Long-term Disability in Survivors of Gun Injury

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ABSTRACT

BACKGROUND: Intentional and unintentional gun injury is a frequent cause of death that generates substantial immediate attention. We examined the risks of subsequent long-term disability for patients surviving acute injury.

METHODS: We conducted a population-based individual-patient longitudinal analysis of adults injured by firearms who received emergency medical care in Ontario, Canada, from April 1, 2002 and April 1, 2018. The primary outcome was death or subsequent application for long-term disability in the years following hospital discharge.

RESULTS: In total, 5,103 patients were injured from firearms including 10% from intentional incidents and 90% from unintentional incidents. After a median 7.31 years of follow-up, patients surviving intentional injuries had a disability rate twice a high as patients surviving unintentional injuries (28.2% vs 11.9%, $p < 0.001$), equivalent to a relative risk of 2.67 (95% confidence interval 2.20 to 3.24). The higher risk of long-term disability for survivors following intentional gun injury was not explained by baseline demographics, extended to survivors treated and released from the emergency department, and was observed regardless of whether the incident was self-inflicted or from inter-personal assault. Half of the disability cases occurred after the first year. Additional predictors of long-term disability included a lower socioeconomic status, an urban home location, a nighttime incident time, a past history of mental illness, and a substance abuse diagnosis.

INTERPRETATION: Gun injury death statistics underestimate the extent of health losses from long-term disability, particularly for those with intentional injuries. More sustained follow-up care might improve patient outcomes.

INTRODUCTION

Guns can be useful for hunting excursions, shooting sports, and self-defense. The Inuit living in wilderness regions, for example, rely on guns for securing food and protecting against animal attacks.[1] A large downside of guns is the risk of injury. Mortality from gun injury in Canada amounts to 800 total deaths annually, equivalent to a rate of 23 per million population yearly.[2] An estimated 700 fewer Canadians would die from gun injury each year if mortality rates in Canada matched those in the United Kingdom.[3 4] Of course, some countries have higher mortality from gun injury including the United States with a rate of around 200 per million population yearly.[5]

Many people survive gun injury which means mortality rates underestimate the total burden of suffering.[6] Indeed, some patients with through-and-through brain injuries stay alive but institutionalized.[7] The intensity of acute pain can be severe and lasting.[8] Up to half of patients show anxiety, depression, or other stress during hospitalization.[9 10] Disfigurement can lead to a further cascade of complications.[11] Of course, some patients view survivorship as a source of personal pride, community prestige, or divine intervention.[12 13] Aside from reports after military combat, however, rigorous studies are near-silent about long-term prognosis and focus on acute care survival.[14 15 16]

We postulated that rates of long-term disability are substantial following gun injury, contrary to the acute nature of the injury and the frequently impressive initial hospital recovery. Moreover, we hypothesized that intentional gun injury, relative to unintentional gun injury, would lead to a greater burden of long-term disability due to the differences in wound anatomy, patient characteristics, injury circumstances, injury severity, psychological damage, and community supports.[17 18 19] Herein we explore this distinction and apply population-wide healthcare databases to examine long-term outcomes for patients who survive gun injury.

METHODS

Study Setting

Ontario is Canada's largest province with a population of 13,069,182 in 2010 (study midpoint) distributed over 1,074,845 square kilometers of land area (urban and rural).[20 21] Hunting season extended mostly from September to December each year and was a popular activity in rural regions.[22] Emergency care was universally available with no user fees for all 178 different hospitals and the healthcare data could be tracked through encrypted databases.[23 24] Prevailing laws included a legal mandate for medical reporting of all patients who experienced gun injury.[25] Diverse disability programs were available for adults above age 18 years based on physician assessments that were included in healthcare databases.[26]

Gun Injury

We identified adults aged 16 years or older injured by firearms who received emergency medical care between April 1, 2002 and April 1, 2018. These dates provided a comprehensive sample of all years available and a minimum one-year follow-up for each patient. Diagnostic codes were based on the International Classification of Disease Version 10 (codes W32-W34) as validated in past research.[27] We excluded patients living outside of Ontario, individuals without a valid healthcard number, those dead at the scene, and youth less than 16 years old (to account for age-based eligibility for disability support). Patients with more than 1 injury were analyzed by first presentation to avoid statistical artifacts and provide conservative estimates.

