Injuries sustained by passengers travelling in the cargo area of light delivery vehicles

J B Howlett, MB ChB; **C Aldous**, PhD; **D L Clarke**, FCS (SA), MMedSci, MBA, MPhil

Pietermaritzburg Hospital Complex, KwaZulu-Natal, South Africa

Corresponding author: *D L Clarke (damianclar@gmail.com)*

Introduction. Despite its inherently dangerous nature, the practice of transporting passengers in the cargo area of light delivery vehicles (LDVs) is widespread in South Africa.
Objective. To review the patterns and outcome of injuries associated with events involving LDVs transporting passengers.
Methods. All patients presenting to the Pietermaritzburg Metropolitan Trauma Service in KwaZulu-Natal Province following an event in which they had been travelling in the cargo area of an LDV between January 2011 and December 2012 were included in the audit.
Results. A total of 66 patients were treated during the study period; 35% were children under the age of 18, and 90% were ejected from the LDV during the incident. The mean injury severity score (ISS) was 23. Collision events were associated with a higher mean ISS (33) than non-collision events (15) (p=0.008). The region most commonly injured was the head and neck, and 11% of victims sustained a permanent disability. The patients collectively spent 873 days in hospital and 70 days in an intensive care unit, and underwent 17 operations.
Conclusion. Transporting passengers in the cargo area of an LDV is dangerous, as ejection from the vehicle resulting from a collision is associated with significant morbidity and mortality. Legislative initiatives to prevent this practice are required as part of an ongoing comprehensive injury prevention programme.

S Afr J Surg 2014;52(2):49-52. DOI:10.7196/SAJS.1963

South Africa (SA) experiences a major burden of injury related to road traffic crashes (RTCs). This situation is not unique to SA and is in fact widespread throughout the developing world. It is estimated that globally each year over 1.2 million people die and up to 50 million are injured as a result of RTCs.[1-4] The burden of disease is disproportionally distributed, however, with 90% of these deaths and morbidities occurring in middle- and low-income countries, where less than half of the world's motor vehicles are owned.[1-4] Despite the fact that only 4% of Africa's population own motor vehicles, compared with 60% of the population in the developed world, our continent has the highest motor vehicle accident-related mortality rate in the world at 28/100 000 population.[1-4] The World Health Organization (WHO) estimates that as a result of urbanisation and increased vehicle ownership in developing countries, there will be an 80% increase in RTC-related mortality over the next decade and that RTCs will rise from the ninth to the fifth leading cause of death worldwide over the same period.[1-4] The situation in SA supports this prediction, with local traffic statistics demonstrating a steadily increasing number of registered vehicles and drivers on the roads. It is estimated that there were 13 802 deaths from RTCs in SA during 2011.[1-6] The SA mortality rate from RTCs is 27/100 000, significantly higher than the world average.[1-6] Of the 13 802 people who died in RTCs in SA in 2011, 20% were travelling in a light delivery vehicle (LDV).[5,6] Injury prevention programmes are urgently required to attempt to reduce the incidence and severity of RTCs. The WHO Decade of Action, which aims to reduce road traffic deaths and injuries across the world between 2011 and 2020, is one such campaign.[1-6] The healthcare profession should play a central role in the design and implementation of such programmes. Identifying appropriate targets for legislation designed to reduce RTC-related morbidity and mortality requires audit and surveillance.

LDVs and passenger transportation

LDVs are known as *bakkies* in SA, pick-up trucks in North America and open-bed trucks elsewhere. LDVs are extremely popular in SA, and more than 50 000 new LDVs are registered annually.[5,6] LDV-related collisions have been shown to result in a higher mortality rate than accidents involving sedans.[4-6] If there is a collision, travelling in the cargo area of an LDV is associated with a mortality rate double that associated with travelling in a closed sedan.[6] Despite these risks, people are commonly transported in the cargo area of LDVs on SA roads. The danger of this practice has been recognised, and it is prohibited in Europe and Australasia. The current laws in SA are unclear and poorly enforced. The law states that passengers can be transported in the cargo area of a goods vehicle, provided the sides are enclosed to a height of 350 mm if passengers are seated and 900 mm if they are standing.[5-7] It is, however, illegal to transport any person in the cargo area together with goods or for reward, or to transport employees in the course of their employment.[5-7] These restrictions are rarely enforced, and there are numerous reports of horrific LDV accidents in the media.[8-13]

Objective

This prospective audit describes the demographics of passengers injured while travelling in the back of LDVs, and the mechanism and spectrum of the injuries. It is intended that the data should inform public health interventions designed to prevent injury.

