Trends in Resource Utilization for Hospitalized Children With Skin and Soft Tissue Infections

WHAT'S KNOWN ON THIS SUBJECT: Skin and soft tissue infections (SSTIs) are a common pediatric condition often requiring inpatient management. Several studies describe recent increases in hospitalizations due to SSTIs.

WHAT THIS STUDY ADDS: In addition to rising hospitalizations, analysis of pediatric SSTI resource utilization trends revealed a twofold increase in incisions and drainages over a 13-year period. A growing number of incisions and drainages were performed in younger children.

abstract

OBJECTIVE: To describe trends in national resource utilization for pediatric skin and soft tissue infection (SSTI) hospitalizations.

METHODS: This was a cross-sectional analysis of hospital discharges from 1997 to 2009 within the Healthcare Cost and Utilization Project Kids' Inpatient Database for children with isolated SSTIs. Outcomes examined included patient and hospital characteristics, number of hospitalizations, and resource utilization including length of stay (LOS), hospital charges, and performance of incision and drainage (I&D). Trends in resource utilization were assessed by using linear regression in a merged data set with survey year as the primary independent variable. Multivariate logistic regression was conducted for 2009 data to assess factors associated with increased I&D.

RESULTS: The weighted proportion of SSTI hospitalizations among all hospitalizations doubled (0.46% vs 1.01%) from 1997 to 2009. During the same period, patient demographic trends included a shift to increased hospitalizations in infant and preschool-age groups as well as publicly insured children. Mean LOS decreased from 3.11 to 2.71 days. Increased resource utilization included changes in mean charges from $6722 to $11 534 per hospitalization and a twofold increase in I&D (21% to 44%). Factors associated with I&D include young age, African American race, female gender, publicly or uninsured children, and southern region of the United States.

CONCLUSIONS: SSTI is responsible for an emerging increase in health services utilization. Additional study is warranted to identify interventions that may effectively address this public health burden. *Pediatrics* 2013;131:e718–e725

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KEY WORDS

infectious disease, health care disparity, health care use, pediatrics, staphylococcal infection

ABBREVIATIONS

ca-MRSA—community-acquired methicillin-resistant *Staphylococcus aureus*
CI—confidence interval
HCUP—Healthcare Cost and Utilization Project
I&D—incision and drainage
KID—Kids' Inpatient Database
LOS—length of stay
MRSA—methicillin-resistant *Staphylococcus aureus*
OR—odds ratio
SSTIs—skin and soft tissue infections

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The rising incidence of skin and soft tissue infections (SSTIs) and accompanying rise in drug-resistant pathogens witnessed in the past decade represent an emerging health problem,[1] with ramifications extending across the health care spectrum. The term SSTI encompasses a variety of processes with suppurative noninvasive microbial infection inducing a host response that can vary from local to systemic symptoms.[2,3] Although most SSTIs can be managed in the outpatient setting, a subset requires inpatient care. National US data have demonstrated increased rates of SSTIs in the ambulatory setting[1,4,5] as well as increased hospitalizations[6,7] with an increasing proportion due to methicillin-resistant *Staphylococcus aureus* (MRSA).[8] As additional evidence of this growing concern, SSTIs went from the 21st most common pediatric discharge in 1997 to ninth most common in 2009.[9]

Although numerous studies have reported the evolving epidemiology of SSTIs, few have assessed resource utilization for SSTI hospitalizations. A regional pediatric health plan study found that cellulitis and abscesses rose locally from fifth to second place for inpatient expenses from 2001 through 2004.[10] A recent study described the high and rising costs associated with SSTI hospitalizations nationally but included medically complex children and children with invasive diease.[11] Inclusion of these subgroups may inaccurately inflate SSTI resource utilization attributable to the general pediatric population. A paucity of resource utilization data in SSTIs exists among healthy children. Knowledge of SSTI trends and changes in resource utilization among healthy children will yield new insights regarding the scope of this pediatric public health problem and potentially provide direction for standardization of care and preventive strategies. The objective of this study was to describe national trends in pediatric SSTI hospital resource utilization including length of stay (LOS), charges, and performance of incision and drainage (I&D) procedures.