Additional Characteristics

Information on patient age, sex, home location, and socioeconomic income quintile was based on linked demographic databases.[28] Additional linked databases identified the time of the incident (year, month, day, hour), firearm type (hand gun, long gun, uncertain), and whether the patient arrived by ambulance.[29] Intentional injuries were defined as self-inflicted or from inter-personal assault according to physician diagnostic codes, with remaining or uncertain cases presumed unintentional.[30] We further searched linked outpatient databases in the prior year to identify earlier psychiatric illnesses and substance abuse diagnoses.[31] General healthcare utilization indicators in the prior year also included total hospitalizations, emergency visits, and outpatient visits.[32 33]

Short-term Care

We examined short-term clinical outcomes for descriptive purposes to corroborate past studies.[34] [35] [36] [37] Hospital mortality included the count of patients who died in the emergency department, during initial hospitalization, or after transfer to a specialized trauma center.[38] Hospital length of stay indicated the total time in days from arrival in the emergency department to death, discharge, or departure (including patients who left against medical advice).[39] The number of operations, use of transfusion products, and days in intensive care were identified, taking into account those who had none. The available databases lacked information on race, injury circumstances, bullet caliber, vital signs, imaging scans, functional status, formal education, and criminal records.[40]

Long-term Disability

The primary analysis involved a longitudinal cohort comparison to evaluate the subsequent rate of death or long-term disability for patients who survived initial injury. We considered disability as the primary outcome accounting for death as a competing risk (each component also tested separately in secondary analysis). We defined disability as the submission of a new disability support application because the document was available, measurable, authenticated, and incorporated the patient's perspective.[41] Such applications must involve the patient's physician which, in turn, allowed tracking of applications using physician codes in the Ontario Health Insurance Plan (K050-K054).[42] [43] These techniques have been validated in past research.[44]

Role of Involved Agencies

The study protocol was approved by the Research Ethics Board of Sunnybrook Hospital including a waiver for direct patient consent. The study was conducted using privacy and security safeguards at the Institute for Clinical Evaluative Sciences (ICES) funded from the Ontario Ministry of Health and Long-Term Care (no endorsement from the Ontario government is intended or should be inferred). The funding organizations had no role in the design and conduct of the study; collection, management, analysis, or interpretation of the data; and in preparation, review, or approval of the manuscript. No

funding was received from a federal agency prohibited from advocating or promoting gun control.[45 46]

Statistical Analysis

Our primary comparison tested whether rates of subsequent disability in the years following gun injury might be higher for those with intentional compared to unintentional injuries. We defined the follow-up interval as starting on the day of hospital departure and included only those who survived initial injuries. We used unadjusted cumulative incidence curves to evaluate survivors for death or disability during the decade following injury.[47] We further examined the rate of death and disability of the full cohort of survivors before and after adjusting for additional measured baseline characteristics using the Fine and Gray model of competing risks (sub-distributional hazard ratios used as the estimate of relative risks).[48]

RESULTS

Descriptive Overview

In total, 5,103 individuals were injured by firearms and received emergency medical care during the 16-year study period. Most (90%) were unintentional injuries and relatively few (10%) were intentional injuries (Table 1). Both groups were mostly men, less than 30 years old, and widely distributed across socioeconomic status quintiles. The group with intentional injuries, relative to the group with unintentional injuries, tended to be younger, injured by a hand gun, living in a city, and to have arrived by ambulance. Weekends were frequent in both groups and a nighttime incident was disproportionately frequent for those with intentional injuries (Appendix §1). For both groups, relatively few had a past hospitalization or a past mental health diagnosis.

*** Table 1 About Here ***

Acute Care Outcomes

A total of 1,103 patients were admitted to hospital. Among those admitted to hospital, about two-thirds required a surgical procedure, one-third required critical care, and one-quarter received transfusion products. Overall, the cohort accounted for 2,864 days in critical care and 10,839 days of hospital stay. The general profile of short-term acute hospital care suggested greater severity of injuries for patients with intentional compared to unintentional gun injury as measured by hospital admission rates, surgical procedures, critical care, blood transfusions, median days in hospital, and risk of acute death (Table 2). A total of 471 patients with intentional gun injury and 4,431 patients with unintentional gun injury survived initial injuries.

