

# Socioeconomic Disparities in Brachial Plexus Surgery: A National Database Analysis

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**Background:** Brachial plexus injuries have devastating effects on upper extremity function, with significant pain, psychosocial stress, and reduced quality of life. The aim of this study is to identify socioeconomic disparities in the receipt of brachial plexus repair in the emergent versus elective setting, and in the use of supported services on discharge.

**Methods:** Analysis of the Healthcare Cost and Utilization Project National Inpatient Sample Database was performed for the years 2009–2014. Adults with brachial plexus injury with or without nerve repair were identified; patient and hospital specific factors were analyzed.

**Results:** Overall, 6,618 cases of emergent brachial plexus injury were retrieved. Six hundred sixty cases of brachial plexus repair were identified in the emergency and elective settings over the study period. Of the 6,618 injured, 153 (2.3%) underwent nerve surgery during the admission. Patients undergoing repair in the elective setting were more likely to be white males with private insurance. Patients treated in the emergency setting were more likely to be African American and in the lowest income quartile. Significant differences were also seen in supported discharge: more likely males ( $P < 0.001$ ), >55 years of age ( $P < 0.001$ ), white ( $P < 0.001$ ), with government-based insurance ( $P < 0.001$ ).

**Conclusions:** There are significant disparities in the timing of brachial plexus surgery. These relate to timing rather than receipt of nerve repair; socioeconomically advantaged individuals with private insurance in the higher income quartiles are more likely to undergo surgery in the elective setting and have a supported discharge. (*Plast Reconstr Surg Glob Open* 2019;7:e2118; doi: 10.1097/GOX.0000000000002118; Published online 5 February 2019.)

## INTRODUCTION

Brachial plexus injuries can have devastating effects on upper extremity function, with significant pain, psychosocial stress, and reduced quality of life.<sup>1,2</sup> Although there is still debate over the optimal timing of surgical intervention, earlier intervention has been associated with improved outcomes in certain circumstances.<sup>3,4</sup>

However, the timing of these interventions can be frequently delayed by factors other than the clinical setting, such as accessibility to care, or the availability of regional resources to perform the specialist surgery and rehabilitate appropriately afterwards.<sup>5</sup> Previous research has identified that lack of finances and access to transportation are limiting agents in patients accessing care in the United States.<sup>6</sup> Patients may find themselves requiring functional support after surgery, and may require a supported discharge to a nursing facility; these needs may also influence access to and use of services, and it may be that the same socioeconomic factors may also hamper access to supported discharge facilities.

Understanding factors that influence the timing of brachial plexus surgery after injury and outcomes may help to identify risk factors for suboptimal management and complications, and the potential need for implementing a structured surgical approach to provide optimal patient care.<sup>7</sup> Using the Healthcare Cost and Utilization

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Project Kids' Inpatient Database, Squitieri et al.<sup>7</sup> found that patients with private insurance were significantly more likely to undergo nerve reconstruction in cases of neonatal brachial plexus injury. However, the variability of socioeconomic factors in the adult, traumatic brachial plexus injury population has not been evaluated for similar discrepancies.

The aim of this article is 3-fold: (1) to analyze national data to ascertain whether there are disparities in the receipt of adult brachial plexus repair in the emergent versus elective setting; (2) to determine whether there are disparities in the receipt of supported discharge after brachial plexus injury in the acute setting; and (3) to evaluate whether brachial plexus repair in the emergency setting influences the need for supported discharge.

## METHODS

### Database and Cohort Selection

A retrospective analysis of the Healthcare Cost and Utilization Project National Inpatient Sample (NIS) Database from the Agency for Healthcare Research was performed for the years 2009–2014. The NIS includes data from >8 million discharge abstracts annually, approximating a 20% sample of all discharges, including nonfederal, short-term, general, and other specialty hospitals, including public hospitals and academic institutions.<sup>8</sup> The NIS is the largest, publicly available all-payer inpatient database in the United States.

Data were extracted using International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes. Adults 18 years of age and over with diagnosis of brachial plexus injury were retrieved (ICD-9-CM diagnosis code: 9543—brachial plexus injury). Procedural data for nerve repair were retrieved using ICD-9-CM codes that have been used in previous research.<sup>7</sup>

### Outcome Variables

Data were collected on patient and hospital characteristics, including gender, age in years (18–34, 35–54, 55+), race (white, African American, Hispanic, other, missing), comorbidities occurring in ≥5% of cases, hospital bed size (small, medium, and large), hospital teaching status (collapsed into rural/urban nonteaching and urban teaching for analysis), hospital region (Northeast, Midwest, South, West), median household income quartile (1 being the lowest), and primary payer (government/state-based, private, other). We also collected data on concomitant injury patterns (orthopedic, thoracoabdominal, or head injury), and discharge status using the “DISPUNIFORM” variable (determining whether or not the patient required supported care on discharge; this was defined as any discharge destination that was not home or self-care).

### Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Macintosh, Version 24 (IBM Corp, Armonk, NY), and statistical significance was taken when  $P < 0.05$ . Patient and hospital-level characteristics were compared in those undergoing

nerve repair in the emergency or elective setting, using Pearson chi-square or Fisher exact tests, as appropriate. Patient and hospital characteristics and discharge status were also compared between those receiving nerve surgery in the emergency setting and those not receiving surgery. Variables subsequently underwent binary logistic regression modeling to evaluate factors affecting the likelihood of supported care on discharge, compared with discharge home. Factors that were significant on univariable analysis or deemed clinically relevant were included in the multivariable model. Results are presented as odds ratios (ORs) with 95% CIs.

## RESULTS

### Brachial Plexus Repair: Elective Versus Emergency Patients

Over the 6-year period, 660 cases of brachial plexus repair were captured in both the emergency and elective settings. We reviewed the patient and hospital-level characteristics of those undergoing surgery in the emergency setting compared with the elective setting (Table 1). There were significant differences in gender ( $P < 0.01$ ), age ( $P < 0.001$ ), ethnicity ( $P < 0.001$ ), insurance ( $P < 0.001$ ), and household income ( $P < 0.001$ ). Patients undergoing repair in the elective setting were relatively more likely to be white (64.0% versus 45.1%) males (90.3% versus 80.4%) with private insurance (55.8% versus 32.0%). Patients treated in the emergency setting were more likely to be African American (19.6 versus 9.7%) and in the lowest income quartile (39.2% versus 21.9%).

### Emergency Admission With Brachial Plexus Injury

Having identified these demographic differences in characteristics between patients undergoing emergent and elective repairs, we then focused our analysis on characteristics of those who received a supported discharge after diagnosis of brachial plexus injury in the emergency setting, compared with those who did not. Overall, 6,618 cases of emergent brachial plexus injury were retrieved. Of these, 153 (2.3%) underwent nerve repair surgery during the admission.

There were significant differences in characteristics between those receiving supported discharge and those not, as detailed in Table 2. Those receiving supported discharge were more likely to be male (65.6% versus 34.4%;  $P < 0.001$ ), relatively more likely to be >55 years of age (41.8% versus 19.0%;  $P < 0.001$ ), white (64.7% versus 57.0%;  $P < 0.001$ ), with government-based insurance (45.6% versus 29.4%;  $P < 0.001$ ). Patients receiving supported discharge were more likely to have anemia ( $P < 0.001$ ), chronic pulmonary disease ( $P = 0.023$ ), depression ( $P = 0.003$ ), diabetes ( $P < 0.001$ ), hypertension ( $P < 0.001$ ), hypothyroidism ( $P < 0.001$ ), obesity ( $P < 0.001$ ), and concomitant psychoses ( $P < 0.01$ ). Patients receiving supported discharge were also more likely to be paralyzed (9.7% versus 4.5%;  $P < 0.001$ ). There were also significant differences in hospital bed size ( $P < 0.001$ ) and region ( $P < 0.001$ ).

**Table 1. Comparison of Characteristics of Those Undergoing Brachial Plexus Repair in the Emergency or Elective Setting**