METHODS

Study Design and Data Source

This was a cross-sectional analysis of pediatric hospitalizations in the United States using the 1997–2009 Kids' Inpatient Database (KID) maintained by the Agency for Healthcare Research and Quality as part of the Healthcare Resource Utilization Project (HCUP).[12] This database is the only pediatric inpatient database including data from all payers and multiple hospital types and contains information on patient demographics, hospital characteristics, diagnoses, procedures, and resource utilization including LOS and total charges. Data sets have been released every 3 years, beginning in 1997. All currently released data sets (1997, 2000, 2003, 2006, 2009) were analyzed. The Institutional Review Board at Baylor College of Medicine approved the study.

Study Participants

Patients ≤18 years of age with a primary diagnosis of SSTI were identified by using *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) discharge codes (Appendix 1). Patients with a secondary diagnosis of invasive disease defined as bacteria in normally sterile bodily fluids (eg, bacteremia, sepsis, myositis, urinary tract infection, meningitis, necrotizing fasciitis, endocarditis, osteomyelitis) were excluded[13] (Appendix 2), as were patients with chronic medical comorbidities[14] as defined by previous HCUP KID studies.[15]

Dependent Variables

The primary outcomes were proportion of SSTI hospitalizations among all pediatric hospitalizations, LOS, charges, and performance of I&D. LOS was determined by subtracting the admission date from the discharge date. Hospital charge information was collected as the total amount charged by the hospital. Performance of an I&D was based on ICD-9-CM procedural code 86.0 and includes an I&D performed at any point during the hospital course included in the discharge record.

Independent Variables

Patient characteristics included age, gender, race/ethnicity, payer type, and household income. Age was divided into <1 year (infant), 1 to 4 years (preschool age), 5 to 12 years (school age), and 13 to 18 years (adolescence). Racial/ethnic data collected by hospitals were categorized as white, African American, Hispanic, or other. Household income was based on median household income quartiles according to patient zip code. Payer types in KID were classified as private, public (Medicaid and other government programs), and other (uninsured). Hospital characteristics included region, hospital size, teaching status, and hospital ownership.[16] Region was categorized as defined in KID: Northeast, Midwest, South, and West. Hospital size was defined as small, medium, and large based on number of hospital beds with approximately one-third of the hospitals in a given region, location, and teaching status in each bed size category.[16] Hospitals were categorized as teaching/urban and nonteaching/urban. Hospital ownership included children's general hospital, children's unit in a general hospital, and hospitals not identified as children's hospital by the National Association of Children's Hospitals and Related Institutions hospital type.[16]

Analysis

Data were weighted to estimate national numbers by using the appropriately scaled weights provided by HCUP.[16] Weighting within each study

year accounted for hospital strata, clustering, and the volume of hospitals within each data set. We performed analyses by using SAS 9.2 (SAS Institute, Inc; Cary, NC). Summary statistics were performed to determine means and proportions. Trends in number of hospitalizations, LOS, charges, and number of I&D were assessed by using weighted multivariate linear regression in a merged data set with survey year as the principal predictor variable. In addition to SSTIs, trend data were also collected for all pediatric hospitalizations to differentiate changes attributable to SSTIs versus global trends in pediatric hospitalizations. SSTI resource utilization was also compared with asthma and pneumonia as references for changes in common pediatric conditions. Charges from 1997, 2000, 2003, and 2006 were converted into 2009 dollars by using the Consumer Price Index for comparison with 2009 charges. Weighted multivariate logistic regression was conducted with the 2009 data to determine current factors associated with performance of I&D. Independent variables examined in both multivariate linear and logistic regression consisted of age, gender, race, insurance, income quartile, region, hospital bed size, teaching status, hospital type, and admission day. Data on race/ethnicity was missing for 25%, 13%, 23%, 23%, and 15% of discharges in years 1997, 2000, 2003, 2006, and 2009, respectively. Such discharges were classified as unknown race/ethnicity, and this group was controlled for in the analysis. Results for logistic regression were reported as odds ratios (OR) with 95% confidence intervals (CI).