*** Table 2 About Here ***

Subsequent Rates of Disability

The 4,902 total survivors accounted for 37,911.7 patient-years of subsequent follow-up (mean: 7.31 years). Patients surviving intentional gun injury accounted for 133 subsequent cases of disability over 3,163.4 patient-years of follow-up (mean: 6.72 years), equal to an incidence of 42 per 1,000 patients annually. Patients surviving unintentional gun injury accounted for 529 subsequent cases of disability over 34,748.3 patient-years of follow-up (mean: 7.85 years), equal to an incidence of 15 per 1,000 patients annually. Together, intentional gun injury was associated with a 2.67 relative increase of subsequent disability (95% confidence interval 2.20 to 3.24, $p < 0.001$). Half of the disability cases occurred after the first year (Figure 1).

*** Figure 1 About Here ***

Additional Predictors of Disability

The risk of subsequent disability associated with gun injury was also related to patient characteristics. Lower socioeconomic status, an urban home location, a nighttime incident time, and ambulance arrival were each associated with higher risks. A past diagnosis of mental illness or substance abuse was also associated with higher risks, as were measures of short-term hospital care. Conversely, long-gun firearms were

associated with lower risks. Patient age and sex were not significant predictors. Neither day nor month was a significant predictor. Adjustment for all measured patient characteristics suggested intentional gun injury was associated with a 1.76 relative increase of subsequent disability (95% confidence interval 1.43 to 2.17, $p < 0.001$).

*** Table 3 About Here ***

Secondary Analyses of Subgroups

The higher relative risk of subsequent disability associated with intentional gun injury extended to important subgroups. In particular, the higher risk was observed for those treated-and-released from the emergency department and for those admitted to hospital (Appendix §2). Similarly, the higher risk was observed regardless of a past history of mental illness, substance abuse, firearm weapon type, ambulance involvement, healthcare in the prior year, acute need for surgery, or length of hospital stay. The higher risk was about the same for incidents that were self-inflicted and those from inter-personal assault. No subgroup showed contrary findings and all subgroups with over 500 patients showed a statistically significant higher relative risk.

Subsequent Mortality

The higher risks of subsequent disability associated with intentional gun injury was also associated with a higher risk of subsequent mortality, although the absolute counts were modest. Patients surviving intentional gun injury accounted for 22 subsequent deaths, equal to an incidence of 7 per 1,000 patients annually. Patients surviving unintentional gun injury accounted for 122 subsequent deaths, equal to an incidence of 4 per 1,000 patients annually. Together, intentional gun injury was associated with a 1.72 relative increase (95% confidence interval 1.09 to 2.71, $p = 0.0197$). Additional predictors of subsequent mortality included older patient age, lower socioeconomic status, an incident occurring at night, and a mental illness diagnosis.

*** Figure 2 About Here ***

INTERPRETATION

We studied gun injury to assess long-term rates of disability. We found that most patients survived initial hospitalization and many later became disabled. Rates of long-term disability were substantial, thereby amounting to one-in-four patients with intentional injuries and one-in-ten patients with unintentional injuries. The higher relative risk of long-term disability following intentional injury was not fully explained by baseline patient demographics, occurred regardless of whether the incident was self-inflicted or from inter-personal assault, and extended to those who were not admitted to hospital. Together, these data suggest mortality statistics underestimate gun injury because many patients do not lose their lives but lose their livelihoods.[49 50]

Our study has many limitations. The patients were injured mostly in isolated incidents and provide little insight about gang violence or mass casualty events.[51 52 53] The data are based on a large North American region and may underestimate losses in populations with more intentional injuries.[54] The study does not account for patients who died at the scene, those who moved away (and assumed fine), or others hurt by a culture of fear.[55 56] Disability data may also underestimate additional losses from missed days at work, career advancement, family relationships, emotional distress, and trauma recidivism.[57] The design was not randomized, prospective, or blinded and cannot establish whether an observed correlation indicates possible causality (E-value = 2.80).[58]

The findings are also prone to distortion in public debates about firearms.[59] Specifically, the observed rates of long-term disability do not directly support or refute calls for gun control.[60] The study does not address safe storage, background checks, licensing policies, waiting periods, safety training, or other particular injury prevention strategies.[61 62] The analysis provides no insights on the benefits of gun ownership for those who gain security and experience no adverse incidents.[63] The research cannot settle the unceasing tension between safety and liberty because moral imperatives extend beyond a biomedical perspective.[64 65] The science, furthermore, is easily manipulated by lobbying groups who have high financial stakes and deep passionate membership.[66]

