Supplemental Information

METHODS

Demographic Data

Demographic covariates included sex, chronic disease profile, hospital type (academic metropolitan, nonacademic metropolitan, and nonmetropolitan), insurance type (public, private, or other), and the zip code median income quintile, a crude measure of socioeconomic status. Measures of illness severity included length of stay, organ failure, and the all patients refined diagnosis related group severity and mortality indices. These indices are proprietary and validated methods of describing illness severity by using administrative data.[31] We defined readmissions with infection as those with infection codes included in the combination coding strategy.[21] We defined readmissions with sepsis using the same criteria as index admissions. We further defined readmissions with infection as the primary reason for readmission as those with infection or sepsis codes as the principal diagnosis. To describe readmissions involving the same pathogen, we grouped all administrative codes describing a specific fungal or bacterial etiology that were present in >0.5% of the cohort with sepsis into groups of organism-specific codes (Supplemental Table 3). We defined readmission with the same organism as readmission of patients with the same pathogen listed in any discharge diagnosis field during both index sepsis admission and readmission.

We combined 2 administrative coding strategies[24,32] to classify chronic disease. Patients were classified as previously healthy if they did not meet criteria for inclusion for any chronic diseases listed in either classification scheme. We used the 12 categories of organ system involvement within the chronic disease classifications to classify patients who were not previously healthy into 1 of 6 mutually exclusive categories: those with cancer or bone marrow transplant; those without cancer or bone marrow transplant but with indwelling devices; those in none of the previous categories but with exactly 1 other affected organ system; those in none of the previous categories but exactly 2 other affected organ systems; exactly 3 other affected organ systems; and >3 other affected organ systems. We classified admissions into the mutually exclusive 7 categories to allow a larger proportion of patients with sepsis to be matched to controls with a similar chronic disease profile,[14,17,33–35] and

because patients with cancer and indwelling devices have a high risk of readmission.[34]

Sensitivity Analyses

Matches were identified by using exact matching to identify index admissions with sepsis that matched index unplanned admissions for other reasons. We created 2 separate matched samples using the chronic disease categories, with a less exact matching strategy using the 7 mutually exclusive categories and the more exact matching strategy using each of the 12 categories. In both samples, we also matched on age groups, month of admission, hospital type, and zip code income quintile.

Second, we determined the excess odds of readmission with longer follow-up and increased the duration of follow-up to 6 months in the subset with discharge dates between January 1 and July 1, 2014. Third, because the data set only included admissions by calendar year, it was unclear whether admissions in the first quarter had been admitted near the end of the previous calendar year. We therefore performed an analysis limited to the index admissions in the second and third quarter of the year, thus allowing us to identify patients without an admission in the previous 90 days.

SUPPLEMENTAL TABLE 2 Clinical Characteristics of Matched Sample of Patients Admitted With Sepsis and for Other Reasons by Using All 3 Matching Strategies

Variable	Demographics Alone		Less Exact Matching Strategy[a]		More Exact Matching Strategy[b]	
	Nonsepsis Admissions (n = 7634)	Sepsis Admissions (n = 7634)	Matched Nonsepsis Admissions (n = 7376)	Matched Sepsis Admissions (n = 7376)	Matched Nonsepsis Admissions (n = 4853)	Matched Sepsis Admissions (n = 4853)
Demographic						
Age <1 y, non-neonate	729 (9.7)	729 (9.7)	707 (9.6)	707 (9.6)	518 (10.7)	518 (10.7)
Age 1–5 y	1693 (22.5)	1693 (22.5)	1667 (22.6)	1667 (22.6)	1067 (22.0)	1067 (22.0)
Age 6–12 y	1881 (25)	1881 (25)	1860 (25.2)	1860 (25.2)	1124 (23.2)	1124 (23.2)
Age 13–18 y	3207 (42.7)	3207 (42.7)	3142 (42.6)	3142 (42.6)	2144 (44.2)	2144 (44.2)
Female	3996 (53.2)	3996 (53.2)	3931 (53.3)	3931 (53.3)	2687 (55.4)	2687 (55.4)
Public insurance	4280 (57.1)	4280 (57.1)	4236 (57.5)	4236 (57.5)	2831 (58.4)	2831 (58.4)
Matched chronic diseases[c]						
Previously healthy patients	2924 (38.9)	1545 (20.6)	1543 (20.9)	1543 (20.9)	1543 (31.8)	1543 (31.8)
Oncologic conditions	168 (2.2)	576 (7.7)	547 (7.4)	547 (7.4)	112 (2.3)	112 (2.3)
Device dependence	424 (5.6)	1973 (26.3)	1930 (26.2)	1930 (26.2)	725 (14.9)	725 (14.9)
1 other complex chronic condition	2789 (37.1)	1751 (23.3)	1750 (23.7)	1750 (23.7)	1657 (34.1)	1653 (34.1)
2 other complex chronic conditions	898 (12)	984 (13.1)	978 (13.3)	978 (13.3)	659 (13.6)	663 (13.7)
3 other complex chronic conditions	238 (3.2)	448 (6)	432 (5.9)	432 (5.9)	131 (2.7)	128 (2.6)
>3 other complex chronic conditions	69 (0.9)	233 (3.1)	196 (2.7)	196 (2.7)	26 (0.5)	29 (0.6)
Other chronic diseases						
Neurologic or neuromuscular conditions	2272 (30.3)	2947 (39.2)	2999 (40.7)	2873 (39.0)	1561 (32.2)	1561 (32.2)
Cardiovascular conditions	359 (4.8)	1330 (17.7)	735 (10)	1276 (17.3)	330 (6.8)	330 (6.8)
Respiratory conditions	1500 (20)	1947 (25.9)	1824 (24.7)	1901 (25.8)	950 (19.6)	950 (19.6)
Renal and urologic conditions	363 (4.8)	1744 (23.2)	775 (10.5)	1688 (22.9)	634 (13.1)	634 (13.1)
Gastrointestinal and hepatologic conditions	986 (13.1)	2622 (34.9)	2228 (30.2)	2549 (34.6)	1136 (23.4)	1136 (23.4)
Hematologic and immunologic conditions	306 (4.1)	778 (10.4)	516 (7)	755 (10.2)	223 (4.6)	223 (4.6)
Metabolic conditions	579 (7.7)	1394 (18.6)	1422 (19.3)	1348 (18.3)	477 (9.8)	477 (9.8)
Congenital and genetic conditions	417 (5.6)	766 (10.2)	820 (11.1)	743 (10.1)	209 (4.3)	209 (4.3)
Solid organ transplant	78 (1)	212 (2.8)	181 (2.5)	204 (2.8)	16 (0.3)	16 (0.3)
Organ failure						
Need for mechanical ventilation	79 (1.1)	1926 (25.6)	142 (1.9)	1890 (25.6)	74 (1.5)	1004 (20.7)
Presence of shock	41 (0.5)	1438 (19.1)	53 (0.7)	1415 (19.2)	33 (0.7)	948 (19.5)
Acute renal failure	47 (0.6)	1061 (14.1)	78 (1.1)	1040 (14.1)	26 (0.5)	579 (11.9)
Neurologic failure	72 (1)	567 (7.5)	122 (1.7)	556 (7.5)	60 (1.2)	326 (6.7)
Hepatic failure	6 (0.1)	70 (0.9)	7 (0.1)	70 (0.9)	5 (0.1)	42 (0.9)
Hematologic failure	47 (0.6)	1326 (17.7)	107 (1.5)	1299 (17.6)	47 (1.0)	796 (16.4)

