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exemptions under the road rules to enable rapid response without undue repercussions; however, paramedics can be charged with dangerous or negligent driving. The law explains that during the emergency response, it is a paramedic's duty to operate the vehicle with reasonable care, and to be exempt from the law, it must also be reasonable that the relevant road rule should not apply.

It is undoubtedly difficult to prepare a person to drive under lights and sirens while on the way to a potentially life-threatening injury or illness but it is always a paramedic's first priority to arrive safely at the scene in the quickest possible time. If, unfortunately, an accident does occur, EMSPA members are advised to comply with their employer's requirements and also to contact their EMSPA Regional Liaison Officer for support, advice and possible legal representation.

Manual handling is an important issue raised by many EMSPA members when treating and transporting patients. At the scene of an RTC, this occurs when moving and/or lifting a patient out of a vehicle onto a stretcher and also, on occasion, when lifting the patient from the ground onto a stretcher. Once the patient is on the stretcher, the loading of a stretcher into the vehicle is another manual handling area that potentially causes injury.

Any injuries sustained by a paramedic should be recorded according to the employer's policy, and an EMSPA liaison officer should also be contacted. When a liaison officer is contacted, EMSPA is able to give the support required and monitor trends in workplace incidents, as well as provide vital legal support during the WorkCover process where required.

This monitoring has, in the past, resulted in EMSPA contacting ambulance service management about workplace health and safety issues. EMSPA has petitioned and lobbied ambulance service management to have recurring 'near misses' or potential hazards examined with the goal of changing paramedic practice for the better.

Motor transport and traffic safety in Australian agriculture: A review

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Abstract

In rural communities, motor transport features as a leading cause of on-farm fatalities. The most common agents of injury are quad bikes, farm utilities and two-wheeled motorcycles. This paper describes the current status of knowledge and action in safety associated with on-farm motor vehicle transport, and provides recommendations to reduce this injury burden.

While farm transport has benefited from improvements in design features associated with on-road vehicles, there are specific design approaches that will further enhance safety – for example, minimising the potential for crush injuries from quad bike rollovers. Additionally, as farmers and farm managers are responsible for health and safety in farm work settings, ensuring maintenance of farm roads and laneways, and enforcing compliance with rules relating to speed, passengers and helmet use, will all be important. The road safety industry can play an important role in assisting the small and generally family-based farming businesses to adopt these approaches.

Keywords

Farm vehicle, Farm injury, Farm safety

Introduction

Motor vehicle safety research and initiatives have focused largely on reducing the human and societal toll associated with vehicle use on public roads and highways. The high rate of road traffic deaths of rural relative to urban populations has been well recognised and explored both internationally (for example, [1]) and in Australia [2-4]. In relation to off-road motor transport safety, the focus of attention has been drawn to driveway deaths of children [5-7], and to deaths and serious injury associated with quad bike deaths of children and adults in a range of settings [8].

The problem of traumatic deaths and serious injury on farms due to a variety of different agents of injury is well recognised internationally and in Australia [9]. However, initiatives to improve safety associated with motor vehicle use in agriculture has been limited to improving quad bike safety on farms and, in North America, to risks associated with driving slow-moving farm 'vehicles' on roads [10, 11]. Little attention has been given to the whole issue of on-farm traffic and the interaction between the wide range of motor vehicles and mobile plant.

Most vehicles that are used to transport people and goods on farms are also used on public roads, quad bikes being the key exception. Similarly, items of mobile plant used in agricultural production are sometimes driven on roads between farms. From a user perspective then, both on- and off-farm (or on- and off-road) safety should not be ignored in any serious attempts to improve safety, whether opportunities be in terms of improvement in vehicle characteristics, in operating environments or in human behaviour.

This paper aims to describe the current status of knowledge and action in safety associated with on-farm ground transport vehicles on Australian farms, and recommends action that should be initiated to reduce the burden of injury.

Published papers and reports were identified using Web of Science™ and Medline™ search engines, and Google Scholar™, and keyword combinations of 'injury', 'off-road', 'farm','motor vehicle' and 'traffic'. The literature is somewhat confusing in light of mixed inclusions of vehicles in different classifications of external cause of injury.