An additional caveat is that our data do not explain the mechanisms where gun injury might lead to higher disability after intentional rather than unintentional incidents. A myriad of biomedical and social factors could contribute including severity of injury, concurrent mental illnesses, and background community supports.[67] [68] [69] [70] Another potential contributor is a possible labeling effect from identifying as a victim that leads to reduced self-esteem, decreased self-efficacy, and depression.[71] [72] [73] [74] A further possibility may be the nature of blame, concept of responsibility, and a negative spiral of disempowerment with anxiety.[75] [76] [77] Regardless of mechanisms, our data suggests the prognosis is shared by self-inflicted and inter-personal assault incidents.[78] [79]

The uncertain reasons underlying long-term disability suggest the need for a multi-modal approach to trauma survivorship.[80] This might include follow-up care from surgeons, psychiatrists, family physicians, physiotherapists, social workers, occupational therapists, spiritual care workers, and other allied professionals.[81] Clinical priorities could include the management of pain, depression, anxiety, sleep, and substance abuse.[82] [83] [84] Some additional counseling might also be necessary for workforce participation including a role for a navigator to negotiate between a disabled survivor and a potential employer.[85] To the best of our knowledge, no trauma center offers such a holistic follow-up clinic for adults after gun injury.[86] [87] Our study highlights a substantial need to support survivors.[88]

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CONFLICTS

The funding organizations had no role in the design and conduct of the study; collection, management, analysis, or interpretation of the data; and preparation, review, or approval of the manuscript. All authors have no financial or personal relationships or affiliations that could influence the decisions and work on this manuscript.

CONTRIBUTIONS

The senior author (DAR) wrote the first draft. The first and last authors (SR, DAR) contributed to study design and background scholarship. All authors (SR, DT, DAR) contributed to manuscript preparation, data analysis, results interpretation, critical revisions, and the final decision to submit.

ETHICS STATEMENT

The study protocol was approved by the Research Ethics Board of Sunnybrook Health Sciences Center including a waiver for direct patient consent.

DATA AVAILABILITY

Patient privacy laws prohibit making individual-level data publicly available. Aggregate data are shown in the paper and appendix. Researchers interested in replicating or extending the work can seek access to individual-level data through the Institute for Clinical Evaluative Sciences (contact http://www.ices.on.ca).

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Table 1. Patient Characteristics

		Intentional * (n = 506)	Unintentional (n = 4,597)
DEMOGRAPHIC			
Age	≤ 29 years	361 (71.3%)	2,795 (60.8%)
	≥ 30 years	145 (28.7%)	1,802 (39.2%)
Sex	male	469 (92.7%)	4,157 (90.4%)
	female	37 (7.3%)	440 (9.6%)
Home	urban	466 (92.1%)	3,702 (80.5%)
	rural	40 (7.9%)	895 (19.5%)
Socioeconomic quintile ¶	highest	39 (7.7%)	605 (13.2%)
	next to highest	64 (12.6%)	709 (15.4%)
	middle	95 (18.8%)	870 (18.9%)
	next to lowest	104 (20.6%)	975 (21.2%)
	lowest	204 (40.3%)	1,438 (31.3%)
PAST YEAR HEALTHCARE			
Hospital admission	yes	8 (1.6%)	107 (2.3%)
	no	498 (98.4%)	4,490 (97.7%)
Emergency visit	yes	191 (37.7%)	1,831 (39.8%)
	no	315 (62.3%)	2,766 (60.2%)
≥7 outpatient visits	yes	37 (7.3%)	414 (9.0%)
	no	469 (92.7%)	4,183 (91.0%)
Substance abuse diagnosis §	yes	42 (8.3%)	235 (5.1%)
	no	464 (91.7%)	4,362 (94.9%)
Mental health diagnosis †	yes	105 (20.8%)	921 (20.0%)
	no	401 (79.2%)	3,676 (80.0%)
ACUTE INCIDENT			
Weapon	hand gun	55 (10.9%)	207 (4.5%)
	long gun	26 (5.1%)	399 (8.7%)
	uncertain	425 (84.0%)	3,991 (86.8%)
Ambulance	yes	324 (64.0%)	1,084 (23.6%)
	no	182 (36.0%)	3,513 (76.4%)

