

Characteristics and conviction rates of injured alcohol-impaired drivers admitted to a tertiary care Canadian Trauma Centre

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Abstract

Purpose: Alcohol intoxication is an important factor in motor vehicle crash (MVC) related morbidity and mortality. Despite greater societal attention, medical admission after MVC results in avoidance of legal consequences. We sought to determine characteristics of, and consequences to, injured alcohol-impaired drivers (IAIDs).

Methods: All injured adults [Injury Severity Score (ISS) ≥ 12 , age > 18] entered in a Trauma Centre registry between April 1 1995 to March 31 2003 were reviewed. Legally intoxicated patients who had been drivers involved in a MVC and who had a blood alcohol content (BAC) ≥ 80 mg/dl were cross-referenced to municipal and federal databases to identify investigations, charges, and legal outcomes.

Results: Of BACs obtained from 1933 (41%) of 4727 patients; 39% (757) were legally intoxicated (BAC ≥ 80 mg/dl); 185 (24%) were IAIDs. The IAIDs were generally very intoxicated (mean BAC 190 mg/dl); seriously injured (median ISS 22); often in ICU (47%), and had 8% mortality. Charges were laid against 69 (37%) of IAIDs, only 58 (31%) suffered legal consequences; 27 (15%) of impaired driving, and 31 (17%) of other convictions. All IAIDs who caused a fatal injury to another were convicted. A lower severity of injury of the IAIDs, non-fatal injury to another,

and occurrence in the more recent years of the study were independently associated with a conviction in multivariable analysis.

Conclusion: Despite increasing convictions over time and among most of those charged, the majority of injured drivers escape legal consequences. Increased BAC testing and reporting of this phenomenon could address this.

Injury is the leading cause of death in Canada in persons under the age of 45 and remains the leading cause of potential years of life lost^{1,2}. Motor vehicle collisions (MVCs) are the most common single cause¹, and unfortunately often involve alcohol-impaired drivers. Despite public awareness of the often horrific consequences of drinking and driving portrayed in the media, and despite the legal penalties one may face if convicted of driving while intoxicated, drinking and driving is still a major cause of unnecessary mortality and morbidity. Transport Canada reported that, in 2003, 38.3% of fatally injured drivers had been drinking, and 83.6% of fatally injured drinking drivers had BACs > 80 mg/dL, while another 16.1% of serious injury crashes were alcohol-related.³ These deaths and injuries are potentially preventable

and, as such, laws are in place to punish and presumably deter the public from this dangerous behaviour. In accordance with the provincial and territorial countermeasures initiatives, if a driver is found to have a blood alcohol content (BAC) >50 mg/dL, the driver's license can be suspended for 24 hr.⁴ A driver can be charged under the Criminal Code of Canada if found to have a BAC of >80 mg/dL.⁵ If the impaired driver is indicted for causing bodily harm he/she would be prohibited from driving for up to 10 years, and could serve up to 10 years in prison. Conviction for causing death could include lifetime prohibition from driving, and serving up to a life sentence in prison.^{4,5}

In spite of these laws, studies over the past 30 yr have shown that the rate of conviction of injured alcohol-impaired drivers (IAIDs) may be very low due to system problems with the process of detection and enforcement of impaired driving, ranging from a failure to detect such drivers, lack of coordination and communication between the medical and law enforcement teams, or insufficient resource allocation for proper follow-up of IAIDs.⁶⁻¹⁰ We observed, clinically, that many of our severely injured patients were intoxicated at the time of injury and that frequently these individuals are drivers of motor vehicles. Although it is commonly believed by the medical community and the public, that Canadian laws and penalties against driving while impaired (DWI) are severe, we suspected that individuals who are guilty of DWI may escape legal consequences if they suffer injury. Therefore, we conducted the present study in a defined cohort of severely injured alcohol-impaired drivers (IAIDs) admitted to a Tertiary Care Regional Trauma Centre to determine the rate, severity and predictors of legal consequences associated with this dangerous behaviour.