On one hand, tractors are specifically included within the classification of Transport Accidents with other vehicles in the External Causes of Morbidity and Mortality in the International Classification of Disease ICD-10-AM [12], rather than within the section on contact with machinery. Hence tractors and some items of mobile plant are included as vehicles in broad transport accident groupings showing cause of death or injury. This is reflected in much of the North American literature relating to slow-moving agricultural mobile plant (tractors and harvesters) on public roads.

On the other hand, occupational health and safety classifications (Type of Occurrence Classification System - TOOCS2.1, May 2002) include tractors within a separate section of 'mobile plant'. This is a more logical placement, as tractors are not primarily designed for driving on roads , nor for pulling or transporting loads or people; rather, they are designed to power mounted or trailed equipment (for example, cultivators, seeders or sprayers) by way of either hydraulic or rotating drive shafts. The National Farm Injury Optimal Dataset has placed tractors within the category of 'mobile plant' [13], and this review has treated tractors as mobile plant and not motor vehicles.

Motor transport injury on Australian farms

The most comprehensive overview of motor vehicle injury and death on Australian farms is found in the chart-book report *Vehicle injury associated with Australian agriculture – The facts 2008* [14]. Motor vehicles made up 34.6 per cent of all injury deaths on farms for the period 2001 to 2004. Table 1 indicates the motor vehicle types that were involved in those deaths, with quad bikes (four-wheeled motorcycles, previously termed all-terrain vehicles or ATVs), farm utilities (pick-ups) and two-wheeled motorcycles comprising the most significant vehicles.

Table 1. On-farm deaths by agent of injury, Australia 2001-2004

Agent of injury death	Number of deaths	Per cent of deaths
Farm vehicle	133	34.6
Truck	9	2.3
Utility	22	5.7
Car	11	2.9
Motorcycle 2-wheel	17	4.4
Motorcycle 4-wheel	51	13.3
Aircraft	11	2.9
Gyrocopter	1	0.3
Helicopter	3	0.8
Farm vehicle other NEC	7	1.8
Unknown	1	0.3
Mobile farm machinery/plant	101	26.3
Farm structure	63	16.4
Animal	26	6.8
Working environment	31	8.1
Fixed plant/equipment	8	2.1
Workshop equipment and materials	10	2.6
Other agents	12	3.1
Total	**384**	**100.0**

Source: Morton C, Fragar LJ, Pollock K. [14].

Quad bike safety

Quad bikes are associated with a large number of deaths and serious injury worldwide, with global focus on deaths and serious injury to children [15, 16], adults and older people [17-19]. The propensity of the vehicle to roll over and crush the rider (and passenger) has been well documented.

Quad bikes are used on farms for a wide range of production activities, including checking water, crops, etc.; mustering stock; spraying weeds; and carrying small loads. Since the late 1990s, the leading agent of vehicle injury death on Australian farms has been quad bikes. Table 2 provides a breakdown of the age of victims related to how the injury occurred that resulted

Table 2. Deaths associated with 4-wheeled motorcycles on farms – Age of victim and mechanism of injury death, 2001-2004, Australia

Mechanism of injury	Age group of victim						Total
	0-9	10-14	15-29	30-54	55+	Unknown	
Passenger							
ATV rolled and pinned victim	2	1					3
Fell off		1					1
Loss of control of ATV and crushed, or other							
Rider							
ATV rolled and pinned victim	2		1	5	15		23
Thrown from ATV after incident		2	4	2	2		10
Loss of control of ATV, crushed or other			1		2		3
Collision with other vehicle					2		2
Loading ATV onto utility				1			1
Knocked by bull, ATV rolled					1		1
Unknown	1				3	3	7
Total	**5**	**4**	**6**	**8**	**25**	**3**	**51**

Source: Morton C, Fragar LJ, Pollock K. [14].

in death. In 27 cases the injury was caused by the quad bike rolling and crushing the victim.

Table 3 shows the activity being undertaken by the victims of on-farm quad bike injury deaths for 2001 to 2004. While for most cases the activity was unknown, mustering stock, spraying weeds and checking were the more common activities being undertaken at time of injury event.

