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Shift in U.S. Payer Responsibility for the Acute Care of Violent Injuries after the Affordable Care Act: Implications for Prevention

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Abstract

Background—Investment in violence prevention programs is hampered by lack of clearly identifiable stakeholders with a financial stake in prevention. We determined the total annual charges for the acute care of injuries from interpersonal violence and the shift in financial responsibility for these charges after the Medicaid expansion from the Affordable Care Act in 2014.

Methods—We analyzed all emergency department (ED) visits from 2009-2014 with diagnosis codes for violent injury in the Nationwide Emergency Department Sample (NEDS). We used sample weights to estimate total charges with adjusted generalized linear models to estimate charges for the 15% of ED visits with missing charge data. We then calculated the share attributable by payer and determined the difference in proportion by payer from 2013 to 2014.

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Results—Between 2009 and 2013, the uninsured accounted for 28.2-31.3% of annual charges for the acute care of violent injury, while Medicaid was responsible for a similar amount (29.0-31.0%). In 2014, there were \$10.7 billion in total charges for violent injury. Medicaid assumed the greatest share, 39.8% (95% CI: 38.0-41.5%, \$3.5-5.1 billion), while the uninsured accounted for 23.6% (95% CI: 22.2-24.9%, \$2.0-3.0 billion), and Medicare accounted for 7.8% (95% CI: 7.7-8.0%, \$0.7-1.0 billion).

Conclusion—After Medicaid expansion, taxpayers are now accountable for nearly half of the \$10.7 billion in annual charges for the acute care of violent injury in the U.S. These findings highlight the benefit to state Medicaid programs of preventing interpersonal violence.

Keywords

Violence; Health Services Research; Injury Prevention; Public Health

1. Introduction

Interpersonal violent injury is an enormous public health and financial burden in the U.S. It is the third leading cause of death among youth aged 15-24 and ranks as the number one cause among Blacks within that same age group [1]. The impact of violence is felt disproportionately in socioeconomically disadvantaged populations including those who suffer from substance abuse disorders, homelessness, unemployment, low income, and a lack of health insurance [2-7]. The U.S. economic impact of violent injury is also substantial. While more current data have not been published, one previous study determined that the total cost of violence in 2000 was over \$70 billion with the majority of its costs resulting from lost productivity, and an estimated \$5.6 billion was spent on medical care alone [8]. In 1994, gun violence alone was estimated to cost the United States \$2.3 billion, with \$1.1 billion paid by tax-payers [9].

Little is known about the financial impact of violent injury for insurance payers and how this was affected after the implementation of the Affordable Care Act. This is important because the lack of a clearly defined stakeholder has led to a lack of investment in effective prevention strategies [10-17]. Beginning in 2014, 32 states as well as the District of Columbia elected to expand Medicaid coverage to low-income individuals under one of the most important provisions of the Affordable Care Act. As a result, many states began providing healthcare coverage to a population disproportionately high-risk for violent-injury, low-income, young men. Recent healthcare reform efforts that repeal insurance coverage would not only have implications to this vulnerable population, but also the safety net trauma centers that care for them [18-21]. Better delineating the financial impact of violence on healthcare payers could spur investments in programs to prevent violence.

To fill these knowledge gaps, we analyzed a national database of emergency department (ED) encounters to determine the total annual charges for the acute care of injuries from interpersonal violence in the U.S. and the shift in financial responsibility for these charges after the Medicaid expansion from the Affordable Care Act in 2014.

2. Methods

2.1 Study Design and Data Source

We conducted a retrospective analysis of all patients presenting to the ED from 2009-2014 for injuries resulting from interpersonal violence. We used financial charge data from the Nationwide Emergency Department Sample (NEDS), a portion of a larger family of databases from the Healthcare Cost and Utilization Project (HCUP). The NEDS is a 20-percent stratified sample of 945 hospitals in 33 states, as well as the District of Columbia. It is the largest all-payer ED database in the U.S. Unweighted it contains approximately 30 million ED visits each year, weighted it has nearly 135 million ED visits. We used these sample weights to estimate total charges attributable to each payer from 2009 thru 2014. This study was determined to be exempt by the University of Pennsylvania Institutional Review Board.