RESULTS

Demographics of the patients and hospitals are shown in Table 1. A shift in increasing SSTI hospitalizations was seen in infants and preschool-age children and public payers.

Trends in Hospitalizations and Resource Utilization

General

The weighted number of SSTI pediatric hospitalizations more than doubled during the study period with an increase from 460 per 100 000 in 1997 to 1010 per 100 000 in 2009 (Table 2). Mean LOS for SSTI hospitalizations decreased from 3.11 days in 1997 to 2.71 days in 2009 ($P < .01$; Table 3). LOS for asthma and pneumonia also decreased (2.48 to 2.19 and 3.67 to 3.42, $P < .01$, respectively). During this same period, mean LOS for all hospitalizations increased from 3.42 to 3.72 ($P < .01$). Mean Consumer Price Index–adjusted hospital charges for SSTIs increased from $6722 in 1997 to $11 534 in 2009 ($P < .01$; Table 3). Charges for asthma, pneumonia, and all KID hospitalizations also increased over the 12 years (Table 3). The percentage of SSTI hospitalizations with I&D procedures performed more than doubled from 1997 to 2009 (Table 2).

Factors Associated With I&D

In 2009, multivariate logistic regression demonstrated increased odds of I&D in hospitalizations for infants and children (0–1 years [reference]; 1–4 years of age, OR 0.92 [95% CI: 0.85–0.99]; 5–12 years of age, OR 0.41 [CI: 0.37–0.45]; 13–18 years of age, OR 0.6 [95% CI: 0.54–0.65]). Increased odds were also seen in females (OR 1.15 [95% CI: 1.10–1.20]), African Americans (OR 1.15 [95% CI: 1.05–1.25]), publicly insured (OR 1.09 [95% CI: 1.03–1.16]) or uninsured (OR 1.15 [CI: 1.04–1.28]), and hospitalizations in the south (OR: 1.39 [95% CI: 1.20–1.62]). Factors analyzed but not significantly associated with I&D included income quartile, hospital bed size, teaching status, and hospital type.

DISCUSSION

SSTI admissions account for a growing proportion of hospitalizations, and knowledge of associated resource utilization provides potential insight into the disease. There are currently a limited number of studies that have examined SSTI resource utilization.[11,17] Previous evidence supports higher resource utilization in children with complex chronic conditions.[15] Our study builds on previous studies by focusing on a healthy population of children without complex chronic diseases or invasive disease. Different from previous work,[11,17] our study includes all currently released data sets over a 13-year period from a nationally representative sample and controls for patient and hospital characteristics with time trend analysis for resource utilization. During the study period, SSTI pediatric hospitalizations and the number of I&D procedures performed doubled. A growing number of I&Ds were attributable to younger children.

Examination of patient demographics in SSTI hospitalizations from 1997 to 2009 reveals several findings with regard to the burden of pediatric SSTI hospitalizations. Our study demonstrated a notable increase in SSTI pediatric hospitalizations among the publicly insured from 1997 to 2009. A previous study among children in the outpatient setting demonstrated an association between community-acquired MRSA (ca-MRSA) colonization and Medicaid.[18] This is potentially due to crowded living conditions in families from a lower socioeconomic status.[18] With a continued focus on areas of high resource burden, additional efforts are needed to identify factors responsible for increased hospital admissions in the publicly insured.

Notable trends were also found according to age. Our study reveals a growing number of hospitalizations from 2000 to 2009 in the infant and preschool-age groups. Although we did not have access to microbiological data, a recent pediatric inpatient study demonstrated an increase in SSTIs attributable to MRSA[8]

TABLE 1 Patient and Hospital Characteristics for Skin and Soft Tissue Infections: 1997, 2000, 2003, 2006, and 2009