Footnote

* denotes self-inflicted (codes X6·, X7·, X80 - X84) or assault (codes X85 - X89, X9·, Y0·)

¶ based on Statistics Canada algorithm

§ OHIP diagnostic codes 303 to 304

† OHIP diagnostic codes 290 to 316 (except 293, 294, 303, 304, 308, 310, 312)

Table 2. Acute Hospital Care

		Intentional (n = 506)	Unintentional (n = 4,597)
Hospital Admission	yes	412 (81.4%)	691 (15.0%)
	no	94 (18.6%)	3,906 (85.0%)
Surgical Procedure	yes	260 (51.4%)	471 (10.2%)
	no	152 (30.0%)	220 (4.8%)
	no admission	94 (18.6%)	3,906 (85.0%)
Critical Care Unit	yes	187 (37.0%)	227 (4.9%)
	no	225 (44.5%)	464 (10.1%)
	no admission	94 (18.6%)	3,906 (85.0%)
Blood Transfusion	yes	101 (20.0%)	149 (3.2%)
	no	311 (61.5%)	542 (11.8%)
	no admission	94 (18.6%)	3,906 (85.0%)
Days in Hospital	median	6 (3-12)	5 (3-10)
	no admission	--	--
Outcome	death	35 (6.9%)	166 (3.6%)
	alive	471 (93.1%)	4,431 (96.4%%)

Footnote

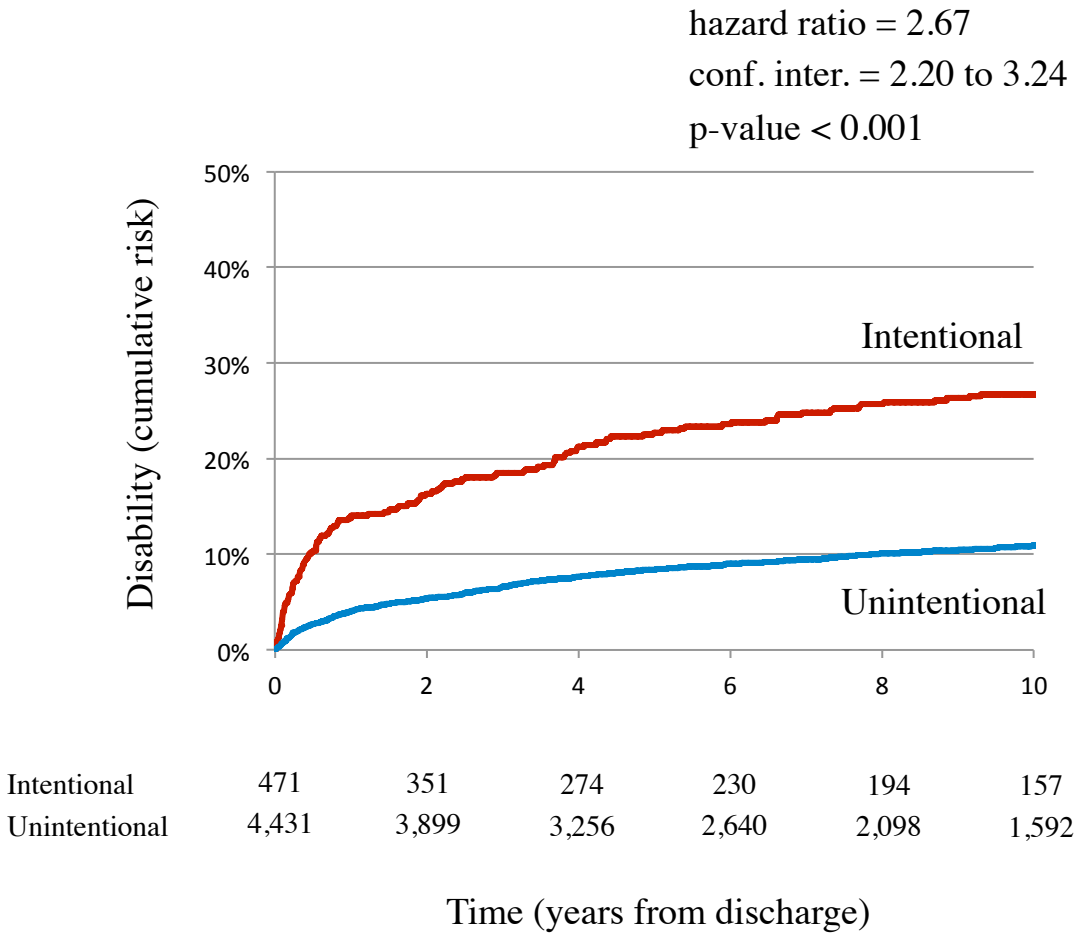
data are counts (percentage) of each column unless noted as median (inter-quartile range)

