

Predictors and Consequences of Violence and Firearm Violence in King County

Report to the Seattle City Council

The Harborview Injury Prevention and Research Center
University of Washington

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Seattle City Council funding of \$153,000 was provided to the University of
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Executive summary

In response to the problem of gun violence in our community and across the nation, the Seattle City Council on June 10, 2013 funded the Harborview Injury Prevention and Research Center of the University of Washington to “Evaluate and report on the interrelationships between substance abuse, mental health diagnoses, gun ownership, and injury admissions and deaths...The overarching goal of the Project is to identify associations between substance abuse, mental health diagnoses, gun ownership, criminal records, and injury related hospitalizations and death. These analyses will inform a specific understanding of comparative risks and rates of gun violence related injury hospitalizations and deaths for individuals living in the City of Seattle and King County.”

The study identified a cohort of individuals admitted to hospitals in Washington State in 2006-07. We then looked back at their records through 2001 to identify prior hospitalizations, arrests and convictions and then forward in time through 2012 to identify subsequent hospitalizations, arrests and convictions. The focus was on mental health, substance abuse and admissions, arrests and convictions for gun-related and other violence.

There were 222 hospitalizations for firearm related injuries in King County during 2006-07. There were nearly 1,300 admissions for suicide attempts that did not involve guns, and nearly 900 admissions for assault-related injuries also not involving guns. Admissions for overdoses were common with over 1,200 during this two year period. Most of the patients admitted for violence were male. Nearly half of those with firearm injuries were young adults, while victims of suicide attempts, assaults and overdoses were most commonly 30-59 years old.

One quarter of individuals hospitalized with a gunshot wound were arrested within the next 5 years for a violent or gun-related crime. This was also true of nearly 20% of those injured from an assault and 7% of those treated for an overdose, but only 1% of those admitted for a medical reason such as an infection. More than 45% of individuals hospitalized with gunshot wounds or injuries due to an assault were subsequently arrested for non-violent crimes, as were 20% of those admitted for an overdose but less than 5% of those treated for a non-injury problem.

Individuals hospitalized with a firearm injury were twice as likely to be arrested for a violent or firearm-related crime than those admitted for a non-injury problem. Individuals with prior psychiatric problems were twice as more likely to be arrested after hospitalization for an injury, than people without such a history. However, this must be examined in light of the fact that individuals treated for an injury, but with a prior history of an arrest for violent or gun-related crime, were 13 times more likely to be arrested again than individuals without such a history.

Individuals hospitalized in 2006-07 for a firearm injury were 30 fold more likely to be hospitalized for another firearm injury than people admitted for medical reasons. Individuals with a prior firearm or violence arrest were over 43 times more likely to be murdered within 5 years after their hospitalization.

These findings contribute substantially to the literature on risks and outcomes related to firearm related injury hospitalization. The study group believes that one potential avenue for further research and collaboration are offering services for hospitalized firearm injured patients that link early criminal justice, psychiatric, and medical interventions that are hospital based linked with community services. These could advantageously involve police and criminal justice linkages as well.

Introduction

Over 30,000 people die each year in the United States from firearms. In the state of Washington, 624 people died from firearm injuries in 2011 (last year data is available), for a rate of 8.83 per 100,000 persons, somewhat lower than the US rate of 10.16 per 100,000. In Washington State, 14% of these were homicides and 79% were suicides. In King County, there were 169 firearm deaths in 2012 of which 47 were homicides, 119 suicides, 2 accidental and 1 undetermined.

Deaths from firearms occur every day in our community. The public's interest has been focused, however, on mass shootings, the most startling of which was the shooting at Sandy Hook elementary school in Newtown, Connecticut on December 14, 2012. The president responded with 23 executive orders in January of 2013, one of which was to lift a 17 year ban on federally sponsored firearm research. While this ban has been lifted, the Centers for Disease Control and Prevention has yet to fund any firearm research since the mid 1990's.

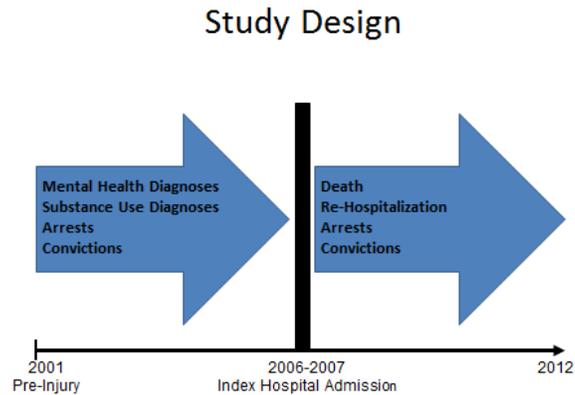
The Seattle City Council took unprecedented action and on June 10, 2013 funded the Harborview Injury Prevention and Research Center of the University of Washington to "Evaluate and report on the interrelationships between substance abuse, mental health diagnoses, gun ownership, and injury admissions and deaths...The overarching goal of the Project is to identify associations between substance abuse, mental health diagnoses, gun ownership, criminal records, and injury related hospitalizations and death. These analyses will inform a specific understanding of comparative risks and rates of gun violence related injury hospitalizations and deaths for individuals living in the City of Seattle and King County."

