patient and hospital location, region, SES, and time of injury; the NBR is the only database that documents the number of days spent in the intensive care unit (ICU) or on a ventilator.

Comparisons of patient characteristics between KID and NBR are summarized in Table 2. Because the two databases draw on similar populations, it was assumed that the differences would be minimal. Most of the patients in both KID and NBR were male. There were 1%—3% more children aged younger than 5 y in the KID, which due to the large numbers,