Table 3. Predictors of Disability After Gun Violence

Characteristic		BASIC ANALYSIS * Relative Risk	BASIC ANALYSIS * Confidence Interval	ADJUSTED ANALYSIS † Relative Risk	ADJUSTED ANALYSIS † Confidence Interval
ACUTE INJURY					
Intentional Injury		2.67	2.20 to 3.24	1.76	1.43 to 2.17
Age group ¥	younger	1.12	0.95 to 1.31	---	---
Sex	male	0.98	0.76 to 1.27	---	---
Home Location π	urban	1.50	1.20 to 1.87	1.16	0.92 to 1.45
Socioeconomic Quintile ¶	higher	0.81	0.62 to 1.05	---	---
	lower	1.59	1.28 to 1.97	1.62	1.29 to 2.03
Incident Month ‡	autumn	0.89	0.72 to 1.09	---	---
	winter	0.96	0.78 to 1.19	---	---
	spring	1.09	0.87 to 1.35	---	---
Incident Day §	weekend	1.09	0.93 to1.27	---	---
Incident Hour #	morning	1.19	0.95 to 1.48	---	---
	night	1.54	1.30 to 1.82	1.19	0.99 to 1.42
Ambulance Transport	yes	2.34	2.00 to 2.73	1.76	1.48 to 2.10
PAST HISTORY					
Hospital Admission in Past	yes	1.34	0.83 to 2.16	---	---
Emergency Visit in Past	yes	1.18	1.02 to 1.38	1.10	0.93 to 1.29
Outpatient visits in Past	count	1.01	1.01 to 1.02	1.00	0.99 to 1.01
Mental Health Diagnosis in Past	yes	2.03	1.72 to 2.39	1.82	1.53 to 2.17
Substance Abuse in Past	yes	2.79	2.21 to 3.52	2.12	1.62 to 2.77
ACUTE HOSPITAL CARE					
Hospital Admission	yes	2.75	2.35 to 3.22	1.58	1.25 to 2.00

Footnotes
* no adjustment for baseline differences
† adjusted for all measures significant in univariate analysis
--- denotes estimates not significant in univariate or multivariate model
¥ referent is age ≥ 30 years
π referent is rural home location
¶ referent is middle socioeconomic quintile
‡ referent is summer
§ referent is weekday
# referent is afternoon
μ multivariate estimate unavailable due to collinearity