Methods

Study design

The study identified a cohort of individuals admitted to hospitals in Washington State in 2006-07. We then looked back at their records through 2001 to identify prior hospitalizations, arrests and convictions and then forward in time through 2012 to identify subsequent hospitalizations, arrests and convictions. This is shown conceptually below in Figure 1.

Figure 1



The focus was on mental health, substance abuse and admissions, arrests and convictions for gun-related and other violence.

Human Subjects Protection. The full study procedures and protocol were approved by the Washington State Department of Health Institutional Review Board. In order to protect the identities of individuals, all data analyses were conducted on linked, de-identified data. Mr. Bill O'Brien, a Data Records Coordinator in the Department of Epidemiology at the University of Washington, received data with identifiers from the different sources, linked the data, and then supplied the study team with the de-identified data set.

Data sources

The study linked a number of different data sources as shown in Figure 2.



Hospitalizations. These data came from the Comprehensive Hospital Abstract Reporting System (CHARS), which is a Department of Health maintained data base on all discharges from acute care hospitals in the state of Washington. It provides information on age, gender, insurance status, discharge diagnoses, cause of injury, length of stay and charges for care.

Deaths. The Department of Health maintains vital statistics on all births and deaths in the state, based on records submitted by county health departments. Death certificates contain information on cause of death.

Arrests. The Washington State Patrol (WSP) maintains a data base on all arrests within the state of Washington. The WSP Criminal records Division submits data to the National Crime Information Center. The WSP approved the transfer of data and agreed to send (1) the criminal history record information and approved (2) the research, evaluative or statistical purpose for which the said information is sought.

Convictions. We obtained data on convictions from the Washington State Administrative Office of the Courts. The Judicial Information System contains data on court cases decided in the state of Washington. This includes all criminal cases with convictions that are “DV” flagged.

Firearm data. We were not able to obtain specific data on firearm ownership because of the restrictions on use of available information.

- *Concealed weapons permits:* Local police handle the application for concealed pistol license (CPL) and then forward the approved license information to the Department of Licensing (DOL) for filing. Gun retailers fill out both a pistol transfer form (state document) and Form 4473 (federal form). They maintain the state document in their own records for 20 years and the Form 4473 (which is a digital form now, though they do still take paper forms) go to the Federal Bureau of Alcohol, Tobacco, Firearms and Explosives. The pistol transfer form is also sent to the DOL to be kept on record. Both

the CPL records and the pistol transfer form records are not publicly accessible due to existing laws and are only available for law enforcement and correctional officers to access

- *Gun registration data:* These are no longer available following the federal 1986 Firearm Owners Protection Act which prohibited the maintenance of gun registries: “No such rule or regulation prescribed [by the Attorney General] after the date of the enactment of the Firearms Owners Protection Act may require that records required to be maintained under this chapter or any portion of the contents of such records, be recorded at or transferred to a facility owned, managed, or controlled by the United States or any State or any political subdivision thereof, nor that any system of registration of firearms, firearms owners, or firearms transactions or disposition be established. Nothing in this section expands or restricts the Secretary's authority to inquire into the disposition of any firearm in the course of a criminal investigation.”
- *Gun-related crimes:* Washington State RCW does not separately code gun related felonies and does not currently have a standardized “crosswalk” for gun related felonies as they relate to federal crimes and FBI related crime data. Therefore the study team consulted with multiple local and national academic investigators and groups. The study aggregated gun related and violent crimes according to a previously developed “crosswalk” supplied by collaborators within the Seattle Police Department. After the consultation process, a “crosswalk” was aggregated for both firearm and violence related crimes.

Categorization of psychiatric and substance abuse disorders. International Classification of Disease (ICD-9-CM) diagnoses contained within the hospitalization data were used to capture psychiatric diagnosis and substance related diagnoses. On the basis of recent epidemiologic investigation by the study team as well as prior studies of traumatically injured patients, we included the following:

Psychiatric disorders/ICD-9 categories.

