

Ride-Sharing and Alcohol-Related Motor Vehicle Trauma in Southwestern Ontario

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Abstract

Background Ride sharing represents a new technology that increases the number of transportation options available to city residents. The arrival of ride sharing has been associated with a reduction in alcohol related car crashes in several US jurisdictions, but this association has not been studied in Canada.

Methods A retrospective cohort study was performed using the South Western Ontario Regional Trauma Registry (SWORTR) between April 1 2013 and Mar 31, 2019. The proportion of injuries from alcohol related motor vehicle crashes occurring prior to the availability of ride-sharing services was compared to those which occurred while these services were available.

Results During the study period 1002 patients injured in motor vehicle crashes were entered in the SWORTR, and 858 patients had an alcohol level recorded. 194 patients were injured when ride sharing was available, and 808 patients were injured when it was not available. For the primary outcome, 23.6% of patients were injured with positive alcohol levels with ride sharing available compared to 19.2% of patients without ride sharing services ($p = 0.23$). Evaluating the city of London alone, no significant difference was observed between alcohol related crashes and the availability of ride sharing (27.0% vs 17.0%, $P = 0.173$).

Conclusions Alcohol related motor vehicle collisions remain an important public health concern, and ride-sharing services have been proposed to reduce the rates of such events. Our research failed to demonstrate any reduction in the proportion of injuries resulting from alcohol related motor vehicle crashes in South Western Ontario with the arrival of ride sharing services.

Introduction

Alcohol-related motor vehicle crashes (MVC) are a major cause of trauma and the leading cause of criminal death in Canada, accounting for 33% of fatal MVCs in 2012¹. While the rate of impaired driving has significantly decreased over time, alcohol related motor vehicle collisions remain a major public health concern in Canada with over 70,000 police-reported cases in 2015 alone². Recently, ride-sharing services such as Uber and Lyft have been moving into Canadian cities, with the potential to drastically alter the way Canadians use transportation³. Uber is the most popular ride-sharing service in the world, with billions of trips provided by the service since its inception⁴. Its launch in Canada has been controversial, with pushback coming mainly for its disruptive effect on local taxi ridership⁵. With its well-established disruptive effects on local transportation use, a major question remains whether Uber and services like it will have an impact on rates of alcohol-related MVCs. Uber itself claims that the arrival of its service in a community can reduce drunk driving⁶. Despite Uber's popularity and its domination of global headlines, there is little research on the effect this service has on the rate of alcohol-related motor vehicle trauma, and to the best of the authors knowledge, no previous study has examined this relationship in Canada. Limited research conducted in the United States suggests that in some markets,

the arrival of Uber resulted in a subsequent reduction in alcohol-related motor vehicle collisions^{4,7}, although other studies in the US and South Africa have found no such effect^{8,9}.

The introduction of a cheap, accessible new transportation service has the obvious potential to affect the rates of drunk driving and therefore alcohol-related MVCs in cities where it is introduced¹⁰. The objective of this study was to investigate the effect that Uber's arrival has had on the rate of alcohol-related MVCs in London Ontario – a major Canadian health centre – as well as its surrounding communities. Uber was introduced in London in 2015, and since then it has become a major provider of transportation services in the city^{5,11,12}. We hypothesized that the introduction of Uber would result in fewer drunk drivers and therefore a lower rate of alcohol-related MVC.

Methods

Study Design:

To determine whether a temporal relationship existed between the introduction of ride sharing services in Southwestern Ontario and the rate of alcohol-related MVCs we performed a retrospective cohort study. This study received prior approval from the Western University Research and Ethics board (HREB #112291).

Data Source:

Using the South Western Ontario Trauma Registry (SWOTR) we performed a retrospective analysis of trauma patients involved in MVCs treated at Victoria Hospital in London, Ontario, Canada. Victoria Hospital is the lead trauma center for Southwestern Ontario and serves as a referral center for a catchment area of 1.7 million patients¹³. The majority of the patients involved in motor vehicle crashes in this registry are injured outside of the London, Ontario city limits. The SWOTR is managed by the Canadian Institute of Health Information (CIHI)¹³. Trained data analysts collect and maintain the data within this registry locally and submit monthly reports to CIHI. Patients are included in the registry if either of the following criteria are met. 1) A full trauma team activation was performed; or 2) all of the following apply: the injury severity score (ISS) was greater than or equal to 12, there was an external cause of injury, and the patient was either admitted to hospital, died in the emergency department, or was evaluated in the emergency department but not admitted to hospital¹³.