	1997 (*N* = 13 225; wt = 30 653)		2000 (*N* = 17 367; wt = 33 155)		2003 (*N* = 26 923; wt = 45 752)		2006 (*N* = 42 854; wt = 70 471)		2009 (*N* = 49 834; wt = 74 443)	
	N (wt)	Weight, %	*N* (wt)	Weight, %	*N* (wt)	Weight, %	*N* (wt)	Weight, %	*N* (wt)	Weight, %
Age, y										
<1	1446 (3327)	10.9	1671 (3119)	9.4	2824 (4807)	10.6	5666 (9305)	13.3	6581 (9915)	13.4
1–4	4105 (9504)	31.2	4877 (9308)	28.1	7788 (13 385)	29.5	13 787 (22 839)	32.6	18 267 (27 490)	37.2
5–12	4674 (10 998)	36.0	5658 (10 878)	32.9	7790 (13 302)	29.3	9931 (16 421)	23.4	10 514 (15 726)	21.2
13–18	2939 (6680)	21.9	5134 (9802)	29.6	8268 (13 865)	30.6	13 205 (21 506)	30.7	14 171 (20 884)	28.2
Gender										
Male	7659 (17 740)	57.9	9974 (19 028)	57.4	14 717 (25 033)	55.8	22 891 (37 663)	54.2	26 389 (39 442)	53.8
Female	5566 (12 912)	42.1	7387 (14 113)	42.6	11 581 (19 800)	44.2	19 280 (31 818)	45.8	22 666 (33 920)	46.2
Race										
White	5098 (11 661)	38.0	7179 (14 677)	44.2	9764 (16 763)	36.6	16 477 (27 500)	39.0	22 222 (33 181)	44.6
Black	2209 (5302)	17.3	2966 (5505)	16.7	3894 (6861)	15.0	55945 (10 052)	14.3	7862 (11 908)	16.0
Hispanic	2412 (4358)	14.2	3744 (6401)	19.3	5028 (8619)	18.9	7578 (12 505)	17.7	8882 (13 043)	17.5
Other	963 (1673)	5.5	1309 (2289)	6.9	1677 (2856)	6.2	2422 (4006)	5.7	3256 (4823)	6.5
Missing	2543 (7659)	25.0	2169 (4285)	12.9	6560 (10 652)	23.3	10 432 (16 409)	23.3	7612 (11 489)	15.4
Insurance										
Private	6461 (14 869)	48.7	8452 (16 467)	49.9	11 839 (19 881)	43.5	16 749 (27 397)	39.0	18 284 (26 882)	36.1
Public	5567 (12 962)	42.4	7178 (13 410)	40.6	12 883 (22 108)	48.4	22 538 (37 207)	52.9	28 015 (42 280)	56.9
Other	1147 (2717)	8.9	1665 (3142)	9.5	2159 (3681)	8.1	3488 (5733)	8.1	3466 (5174)	7.0
Income quartile										
First quartile	4608 (11 765)	40.2	2680 (4751)	14.6	8864 (15 532)	34.7	15 343 (25 676)	37.4	18293 (28 003)	38.5
Second quartile	2465 (5843)	20.0	5075 (9924)	30.4	6780 (11 449)	25.6	10 294 (16 763)	24.4	12668 (18 923)	26.0
Third quartile	1986 (4309)	14.7	4230 (8549)	26.2	5790 (9623)	21.5	8919 (14 407)	21.0	10041 (14 795)	20.3
Fourth quartile	3601 (7348)	25.1	5099 (9393)	28.8	4940 (8185)	18.2	7240 (11 852)	17.2	7648 (10 998)	15.2
Region										
Northeast	1948 (6268)	20.4	1050 (5343)	16.1	5723 (8825)	19.3	9164 (13 998)	19.9	9848 (14 471)	19.4
Midwest	4553 (7211)	23.5	5052 (7505)	22.6	4487 (8038)	17.6	5928 (11 084)	15.7	9038 (12 326)	16.6
South	2896 (10 765)	35.1	6980 (13 285)	40.1	11 392 (20 683)	45.2	19 481 (32 904)	46.7	22157 (35 288)	47.4
West	3828 (6410)	21.0	4285 (7023)	21.2	5321 (8204)	17.9	8281 (12 485)	17.7	8791 (12 358)	16.6
Bed size										
Small	2848 (6778)	22.1	2620 (5545)	16.8	4488 (7426)	16.7	6146 (10 931)	16.0	5120 (8210)	12.2
Medium	4488 (9750)	31.8	5572 (10 514)	31.8	8291 (14 377)	32.2	10 983 (18 333)	26.7	10 954 (16 428)	24.4
Large	5889 (14 125)	46.1	9141 (17 034)	51.5	13 987 (22 801)	51.1	24 624 (39 276)	57.3	29 136 (42 582)	63.4
Teaching status										
Nonteaching/Urban	5037 (11 496)	43.7	5490 (9514)	33.3	9024 (14 106)	36.2	13 572 (21 009)	35.0	15 123 (21 813)	37.8
Teaching/Urban	6940 (14 827)	56.3	9937 (19 041)	66.7	14 380 (24 877)	63.8	23 375 (38 973)	65.0	24 222 (35 846)	62.2
Hospital type										
Not children's hospital	8883 (19 856)	64.8	11 684 (21 732)	67.1	17 201 (28 248)	65.0	25 178 (40 122)	61.3	28 585 (41 790)	64.4
Children's GH	1775 (4564)	14.9	2611 (5926)	18.3	4522 (8663)	19.9	6668 (12 374)	18.9	5920 (9564)	14.7
Children's unit in GH	2567 (6233)	20.3	2667 (4717)	14.6	3938 (6548)	15.1	8154 (12 967)	19.8	9334 (13 576)	20.9

