

**Table S1** Characteristics of All TBI Admissions in the 2012-2016 NTDB

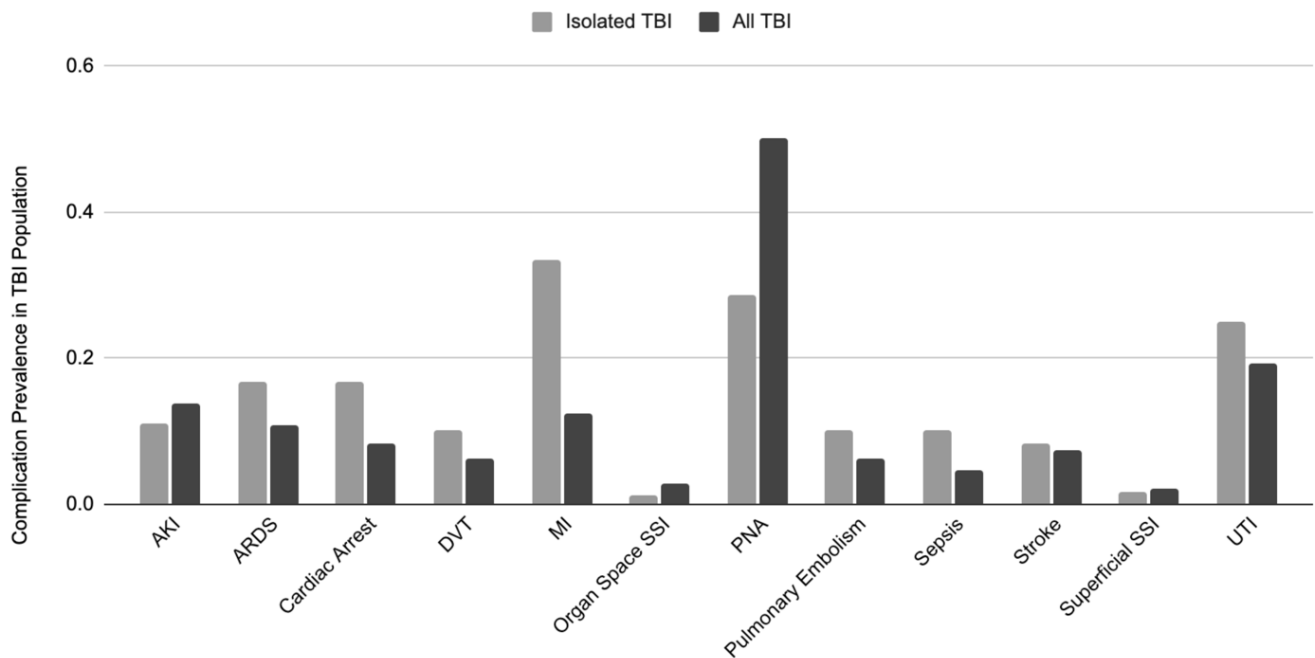
Variable	Number of Admissions (%)
Age, in years	
Pediatric	135,841 (14.0)
Adult	833,068 (86.0)
Mean $\pm$ standard deviation	46.8 $\pm$ 24.4
Sex	
Male	624,416 (64.4)
Female	344,191 (35.5)
Other	2 (<0.1)
Race	
White	699,779 (72.2)
African American	120,435 (12.4)
Asian	21,355 (2.2)
American Indian	7,998 (<0.1)
Native Hawaiian/Pacific Islander	2,387 (<0.1)
Other/unknown	116,955 (12.1)
Hospital teaching status	
Community	380,081 (39.2)
University	460,968 (47.6)
Non-teaching	127,860 (13.2)
Hospital region	
Northeast	168,156 (17.4)
Midwest	237,964 (24.6)
South	350,122 (36.1)
West	212,667 (21.9)
Injury type	
Blunt	289 (<0.1)
Penetrating	355,239 (36.7)
Other	
GCS admission score	
Severe	43,439 (4.5)
Moderate	799,644 (82.5)
Mild	13.2 $\pm$ 3.7
Mean $\pm$ Standard Deviation	
Complications	
Acute Kidney Injury	9,498 (1.0)
Acute Respiratory Distress Syndrome	8,156 (0.8)
Cardiac Arrest	10,308 (1.1)
Deep Vein Thrombosis	2,221 (0.2)
Myocardial Infarction	1,019 (0.1)
Organ Space SSI	25,756 (3.4)
Pneumonia <sup>+</sup>	3,158 (3.3)
Pulmonary Embolism	4,258 (0.4)
Sepsis	4,103 (0.4)
Stroke	1,364 (0.1)
Superficial SSI	14,043 (1.8)
Urinary Tract Infection <sup>+</sup>	
Comorbidities Present	
Hypertension Requiring Medication	72,188 (7.5)
Bleeding Disorder	27,541 (2.8)
Congestive Heart Failure	25,815 (2.7)
Stroke/CVA	110,519 (11.4)
Diabetes	60,136 (6.2)
Respiratory Disease	12,131 (1.3)
Myocardial Infarction	
ISS (Mean $\pm$ Standard Deviation)	12.9 $\pm$ 9.9