Table 3. On-farm activity being undertaken at time of quad bike injury death 2001-2004

Activity	Number of deaths
Shooting/hunting	2
Checking	5
Mustering	7
Work other	6
Spraying	5
Leisure	1
Unknown	25
Total	**51**

In a summary of all quad bike deaths in Australia, it was noted that the body parts injured and associated with death were most commonly head (28% of cases) and cervical spine and thorax (9%) [20].

Interventions to reduce quad bike deaths on Australian farms

Farmsafe Australia, the peak association of organisations that share an objective of improving safety on Australian farms, established an all-terrain vehicle safety reference group and developed its national strategy to improve quad bike safety in 2004 [21]. In implementing the strategy, a number of television promotions were undertaken and a guideline for farmers and operators was produced [22]. These guidelines have been incorporated into farm safety management resources made available to farmers and managers on the Farmsafe Australia website (www.farmsafe.org.au). Principles for quad bike safety for farmers include:

- Selection of the safe machine to do the job. The quad bike may not be the right machine
- Wearing of a helmet to prevent head injury
- Ensuring that all riders are properly trained to operate and control a quad bike
- Keeping quad bikes well maintained
- Attention to ensure that quad bikes are not overloaded
- No operators under 16 years of age
- No passengers.

More recently, the Heads of Workplace Safety Authorities has assembled the Trans-Tasman Industry Solutions Program Working Party Quad Bikes (Agricultural Industry), which is addressing the issue of quad bike safety on farms in Australia and New Zealand. This group is working to establish solutions across the whole 'hierarchy of control', with a clear focus on the difficult problem of prevention of rollover and crush injuries. Options for improved design and protection of operators, safety training and use of personal protective equipment (particularly helmets) are being examined. This group has a strong record of achieving positive change for improved standards for some agricultural machines (for example, grain auger guarding).

Farm utilities, trucks and cars

Farm utilities (colloquially termed 'utes' in Australia, Figure 1) are typically more open-style vehicles than the North American 'pick up' utility vehicle. They are in constant use by farmers and workers both on-farm and on public roads for getting around the farm and for transporting small- and medium-sized farm items – for example, tools, fencing gear and feed.

Figure 1. Typical Australian farm utility vehicle or 'ute'

Fatalities associated with farm utilities were from all ages. Table 4 indicates the activities being undertaken at the time of injury event and how the injury occurred. Of concern are the six deaths where people were riding unrestrained on the tray-back of utilities, while engaged in shooting or hunting activity.

There are a wide range of heavier trucks used to transport goods on and off farms. All 9 victims of injury death associated with trucks were adults aged over 30 years of age engaged in work. Three of the 9 deaths were associated with hydraulics failure during truck maintenance or repair activity. One death was associated with collision of the truck with another vehicle on farm.

The 11 deaths associated with sedan cars on farms included 2 children under 14 years of age where the child was unrestrained either in a towed vehicle or on the exterior of the car, and 9 adults over 30 years old where the injury event involved loss of control, cars hitting objects and/or rolling over (6 cases). There were 3 cases where the person was out of the car and was run over or crushed by the car.

Interventions to improve ground transport safety on farms

There has not been an Australia-wide approach to specifically address safety of utilities, trucks and cars on farms, although

Table 4. Deaths associated with utilities on farms – activity being undertaken and mechanism of injury death (where known), 2001-2004, Australia

Mechanism of injury	Activity being undertaken							
	Shooting/ hunting	Checking	Vehicle maintenance	Mustering	Work other	Spraying	Watering	Unknown
Passenger								
On back of ute	6							
Sitting on driver's lap/fell out		2						
Other				1				
Bystander								
Run over by utility					2			
Driver								
Got out, run over/crushed		2					1	1
Swerved/lost control						1		2
Mechanic/operator								
Welding explosion			1					
Changing tyre/jack failed			1					
Total	**6**	**4**	**2**	**1**	**2**	**1**	**1**	**3**

Source: Morton C, Fragar LJ, Pollock K. [14].

traffic safety is included within safety checklists, industry-specific guidelines and safety induction guides provided though Farmsafe Australia (see above).

In New South Wales, the NRMA and Farmsafe New South Wales joined forces to produce the leaflet, 'Don't wait till you're at the front gate to put your seat belt on. Seat belts save lives on farms too!' This leaflet has been circulated at farm field day promotions and at all relevant events by both organisations.