2.2 Population

We identified all ED visits in the NEDS from 2009-2014 with an International Classification of Disease, Ninth Revision (ICD-9) diagnosis code for violent injury (E960-969) [2].

2.3 Measurements

The primary outcome was charge data in US dollars (\$). Charges are often determined by hospital contracts with federal, state, and third-party payers. These contracts, set by each hospital, significantly impact the final amount charged to each payer. HCUP charge data contain charges as reported by each facility. With the exception of Florida, states do not include professional and patient convenience fees in their final amounts. The primary independent variable of interest was primary payer: self-pay/uninsured, Medicaid, Medicare, private, no charge, and other. For the purposes of simplicity, no charge (1.24% of the sample) was reclassified as uninsured. Other variables we extracted included age, sex, disposition, length of hospital stay, injury mechanism, ICD-9 coded mapped injury severity score (ISS) provided by the NEDS [22], and disposition. We grouped ISS into three groups: minor (<9), moderate (9-15), and severe (>15). In the NEDS, injury type is classified as injury by cut, firearm, poison, struck, or suffocation. We grouped the disposition variable as: discharged from the ED, expired in the ED, admitted to inpatient and then discharged, and expired during admission.

2.4 Statistical Analysis

We applied sample weights to allow us to provide national estimates about the entire U.S. population. We tabulated descriptive statistics including age, sex, injury mechanism, payer, and disposition for the study population. We then determined the overall mean charge for an ED encounter and then stratified this outcome by disposition and payer. Next, we estimated total annual charges. In the overall sample, 15% of ED encounters not resulting in admission were missing charge data. Of those who were admitted to inpatient, only 0.5% were missing charge data. In the NEDS, inpatient charge data contain total charges incurred during admission, including ED charges. A complete case analysis would underestimate and provide a conservative estimate of total charges. Based on prior work with HCUP charge

data, we used generalized linear modeling with gamma function and log link using age, sex, injury severity, mechanism of injury, and payer to estimate the charges for encounters in which charge data was missing [23]. We stratified total charges by primary payer: Medicaid, Medicare, Uninsured, Private, or Other. We then calculated the share attributable by payer by year and with 95% confidence intervals. To account for variation in how charges are determined between hospitals and payers, we determined the change in relative share of charges by each payer before and after ACA implementation. The NEDS does not include variables that enable identification of hospitals thus, we were not able to calculate the acute costs of care by using cost-to-charge ratios. Analysis was completed using STATA Version 14.

3. Results

3.1 Characteristics of the Subjects

The demographic and clinical characteristics of the overall sample are displayed in Table 1. From 2009-2014, there were an estimated mean number of 1,019,866 ED encounters for violent injury per year. Most encounters were by men (62.5%) and most were young with a mean age of 31 years. The most common mechanism of injury was being struck (52.9%), while firearm injuries only represented 3.1% of ED visits for violent injury from 2009-2014. Most injuries were minor: 94.0 % had an Injury Severity Score (ISS) less than 9. Only 7.2% of patients had ED visits resulting in admission. A very small proportion of patients died in the ED (0.2%) and during admission (0.1%).

3.2 Total Charges

Table 3 demonstrates the charges from ED encounters and those resulting in inpatient admission by year. The primary analysis uses modeling to estimate the missing data while the complete case analysis uses the available data to obtain a more conservative estimate. In 2009, there were \$7.56 billion in total charges for violent injury. By 2014, there were \$10.7 billion in total charges. The mean charges by disposition in 2014 are provided in Table 2. The mean charge for an ED encounter for violent injury was \$7,165, and \$73,367 for those who survived to hospital admission. There was also wide variation in charges across disposition categories.