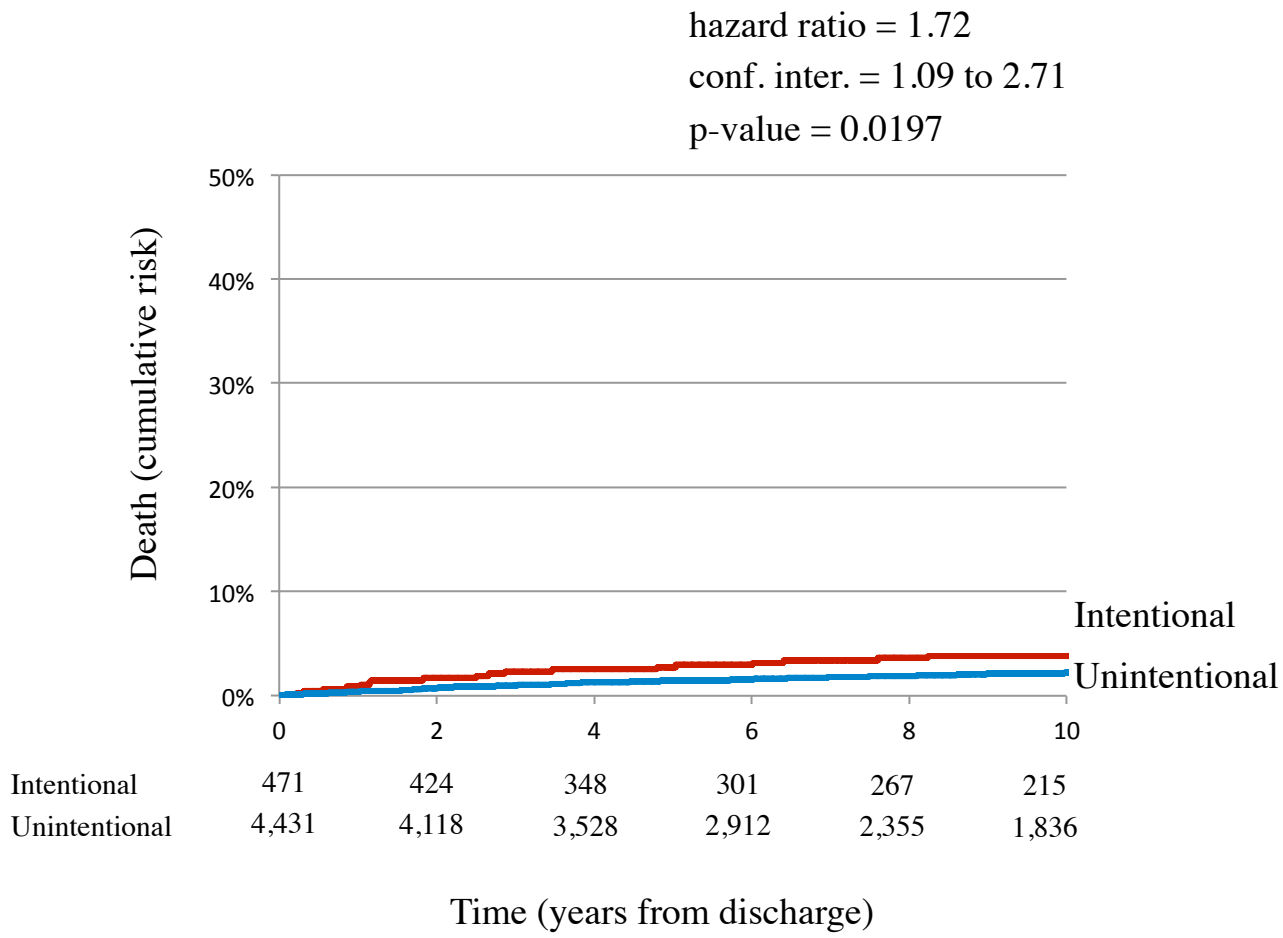
Figure 1. Risk of Subsequent Disability



Footnote

Cumulative incidence plots of absolute risk of disability following injury. X-axis shows time following injury spanning ten years. Y-axis shows cumulative incidence of disability. Intentional gun violence patients indicated by red line and unintentional gun violence patients indicated by blue line. Numerical counts show number of patients alive without disability at corresponding time. P-value based on Fine and Gray model. Results show increasing incidence of disability with time, particularly after intentional gun violence.

Figure 2. Risk of Subsequent Death



Footnote

Cumulative incidence plots of absolute risk of death following injury. X-axis shows time following injury spanning ten years. Y-axis shows cumulative incidence of death following hospital discharge. Intentional gun violence patients indicated by red line and unintentional gun violence patients indicated by blue line. Numerical counts show number of patients alive at corresponding time. P-value based on Fine and Gray model. Results show low incidence of death over time, particularly after unintentional gun violence.

Appendix §1. Incident Time and Prior Disability

		Intentional (n = 506)	Unintentional (n = 4,597)
Year	April 2002 - March 2010	275 (54.3%)	2,303 (50.1%)
	April 2010 - March 2018	231 (45.7%)	2,294 (49.9%)
Month	spring	104 (20.6%)	1,104 (24.0%)
	summer	146 (28.9%)	1,336 (29.1%)
	autumn	126 (24.9%)	1,326 (28.8%)
	winter	130 (25.7%)	831 (18.1%)
Day	weekend	203 (40.1%)	1,621 (35.3%)
	weekday	303 (59.9%)	2,976 (64.7%)
Hour	morning (0400h - 1159h)	77 (15.2%)	864 (18.8%)
	afternoon (1200h -1959h)	148 (29.2%)	2,041 (44.4%)
	night (2000h - 0400h)	281 (55.5%)	1,692 (36.8%)
Prior Disability §	yes	11 (2.2%)	81 (1.8%)
	no	495 (97.8%)	4,516 (98.2%)

