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Increasing Number of Septicemia Hospitalizations in New Mexico, 2010-2015

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Septicemia, or sepsis, is caused by an immune response to a severe infection, which includes a range of infections from a urinary tract infection to pneumonia. Symptoms include fever, increased heart rate, increased respiratory rate, and confusion. If not treated, severe sepsis could ensue leading to poor organ function and potentially septic shock. Symptoms of severe septicemia include changes in mental status, difficulty breathing, and abdominal pain, in addition to those symptoms observed for septicemia. Septicemia is associated with high morbidity and mortality[1] and is one of the most expensive conditions treated in U.S. hospitals; accounting for over $23 billion in health care expenditures in 2013.[2]

Multiple studies using large administrative datasets have shown that hospitalizations for septicemia have increased year after year.[1,3-5] Due to these large yearly increases, septicemia prevention has become a public health priority. Multiple prevention initiatives are being promoted by hospitals and include early recognition and treatment of sepsis.[1]

Methods

This study is a retrospective analysis of hospital inpatient discharge data (HIDD) from hospitals across the state of New Mexico (both public and private facilities). These data consists of inpatient discharges from 36 non-federal, public acute hospitals and 16 non-federal specialty hospitals. Data elements included are patient characteristics such as age, sex, and patient residence information, as well as discharge characteristics such as 18 diagnosis fields, dates and times of admission and discharge, and how the patient was discharged from the facility.

Six years of New Mexico HIDD data were analyzed (2010-2015) with an average of 195,000 discharges per year. For this analysis, the following ICD-9-CM and ICD-10-CM codes were used: [ICD-9-CM] 003.1, 020.2, 022.3, 036.2, 038.0-038.9, 054.5, 449, 771.81, 790.7, 995.91, 995.92 and [ICD-10-CM] A02.1, A20.7, A22.7, A26.7, A32.7, A39.2, A39.3, A39.4, A40.0, A40.1, A40.3, A40.8, A40.9, A41.01, A41.02, A41.1, A41.2, A41.3, A41.4, A41.50, A41.51, A41.52, A41.53, A41.59, A41.81, A41.89, A41.9, A42.7, A54.86, B00.7, B37.7n I76, P36.0, P36.10, P36.19, P36.2, P36.30, P36.39, P36.4, P36.5, P36.8, P36.9, R65.20. Septicemia was defined as a discharge record with a septicemia code [above] listed in any of the diagnosis fields; primary septicemia was defined when the code appeared in the first diagnosis code. Severe septicemia was defined as a discharge with primary septicemia and diagnosis codes for hypotension and/or shock [ICD-9-CM] 427.5, 458.0, 458.8, 458.9, 785.5, 796.3; [ICD-10-CM] I46.9, I95.1, I95.89, I95.9, R03.1, R57.9 or metabolic and/or lactic acidosis [ICD-9-CM] 276.2; [ICD-10-CM] E87.2.

Discharges with primary septicemia were compared to discharges with severe septicemia using chi-square tests and t-tests.

For national and state (Arizona, Colorado, and Texas) estimates of septicemia discharges, five years of hospital discharge data were analyzed (2010-2014) using HCUPnet, Healthcare Cost and Utilization Project data from the Agency for Healthcare Research and Quality. HCUPnet uses data from individual states [National Inpatient Sample – NIS] and weights this individual state data to create a weighted national estimate. For the 2014 NIS dataset, 44 states provided data plus the District of Columbia; https://www.hcup-us.ahrq.gov/nisoverview.jsp