Motorcycle safety

Two-wheeled motorcycles continue to be used for mustering stock and getting about many farms. Table 5 shows the age group of the 17 riders of two-wheeled motor cycles who died between 2001 and 2004 on Australian farms. Two cases were associated with use of the motorcycle for mustering, and in 10 cases the motorcycle was most likely being used in leisure activities. The greatest number of deaths associated with two-wheeled motorcycles occurred in young adults and all cases were males.

Table 5. Age distribution of victims of two-wheeled motorcycle injury deaths on farms, 2001-2004, Australia.

Age group	Number of deaths
0-9	1
0-14	2
15-29	10
30-54	3
55+	1
Total	**17**

Helmet wearing to increase motorcycle safety

The key message being promoted to reduce deaths and serious injury associated with two-wheeled motorcycles has been the importance of wearing helmets. Moves have been made by Farmsafe Australia and farmer organisations to develop a single Australian and New Zealand standard for a farm helmet that would be used to protect the head and neck when riding two-wheeled motorcycles, quad bikes and horses. There are many farms where all three forms of transport are used, and such a helmet needs to be comfortable for use throughout the working day and provide ventilation for work in hot conditions.

Data was presented to the Committee of Standards Australia that demonstrated the need and usefulness of such an approach. While a draft standard was produced by the working committee, the standard failed to be adopted by Standards Australia at a higher committee level.

On-farm traffic and mobile plant

Many farms in the broad-acre cropping sector experience heavy on-farm traffic of trucks, utilities, and mobile harvesters and other plant, especially at harvest time. Similarly, traffic around packing sheds can be heavy in fruit and vegetable enterprises. These industries have included guidelines to assist producers in managing traffic safety in their safety guidelines, again available through the Farmsafe Australia website.

Trends

While there have been some general reductions in numbers of ground transport deaths over time (specifically deaths associated with trucks, cars and two-wheeled motorcycles), there has been a dramatic increase in deaths associated with quad bikes and a small increase in deaths associated with farm utilities between the periods 1989-1992 and 2001-2004 (Table 6).

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Table 6. Type of ground transport vehicle causing death on Australian farms in two study periods

Ground transport type	Number deaths 1989-1992	Number deaths 2001-2004
Truck	23	9
Utility	20	22
Car	32	12
Motorcycle 2-wheel	24	16
Motorcycle 4-wheel	4	51

Source: Fragar L, Pollock K, Morton C. [9]

Discussion

Internationally, with the exception of New Zealand and Australian work addressing quad bike safety, there has been no strategic focus on the problem of ground transport injury and deaths on farms. This review has only considered deaths, but serious injury associated with transport is also a major problem, clearly described by reference to hospital admissions and workers' compensation claims [14]. Clearly the work of the Trans-Tasman Industry Solutions Program Working Party Quad Bikes should be supported strongly. However, broad strategies are also appopriate.

Farm transport safety has benefitted from the improvements in safety design features of vehicles used on public roads – cars, utilities and trucks. However, many of these potential benefits are not being realised in the farm setting (for example, seat belts), as responsibility for safety on farms rests with farmers and farm managers under occupational health and safety regulatory arrangements. There is little or no compliance activity to ensure people are restrained in seat belts, or to ensure roads, laneways and traffic ways are maintained to a safe standard.

It is proposed that the agriculture sector, through its Farmsafe Australia members, enter into partnership with relevant Australian road safety agencies to systematically examine the known factors associated with transport safety on Australian farms and to develop evidence-based solutions that will provide farmers, managers, operators and other stakeholders with improved systems and guidelines to enhance safety. These will include:

- Vehicle design safety – furthering the work on quad bikes, and including farm utilities
- Maintenance of farm roads and laneways to a safe standard for the likely traffic use with relevant speed limits/restriction
- Assistance in establishing and enforcing compliance with farm rules that include
  - restraint for drivers and passengers inside the vehicle
  - helmet use
  - on-farm traffic control
- Design of a suitable helmet for use on two-wheeled motorcycles, quad bikes and horses
- Safety in maintenance of farm transport.

Many of these solutions are in use in other workplaces. However, isolated farming businesses need assistance to learn from other industries and disciplines, and the road safety industry can help make a difference.

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