Setting

The Pietermaritzburg Trauma Service (PMTS) aims to provide resources and expertise, as well as strategic and political leadership in trauma care, to the city of Pietermaritzburg and the western rural health districts of KwaZulu-Natal Province (KZN). Pietermaritzburg is the capital of KZN and the largest city in the western part of the province. It has a population of 1 001 000 and is served by a tertiary hospital (Grey's), a regional hospital (Edendale) and a district hospital (Northdale). There are three private hospitals in the city. Western KZN is predominantly rural, with a population of approximately two million people, and consists of four health districts.[14]

The Pietermaritzburg Trauma Registry

The PMTS runs a comprehensive electronic trauma registry.[14] Ethical approval to maintain an electronic medical registry system has been obtained (ethics no. BCA221/13 BREC UKZN). The registry is a hybrid electronic medical record system that directly captures data into the database during patient admission, during operations and on discharge. Specific ethical clearance was obtained for collecting clinical data on people injured as a result of travelling in the cargo area of an LDV (ethics no. BE 159/11).

Methods

All patients presenting to the PMTS between January 2011 and December 2012 following an accident when they had been travelling in the cargo area of an LDV were included in the study. The primary author (JBH) recorded demographic details and information on the mechanism and pattern of injury, and interviewed each patient included in the study. The trauma registry was also cross-checked for patients who met the inclusion criteria. When necessary, a telephonic interview was performed in conjunction with clinical record review. The data were analysed using a standard statistics package, with the assistance of a qualified statistician.

Definitions. A collision event involved a collision between an LDV and another vehicle or a stationary object. A non-collision event involved passengers being ejected from or falling out of an LDV without a collision.

Results

Sixty-six patients involved in 53 events were identified over the 2-year study period. There were 15 collision events, 28 non-collision events and ten events in which the mechanism was uncertain. For 30 of the 53 events, patients were able to state how many people had been in the back of the LDV with them. There were a total of 217 people in the back of 30 LDVs, an average of just over seven people per LDV. In 42 cases the time of the accident was verified: 35 events occurred during the day and seven at night. A total of 66 patients were treated by the PMTS following an event. There were 43 males (65.2%), the mean age of the patients was 20 years (range 1 - 60), and 23 (34.8%) were children under the age of 18 years. Of the 66 patients, 60 (90.9%) were ejected and four jumped from the vehicle, and two were not ejected. In two cases the LDV had a hard canopy over the cargo area with passengers inside. In one of these cases all three passengers were ejected despite the presence of the canopy, and in the other the patient sustained minor injuries while inside. In 35 cases the type of road was identified: eight patients were injured on gravel farm roads, 18 on secondary tar roads and nine on a highway. Thirty-eight events occurred during the summer and 28 during winter. Fig. 1 schematically describes the patient cohort.

Injury pattern and outcome

The mean injury severity score (ISS) was 23. Of the patients 59 were admitted and seven discharged. The mean hospital stay was 15 days, and 13 patients were admitted to an intensive care unit (ICU). All the patients requiring ICU admission had been ejected from the vehicle. The mean ICU stay was 5 days. Thirteen patients required a total of 17 operations. Thirty-eight patients sustained head and neck injuries, 17 had chest, pelvic and extremity injuries, 12 had abdominal injuries and eight had facial injuries (Table 1). Eleven patients died on the scene. Of the 66 patients who reached hospital, five died (7.6%) and seven (10.6%) sustained permanent disability including paraplegia and quadriplegia. The patients in the collision group had a mean ISS of 33, as opposed to 16 in the non-collision group (p=0.008). The mean ISS was 23 for patients who were ejected from the vehicle, 9 for those who jumped out and 5 for those who were not ejected. However, owing to the high rate of ejection this difference was not significant (p=0.223).

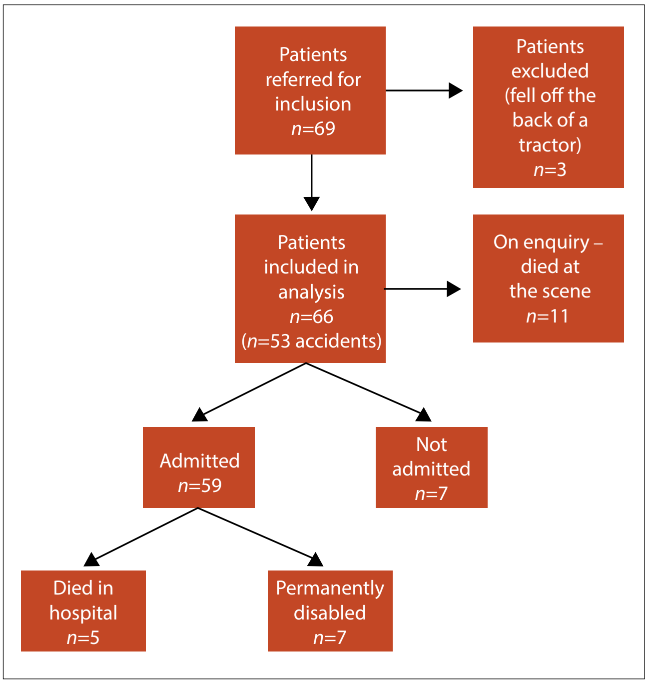

Fig. 1. Summary of data acquisition.