- Anxiety and acute stress (including PTSD, 309.81; acute stress disorders, 308.0–308.9; adjustment disorders, 309.0–309.9; panic disorder, 300.01, 300.21, and 300.22; phobia, 300.29; social anxiety, 300.23; obsessive-compulsive disorder, 300.3; generalized anxiety disorder, 300.02; other anxiety, 293.84, 300.00, 300.09, and 300.2; and other childhood anxiety, 313.0)
- Depressive disorders (including major depressive disorder, 296.2–296.99; dysthymia, 300.4; and other depressive disorders, 309.1 and 311.0)
- Disruptive behavior disorders (including attention-deficit hyperactivity disorder [ADHD], 314.0–314.9; conduct disorder, 312.0–312.4, 312.8, and 312.9; and oppositional defiant disorder, 313.81)

Substance related diagnoses included.

- Alcohol use disorders, (291.0–291.3, 291.5, 291.8, 291.9, 303.0, 303.9, and 305.0)
- Drug use disorders, (292.0, 304.0, and 305.2–305.9)

Psychiatric and substance related diagnoses were divided into two categories: 1) diagnoses that were identified during the index 2006-2007 injury admission and 2) diagnoses that were identified during hospitalizations that occurred prior to the index psychiatric admission.

Data analysis

Using survival analysis approaches, individuals hospitalized due to a firearm-related injury (of any intent) were compared with those hospitalized due to a non-injury reason (e.g., cardiovascular disease, infections) with regard to the risk of the following outcomes (dependent variables of interest): in-hospital death (separated by cause such as the use of firearms), out-of-hospital death (separated by cause such as the use of firearms), first rehospitalization (separated by specific discharge diagnosis such as injury due to the use of firearms), first arrest (separated by category such as firearm-related or violent crimes, and non-firearm-related non-violent crimes) and first conviction (separated by category such as firearm-related or violent crimes, and non-firearm-related non-violent crimes). Additionally, the risk of these outcomes was compared between individuals hospitalized due to non-firearm-related injuries (suicide attempts, assaults, overdoses, and unintentional (i.e., accidents)) and those hospitalized due to a non-injury reason. Main confounders of interest included age, gender, history of substance abuse diagnosis, history of mental illness diagnosis, history of arrest, and history of conviction ("history" refers to the 5-year period prior to the index hospitalization in 2006-7). These confounders were taken into account in the analyses to separate out the independent effect of main group of interest (i.e., firearm-related injury) on the aforementioned outcomes.

Findings

Hospitalizations in 2006-07

As shown in Table 1, there were 680 hospitalizations for firearm related injuries in Washington State during 2006-07. There were nearly 6,000 admissions for suicide attempts that did not involve guns, and 2,526 admissions for assault-related injuries also not involving guns. Admissions for overdoses were common with nearly 5,000 during this two year period.

Table 1. Admissions to hospitals in King County and Washington State in 2006-2007

Diagnosis	King County	Washington State
Firearm related	222	680
Non-gun suicide attempts	1,280	5,842
Non-gun assaults	873	2,526
Overdoses	1,257	4,844
Injuries due to accidents	16,418	62,819
Other admissions	47,816	180,841

As shown in Table 2 below, most of the patients admitted for violence were male. Nearly half of those with firearm injuries were young adults, while victims of suicide attempts, assaults and overdoses were most commonly 30-59 years old. The highest mortality was seen with firearm injuries. It is important to understand that these data do not include individuals who were pronounced dead at the scene, but only those who arrived at the hospital and were treated in the emergency department.

Table 2. Characteristics of patients by reason for admission in King County (Percents)

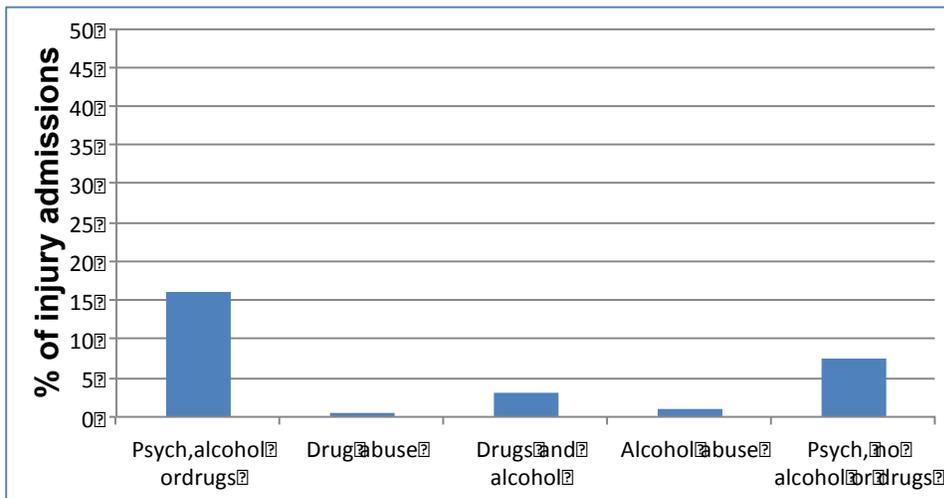
Reason for admission →	Firearm injuries	Suicide attempt	Assault injuries	Overdose	Accidental injuries	Non-injury causes
Male	86.0	42.5	80.3	49.6	49.6	39.0
Age						
0-9	0.9	0.2	4.5	3.9	4.1	3.0
11-19	24.3	15.3	12.5	7.4	6.3	4.4
20-29	46.4	22.5	24.3	10.8	8.3	6.9
30-59	26.6	56.7	55.2	53.3	31.3	37.7
60-69	0.9	2.5	1.3	11.6	9.6	12.0
70+	0.9	2.8	2.2	13.0	40.4	36.0
Died in the hospital	8.6	2.7	2.5	7.4	8.3	2.3