Methods

1. Study Population

The Calgary Health Region (CHR) is a fully integrated, publicly funded health system that provides virtually all medical and surgical care to residents of the cities of Calgary, Airdrie and a large surrounding area. In the CHR, adult trauma services are regional-

ized to the Foothills Medical Centre (FMC), which is the only tertiary care trauma centre in the southern half of the province of Alberta. The CHR Trauma Registry prospectively identifies and collects detailed data on all victims of trauma who have an injury severity score (ISS) ≥ 12 and who have been assessed by the trauma service at the FMC, or have died in the emergency department. A retrospective review of the CHR Trauma Registry was performed to identify all drivers of motor vehicles (excluding motorcycles) involved in an MVC between April 1, 1995 and March 31, 2003. This end point was chosen as it was assumed that the legal proceedings related to any charges filed against a patient would be completed. Drivers with a measured BAC were identified, and those with a BAC ≥ 80 mg/dL formed the primary group for analysis. To characterize this group the following variables were examined: gender, mean age, mean injury severity score (ISS), mean admission BAC, and disposition upon admission (death, ICU, trauma unit).

2. Study Protocol

After obtaining permission from the Conjoint Health Research Ethics Board at the University of Calgary, and with the supervision of the Freedom of Information and Protection of Privacy branch of the Calgary Police service, the Calgary Police Service (CPS) databases consisting of the Police Information Management System (PIMS) and Justice On-Line Information Network (JOIN) were searched by patient name. Since patients were identified by elevated BAC levels obtained without a legal chain of evidence, it was understood there were no implications for legal consequences.

Information with respect to charges, convictions, and injury and/or death of a victim at the scene was extracted from these CPS files. For MVCs occurring outside Calgary city limits or not identified in the CPS databases, the Canadian Police Information Centre (CPIC) database operated by the Royal Canadian Mounted Police (RCMP) was searched to obtain information on convictions in the study group. Neither information on the original charge(s) nor on the events

surrounding the MVC (eg. involvement of other persons) was available from this resource. Legal information could not be obtained for three patients. These three patients were included in the analyses to characterize this trauma population but they were excluded from analyses on legal outcomes.

3. Study Definitions

Legal impairment was defined as a blood alcohol content of greater than or equal to 80 mg/dL or 17.4 mmol/L as stated in the Criminal Code of Canada⁵.

4. Statistical Analysis

Statistical analysis was performed using Stata version 9.0 (Stata Corp, College Station, TX.). Normally or near-normally distributed variables were reported as means \pm standard deviations (SD) and non-normally distributed variables as medians with inter-quartile ranges (IQR). Means were compared using student's *t* test and medians using the Mann-Whitney U test. Differences in proportions among categorical data were assessed using Fischer's exact test. Multivariable logistic regression models were developed to identify independent factors associated with conviction for a serious legal offence. The initial models included those variables significant to the $P < 0.2$ level in univariate analysis. Backward step-wise variable elimination was then performed to develop the final model. Discrimination was assessed using the area under the receiver operator curve (ROC) and calibration using the Hosmer-Lemeshow goodness of fit test. A P value < 0.05 was considered to represent statistical significance for all comparisons.

Results

During the 8 year study period, 4727 adult major trauma victims were identified in the CHR Trauma registry; 3505 (74%) were male, the median age was 40 (IQR, 26-58) years, and the median ISS was 20 (IQR, 16-26). The primary type of injury was blunt trauma in 4373 (93%), with 205 (4%) patients suffering penetrating, 96 (2%) burn, and 53 (1%) other types of injuries. Only 41% (1933) of patients had an

TABLE 1 Legal consequences of the 168 surviving injured alcohol impaired drivers, Calgary, 1995-2003.

Outcome	No. of IAIDs (%)
Not charged	*99 (59%)
Charged	69 (41%)
Convicted	58 (35%)
Charge withdrawn	5 (3%)
Not guilty	2 (1%)
Stayed/Dismissed	2 (1%)
Pending arrest/trial	2 (1%)

*May be an underestimation, please see Interpretation

ethanol concentration determined at presentation, and of these patients 954 (49%) had undetectable levels (< 10 mg/dL). Of the 979 patients with detectable ethanol levels, 152 (16%) were < 50 mg/dL, 70 (7%) had 50 – 79 mg/dL, and 757 (77%) had ≥ 80 mg/dL.