Table 1. Abbreviated injury severity score (AIS)

Organ system	*n*	Mean AIS
Head and neck	38	3.1
Face	8	2.1
Chest	17	3.6
Abdomen	12	3.7
Pelvis and extremities	17	3.4
External	34	1.8

Discussion

Our data indicate that travelling in the cargo area of an LDV is associated with significant risks. We found a high rate of ejection of passengers from the vehicle (90.9%), significantly higher than would be expected in RTCs involving closed sedan-type vehicles. Ejection from a vehicle is a significant mechanism of injury and associated with a diverse injury pattern and an increased risk of mortality and permanent disability.[15-19] In our cohort ejection was associated with a much higher mean ISS and an increased need for ICU admission compared with non-ejection. Collision events had a statistically significantly higher mean ISS than non-collision events.

Passengers involved in RTCs while travelling in the back of an LDV also have a significant chance of sustaining a devastating neurological injury – 10.6% of our patients (7/66) had permanent disability, including quadriplegia and paraplegia. The commonest region injured was the head and neck. This is consistent with the findings of other case series, which found the head and neck to be the most common region injured in incidents involving passengers travelling in the back of a flat-bed truck.[15-18] Although the head was the commonest site of injury, severe injuries to the torso, pelvis and long bones were also commonly sustained. Children and young men were the groups most affected. The majority of the events occurred during daylight hours, indicating that many children and young adults ride in the back of an LDV to get to school and to work.

The injuries resulted in significant costs to the healthcare system, amounting to a total of 873 days in hospital, including 70 days in an ICU, and 17 operations. The economic impact of these injuries to broader society is more difficult to quantify, but is probably significant.

Study limitations

One of the limitations of the study is that the patients were identified at referral hospitals. Passengers who were either not injured badly enough to be admitted to hospital or who died at the scene of the accident may therefore not have been included. This was mitigated by attempting to establish the number of casualties and deaths at each scene. However, this methodology may have led to an over-estimation of morbidity, as only the more severely injured patients came to hospital, and an under-estimation of incidence, as mildly injured passengers did not.

Interventions

The three primary interventions to prevent and reduce RTCs are engineering, education and legislation. Other than manufacturing double-cab vehicles to accommodate passengers inside the vehicle, little has been done to deal with the problem from an engineering point of view. Canopies do not offer significant protection, and occupants of enclosed cargo areas have a fatality risk 1.8 times higher than the occupants of the cab.[4-7,15-19] In our series, three of the four patients travelling in an LDV with a canopy were ejected. Although not statistically significant, this highlights the fact that canopies do not protect against ejection. Furthermore, the back of an LDV is a hard shell without seatbelts, airbags or protective padding, and patients are at risk of a 'second collision' even if they are not ejected, as demonstrated by one of the patients in our series.

Education is important, and should be targeted at schoolchildren and their parents as well as young working people. Farm owners and labourers also need to be educated (eight of the injuries in our series occurred on farm roads). However, it has been demonstrated repeatedly that legislation is more effective than education alone in bringing about changes in behaviour, and the introduction of effective road safety legislation is one of the core principles laid out in the WHO Decade of Action campaign to reduce RTCs.[20, 21]

The majority of the LDVs in our series were overloaded, with an average of just over seven people travelling in the cargo area of each vehicle in the cases for which information on numbers of passengers was available. LDVs are only licensed to carry two to three passengers. A driver carrying passengers in the back of an LDV can be fined for overloading, but this is rarely enforced. Nevertheless, preventing overloading alone will not be sufficient, and legislation that specifically prohibits travelling in the cargo area of an LDV may be necessary. The introduction of legislation to enforce the wearing of seatbelts and motorcycle helmets has had dramatic effects on road traffic-related mortality and morbidity, and it is hoped that this can be replicated by the introduction of legislation to prevent the transportation of passengers in the back of LDVs.[20,21]

Conclusion

Passengers travelling in the cargo areas of LDVs are particularly vulnerable in the event of a collision, and it is unsafe to transport passengers in this manner. Injuries sustained while travelling in the back of an LDV result in significant preventable morbidity and mortality. A multifaceted injury prevention programme must include educational initiatives and obtain legal sanction if it hopes to reduce road traffic-related mortality and morbidity.