Psychiatric and substance abuse problems

Our data on psychiatric disorders and substance abuse relied on these diagnoses being coded at the time of a hospitalization, because we did not have any outpatient information on these patients. These diagnoses could have been coded during the 2006-07 hospitalization or during a prior hospitalization 2001-05.

Figure 3

Percent of injury admissions 2006-07 with prior psychiatric, alcohol or drug problems



As seen in Figure 3 (left), 15% of patients admitted for an injury in 2006-07 had an admission in the prior 5 years in which they were given a diagnosis of a psychiatric, alcohol, or drug abuse disorder.

Percent of injury admissions 2006-07 with psychiatric, alcohol or drug problems noted at hospitalization

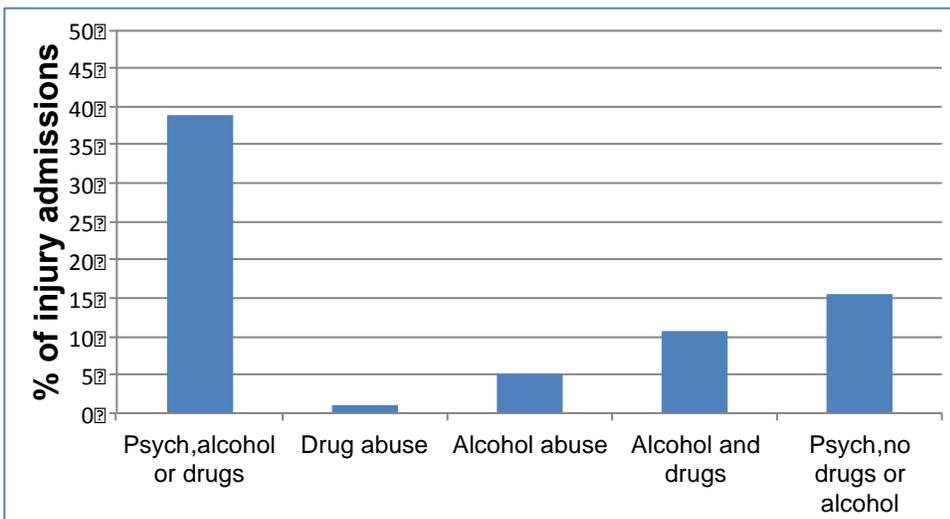


Figure 4 (left), demonstrates that 40% of patients admitted in had a drug abuse, alcohol or psychiatric, disorder noted at the time of the hospitalization for treatment of injury.

Prior crime

We examined the criminal histories for individuals hospitalized in 2007-07, prior to the index hospitalization. As shown below in Table 3, 50% of those admitted for firearm injuries and 47% of those admitted for injuries from assault had an arrest in the prior 5 years. This is in contrast to only 3.8% of those admitted to the hospital for a non-injury reason.