\*Percentages may not add up to 100% due to rounding or missing data. <sup>+</sup> Complication information for pneumonia and urinary tract infection were not present in the 2016 NTDB. Prevalence and analysis based on 2012-2015 data only.

**Table S2** Prevalence of Complications by TBI Subgroup

Variable	Severe TBI (n=9,590)	Moderate TBI (n=4,594)	Mild TBI (n=89,484)	Pediatric TBI (n=19,933)	Adult TBI (n=83,735)
Complications: Isolated TBI					
AKI	86 (0.9)	47 (1.0)	253 (0.3)	2 (<0.1)	384 (0.5)
ARDS	225 (2.3)	42 (0.9)	206 (0.2)	19 (0.1)	454 (0.5)
Cardiac Arrest	168 (1.8)	27 (0.6)	179 (0.2)	24 (0.1)	350 (0.4)
DVT	155 (1.6)	64 (1.4)	331 (0.4)	13 (0.1)	537 (0.6)
MI	53 (0.5)	19 (0.4)	162 (0.1)	0	234 (0.3)
Organ Space SSI	11 (0.1)	2 (<0.1)	9 (<0.1)	4 (<0.1)	18 (<0.1)
Pneumonia <sup>+</sup>	652 (7.0)	182 (4.1)	702 (0.8)	57 (0.3)	1,479 (1.8)
Pulmonary Embolism	24 (2.5)	18 (0.4)	70 (0.1)	0	112 (0.1)
Sepsis	72 (0.8)	30 (0.7)	134 (0.1)	4 (<0.1)	232 (0.3)
Stroke	108 (1.1)	25 (0.5)	172 (0.2)	15 (0.1)	290 (0.3)
Superficial SSI	10 (0.1)	7 (0.2)	28 (<0.1)	2 (<0.1)	43 (0.1)
UTI <sup>+</sup>	252 (2.7)	124 (2.8)	936 (1.1)	21 (0.1)	1,291 (1.6)
GCS (Mean + SD)	4.2 ± 1.8	10.7 ± 1.1	14.8 ± 0.5	14.1 ± 2.5	13.5 ± 3.3
ISS (Mean + SD)	16.6 ± 9.5	11.0 ± 8.4	8.3 ± 6.9	4.9 ± 5.2	10.2 ± 7.8
Subgroup size (n)	9,590	4,594	89,484	19,933	83,735
Complications: All TBI					
AKI	2,050 (1.6)	486 (1.1)	3,525 (0.4)	157 (0.1)	5,904 (0.1)
ARDS	5,162 (4.1)	872 (2.0)	3,464 (0.4)	771 (5.7)	8,727 (1.0)
Cardiac Arrest	5,045 (4.0)	487 (1.1)	2,624 (0.3)	739 (5.4)	7,417 (0.9)
DVT	4,336 (3.4)	871 (2.0)	5,101 (0.6)	427 (3.1)	9,881 (1.2)
MI	458 (3.6)	176 (0.4)	1,587 (0.2)	7 (<0.1)	2,214 (0.3)
Organ Space SSI	456 (3.6)	85 (0.2)	478 (0.1)	96 (0.1)	923 (0.1)
Pneumonia <sup>+</sup>	13,970 (14.3)	2,571 (7.6)	9,215 (1.5)	1,698 (1.6)	24,058 (3.7)
Pulmonary Embolism	1,068 (0.8)	240 (0.6)	1,850 (0.2)	81 (0.1)	3,077 (0.4)
Sepsis	1,831 (1.5)	399 (0.9)	2,028 (0.3)	147 (0.1)	4,111 (0.5)
Stroke	1,727 (1.4)	361 (0.8)	2,015 (0.3)	228 (0.2)	3,875 (0.5)
Superficial SSI	584 (0.5)	114 (0.3)	666 (0.1)	113 (0.1)	1,251 (0.2)
UTI <sup>+</sup>	4,235 (4.3)	1,276 (3.8)	8,532 (1.4)	589 (0.5)	13,545 (2.1)
GCS (Mean + SD)	4.1 ± 1.7	10.7 ± 1.1	14.8 ± 0.5	13.3 ± 3.6	13.2 ± 3.7
ISS (Mean + SD)	24.1 ± 13.1	15.8 ± 10.5	11.0 ± 7.8	10.3 ± 9.8	13.4 ± 9.8
Subgroup size (n)	125,826	43,439	799,644	135,841	833,068