REFERENCES

1. Parkinson F, Kent S, Aldous C, Oosthuizen G, Clarke D. Road traffic crashes in South Africa: The burden of injury to a regional trauma centre. S Afr Med J 2013;103(11):850-852. [http://dx.doi.org/10.7196/SAMJ.6914]
2. Parkinson F, Kent S, Aldous C, Oosthuizen G, Clarke DL. Patterns of injury seen in road crash victims in a South African trauma centre. S Afr J Surg 2013;51(4):131-134. [http://dx.doi.org/10.7196/SAJS.1627]
3. Parkinson F, Kent SJ, Aldous C, Oosthuizen G, Clarke D. The hospital cost of road traffic accidents at a South African regional trauma centre: A micro-costing study. Injury 2014;45(1):342-345. [http://dx.doi.org/10.1016/j.injury.2013.04.007]
4. World Health Organization. Violence and Injury Prevention. 2009. www.who.int/violence_injury_prevention/road_safety_status/2009 (accessed 3 August 2012).
5. Road Traffic Management Corporation. Arrive Alive – Road Traffic Report 2011. 31 March 2011. http://www.arrivealive.co.za/pages.aspxi=2826 (accessed 3 August 2012).

6. Lehohla P. Road traffic accident deaths in South Africa, 2001-2006: Evidence from death notifications. Statistician-General, Statistics South Africa. Report No. 03-09-07 (2001-2006), 2009. http://www.statssa.gov.za/publications/Report-03-09-07/ (accessed 11 September 2013).
7. Afukaar FK. Speed control in developing countries: Issues, challenges and opportunities in reducing road traffic accidents. Inj Control Saf Promot 2003;10(1-2):77-81. [http://dx.doi.org/10.1076/icsp.10.1.77.14113]
8. looklocal. 11 injured after bakkie overturns. http://www.looklocal.co.za/looklocal/content/en/roodepoort/roodepoort-news-general?oid=7135504&sn=Detail&pid=489967&11-Injured-after-bakkie-overturns (accessed 22 May 2014).
9. ER24. Tag 'bakkie accident'. http://blog.er24.co.za/tag/bakkie-accident/ (accessed 22 May 2014).
10. IOL News. Four pupils killed in bakkie accident. http://www.iol.co.za/news/south-africa/eastern-cape/four-pupils-killed-in-bakkie-accident-1.1482532 (accessed 22 May 2014).
11. Arrive Alive. Amanzimtoti crash between bakkie and eighteen-wheeler leaves one dead – one critical. http://roadsafety.co.za/tag/bakkie/ (accessed 22 May 2014).
12. Arrive Alive. Bakkie vs tree leaves 1 critically injured. http://roadsafety.co.za/2013-01/bakkie-vs-tree-leaves-1-critically-injured/ (accessed 22 May 2014).
13. Accidents.co.za. Twelve school children injured after bakkie crashes into taxi. http://www.accidents.co.za/2012/11/14/tweleve-school-children-injured-after-bakkie-crashes-into-taxi/ (accessed 22 May 2014).
14. Laing GL, Bruce JL, Aldous C, Clarke DL. The design, construction and implementation of a computerized trauma registry in a developing South African metropolitan trauma service. Injury 2014;45(1):3-8. [http://dx.doi.org/10.1016/j.injury.2013.05.013]
15. Anderson CL, Agran PF, Winn DG, Greenland S. Fatalities to occupants of cargo areas of pick up trucks. Accid Anal Prev 2000;32(4):533-540. [http://dx.doi.org/10.1016/s0001-4575(99)00075-5]
16. Anderson CL, Agran PF, Winn DG, Greenland S. Fatalities to occupants of cargo areas of pickup trucks. Accid Anal Prev 2000;32(4):533-540. [http://dx.doi.org/10.1016/s0001-4575(99)00075-5]
17. Agran PF, Winn DG, Castillo DN. Pediatric injuries in the back of pick-up trucks. JAMA 1990;264(6):712-716. [http://dx.doi.org/10.1001/jama.1990.03450060058029]
18. German JW, Klugh A 3rd, Skirboll SL. Cargo area of pickup trucks: An avoidable mechanism for neurological injuries in children. J Neurosurg 2007;106(5 Suppl):368-371. [http://dx.doi.org/10.3171/ped.2007.106.5.368]
19. Bucklew PA, Osler TM, Edison JJ, et al. Falls and ejections from pickup trucks. J Trauma 1992;32(4):468-471. [http://dx.doi.org/10.1097/00005373-199204000-00011]
20. Christoffel T, Agran P, Winn D, Anderson C, Del Valle C. Developing a model law restricting the transporting of passengers in the cargo areas of pickup trucks. J Public Health Policy 2000;21(1):61-81. [http://dx.doi.org/10.2307/3343474]
21. Van Hoving DJ, Wallis LA. Patterns of seatbelt use in different socioeconomic communities in the Cape Town Metropole, South Africa. S Afr Med J 2013;103(9):628-631. [http://dx.doi.org/10.7196/SAMJ.7126]