GH, general hospital; wt, weighted.

and raises the question of whether the rise in hospitalizations in the infant and preschool-age children is also due to MRSA. A study based on Centers for Disease Control and Prevention surveillance data found that ca-MRSA was more common in persons <2 years of age compared with those >2 years of age,[19] and a study of day-care centers found their MRSA rates to be comparable to long-term care facilities and rehabilitation centers.[20] These increased rates of ca-MRSA in the youngest cohorts likely contributed to the increased hospitalizations seen over time. Additionally, younger children are more likely to require sedation for I&D of abscesses,[21] and this likely drives an increased need for hospitalization in this group. The rise in SSTIs in infants and preschool-age children demonstrated in our study suggests a need for additional targeted intervention efforts in younger children to address the increasing burden of SSTI hospitalizations.

Overall, our study demonstrated a substantial rise in SSTI hospitalizations relative to other patterns among pediatric hospitalizations. Over a 13-year span, SSTI hospitalizations doubled from 30 653 to 74 443. During this time, the weighted number of all pediatric hospitalizations rose as well but much less dramatically. Whereas SSTI hospitalizations increased, the weighted proportion of hospitalizations for common conditions requiring inpatient care (asthma and pneumonia) decreased

TABLE 2 SSTI Hospitalizations and I&Ds: 1997, 2000, 2003, 2006, and 2009

	1997 *N* (wt)	Weight, %	2000 *N* (wt)	Weight, %	2003 *N* (wt)	Weight, %	2006 *N* (wt)	Weight, %	2009 *N* (wt)	Weight, %	*P*
No. of hospitalizations											
All US hospitalizations	1 905 797 (6 657 325)	—	2 516 833 (7 291 039)	—	2 984 129 (7 409 162)	—	3 131 324 (7 558 812)	—	3 407 146 (7 370 203)	—	
SSTI	13 225 (30 653)	0.46	17 367 (33 155)	0.45	26 923 (45 752)	0.62	42 854 (70 471)	0.93	49 834 (74 443)	1.01	<.01
Receiving I&D	2779 (6284)	20.5	4122 (7764)	23.4	8298 (14 233)	31.1	16 786 (27 640)	39.2	21 544 (32 431)	43.6	<.01
Asthma	86 698 (200 699)	3.01	84 479 (158 820)	2.17	102 101 (173 392)	2.34	86 968 (143 854)	1.90	97 117 (143 641)	1.95	<.01
Pneumonia	77 936 (197 584)	2.97	85 476 (170 806)	2.34	101 141 (170 860)	2.31	103 853 (168 864)	2.23	118 317 (176 145)	2.39	<.01

wt, weighted.