\* Prevalence is reported as a percentage in parenthesis <sup>+</sup> Complication information for PNA and UTI not present in the 2016 NTDB. Prevalence and analysis based on 2012-2015 data only.



**Figure S1** Range of Complication Prevalence in the TBI Population by Facility. Minimum and maximum proportion of patients who developed a complication across facilities. Prevalence of complications in the isolated TBI population shown in light gray and all TBI shown in dark gray. At least one facility had a prevalence = 0 for each complication. Abbreviations: ARDS = acute respiratory distress syndrome, DVT = deep vein thrombosis, MI = myocardial infarction, SSI = surgical site infection, PNA = pneumonia, UTI = urinary tract infection.

**Table S3** Burden of Each Complication on All TBI Care Based on Adjusted Multivariate Analysis

Complication	Burden Discharge Disposition	Odds Ratio, [95% CI]	Discharge Disposition p-value	Burden LOS
AKI	0.006	1.899, [1.723, 2.094]	p<0.001	0.63
ARDS	0.007	1.683, [1.561, 1.814]	p<0.001	0.61
Cardiac Arrest	0.009	2.024, [1.724, 2.377]	p<0.001	-0.64
DVT	0.02	2.851, [2.665, 3.051]	p<0.001	1.55
MI	0.019	1.854, [1.614, 2.129]	p<0.001	0.33
Organ Space SSI	<0.001	1.316, [1.086, 1.595]	0.005	3.1
Pneumonia	0.07	3.221, [3.089, 3.358]	p<0.001	2.11
Pulmonary Embolism	0.003	2.004, [1.782, 2.254]	p<0.001	1.18
Sepsis	0.004	1.981, [1.742, 2.252]	p<0.001	1.16
Stroke	0.011	3.733, [3.275, 4.255]	p<0.001	0.59
Superficial SSI	0.001	1.646, [1.390, 1.949]	p<0.001	2.42
UTI	0.035	2.987, [2.845, 3.137]	p<0.001	1.71

All results are reported for an interval of +1 patients. 95% confidence intervals are listed. Odds ratio > 1 indicates more likely to be discharged to a care or rehab facility than home. Discharge Disposition Burden represents the proportion of patients with a worse discharge disposition attributable to the complication. LOS burden represents the proportional change in LOS attributable to the complication in days.

