Epidemiology, Societal Cost, and Orthopaedic Injury Patterns Comparing Motorcycle and Moped Collisions

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Introduction: Moped collisions among patients with revoked driver’s licenses are a significant public health problem. This study was designed to analyze differences in demographic characteristics and societal costs between moped and motorcycle drivers involved in a collision. The first hypothesis was that moped drivers were likely to have a previous criminal history and therefore used mopeds as their only legal means of transportation. Additionally, moped drivers were more likely to have a history of previous criminal convictions, including driving while intoxicated, than motorcycle drivers. Third, moped drivers would be less likely to be employed and less likely to have health insurance compared with motorcycle drivers. Additionally, that moped drivers would have a longer length of stay, accumulate a larger hospital bill, and pay back a smaller portion of their bill. Finally, that these cohorts differed in both injury patterns and blood alcohol level on admission.

Methods: The medical records of all patients who were admitted to the trauma service at our institution following motorcycle or moped accidents were retrospectively reviewed from the years 2005 to 2010. These patients were then cross-referenced with data from the Department of Corrections public database to determine any previous criminal convictions on record within the state. To analyze the data, we calculated the relative risk of an operator involved in a moped accident having a DWI (driving while intoxicated), possession, revoked license, or other serious driving conviction versus the operator in a motorcycle accident meeting the same criteria. The injury diagnoses and blood alcohol level were also reviewed. The anatomic distribution of injuries was evaluated as well. For analysis, the following injury types were grouped: spinal fracture or injury (cervical, thoracic, or lumbar), pelvic fractures (sacrum, pelvic ring, or acetabulum fractures), upper extremity fractures (including clavicle and scapula fractures), lower extremity fractures, head injury (skull fracture, face/scalp wound, brain injury), thoracic injury (lung injury, pneumothorax, rib fractures, aorta/mediastinum injury), and abdominal injury (e.g. viscera injury, abdominal aortic injury). For categorization, patients were classified as having a given injury type if they had one or more of the injuries listed as subtypes within that group. The rates of these injuries were compared between the two cohorts. Information was gathered to determine employment, insurance status, length of stay, length of ICU stay (if applicable), total charges accrued during the hospital stay, and charges recouped by the hospital.

Results: There were 1590 total patients; 938 patients involved in a motorcycle accident, 652 in a moped accident. At the time of admission, the mean blood alcohol level of motorcyclists was 53.1 mg/dL compared with 99.5 mg/dL for moped drivers; p<0.05. 35.5% of moped drivers had a blood alcohol level exceeding the legal limit versus 19% of motorcyclists; p<0.05. Spinal injury rates were similar between the two cohorts; 220 motorcyclists (23.5%), 160 moped drivers (24.5%). Pelvic injuries were seen more commonly in motorcyclists (N=128; 13.7%) than in mopeds (N=57; 8.7%), p=0.003. Upper extremity fractures were more common in motorcyclists (N=380, 40.5%) than in moped drivers (N=178, 27.3%), p<0.001. Abdominal injuries and thoracic injuries were not statistically significantly different. Head injuries were more common in moped drivers (N=280, 37.1%) than in motorcyclists (N=318, 33.9%), p<0.001. The average summary of charges were similar between the motorcycle group ($56,924.63) and the moped group ($56,733.77), p=0.22. However, on average the motorcycle group paid a significantly higher portion of their total charges ($25,136.09, 44.2%) compared to the moped group ($17,408.12, 30.7%), p<0.001. Motorcycle drivers spent on average one extra day in the hospital compared with moped drivers (8.2 days vs. 6.9 days, p=0.003). However, the length of ICU stay did not differ significantly, p=0.457. Without consideration of alcohol consumption, being African American (OR=1.74, 95% CI 1.15-2.62) and being discharged home instead of to a rehabilitation facility (OR=1.27, 95% CI 0.93-1.75) were more predictive of being a moped driver, while being employed (OR=0.58, 95% CI 0.47-0.73) and having insurance (OR=0.49, 95% CI 0.37-0.65) were more predictive of being a motorcycle driver. There was an incidence of DWI, possession, revoked license, or other serious driving conviction of .646 for moped operators, and .134 for motorcycle operators; the relative risk is 4.82 for a moped operator to have a prior conviction of this type compared with a motorcycle operator who is involved in a collision.

Discussion: Significant differences exist in motorcycle and moped drivers involved in traffic collisions in terms of blood alcohol levels and injury patterns, representing a significant public health concern. Moped drivers are significantly more likely to be over the legal limit for intoxication and more commonly sustain head injuries. In addition, there are significant differences in demographic factors and societal costs between motorcycle and moped drivers involved in a collision. Moped drivers are less likely to be employed, less likely to have health insurance, and less likely to repay their hospital charges compared with motorcycle drivers. These differences are possibly explicable in terms of decreased regulations and restrictions that exist for

operating mopeds.

**Significance:** Moped drivers’ criminal history, alcohol intoxication, head injuries, and lack of repayment of hospital bills result in a greater burden on the healthcare system than that of motorcycle drivers. States without laws regulating the legal use of a moped should adopt stricter laws that require a valid driver’s license for the operation of a moped; this could improve transportation safety and reduce the cost of moped collisions to society and to the healthcare system. The fact that moped operators were significantly more likely to have a previous alcohol-related conviction or other conviction related to poor driving is also an indicator that moped drivers should have legal requirements for operation of this equipment to avoid them being a legal mode of transit for intoxicated drivers with a history of criminal conviction.

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**References:**

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