Of the 4727 trauma patients, 1050 (22%) were identified as drivers of a motor vehicle (excluding motorcycle), 541 (52%) had a BAC tested, and of those drivers tested, 181 (17%) had a BAC above the legal limit. Four other drivers had concentrations < 80 mg/dL at presentation to FMC but had levels above the legal limit at peripheral hospitals prior to transfer and were therefore classified as IAIDs. Therefore, the total number of impaired drivers identified was 185 (Figure 1).

Our population of IAIDs was comprised of moderate to severely injured (median ISS 22, IQR 16-33), young adults (median age 32 yr, IQR 23-41), the majority of whom were male (154, 83%). Eighty-eight (47%) IAIDs required admission to the ICU and 14 (8%) died before hospital discharge. Of note, 92% of IAIDs had a BAC > 100 mg/dl; the mean BAC of the IAIDs was greater than twice the legal limit (190 ± 73 mg/dl). Of the 185 IAIDs, 67 were investigated by the CPS, 114 by the RCMP, one was investigated by both police forces, and information could not be obtained for the remaining three.

Of the 168 impaired drivers who survived major trauma, and where complete information was avail-

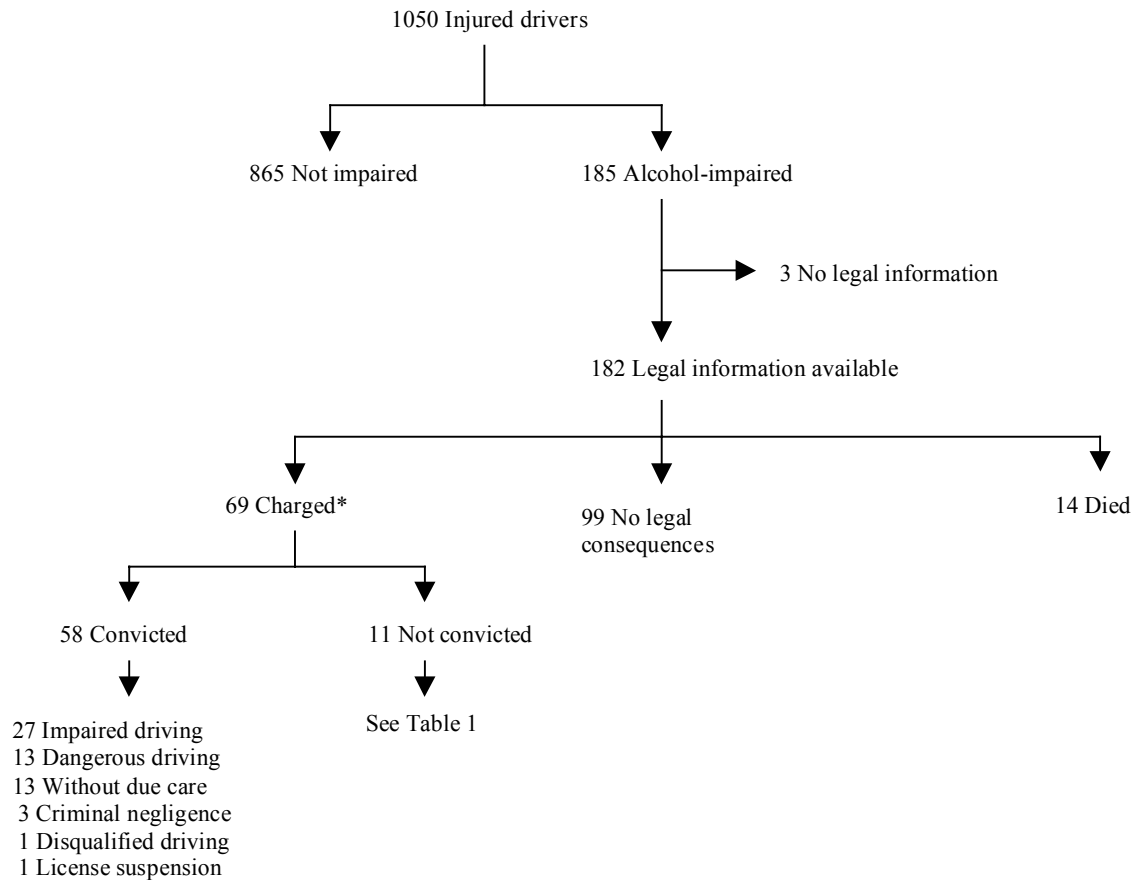


FIGURE 1. Establishment of study cohort and the outcomes.