(Table 2). These findings within the context of other pediatric hospitalizations suggest that SSTI hospitalizations are following a unique pattern rather than global trends in hospitalizations. Furthermore, these results suggest a great potential for SSTI hospitalizations to continue to rise as a common cause of pediatric hospitalizations.

With the increases in SSTI hospitalizations, trends in LOS warrant additional exploration to fully evaluate resource utilization. Several factors may explain why LOS decreased over the 13-year span of our study. First, changes in management may have reduced LOS. In our study, we demonstrated more I&Ds over time, which may reflect changes in practice that in turn reduced LOS. Second, research efforts in the past decade have also been responsible for improved recognition of the MRSA pathogen,[22] which may also have reduced LOS.[23] Third, the trend in shorter LOS for SSTIs may be following more global trends in LOS for common pediatric diagnoses. In our study, decreased LOS was also described for pneumonia and asthma, whereas LOS for all hospitalizations overall increased. This may be related to longer LOS in children with complex conditions[15] reflected in "all hospitalizations." A previous study demonstrated a trend toward shorter hospital stays (0–1 night) in the most common pediatric diagnoses including asthma and pneumonia.[24] This trend in reduced number of hospital days is possibly related to increased utilization of clinical guidelines for common pediatric diagnoses. As SSTIs has increasingly become a common pediatric inpatient diagnosis, duration of stay may be decreasing due to use of clinical guidelines as well.[25] The improvement in LOS is noteworthy in the context of otherwise increased resource utilization observed in SSTI hospitalizations.

Our study found increased charges for SSTI hospitalizations despite adjustments for inflation. These findings are consistent with those from previous studies.[8,10,11] An increase in I&D procedures may be responsible for a portion of the increase in charges seen in SSTIs. However, more global factors are also likely driving charge increases given the changes seen across asthma, pneumonia, and all hospitalizations from 1997 to 2009.

One of the major findings in our study is the large increase in the number of I&Ds performed in 2009 compared with 1997. This change in practice is likely due to more abscesses in the ca-MRSA era. In the *ICD-9-CM* coding system, "cellulitis and abscess" are classified as the same condition. However, recent evidence supports an increased clinical presentation of abscesses versus other presentations of SSTIs in 2007 compared with 1997.[5]

Given the dramatic increase in I&Ds seen in our study, we studied factors associated with performance of I&D. Our study showed an inverse association with age and I&D as well as an association with African American race and uninsured children. The reason for the greater number of I&Ds in the youngest age category of 0 to 1 is unclear. As mentioned earlier, there is an association between ca-MRSA and children <2 years of age,[19] which is likely responsible for increased number of abscesses[5] requiring I&D.

Our study also described increased I&D in African American children, as well as children from lower socioeconomic classes. These results must be interpreted with caution given that race/ethnicity was missing for a proportion of the population throughout the study years. However, even when controlling for missing race/ethnicity data, small but statistically significant disparities were found. The reason for these disparities is uncertain because

TABLE 3 Total Charges and LOS for SSTI Hospitalizations

Variable	1997 Mean (95% CI)	2000 Mean (95% CI)	2003 Mean (95% CI)	2006 Mean (95% CI)	2009 Mean (95% CI)	*P*
LOS (d)						
SSTI	3.11 (3.03–3.18)	3.01 (2.95–3.06)	3.01 (2.97–3.05)	2.89 (2.85–2.94)	2.71 (2.66–2.75)	<.01
Asthma	2.48 (2.43–2.53)	2.37 (2.32–2.42)	2.33 (2.28–2.37)	2.22 (2.18–2.26)	2.19 (2.14–2.24)	<.01
Pneumonia	3.67 (3.58–3.76)	3.63 (3.49–3.77)	3.53 (3.40–3.66)	3.41 (3.30–3.53)	3.42 (3.32–3.53)	<.01
All Hospitalizations	3.42 (3.34–3.50)	3.48 (3.41–3.55)	3.56 (3.49–3.63)	3.67 (3.60–3.74)	3.72 (3.65–3.79)	<.01
Total charges (dollars)[a]						
SSTI	6722 (6268–7175)	7425 (7048–7803)	9571 (9152–9991)	10 558 (10 167–10 948)	11 534 (11 095–11 973)	<.01
Asthma	6739 (6399–7078)	7219 (6831–7607)	8964 (8469–9460)	9810 (9277–10 342)	11 720 (10 997–12 443)	<.01
Pneumonia	9853 (9272–10 433)	11 289 (10 519–12 060)	14 115 (12 992–15 239)	15 326 (14 272–16 380)	18 158 (17 112–19 204)	<.01
All Hospitalizations	8409 (7962–8856)	9659 (9025–10 292)	11 941 (11 390–12 491)	13 933 (13 283–14 583)	16 818 (16 025–17 611)	<.01