Patient Characteristics	Overall	Elective	Emergency	P			
Total	<b>660</b>	<b>100%</b>	<b>507</b>	<b>76.8%</b>	<b>153</b>	<b>23.1%</b>	
Male gender	581	88.0%	458	90.3%	123	80.4%	<b>0.001</b>
Age							<b>&lt;0.001</b>
18–34	396	60.0%	317	62.5%	79	51.6%	
35–54	219	33.2%	145	28.6%	74	48.4%	
55+	45	6.8%	45	8.9%	0	0.0%	
Ethnicity							<b>&lt;0.001</b>
White	393	59.6%	324	64.0%	69	45.1%	
African American	79	12.0%	49	9.7%	30	19.6%	
Hispanic	64	9.7%	49	9.7%	15	9.8%	
Other	69	10.5%	45	8.9%	24	15.7%	
Missing	54	8.2%	39	7.7%	15	9.8%	
Comorbidities							
Anemia	30	4.5%	25	4.9%	5	3.3%	0.387
Alcohol	54	3.2%	21	4.1%	33	21.6%	<b>&lt;0.001</b>
CPD	44	6.7%	34	6.7%	10	6.5%	0.941
Depression	65	9.9%	55	10.9%	10	6.5%	0.115
Diabetes	25	3.8%	15	3.0%	10	6.5%	<b>0.043</b>
Drug abuse	34	5.2%	15	3.0%	19	12.4%	<b>&lt;0.001</b>
Hypertension	104	15.8%	95	18.7%	9	5.9%	<b>&lt;0.001</b>
Psychoses	30	4.6%	15	3.0%	15	9.8%	<b>0.001</b>
Obesity	66	10.0%	51	10.1%	15	9.8%	0.927
Paralysis	24	3.6%	24	4.7%	0	0.0%	<b>0.006</b>
Hospital bed size							<b>&lt;0.001</b>
Small	25	3.8%	20	4.0%	5	3.3%	
Medium	74	11.2%	30	5.9%	44	28.8%	
Large	560	85.0%	456	90.1%	104	68.0%	
Hospital teaching status							<b>0.015</b>
Rural/urban nonteaching	35	5.3%	21	4.1%	14	9.2%	
Urban teaching	625	94.7%	486	95.9%	139	22.2%	
Region							<b>&lt;0.001</b>
Northeast	108	16.4%	99	19.5%	9	5.9%	
Midwest	116	17.6%	87	17.2%	29	19.0%	
South	295	44.7%	236	46.5%	59	38.6%	
West	141	21.4%	85	16.8%	56	36.6%	
Median household income*							<b>&lt;0.001</b>
1 (lowest)	166	25.2%	97	19.2%	69	45.1%	
2	198	30.0%	159	31.4%	39	25.5%	
3	164	24.9%	139	27.5%	25	16.3%	
4 (highest)	131	19.9%	111	21.9%	20	13.1%	
Payer							<b>&lt;0.001</b>
Government	171	25.9%	111	21.9%	60	39.2%	
Private	332	50.3%	283	55.8%	49	32.0%	
Other	157	23.8%	113	22.3%	44	28.8%	
Orthopedic injury	9	1.4%	5	1.0%	4	2.6%	0.129
Thoracoabdominal injury	15	2.3%	0	0.0%	15	9.8%	<b>&lt;0.001</b>
Head injury	11	1.7%	0	0.0%	11	7.1%	<b>&lt;0.001</b>

\*Estimated median household income is calculated according to the zip code of the patient and varies annually. Figures per year can be obtained from the HCUP website at [https://www.hcup-us.ahrq.gov/db/vars/zipinc\\_qrtl/nisnote.jsp](https://www.hcup-us.ahrq.gov/db/vars/zipinc_qrtl/nisnote.jsp).

CPD, chronic pulmonary disease; HCUP, Healthcare Cost and Utilization Project. Bold indicates statistical significance.

On unadjusted analysis, there were lower rates of brachial plexus surgery in those requiring supportive care on discharge compared with those who were discharged home (1.8% versus 2.7%;  $P = 0.018$ ). On multivariable analysis, there were many factors that affected the likelihood of supported discharge, as shown in Table 3. Notably, brachial plexus surgery in the emergency setting was associated with an increased need for supported discharge, after adjusting for other patient and hospital-level characteristics (OR, 1.804; CI, 1.225–2.657). Highest quartile income also increased the likelihood of supported discharge (OR, 1.354; CI, 1.137–1.613).

## DISCUSSION

This study examined the NIS from 2009 to 2014 to evaluate potential differences in the characteristics of those who undergo brachial plexus surgery during an

emergency or elective admission and factors affecting likelihood of requiring supported discharge in those with an acute brachial plexus injury. Overall, our results suggest that there are socioeconomic factors affecting the timing of brachial plexus surgery. Moreover, patients undergoing brachial plexus surgery in the acute setting are less likely to be discharged home in a self-caring status, but those who do receive supported care on discharge are more likely to be in the highest income quartile.