Table 3. Prior criminal history of people admitted to the hospital in 2006-07

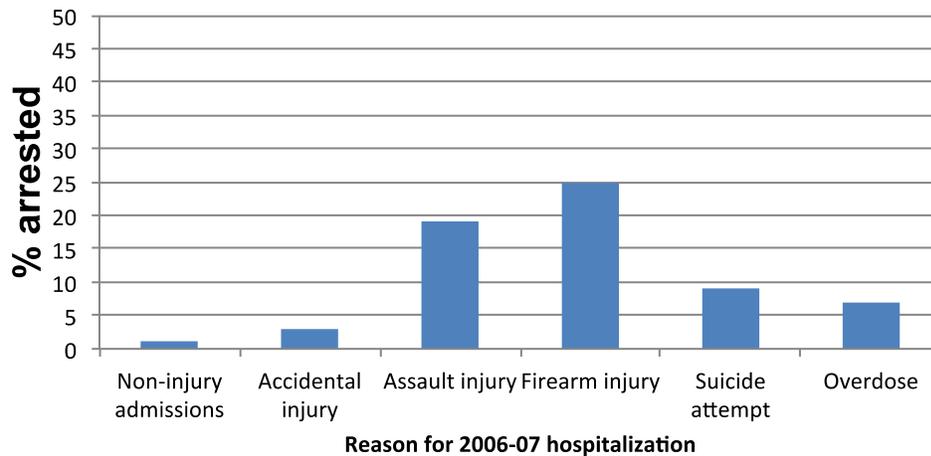
Reason for admission	Firearm injuries	Suicide attempt	Assault injuries	Overdose	Accidental injuries	Non-injury causes
ARRESTS						
No arrest	111 (50.0%)	1,011 (79.0%)	464 (53.2%)	959 (76.3%)	14,898 (90.7%)	46,015 (96.2%)
Gun or violent crime	65 (29.3%)	97 (7.6%)	176 (20.1%)	90 (7.2%)	428 (2.6%)	468 (1.0%)
Non-violent crime	46 (20.7%)	172 (13.4%)	233 (26.7%)	208 (16.5%)	1,092 (6.7%)	1,333 (2.8%)
CONVICTIONS						
No conviction	196 (88.3%)	1,214 (94.9%)	797 (91.3%)	1,197 (95.2%)	16,099 (98.1%)	47,518 (99.4%)
Gun or violent crime	8 (3.6%)	22 (1.7%)	30 (3.4%)	16 (1.3%)	96 (0.6%)	69 (0.1%)
Non-violent crime	18 (8.1%)	44 (3.4%)	46 (5.3%)	44 (3.5%)	223 (1.3%)	229 (0.5%)

Crime following hospitalization.

An important outcome of the study was the number of individuals committing crimes, especially violent or gun-related crime after the hospitalization.

Figure 5

Arrests for violent or firearm-related crimes during 5 years after 2006-2007 hospitalization



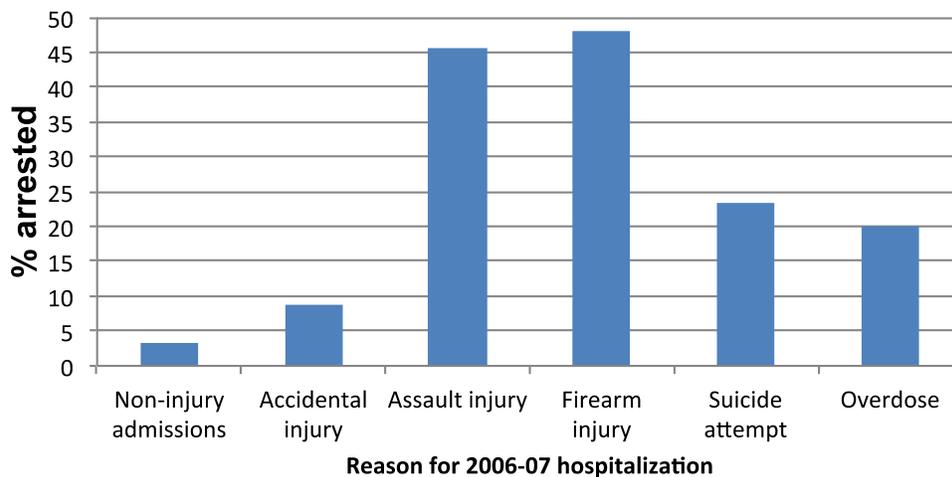
25% of people hospitalized in 2006-07 for firearm-related injury were arrested for violent or firearm-related crime over next 5 years

11

One quarter of individuals hospitalized with a gunshot wound were arrested within the next 5 years for a violent or gun-related crime (Figure 5). This was also true of nearly 20% of these injured from an assault and 7% of those treated for an overdose, but only 1% of those admitted for a non-injury reason.