SUPPLEMENTAL TABLE 2 Continued

Variable	Demographics Alone		Less Exact Matching Strategy[a]		More Exact Matching Strategy[b]	
	Nonsepsis Admissions (n = 7634)	Sepsis Admissions (n = 7634)	Matched Nonsepsis Admissions (n = 7376)	Matched Sepsis Admissions (n = 7376)	Matched Nonsepsis Admissions (n = 4853)	Matched Sepsis Admissions (n = 4853)
APRDRG illness severity						
Mild and/or moderate severity	6632 (88.3)	2453 (32.7)	5594 (75.8)	2422 (32.8)	4017 (82.8)	2125 (43.8)
Major severity	775 (10.3)	2783 (37.1)	1524 (20.7)	2730 (37.0)	721 (14.9)	1671 (34.4)
Extreme severity	100 (1.3)	2260 (30.1)	246 (3.3)	2210 (30.0)	109 (2.2)	1048 (21.6)
APRDRG risk of mortality						
Mild and/or moderate risk	7363 (98)	4409 (58.7)	7081 (96.0)	4347 (58.9)	4706 (97.0)	3246 (66.9)
Major risk	108 (1.4)	1956 (26)	230 (3.1)	1908 (25.9)	117 (2.4)	1029 (21.2)
Extreme risk	36 (0.5)	1131 (15.1)	53 (0.7)	1107 (15.0)	24 (0.5)	569 (11.7)
Hospital type						
Metropolitan teaching hospital	799 (10.6)	799 (10.6)	742 (10.1)	742 (10.1)	516 (10.6)	516 (10.6)
Metropolitan nonteaching	6408 (85.3)	6408 (85.3)	6359 (86.2)	6359 (86.2)	4123 (85)	4123 (85)
Nonmetropolitan	303 (4)	303 (4)	275 (3.7)	275 (3.7)	214 (4.4)	214 (4.4)
Length of stay, median (IQR)	2 (1–4)	4 (2–9)	2 (2–4)	4 (2–9)	2 (1–4)	4 (2–7)

Cohort consists of children 18 y or younger and discharged alive and excluded neonates and those discharged against medical advice. APRDRG, all patients refined diagnosis related group IQR, interquartile range.

[a] Matching was performed by using the 7-level chronic disease classification variable.
[b] Matching was performed by using the 12 chronic disease group indicator variables.
[c] Because patients could have >1 chronic disease, percentages add to >100%.

SUPPLEMENTAL TABLE 3 List of ICD-9-CM Organism-Specific Diagnosis Codes

Organism	ICD-9-CM–Specific Codes
S aureus	0381, 0411, 3203, 4824, 00841
E coli	0080, 0414, 03842, 48282
Klebsiella pneumoniae	0413, 4820
Haemophilus influenzae	0415, 4822, 3200, 03841
Streptococcus species	034, 481, 0380, 0382, 0410, 0412, 3201, 3202, 4823, 5671
Proteus mirabilis	0083, 0416
Pseudomonas species	0417, 4821, 00842, 03843
Clostridium difficile	00845
Serratia marascens	03844
Candida species	112
Aspergillus species	1173

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