3.3 Charges by Payer

Figure 1 displays share attributable by payer by year. Between 2009 and 2013, the share attributable across payers was stable. The uninsured accounted for 28.2-30.5% of annual charges for the acute care of violent injury while Medicaid was responsible for a similar amount (29.0-31.0%). However, in 2014 after ACA implementation, Medicaid assumed the greatest share, 39.8% (95% CI: 38.0-41.5%, \$3.5-5.1 billion), while the uninsured decreased to 23.6% (95% CI: 22.2-24.9%, \$2.0-3.0 billion), and Medicare remained stable at 7.8% (95% CI: 7.7-8.0%, \$0.7-1.0 billion), as did private insurance at 16.2% (95% CI: 15.6-16.7%, \$1.4-2.0 billion). Combining Medicare and Medicaid, taxpayers were responsible for nearly half of the expenses for violent injury in 2014 (48.3%). From 2009-2014, there was a 13.2% increase in charges borne by taxpayers, while there was a 6.2% decrease in charges to the uninsured.

4. Discussion

In an analysis of U.S. ED encounters from 2009-2014, we found a substantial shift in the financial burden due to the acute care of injuries from violence to the Medicaid program in 2014, as a result of the expansion of insurance coverage associated with Affordable Care Act implementation. Medicaid now is responsible for 39.8% of the bill for violent injuries, up from 30% in the years prior. When also considering Medicare, taxpayers became responsible for half of the bill created by acute care of violent injuries. In 2014, the uninsured were responsible for 23.6% of the charges, nearly a 7% decrease when compared to 2009. However, there is a dearth of investment in effective violence prevention initiatives [10, 11]. This may be a consequence of a lack of clearly identifiable stakeholders. These findings highlight an increased financial motivation for states and the federal government to invest in violence prevention, particularly the higher severity injuries that result in hospital admission.

Victims of violent injury tend to be much more likely to be uninsured than the general population prior to the ACA [4, 5]. One study examining recidivism in violent injury in Florida cited that as high as 54.8% were uninsured [2]. As a result, a substantial portion of the costs of violence are passed on to financially vulnerable patients and the safety net hospitals and trauma centers that serve them. Starting January 1st 2014, states that opted towards expanding Medicaid provided an additional 12.3 million low-income Americans with health insurance[24]. This shifted a significant amount of the bill for violent injury from patients and hospitals to taxpayers.

Policy measures and programs that prevent violent injury would provide considerable financial relief to patients, hospitals, and taxpayers [13, 15, 17, 25-29]. Violence intervention programs such as the Wrap-around Program (WAP) based out of San-Francisco General Hospital have been shown to be cost-effective in reducing violence [30]. Furthermore, public investment in other sectors, such as with urban blight remediation, stabilizing vacant lots and abandoned homes, are cost-beneficial in terms of reducing violence [31]. De-implementation of Medicaid expansion would likely lead to a rise in the number of uninsured which would further increase uncompensated care at trauma centers and safety net hospitals [18, 20, 21]. This may also lead to cost-shifting to privately insured patients treated in those same settings [32].

When the Affordable Care Act was passed, it required a decrease in the federal Medicaid Disproportionate Share Hospital (DSH) payments, which was originally slated to begin in 2014 but now delayed until 2018. DSH payments were developed to reimburse hospitals that provide a substantial burden of uncompensated care. If the Affordable Care Act is repealed, lawmakers reinstating DSH payments will be essential for preventing the financial instability of trauma centers [33-36].

4.1 Limitations

While our study is novel in documenting the shifts in payer financial responsibility for the acute care of violent injury before and after the Affordable Care Act's Medicaid expansion, it has limitations. First, the NEDS does not include variables that enable the identification of hospitals, and therefore we were not able to link the data to hospital cost-to-charge ratios.