There are clear indications for delayed repair, including gravity of associated injuries and less-severe brachial plexus injuries with a favorable prognosis.<sup>9</sup> The exact timing of surgery after other brachial plexus injuries is controversial. Proponents of immediate reconstruction believe that axonal transection leads to neuronal degeneration due to loss of neurotrophins, and that delayed repair is associated with irreversible neuronal death.<sup>9</sup> De-

**Table 2. Comparison of Outcomes in Those Admitted With an Emergency Brachial Plexus Injury Between Those Requiring Supported Discharge or Not**

Patient Characteristics	Overall		Supported Discharge		Unsupported		P*
Total	<b>6,618</b>	<b>100%</b>	<b>153</b>	<b>2.3%</b>	<b>6,465</b>	<b>97.7%</b>	
Male gender	4,666	70.5%	1,795	65.6%	940	34.4%	<0.001
Age							<0.001
18–34	2,515	38.0%	797	29.1%	1,718	44.2%	
35–54	2,222	33.6%	796	29.1%	1,426	44.2%	
55+	1,881	28.4%	1,142	41.8%	739	19.0%	
Ethnicity							<0.001
White	3,984	60.2%	1,769	64.7%	2,215	57.0%	
African American	1,058	16.0%	394	14.4%	664	17.1%	
Hispanic	687	10.4%	223	8.2%	464	11.9%	
Other	347	5.2%	126	4.6%	221	5.7%	
Missing	542	8.2%	223	8.2%	319	8.2%	
Comorbidities							
Anemia	679	10.3%	361	13.2%	318	8.2%	<0.001
Alcohol	1,010	15.3%	411	15.0%	599	15.4%	0.657
CPD	602	9.1%	275	10.1%	327	8.4%	<b>0.023</b>
Depression	484	7.3%	231	8.4%	253	6.5%	<b>0.003</b>
Diabetes	694	10.5%	435	15.9%	259	6.7%	<0.001
Drug abuse	592	8.9%	213	7.8%	379	9.8%	<b>0.006</b>
Hypertension	1,823	27.5%	1,012	37.0%	811	20.9%	<0.001
Hypothyroidism	388	5.9%	221	8.1%	167	4.3%	<0.001
Psychoses	456	6.9%	248	9.1%	208	5.4%	<0.001
Obesity	440	6.6%	264	9.7%	176	4.5%	<0.001
Paralysis	425	6.4%	249	9.1%	176	4.5%	<0.001
Hospital bed size							<0.001
Small	410	6.2%	216	7.9%	194	5.0%	
Medium	1,421	21.5%	620	22.7%	801	20.6%	
Large	4,787	72.3%	1,899	69.4%	2,888	74.4%	
Hospital teaching status							0.091
Rural/urban nonteaching	1,838	27.8%	790	28.9%	1,048	27.0%	
Urban teaching	4,779	72.2%	1,945	71.1%	2,834	73.0%	
Region							<b>0.002</b>
Northeast	1,399	21.1%	619	22.6%	780	20.1%	
Midwest	1,409	21.3%	617	22.6%	792	20.4%	
South	2,349	35.5%	937	34.3%	1,412	36.4%	
West	1,461	22.1%	562	20.5%	899	23.2%	
Median household income							<0.001
1 (lowest)	1,915	28.9%	741	27.1%	1,174	30.2%	
2	1,757	26.5%	705	25.8%	1,052	27.1%	
3	1,674	25.3%	690	25.2%	984	25.3%	
4 (highest)	1,272	19.2%	599	21.9%	673	17.1%	
Payer							<0.001
Government	2,392	36.1%	1,249	45.7%	1,143	29.4%	
Private	2,625	39.7%	1,122	41.0%	1,503	38.7%	
Other	1,601	24.2%	364	13.3%	1,237	31.9%	
Orthopedic injury	3,188	48.1%	1,463	53.5%	1,725	44.4%	<0.001
Thoracoabdominal injury	1,754	26.5%	735	26.9%	1,019	26.2%	0.567
Head injury	958	14.5%	565	20.7%	393	10.1%	<0.001
Brachial plexus surgery	153	2.3%	49	1.8%	104	2.7%	<b>0.018</b>

\*Estimated median household income is calculated according to the zip code of the patient and varies annually. Figures per year can be obtained from the HCUP website at [https://www.hcup-us.ahrq.gov/db/vars/zipinc\\_qrd/nisnote.jsp](https://www.hcup-us.ahrq.gov/db/vars/zipinc_qrd/nisnote.jsp).