**Table S4** Adjusted Association of Each Complication with Likelihood of Discharge Home *vs.* Care or Rehab Facility by TBI Subtype for All TBI

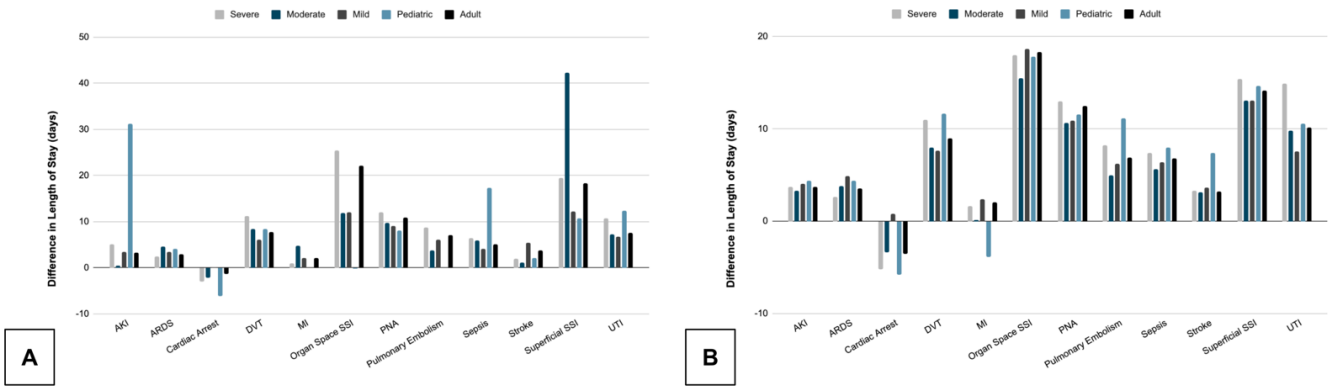
Complication	Severe TBI (n=125,826)	Moderate TBI (n=43,439)	Mild TBI (n=799,644)	Pediatric TBI (n=135,841)	Adult TBI (n=833,068)
AKI	1.279, [1.038, 1.575] *	1.220, [0.854, 1.745]	2.131, [1.901, 2.388] **	0.926, [0.442, 1.941]	1.933, [1.752, 2.133] **
ARDS	1.154, [1.046, 1.273] *	1.827, [1.451, 2.300] **	2.797, [2.475, 3.160] **	1.158, [0.906, 1.480]	1.753, [1.620, 1.897] **
Cardiac Arrest	1.474, [1.146, 1.897] *	1.089, [0.627, 1.892]	2.696, [2.175, 3.341] **	2.591, [1.401, 4.790] *	1.961, [1.661, 2.315] **
DVT	2.001, [1.146, 2.242] **	2.270, [1.790, 2.879] **	3.503, [5.311, 3.820] **	3.514, [2.494, 4.952] **	2.873, [2.681, 3.078] **
MI	1.344, [0.994, 1.968]	1.014, [0.588, 1.750]	1.978, [1.697, 2.307] **	1.009, [0.075, 13.553]	1.850, [1.611, 2.124] **
Organ Space SSI	0.818, [0.622, 1.074]	1.589, [0.838, 3.013]	1.940, [1.492, 2.522] **	0.672, [0.351, 1.288]	1.409, [1.152, 1.723] *
Pneumonia	2.891, [2.726, 3.066] **	2.584, [2.279, 2.931] **	3.726, [3.491, 3.977] **	4.083, [3.486, 4.783] **	3.206, [3.070, 3.348] **
Pulmonary Embolism	1.114, [0.905, 1.372]	1.391, [0.901, 2.148]	2.721, [2.358, 3.140] **	4.121, [1.921, 8.843] **	2.015, [1.789, 2.269] **
Sepsis	1.657, [1.365, 2.011] **	1.851, [1.216, 2.817] *	2.274, [1.901, 2.722] **	1.702, [0.575, 3.062]	2.016, [1.767, 2.299] **
Stroke	2.612, [2.069, 3.298] **	2.076, [1.373, 3.138] *	4.535, [3.840, 5.355] **	4.178, [2.532, 6.786] **	3.718, [3.243, 4.262] **
Superficial SSI	1.446, [1.106, 1.891] *	1.057, [0.615, 1.816]	1.950, [1.556, 2.443] **	2.161, [1.167, 4.002] *	1.628, [1.366, 1.940] **
UTI	1.803, [1.638, 1.985] **	1.863, [1.583, 2.193] **	3.557, [3.351, 3.775] **	2.904, [2.266, 3.722] **	3.001, [2.855, 3.155] **

All results are reported for an interval of +1 patients. 95% confidence intervals are listed. Odds ratio > 1 indicates more likely to be discharged to a care or rehab facility than home. \* indicates p<0.05. \*\* indicates p<0.001.