*May be an underestimate, please see Interpretation

able, only 58 (35%) were convicted of an offence. Overall, 82 convictions were received by these 58 IAIDs. Forty-six IAIDs were convicted of at least one Criminal Code of Canada offence, 27 of which were for impaired driving, 12 pleaded to lesser charges under the Highway Traffic Act, in addition, one has a pending trial, and one has a warrant for arrest. In general, IAIDs who had less severe injury, and whose actions were associated with harm to others were more likely to be convicted of an offence as shown in Table 2. A multivariable logistic regression model was developed to determine independent factors associated with conviction among surviving impaired drivers of motor vehicle crashes. The model ($n=168$) had good discrimination (area under receiver operator character-

istic curve 0.82) and calibration (goodness of fit $P=0.4$). Increasing severity of injury was associated with lower risk, and causing injury to another and involvement in the latter half of the study period were associated with a higher risk of conviction as shown in Table 3.

Discussion

Drinking and driving is an all-too-common problem and a leading contributor to fatalities and serious injuries on our roads.¹¹ This study revealed that, in the Calgary regional health-care system, over half of the trauma population who had had a BAC tested, had been consuming alcohol. Seventy-seven percent of patients were legally intoxicated and 24% of these le-

TABLE 2. Factors associated with conviction of a criminal offence among impaired drivers surviving major traumatic vehicle crashes.

Factor	Conviction (n=55)	No conviction (n=113)	RR (95% CI)	P
Male	47 (85%)	95 (84%)	1.02 (0.89-1.16)	1.0
Median age (IQR)	29 (23-36)	33 (24-32)	-	0.09
Median ISS (IQR)	21 (14-29)	24 (17-33)	-	0.11
ICU admission	19 (35%)	55 (49%)	0.71 (0.47-1.07)	0.10
Injured victim	24 (44%)	5 (4%)	9.86 (3.98-24.45)	<0.001
Killed victim	10 (19%)	0	-	0.0001
Calgary vs. other	38 (69%)	57 (50%)	1.37 (1.06-1.77)	0.03
Ethanol level \pm SD	201.6 \pm 77.9	191.1 \pm 64.2	-	0.4
Second half vs. first half of study period	45 (82%)	67 (59%)	1.38 (1.13-1.68)	0.005
Median days of hospital stay	8 (IQR, 4-15)	13 (IQR, 6-27)		0.01

TABLE 3. Logistic regression modeling of factors associated with conviction among impaired drivers surviving major trauma.

Factor	Odds Ratio (95% confidence interval)	P
Injured victim	19.82 (6.45-60.90)	<0.0001
Second half study period	4.01 (1.59-10.13)	0.003
ISS (per point)	0.95 (0.91-0.99)	0.013

gally intoxicated patients were drivers. According to the Criminal Code of Canada, these drivers have committed a criminal act. However, this study revealed that nearly 60% of IAIDs were not charged. Of the surviving IAIDs, only 34% suffered major legal consequences, and only 15% were convicted of an alcohol-related driving offence. Multivariable logistic regression analysis revealed that increasing severity of injury was associated with a lower risk of conviction. Although there are multiple reasons as to why so few IAIDs suffer legal consequences, the simplest explanation is that, solely by virtue of being injured, these patients are thought to have been punished.