Footnote
data are count (percentage) of each column
§ OHIP fee codes K050 to K054

Appendix §2 (page 1). Relative Risk of Disability After Intentional Gun Violence for Subgroups

		Total Patients	Disability Cases	Relative Risk	Confidence Interval
TOTAL COHORT		4,902	662	2.67	2.20 to 3.24
DEMOGRAPHIC SUBGROUP					
Age	younger	3,050	429	2.82	2.25 to 3.53
	older	1,852	233	2.28	1.56 to 3.34
Sex	male	4,439	598	2.85	2.34 to 3.48
	female	463	64	1.00	0.40 to 2.48
Home	urban	4,000	573	2.55	2.08 to 3.12
	rural	902	89	2.99	1.50 to 5.96
Socioeconomic quintile	higher	1,373	123	4.68	3.06 to 7.16
	middle	931	102	2.29	1.38 to 3.81
	lower	2,551	430	2.19	1.73 to 2.79
ACUTE INCIDENT SUBGROUP					
Incident Month	autumn	1,401	174	3.11	2.12 to 4.56
	winter	913	136	2.41	1.63 to 3.55
	spring	1,162	155	2.54	1.66 to 3.90
	summer	1,426	197	2.56	1.80 to 3.65
Incident Day	weekend	1,751	249	2.49	1.83 to 3.39
	weekday	3,151	413	2.78	2.17 to 3.56
Incident Hour	morning	897	116	2.89	1.77 to 4.74
	afternoon	2,135	236	3.32	2.34 to 4.72
	night	1,870	310	2.09	1.61 to 2.72
Weapon	hand gun	244	35	2.05	1.02 to 4.12
	long gun	416	34	2.16	0.77 to 6.06
	uncertain	4,242	593	2.74	2.23 to 3.36
Ambulance Transport	yes	1,230	276	1.81	1.41 to 2.32

no	3,672	386	2.39	1.71 to 3.34	

Appendix §2 (page 2). Relative Risk of Disability After Intentional Gun Violence for Subgroups

		Total Patients	Disability Cases	Relative Risk	Confidence Interval
TOTAL COHORT		4,902	662	2.67	2.20 to 3.24
PAST HISTORY SUBGROUP					
Hospital admission in past	yes	105	18	4.85	1.27 to 18.6
	no	4,797	644	2.65	2.18 to 3.23
Emergency visit	yes	1,941	288	2.63	1.95 to 3.55
	no	2,961	374	2.71	2.11 to 3.49
Outpatient visits	few (≤6)	4,482	590	2.77	2.26 to 3.39
	more (≥7)	420	72	1.99	1.00 to 3.95
Mental health diagnosis	yes	971	212	1.64	1.13 to 2.39
	no	3,931	450	3.20	2.56 to 4.00
Substance abuse	yes	265	82	1.71	1.05 to 2.77
	no	4,637	580	2.71	2.20 to 3.34
Mental or substance abuse	Yes to either	1,085	240	1.81	1.29 to 2.55
	no for both	3,817	422	3.17	2.51 to 4.00
ACUTE CARE SUBGROUP					
Hospital Admission	yes	1,047	263	1.42	1.11 to 1.80
	no	3,855	399	2.09	1.30 to 3.37
Surgical Procedure	yes	706	186	1.42	1.07 to 1.90
	no	4,196	476	2.52	1.89 to 3.36
Critical Care Admission	yes	366	110	1.03	0.71 to 1.49
	no	4,536	552	2.74	2.17 to 3.45
Blood Transfusion	yes	216	78	1.19	0.75 to 1.88
	no	4,686	584	2.58	2.08 to 3.19

Days in Hospital	few (≤ 2)	4,070	437	2.26	1.57 to 3.26
	more (≥ 3)	832	225	1.32	1.02 to 1.72
INJURY TYPE SUBGROUP					
Type of Intentionality	self-inflicted	4,477	542	2.67	1.52 to 4.68
	assault	4,856	649	2.67	2.18 to 3.26