Patient Selection and Data Extraction:

The SWOTR was searched for patients involved in motor vehicle crashes treated at Victoria Hospital between April 1, 2013 to March 31, 2019 Pediatric patients, pedestrians struck, and cyclists struck were excluded from the analysis. Motorcycle crashes were included and drivers operating a motorcycle were

classified as drivers for the analysis. All patients were included in the primary analysis regardless of position in vehicle (driver vs passenger). Blood alcohol level, age, gender, position in motor vehicle, ISS score, length of stay, discharge status, trauma team activation, date, and location of car crash were all abstracted from the registry.

Outcome:

In Ontario, Uber has been the first ride-sharing platform to arrive in most jurisdictions¹⁴. For this reason, we used the arrival of Uber services in the community within which the crash occurred as the date for which ride sharing services commenced. All periods after the arrival of Uber in a community were considered periods for which ride sharing services were available.

The primary outcome was the proportion of patients injured in alcohol related motor vehicle crashes during the period prior to the arrival of ride sharing services compared to the period where ride sharing services were available. The null hypothesis was that there would be no observed difference between these two periods.

For the primary analysis, all patients who arrived with a positive blood alcohol screen, regardless of level, were considered to be involved in an alcohol related car crash. Secondary analysis was performed specifically on patients who were in the driver position of the motor vehicle and had positive blood alcohol concentrations, as well as all patients arriving with blood alcohol levels above the legal limit. An analysis was also performed comparing crashes that occurred in regions that have never had access to ride sharing services compared to those regions that were serviced by Uber at any time during the study period. Descriptive statistics were calculated for all variables. Categorical data are reported as percentages and compared using Pearson's chi-square test. Analysis of characteristics associated with a positive blood alcohol level was performed using logistic regression. Significance levels for all statistics reported were set at 0.005. Statistical analysis was performed using SPSS vs. 24 (Chicago, Illinois).

Results

Between April 1, 2013 and March 31, 2019, a total of 1002 patients involved in motor vehicle crashes were treated at Victoria Hospital and included in the South Western Ontario Trauma Registry. Of these 1002 patients, 858 had a blood alcohol level recorded at the time of their presentation to hospital. 684 patients were motor vehicle drivers (cars and trucks), 162 patients were motorcycle drivers and the remaining 174 passengers were categorized as all motorized vehicle types (Table 1). At the time of the crash 808 patients did not have ride sharing available in their region compared to 194 patients who did have access to ride sharing. 731 patients were injured in rural communities none of which had ride sharing and 271 were injured in urban communities.

Evaluating the primary outcome of proportion of injured patients with positive blood alcohol screens, there was no significant difference in events involving alcohol during the time period where ride sharing

services were available compared to the time period where ride sharing services were unavailable. During the ride sharing period, 23.6% (+/-6%) of patients injured in a motor vehicle crash had positive blood alcohol screens, whereas for periods and locations where ride sharing was not available, 19.2% (+/-6%) of patients injured in MVC had positive alcohol screens (P = 0.230).

Among the patients injured in a MVC, 678 patients were operating the motor vehicle and had a blood alcohol level drawn at the time of their presentation to hospital. Among these patients, 18.4% of those injured prior to the availability of ride sharing had a positive alcohol level, compared to 25% of drivers with ride-sharing available in their city (P = 0.106).

Evaluating crashes occurring within the city limits of London alone there were 169 patients with alcohol levels recorded. Again, no difference was seen during the period where ride sharing services were available compared to the period without ride sharing services (27.1% vs 17.0%, P = 0.173).

Since residents of rural areas may have fewer transportation options available to them a secondary analysis was performed comparing injuries occurring in rural communities vs urban communities. Among patients injured in a motor vehicle crash in an urban community 20.6% had a positive blood alcohol screen compared to 19.8% of crashes originating in rural communities (P = 0.801).

Finally, a logistic regression was performed with age, gender and the availability of ride sharing services as the independent variable. Only gender was independently associated with a positive blood alcohol level at the time of presentation to hospital, with male gender resulting in an odds ratio of 1.65 times more likely than female gender (P = 0.021).