Thus, we were unable to calculate the costs of acute care, which are typically significantly less than charges. Second, charges are significantly affected by hospital contracts with federal, state, and third-party payers. This may lead to discrepancies in how the bill is determined between different hospitals. However, we do not anticipate substantial changes in how charges are calculated by insurers over time. Lastly, although the NEDS has near complete inpatient charge data, it is missing approximately 15% of ED charge data. To address the potential undercount of total charges, we used a regression model to predict what the charges were likely to be based on observable characteristics of the encounter. However, when comparing our primary analysis to a conservative complete analysis, there were no significant differences in total charges by payer by year.

5. Conclusion

In summary, we examined the trends in financial charges for acute care of violent injury by payer before and after the ACA Medicaid expansion. The uninsured were responsible for approximately one third of total charges for violent injury from 2009–2013. Beginning in 2014, the first year of Medicaid expansion, taxpayers were accountable for nearly half of the bill. As more states continue to opt towards expanding Medicaid to low-income residents, they should also have an increased financial interest in preventing interpersonal violence. Previously proposed health reform plans would likely increase the numbers of uninsured and further encumber trauma centers and safety net hospitals with uncompensated medical care.

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Figure 1. Percentage of Total Charges by Payer

Table 1
Characteristics of Emergency Department Encounters for Violent Injuries Treated in US Hospitals from 2009-2014

Variable	N=7,119,205 N(%)
Age (y)	
<18	873,727 (12.3)
18-34	3,768,521 (53.0)
35-54	2,036,923 (28.6)
>54	43,842 (6.2)
Sex	
Female	2,669,645 (37.5)
Payer	
Medicare	430,586 (6.1)
Medicaid	2,117,347 (29.8)
Private	1,476,805 (20.8)
Uninsured	2,373,564 (33.4)
Other	718,119 (10.1)
Injury Severity Score	
<9	6,688,681 (94.0)
9 to 15	323,118 (4.5)
>15	105,334 (1.5)
Injury Type	
Firearm	217,784 (3.1)
Struck	3,762,116 (52.9)
Cut	525,956 (7.4)
Disposition	
Admitted	511,010 (7.2)
Died in ED	13,523 (0.2)
Died in Hospital	9,964 (0.1)
Discharged	6,247,418 (87.8)

Table 2

Mean and Percentile Charges by Disposition in 2014

Disposition	Mean Charge (95%CI)	5th Percentile *	25th Percentile	5th Percentile	75th Percentile	95th Percentile
All ED Encounters	7,165 (6,669-7,661)	379	1,078	2,405	4,452	22,174
Treated and Released from ED	3,094 (3,001-3,186)	362	1,001	2,189	3,718	9,420
Died in ED	15,106 (10,123-20,088)	778	2,688	6,345	13,347	35,231
Admitted to Hospital and Discharged	73,367 (64,604-82,130)	6,363	16,033	30,907	60,435	192,777
Died in Hospital	147,646 (112,684-182,609)	12,399	35,623	73,026	144,608	381,468
Discharged from Hospital	48,572 (45,190-51,954)	6,306	15,457	29,032	53,993	148,192

* Percentile Charges are unweighted

Table 3
Total Charges for Violent Injuries Treated in Both Emergency Department and Inpatient Encounters by Year

Year	Complete Case Analysis (\$ Billions)	Primary Analysis (\$ Billions)
2009		
ED	2.7	3.08
Inpatient	4.59	4.63
Total	7.13	7.56
2010		
ED	2.99	3.43
Inpatient	4.59	4.61
Total	7.44	7.9
2011		
ED	2.86	3.3
Inpatient	4.43	4.47
Total	7.15	7.77
2012		
ED	3.23	3.76
Inpatient	5.33	5.36
Total	8.4	8.97
2013		
ED	3.35	3.87
Inpatient	4.56	4.58
Total	7.76	8.3
2014		
ED	3.76	4.42
Inpatient	6.36	6.4
Total	9.96	10.7