This perception is neither in the best interest of the IAID or society, nor new. The perception that admission to hospital provides a safe-haven for alcohol-

impaired drivers who were involved in an MVC has been suggested previously.⁹ Studies over the past 20 yr reported that alcohol-related conviction rates for IAIDs ranged from 0-63%. Convictions rates for IAIDs have generally increased since the first report by Maull *et al.* in 1984 in which no IAID received an alcohol-related conviction. Maull *et al.* discovered that of 56 injured drivers with a mean BAC of 230 mg/dL, none received alcohol-related convictions. Notably, during the same time period, 12,200 driving under the influence of alcohol (DUI) arrests were made with an average conviction rate of 31%. Based on this rate, 17-18 DUI convictions were expected in their study group.⁶ In the 20 yr since this paper was published, have things changed? Several studies have shown that there has been an increase in the convic-

tion rate, anywhere from 10 - 63% of IAIDs received convictions.^{7,8,12-15} However, in 2004, Biffi *et al.* revealed that 80% of drivers from Rhode Island admitted to a Level I Trauma Center with a BAC ≥ 100 mg/dL were not charged with a traffic offence, and only 9% received a DUI conviction.⁹ In comparison with this most recent study from the United States of America, we had a slightly higher conviction rate for DWI, and more IAIDs who were charged, Albertan impaired drivers are almost as unlikely as their neighbours to the south to suffer legal consequences. The low conviction rate seen in southern Alberta is consistent with a study from Vancouver, BC in which 11% of impaired drivers were convicted of impaired driving¹⁶.

While Pursell *et al.* addressed reasons why convictions rates are low, they were unable to comment on whether IAIDs were not charged or not convicted. Our study has shown that if charged, 84% of IAIDs are convicted, whereas 59% were never charged. Hence we believe that part of the problem is that IAIDs are not being charged. The barriers to criminal charges, including difficulties in identifying that a driver was intoxicated, challenges in obtaining legal blood samples, and general lack of resources in processing such charges outlined previously¹⁶ could contribute to the low number of charges being laid in our health region.

The mean BAC of intoxicated drivers was 190 mg/dL, and this is over twice the legal limit. Yates *et al.* state that "it is generally considered that a patient who presents for medical treatment with a BAC over 200mg% [200mg/dL] has an alcohol problem..."¹⁷. Such elevated concentrations of blood alcohol leads to speculation that a number of the drivers in this study have developed a certain alcohol-tolerance associated with prolonged and chronic use. Thus, this patient population may be comprised of a number of people who have alcohol use disorders. Unless the issue of a potential underlying alcohol use problem is addressed, what is to stop this patient from drinking and driving again? The knowledge that it is illegal to drive with a BAC >80 mg/dL has proved not to be a deterrent and, with a low likelihood of suffering a legal consequence

if one drinks, drives and only injures oneself, what is to stop recidivism?

Admission to hospital for an alcohol-related injury provides an opportunity to screen for substance abuse. Because alcohol plays an important role in trauma, the American College of Surgeons Committee on Trauma has made it a requirement that American Level I trauma centers screen for alcohol disorders.¹⁸ A patient who has a BAC above the legal limit could then be screened with tools such as CAGE or the Alcohol Use Disorders Identification Test (AUDIT). A patient who screens positive would have brief intervention sessions with a physician, a social worker or a dedicated team. Previous studies have shown that the most effective means to reduce recidivism appears to be alcohol treatment (eg. brief interventions) combined with legal sanctions, especially for first time offenders^{19,20}. Unless the issue of drinking and driving is addressed with the patient at this critical time, the negative impact of the injury alone may not prevent recidivism.^{6,7,15}

The low rate of blood alcohol testing was both an important result as well as a potential study limitation resulting in a conservative bias. A considerable number of IAIDs may have escaped recognition due to lack of universal testing, as less than half of all patients were tested. Two other limitations include the lack of complete information on three patients as described earlier, and relative brevity in the detail of information on the legal consequences to the IAIDs convicted by the RCMP. As we do not have information on the number of patients charged by the RCMP but never convicted, we may be underestimating the number of IAIDs charged. However, this, does not affect the key endpoint which is conviction.

It has been nearly 20 yr since Colquitt *et al.* suggested making injury to intoxicated drivers a reportable event, emphasizing the responsibility of physicians and the health care system to society over individual patients rights.¹⁰ Mandatory testing of all injured drivers is inherently rational given the immense burden of injury inflicted by such behaviour. Unfortunately, at this time, the impaired driver, especially the alcohol-impaired one remains common, and continues to place society at risk.

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