Figure 6

Arrests for non-violent, non-gun related crimes during 5 years after 2006-07 hospitalization



Nearly 50% of people hospitalized in 2006-07 for a firearm-related injury were arrested for a non-violent crime over next 5 years

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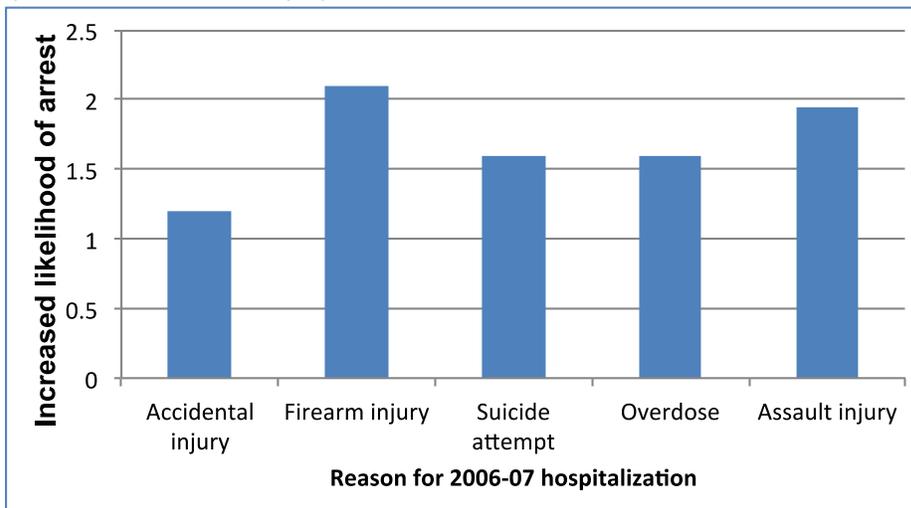
We also examined arrests for non-violent crimes in the five years after hospitalization, as shown in Figure 6 at left. More than 45% of individuals hospitalized with gunshot wounds or injuries due to

an assault were subsequently arrested for non-violent crimes, as were 20% of those admitted for an overdose but less than 5% of those treated for a non-injury problem.

When we examined the arrest histories of people admitted for an injury, compared to those admitted for non-injury reasons, and take into account age, gender, psychiatric, alcohol or drug abuse problems, we can better see how the reasons for admission affect the likelihood of subsequent crime. This is shown in Figures 7 and 8.

Figure 7

Increased likelihood of **arrest for violent or firearm-related crime** within 5 years after 2006-07 injury hospitalization compared to other hospitalization



Individuals hospitalized with firearm injury in 2006-07 were twice as likely to be arrested over next 5 years than people admitted for non-injury reasons

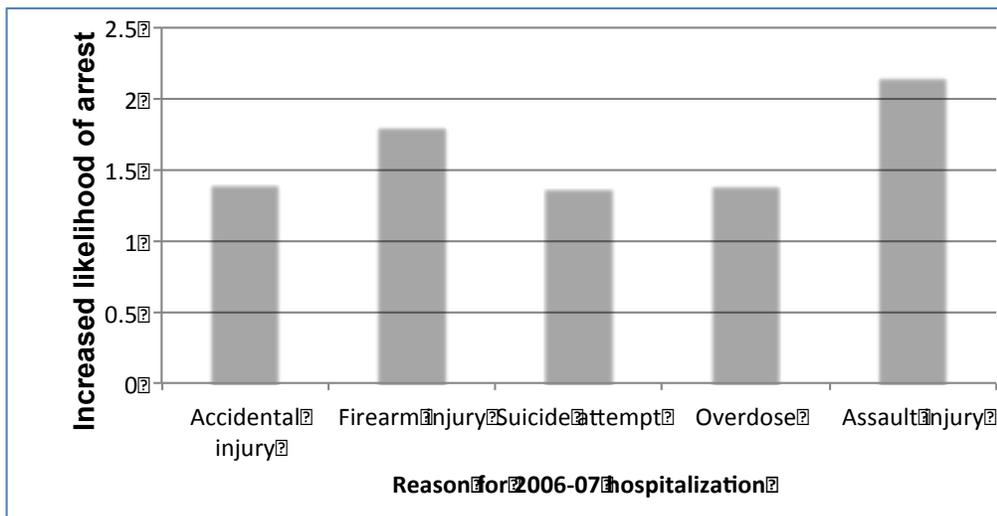
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Individuals hospitalized with a firearm injury were twice as likely to be arrested for a violent or firearm-related crime than those admitted for a non-injury problem. The increased risk of subsequent violent crime was almost as high for those with injuries due to assault.

It is not surprising that individuals admitted with overdoses would have a higher risk of subsequent violent crime potentially related to drug seeking behavior. However, the finding that crime was higher among patients admitted with suicide attempts was unexpected.

Figure 8

Increased likelihood of **arrest for non-violent crime** within 5 years after 2006-07 injury hospitalization compared to people with other hospitalization



Similarly, there was an increased likelihood of non-violent crime among these same groups of hospitalized individuals, during the 5 years after discharge, as seen in Figure 8, left.