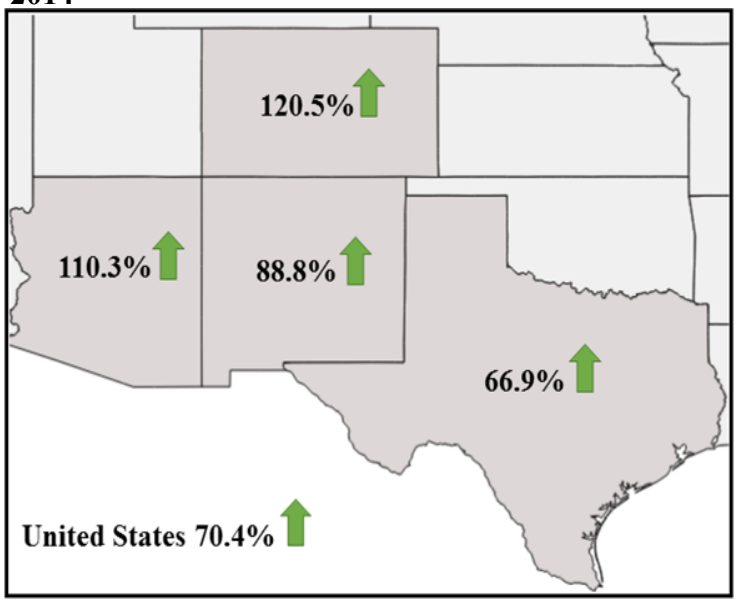
Results

The annual number of hospital discharges in New Mexico for primary septicemia increased from 4,664 in 2010 to 11,699 in 2015; an increase of 150.8% (Figure 1). On the national level, total estimated hospital discharges for primary septicemia increased 70.4% from 2010 to 2014 (for the same period, New Mexico had a 88.8% increase (in 2014 there were 8,805 discharges)). New Mexico was not the only state to see an increase in the number of discharges for primary septicemia; all neighboring states (Arizona, Colorado, and Texas) also saw large increases from 2010 to 2014 (Figure 2).

In New Mexico, patients with primary septicemia were more likely to be female and over the age of 64 years. The average age of primary septicemia patients was 62 years (over the six year time period). In 2010, 15.2% of primary septicemia hospitalizations ended in patient deaths, this percent decreased to 8.0% in 2015. During the six year time period, the percent of deaths due to primary septicemia was 11.5%.

On average, 5.0% of hospitalizations with primary septicemia had a code for hypotension and/or shock and 15.2% of hospitalizations had a code for metabolic and/or lactic acidosis [severe septicemia]. Overall, patients who had hypotension and/or shock had an average age of 65.4 years, an average hospital stay of 9 days, and were more likely to be female. Patients with metabolic and/or lactic acidosis were more likely to be male, with an average age of 62.7 years, and stayed in the hospital on average for 7 days. On average, patients with severe septicemia died in the hospital roughly 30.0% of the time compared to 11.5% for patients with primary septicemia.

Figure 2. Increases in the Number of Primary Septicemia Hospitalizations for Southwest States, 2010-2014



In a combined six year analysis, patients with severe septicemia were significantly older than patients with just primary septicemia; 63.3 vs. 61.9 years ($p<0.01$). Patients with severe septicemia were more likely to die in the hospital compared to patients with just primary septicemia; 2,144 vs. 2,680 deaths ($p<0.01$).

Discussion

Increases in sepsis observed in NM are consistent with national data. Increases in sepsis incidence could be due to the aging of the U.S. population, comorbidities, and the liberal use of sepsis codification, by including patients with less severity.[6,7] Diabetes mellitus, congestive heart failure, chronic pulmonary disease, immunosuppresion, liver disease, cancer and chronic renal failure have all been associated with sepsis.[6] Alcohol con-

Table 1. Number of Admissions with Any Septicemia, Primary Septicemia, and Severe Septicemia, New Mexico, 2010-2015

	Septicemia (any field)	*Primary Septicemia (first field)*	*Severe Septicemia (any field)*
2010	8,714	4,664	871
2011	9,914	5,769	1,180
2012	9,868	6,468	1,218
2013	11,714	7,217	1,447
2014	13,573	8,805	1,776
2015	16,132	11,699	2,019

sumption has also been shown to increase the risk of sepsis.[8]

New Mexico hospitalization data has followed the trend of other large administrative datasets, showing an increase in the number of hospitalizations due to septicemia. This increasing trend observed nationwide has sparked organizations, like the Centers for Disease Control and Prevention (CDC), to embark on sepsis initiatives focused on improving patient outcomes by promoting protocol-driven approaches that facilitate early recognition and treatment.[1]

Multiple analyses using administrative datasets[1,3,4] have shown an increase in sepsis incidence, but upon comparison to other collection methods, Rhee, et. al.[9] found that rates of sepsis have either remained stable or decreased. Rhee, et. al.[9] based their analysis on clinical markers for sepsis: positive blood cultures, use of vasopressors, and/or elevated lactic acid levels and found that many records coded as sepsis lacked positive clinical markers. Rhee, et.al. suggest that another surveillance strategy be used to monitor sepsis cases, as the current claims based approach (administrative datasets) have a tendency to overestimate the true burden of disease. More objective measures (reviews of patient charts via electronic health records) may provide a more accurate portrayal of sepsis nationwide. Rhee, et. al noted that although they did not observe the large increase of septicemia cases found with administrative datasets when using clinical markers, they did observe a small increase in the number of cases with severe septicemia as indicated by clinical markers. New Mexico administrative data also showed an increase in severe septicemia from 2010-2015, although this increase was not based on positive clinical markers (Table 1).

Recommendations

Sepsis has a high case fatality rate and provides significant challenges to the healthcare system. It is important for healthcare personnel to accurately and quickly diagnosis sepsis and to properly treat the condition. New protocols focused on early recognition, treatment, and accurately diagnosing would be beneficial for improving patient outcomes.[1]

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Figure 1. Estimates of Primary Septicemia Hospitalizations, NM and U.S. (HCUPnet), 2010-2015