[a] Charges for 1997, 2000, 2003, and 2006 were converted to 2009 estimated value by using the Consumer Price Index.

several potential causative variables (eg, size/location of cellulitic area or abscess, signs of invasive disease, microbiologic etiologies, empirical antibiotic therapy, time to I&D) could not be evaluated in the KID database. These children may also have had more severe disease due to delayed presentation because of lack of access to health care[26] or other factors that may render them more susceptible hosts (eg, poor nutritional status). After presentation, it is possible that poor and minority children may have had delays in I&D or received less effective antibiotics than white or more affluent children. Additional clinical data and more complete data on race/ethnicity would allow for better elucidation of the relationship between these socioeconomic disparities and I&D.

There were methodological limitations to our study. Although HCUP KID is considered to provide a representative sample of pediatric hospitalizations, discharge information is only released every 3 years and originated from a limited number of states in early years. Use of weighted numbers in analysis as done in our study accounts for most selection bias. HCUP KID does not contain unique patient identifiers or record linkages, thereby preventing analysis of utilization according to detailed patient characteristics and severity of illness. It is also possible that 1 patient contributed to multiple discharges. HCUP KID does not provide data on microbiology or medication administration. Therefore, we could not assess the specific impact of MRSA and medication choices on our outcomes, which have been shown to affect LOS and charges in adult literature.[27] Cost data across all study years were not evaluated because cost to charge ratio files are unavailable through HCUP for all study years. Lastly, because HCUP KID is an administrative database, our study has the limitations inherent to using such data sources, including coding errors, missing variables such as race, and misclassifications.

CONCLUSIONS

Pediatric SSTI hospitalizations are responsible for significant and growing resource utilization. Not only have the numbers of SSTI hospitalizations increased, the number of I&Ds have also risen rapidly. According to this work, potential areas of focus for pediatric and public health stakeholders include infant and preschool-age groups, the African American population, and publicly and uninsured children. SSTI disease requires the continued attention of the pediatric community, and factors such as age, race, and socioeconomic status warrant additional epidemiologic study because trends suggest the burden attributable to this disease will continue to escalate.

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APPENDIX 1 Patient Sample: Children ≤18 Years With Any of the Following ICD-9 Codes as DX 1

	Codes
Cellulitis and abscess of finger and toe	681.0–681.9
Other cellulitis and abscess	682.0–682.9
Carbuncle and furuncle	680.0–680.9
Impetigo	684.00

APPENDIX 2 Exclusion 1 Invasive Disease: ICD-9 Codes DX2–DX15

	Codes
Acute lymphadenitis	683.00
Necrotizing Fasciitis	728.86
Acute and subacute endocarditis	421.0–421.9
Arthropathy associated with infection	711.0–711.9
Disorders of muscle, ligament, and fascia (infective myositis)	728.0–728.9
Osteomyelitis, periostitis, and other infections involving bone	730.0–730.9
Meningitis of unspecified cause	322.0–322.9
Bacterial meningitis	320.0–320.9
Urinary tract infection	V13.02
Urinary tract infection, site not specified	599.0
Urinary tract infection of newborn	771.82
Bacteremia	790.7
Systemic inflammatory response syndrome, unspecified	995.90–995.94