**Table S5** Adjusted Association of Each Complication with Likelihood of Discharge Home *vs.* Care or Rehab Facility by TBI Subtype for Isolated TBI

Complication	Severe TBI (n=9,590)	Moderate TBI (n=4,594)	Mild TBI (n=89,484)	Pediatric TBI (n=19,933)	Adult TBI (n=83,735)
AKI	3.084, [1.127, 8.442] *	0.618, [0.225, 1.702]	2.203, [1.522, 3.188] **	0.248, [0.005, 11.904]	2.077, [1.498, 2.879] **
ARDS	1.490, [0.907, 2.448]	2.568, [0.829, 7.956]	7.293, [4.089, 13.007] **	4.863, [1.096, 21.583] *	2.911, [2.014, 4.209] **
Cardiac Arrest	3.179, [1.035, 9.767] *	1.091, [0.114, 10.411]	3.249, [1.500, 7.033] *	2.060, [0.001, 6533.637]	2.791, [1.492, 5.220] *
DVT	1.918, [1.149, 3.202] *	6.536, [2.362, 18.083] **	3.249, [1.500, 7.033] *	4.040, [0.923, 17.684]	3.038, [2.345, 3.936] **
MI	0.993, [0.349, 2.823]	1.141, [0.284, 4.576]	3.223, [2.369, 4.386] **	--	1.869, [1.255, 2.783] *
Organ Space SSI	1.541, [0.207, 11.491]	0.183, [0.006, 5.499]	2.169, [1.375, 3.420] *	1.339, [0.012, 155.656]	3.033, [0.690, 13.339]
Pneumonia	3.835, [2.918, 5.041] **	3.950, [2.277, 6.855] **	2.169, [1.375, 3.420] *	3.730, [1.608, 8.653] *	4.739, [3.949, 5.687] **
Pulmonary Embolism	1.239, [0.371, 4.137]	0.721, [0.134, 3.886]	11.628, [1.017, 132.937] *	--	2.228, [1.240, 4.004] *
Sepsis	2.235, [0.843, 5.924]	0.292, [0.084, 1.013]	5.084, [3.923, 6.588] **	4.878, [0.342, 69.493]	5.915, [3.650, 9.585] **
Stroke	5.150, [1.667, 15.694] *	1.971, [0.357, 10.880]	2.740, [1.323, 5.677] *	17.981, [1.847, 52.670] *	2.264, [0.501, 5.490]
Superficial SSI	1.895, [0.336, 10.701]	--	3.003, [1.496, 6.029] *	0.289, [0.006, 13.251]	3.869, [3.302, 4.534] **
UTI	1.924, [1.255, 2.950] *	2.329, [1.351, 4.017] *	3.003, [1.496, 6.029] *	12.018, [2.921, 49.451] **	

All results are reported for an interval of +1 patients. 95% confidence intervals are listed. Odds ratio > 1 indicates more likely to be discharged to a care or rehab facility than home. \* indicates p<0.05. \*\* indicates p<0.001.



**Figure S2** Adjusted Difference in LOS by Complication for Each TBI Subtype. All results are reported for an interval of +1 patients after multivariate analysis controlling for demographic, clinical, and facility variables. A. Differences in LOS for isolated TBI patients. B. Differences in LOS including non-isolated TBI. Abbreviations: AKI = acute kidney injury, ARDS = acute respiratory distress syndrome, DVT = deep vein thrombosis, MI = myocardial infarction, SSI = surgical site infection, PNA = pneumonia, UTI = urinary tract infection.