Individuals hospitalized with assault injury in 2006-07 were twice as likely to be arrested within 5 years after discharge than people admitted for non-injury reasons

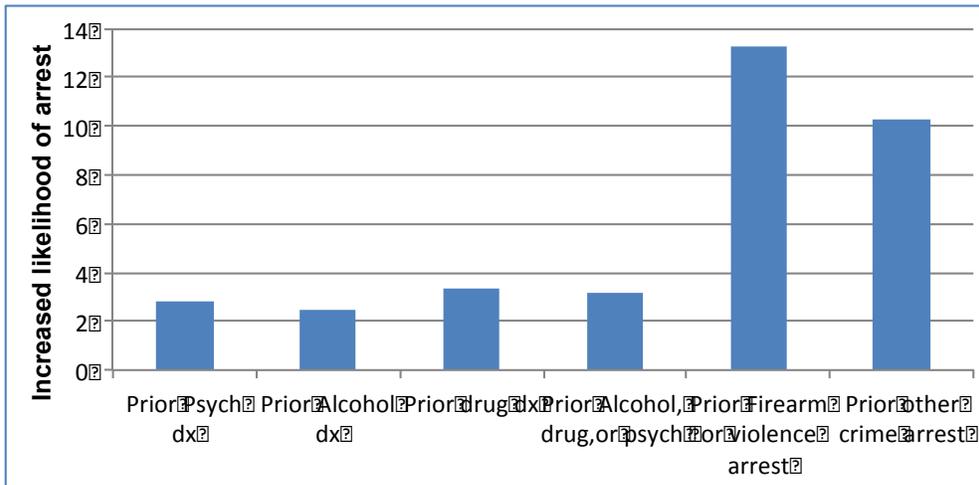
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Contribution of psychiatric disorders and substance abuse

One of the key issues in public discussion is how much psychiatric and substance abuse contributes to subsequent violent or gun related crime. We were able to examine this issue, as shown in Figure 9; consider Figures 7 and 8 above as well when interpreting these data.

Figure 9

Increased likelihood of arrest for any crime within 5 years after 2006-07 injury hospitalization compared to people without prior psych or crimes



As can be seen in Figure 9, individuals with prior psychiatric problems were 100% more likely to be arrested after hospitalization for an injury, than people without such a history. However, this must be examined in light of the

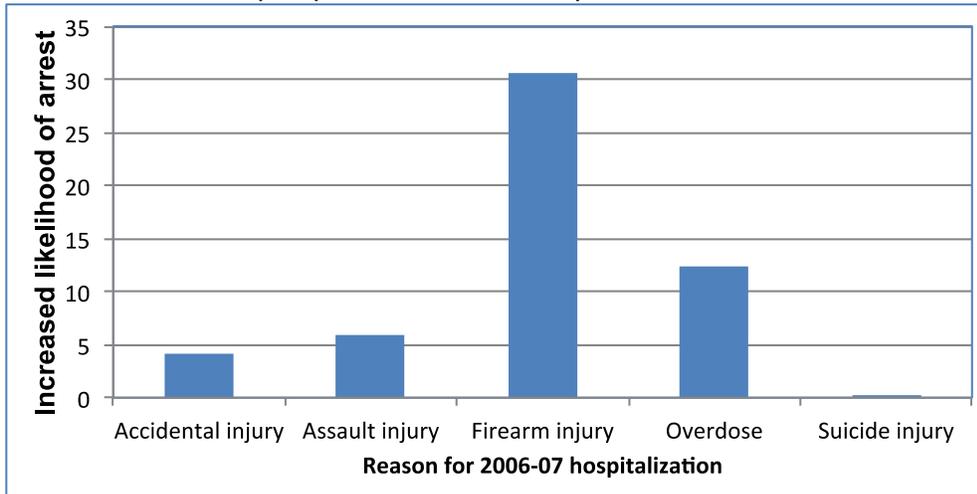
Individuals hospitalized with an injury who had prior arrest for firearms or violence were 13-fold more likely to be arrested over next 5 years ----- People with prior psychiatric history were only twice as likely to be arrested

fact that individuals treated for an injury, but with a prior history of an arrest for violent or gun-related crime, were 1200% more likely to be arrested again than individuals without such a history.

Repeat hospitalization

Figure 10

Increased likelihood of being **hospitalized for firearm injury** within 5 years after 2006-07 injury hospitalization compared to people with other hospitalizations



Individuals admitted in 2006-07 for a firearm related injury were at greatly increased risk of repeated hospitalization for another firearm injury over the next 5 years.