CPD, chronic pulmonary disease; HCUP, Healthcare Cost and Utilization Project. Bold indicates statistical significance.

layed surgery is also more technically challenging because of scarred tissue planes and recoil of ruptured nerves.<sup>9</sup> In contrast, proponents of delayed reconstruction believe that waiting 2–4 months can be essential for accurate assessment of the injury using magnetic resonance imaging and electrodiagnostic studies and for optimizing surgical planning.<sup>10</sup>

However, our results suggest that it is more than clinical reasoning alone influencing the timing of care: white males with private insurance were far more likely to be treated in the elective setting than African American patients or those in the lowest income quartile. Of course, it may be that injury patterns are different in these distinct demographic groups. Analysis of the U.S. National Trauma Data Bank has shown that African American and

Hispanic patients, and those who are uninsured, are not only more likely to be the subject of high-energy penetrating trauma than white or insured patients, but also more likely to die as a result of their injuries.<sup>11</sup> The authors also found that after controlling for anatomical and physiological injury severity, in addition to mechanism of injury, the disparities persisted—suggesting that injury pattern alone does not fully explain the findings. Therefore, we must also consider that other factors, such as patient education and resources, play a role.

According to work published by Thomas and Penchansky,<sup>12</sup> there are 5 distinct components to consider when examining access to health care: affordability, accommodation, availability, accessibility, and acceptability.<sup>13</sup> A study of 12 patients with brachial plexus injury found that

**Table 3. Results of Multivariable Binary Logistic Regression: Factors Associated With Supported Discharge in the Emergent Brachial Plexus Injury**

Outcomes	Odds Ratio (95% CI)	P
Gender		
Male	(Reference)	
Female	<b>1.351 (1.189–1.535)</b>	<b>&lt;0.001</b>
Age		
18–34	(Reference)	
35–54	<b>1.143 (0.991–1.317)</b>	0.066
55+	<b>2.540 (2.127–3.032)</b>	<b>&lt;0.001</b>
Race		
White	(Reference)	
African American	1.015 (0.864–1.191)	0.857
Hispanic	0.886 (0.726–1.080)	0.231
Other	<b>0.766 (0.597–0.983)</b>	<b>0.036</b>
Comorbidities		
Anemia	<b>1.300 (1.082–1.563)</b>	<b>0.005</b>
CPD*	0.962 (0.792–1.168)	0.969
Depression	0.885 (0.709–1.104)	0.280
Diabetes	<b>1.650 (1.355–2.008)</b>	<b>&lt;0.001</b>
Drug abuse	0.981 (0.799–1.205)	0.856
Hypertension	<b>1.441 (1.240–1.675)</b>	<b>&lt;0.001</b>
Hypothyroidism	1.132 (0.889–1.442)	0.316
Obesity	<b>1.614 (1.284–1.568)</b>	<b>&lt;0.001</b>
Paralysis	<b>2.066 (1.634–2.613)</b>	<b>&lt;0.001</b>
Psychoses	<b>2.066 (1.284–2.030)</b>	<b>&lt;0.001</b>
Hospital bed size		
Small	(Reference)	
Medium	0.841 (0.649–1.089)	0.188
Large	<b>0.676 (0.533–0.859)</b>	<b>0.001</b>
Region		
Northeast	(Reference)	
Midwest	1.101 (0.922–1.316)	0.289
South	0.956 (0.818–1.118)	0.573
West	0.909 (0.765–1.081)	0.282
Median household income		
1 (lowest)	(Reference)	
2	1.035 (0.884–1.212)	0.668
3	1.171 (0.999–1.373)	0.052
4 (highest)	<b>1.354 (1.137–1.613)</b>	<b>0.001</b>
Payer		
Government	(Reference)	
Private	0.933 (0.814–1.071)	0.325
Other	<b>0.405 (0.343–0.479)</b>	<b>&lt;0.001</b>
Orthopedic injury	<b>1.919 (1.691–2.177)</b>	<b>&lt;0.001</b>
Head injury	<b>2.955 (2.504–3.487)</b>	<b>&lt;0.001</b>
Brachial plexus surgery	<b>1.804 (1.225–2.657)</b>	<b>0.003</b>

\*Estimated median household income is calculated according to the zip code of the patient and varies annually. Figures per year can be obtained from the HCUP website at [https://www.hcup-us.ahrq.gov/db/vars/zipinc\\_qrtl/nisnote.jsp](https://www.hcup-us.ahrq.gov/db/vars/zipinc_qrtl/nisnote.jsp).