Table 1

Category	n
All Patients	1002
All Patient with EtOH levels recorded	858
Motor Vehicle Drivers	684
Motorcycle Drivers	174
Drivers with EtOH levels recorded	678
Rural Communities	731
Urban Communities	271
Direct from scene	400
Referred from community hospital	458

Table 2

Category	%	P
All Patients		
Ride share available and Positive EtOH	23.6%	0.23
Ride Share unavailable and Positive EtOH	19.2%	
Ride share available and above legal limit	16.0%	0.379
Ride Share unavailable and above legal limit	20.4%	
Urban and Positive EtOH	20.6%	0.801
Rural and Positive EtOH	19.8%	
Ride share available and Direct with positive EtOH	21.8%	0.267
Ride share available and Indirect with positive EtOH	18.6%	
Drivers		
Ride share Available and Positive EtOH	25.0%	0.106
Ride Share Unavailable and Positive EtOH	18.4%	
Ride share available and above legal limit	16.6%	0.819
Ride Share unavailable and above legal limit	17.5%	
Urban and Positive EtOH	16.7%	0.978
Rural and Positive EtOH	16.8%	
Ride share available and Direct with positive EtOH	36.80%	0.477
Ride share available and Indirect with positive EtOH	25.90%	

Discussion

As ride-sharing services continue to make inroads into new Canadian markets, a greater understanding of their impact on road safety is of interest to the Canadian trauma community. These services appeal to younger, technologically savvy customers who continue to abandon traditional taxi services in favour of smartphone-friendly ride-sharing^{15,16}. It is well-known that young adults engage in higher levels of alcohol consumption and suffer disproportionate rates of motor vehicle trauma^{2,17-19}. Taken together, these two factors would suggest that services which appeal to young people and which provide a fast and simple means of obtaining transportation might also reduce the number of drunk drivers on the road. Indeed, this is an argument made by Uber itself⁶. However, despite the ubiquity of ride-sharing services, this effect has not been widely studied.

In this retrospective cohort study, we examined the effect that Uber has had on the rate of alcohol-related MVC injuries in Southwestern Ontario following its arrival in London, using data obtained from the SWORTR for the period between April 1 2013 and Mar 31 2019. We hypothesized that the relatively large impact Uber has had on transportation in London would be reflected by reduced rates of alcohol-related MVC trauma. We first examined all cases of MVC-related trauma which occurred during the study period in Southwestern Ontario, for which London is the major trauma centre. Our results did not demonstrate a significant difference in the proportion of patients injured in alcohol-related MVCs prior to the arrival of Uber compared to those injured after Uber began operations in London. In order to better capture the patients who would be most likely to directly benefit from increased transportation availability, we performed a secondary analysis for those patients specifically listed as being the driver at the time of the accident. Again, no significant difference was observed.

Lastly, we sought to determine whether there were other factors that could be associated with higher rates of alcohol-related MVC trauma. We therefore performed a logistic regression using positive alcohol level as the dependant variable and age, gender, and availability of ride-sharing as the independent variables. Among these, only male gender was independently associated with a positive alcohol level ($p = 0.021$). This result is consistent with Canadian data showing that men are more likely to drink and drive than women².

To our knowledge, this is the first study in Canada to investigate the impact that ride-sharing services have had on alcohol-related MVC trauma. Studies in other countries have reached mixed conclusions on this topic. Results from the US and elsewhere have demonstrated regional differences in the impact of ride-sharing services, with some areas experiencing a reduction in MVCs while others did not^{4,7-9}. Here, we have shown that the introduction of ride-sharing services was not correlated with a change in the rate of alcohol-related MVC trauma in one Canadian metropolitan area. Given the significant impact Uber has had on the transportation environment in London, we expected that there would be a concurrent reduction in the number of people who choose to drink and drive, and thus reduced alcohol-related MVC trauma cases. However, in contrast to data from the U.S., our results do not support our hypothesis. Taken together, our results add to the literature supporting location-specific effects of the introduction of ride-sharing services. Further research is needed to elucidate the role of ride-sharing in other areas of Canada.

Conclusion

Alcohol-related MVC trauma remains an important public health concern. New ride-sharing services have been proposed to reduce the rates of alcohol-related MVCs, and their impact on traffic safety is therefore of interest to the trauma community. Our research failed to demonstrate a reduction in the proportion of alcohol-related MVC injuries in Southwestern Ontario following the arrival of ride-sharing services. This study highlights the need for further investigation in order to elucidate the impact these services have had in other Canadian metropolitan areas.

Abbreviations

SWORTR

South Western Ontario Regional Trauma Registry

MVC

Motor Vehicle Crash

CIHI

Canadian Institute of Health Information

ISS

Injury Severity Score

Declarations

Ethics declarations

Ethics approval and consent to participate

This study received prior approval from the Western University Research and Ethics board (HREB #112291). Consent to participate waved by the Western University Research and Ethics Board for this retrospective study

Consent for publication

Patient consent for publication was waved by the Western University Research and Ethics Board for this retrospective study.

Competing interests

The authors declare that they have no competing interests.

Availability of supporting data

Anonymized data may be made available upon written request of the authors

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Authors' contributions

RH, ML, and RL All contributed to study conceptualization, methodological design, data gathering, data analysis, interpretation of results and manuscript preparation.

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