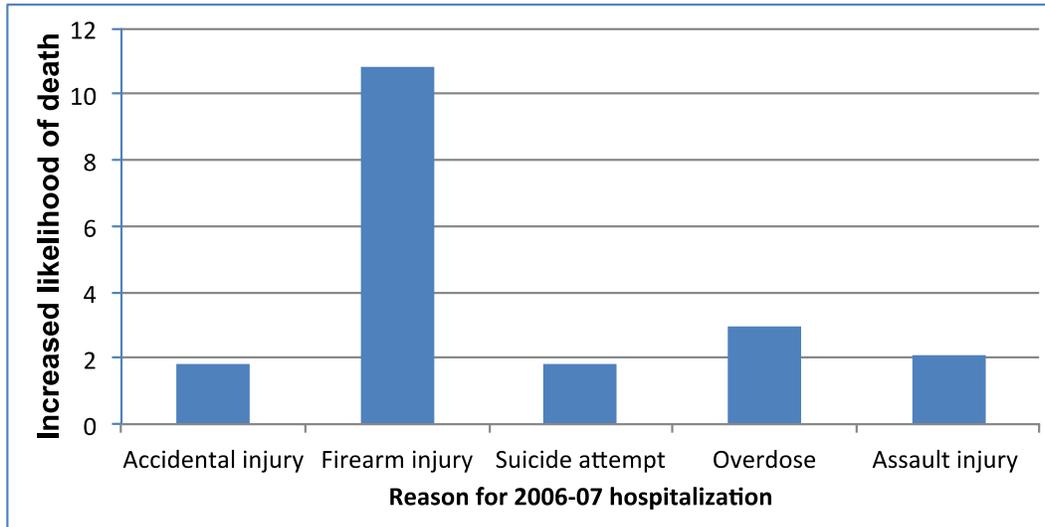
Individuals hospitalized for firearm injury in 2006-07 were 30 times more likely to be re-hospitalized for another firearm injury than people admitted for non-injury reasons

16

Risk of death within 5 years after hospitalization

Figure 11

Increased likelihood of **death due to firearm** within 5 years after 2006-07 injury hospitalization compared to other hospitalizations



Similarly, firearm related injury was associated with a greatly increased risk of death from injury within the next five years.

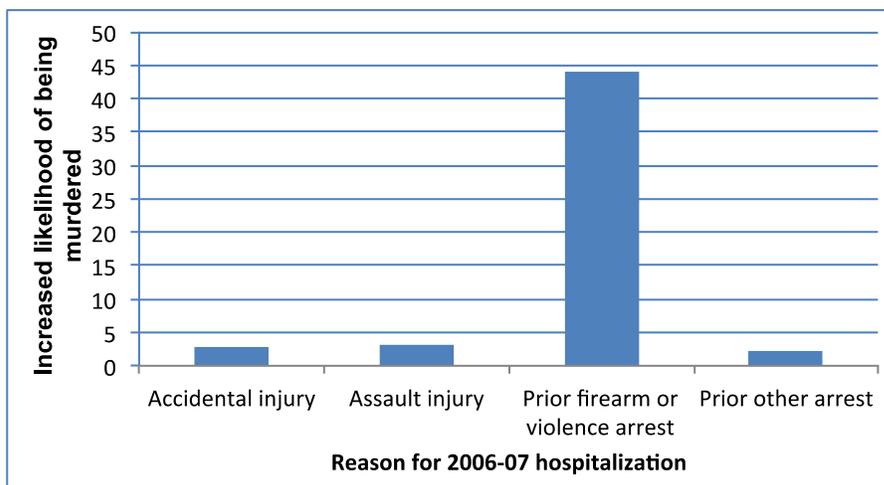
Individuals hospitalized with firearm injury in 2006-07 were 11 times more likely to die due to a gun over next 5 years than people admitted for non-injury reasons

17

Risk of being murdered

Figure 12

Increased likelihood of being **murdered** within 5 years after 2006-07 injury hospitalization compared to people with other hospitalizations



Individuals with a prior firearm or violence arrest were over 43 times more likely to be murdered within 5 years after their hospitalization.

Individuals hospitalized with injury in 2006-07 and with prior gun or violence arrest were 43 times more likely to be murdered over next 5 years after discharge than people without such a history

18

Discussion

Firearm related injury hospitalizations are associated with a number of poor outcomes including recurrent crime, challenges with substance abuse and psychiatric disorders, and repeat hospitalization and death.

These findings contribute substantially to the literature on risks and outcomes related to firearm related injury hospitalization. The study group believes that one potential avenue for further research and collaboration is offering services for hospitalized firearm injured patients that link early criminal justice, psychiatric, and medical interventions that are hospital based linked with community services. These could advantageously involve police and criminal justice linkages as well.

Of particular note, the study group will be doing ongoing analyses of these data with the intent of publishing a number of manuscripts in high quality peer-reviewed academic journals. The study group will acknowledge the support of the Seattle City Council funding in all published products of the study.