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the biggest barriers to surgery were lack of insurance coverage, insufficient information regarding treatment options, and delayed diagnosis.<sup>14</sup> The reverse, therefore, may also be true: it may be that the more socioeconomically advantaged individuals identified in the present study have a greater awareness of the need for specialist input, coupled with the financial resources to seek out care at a specialist nerve center, thus delaying their care until they can find a surgeon of their choosing. Clinicians and hospital systems should consider the socioeconomic barriers to ethnic minority, low-income patients with brachial plexus injury that affect their access to specialist services. Shafi et al.<sup>15</sup> published results of U.S. population study examining factors affecting placement into rehabilitation after traumatic brain injury.<sup>11</sup> Results showed that, even after

adjusting for injury severity and insurance status, ethnic minority patients were less likely to be placed into rehabilitation on discharge than non-Hispanic white patients. The authors postulated several reasons for this, including the prohibitive effects of cost, inadequate identification of rehabilitation requirements, geographic distance prohibiting travel for patients and families, or lack of certain services, such as translators.<sup>11</sup>

We also observed disparities in the receipt of supported discharge for those with a diagnosis of brachial plexus injury in the acute setting: those in the highest income quartile were more likely to receive supported care on discharge. Interestingly, those who underwent brachial plexus repair in the emergent setting were also more likely to require supported discharge. The increase in patients being discharged to a supported facility rather than home as found in the present study is perhaps surprising because it is widely accepted that traumatic brachial plexus injury benefits from early surgical exploration and repair.<sup>9</sup> Although it is difficult based on the heterogeneity of the research population to determine individual injury patterns and associated injuries, indications for an early repair commonly include concomitant arterial injury or penetrating trauma.<sup>10</sup> Whereas, closed or blunt injuries may have a higher rate of deferred repair in the elective setting. As discussed earlier, it is highly likely that injury severity, which is not captured by the NIS, plays an important role in our observations: those undergoing brachial plexus repair in the acute setting are perhaps more likely to have had injuries where there was no doubt about the diagnosis as a result of increased severity of the injury. Moreover, it is important to highlight that the severity of the underlying injury might lead to increased need for supported discharge, which we could not include in our analysis. We attempted to adjust for this by factoring concomitant major injury, but future studies may benefit from an assessment of brachial plexus injury severity.

Bringing these findings together, our results suggest that race, insurance status, and income may affect timing of brachial plexus surgery in the adult population, and that income may affect receipt of supported discharge.

Moving forward, when considering brachial plexus service provision, clinicians and hospital systems should identify what the specific barriers to these groups are and find ways of circumnavigating them. For example, the inclusion of language and culturally appropriate educational material has been found to be of key importance in ensuring equitable access to healthcare services for minority ethnic populations.<sup>11</sup> Readily available translation services should be provided. Consideration of ways to address costs that may prohibit access to rehabilitative services may be beneficial, such as sponsored hospital transport, or telemedicine clinics enabling specialist input in remote areas.

There are a variety of charities and patient support groups for people with brachial plexus injuries in the United States.<sup>16</sup> There are those that focus on connecting patients with other individuals who have had a similar experience to create a support network for those affected. Others serve to educate on the injuries and management strategies in the short and long term. In addition to these,

some provide information on adaptive equipment that may help the individual perform their activities of daily living more independently. Information on legal proceedings that may be relevant is also highlighted, including relevant disability acts and provisions that may be required in certain situations. Health care providers may consider ways to increase the collaboration with these charitable organizations to improve the overall care provided to this patient group.

### Limitations

There are several limitations of this study. The retrospective analysis of administrative data may be prone to human error, as the reliability and validity of the data depend on ICD-9-CM coding. There is no specific code for brachial plexus nerve repair and so we rely on surrogate codes that have been used by previous authors, but these may encompass other concomitant nerve surgeries during the same admission. As we have highlighted, one of the most important limitations is that we did not have data on injury severity or mechanism of injury. The lack of information specifically relating to clinical presentation, referral patterns, and the rationale behind the treatment decision-making limits our understanding of the whole picture. Finally, this dataset does not provide information on outpatient visits or referrals, making it difficult to assess long-term patient outcomes.

### CONCLUSIONS

There are socioeconomic disparities in the timing of brachial plexus surgery: socioeconomically advantaged individuals with private insurance in the higher income quartiles are more likely to undergo surgery in the elective setting. Moreover, patients undergoing brachial plexus surgery in the acute setting are more likely to require supported discharge. Further research should seek to fully elucidate any disparities that may exist, so that equitable provision of brachial plexus services may be possible.

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