

# Targeted Study of Injury Data Involving Motorised Mobility Scooters

A report commissioned by the Australian Competition  
and Consumer Commission



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## **Disclaimer**

This research was funded by the Australian Competition and Consumer Commission to better understand the risks and harms of motorised mobility scooters from the perspective of a consumer product safety regulator. As such, all suggested opportunities for action contained in this report reflect this focus on activities within the ACCC's sphere of influence in consumer product safety. Additional possible action areas suggested by Monash University but not present in this report will be directed to the appropriate body by the ACCC and published in the scientific literature.

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# 1. Executive Summary

Monash University Department of Forensic Medicine and Accident Research Centre were commissioned by the Australian Competition and Consumer Commission (ACCC) to conduct a targeted study of injury data involving motorised mobility devices. The objectives of the research were to determine the number of deaths and injuries associated with motorised mobility scooters and to identify details of associated causal factors and related issues.

## **Injury associated with motorised mobility scooters**

Available hospitalisations and emergency department presentations data were accessed from the National Injury Surveillance Unit, Victorian Injury Surveillance Unit, Victorian Trauma Registry and the Queensland Injury Surveillance Unit.

Key findings:

- There were 442 motorised mobility scooter *fall* injury hospitalisations in Australia over the two year period July 2006 to June 2008.
- The *total* number of motorised mobility scooter hospitalisations for the same period is likely to be greater than 700 due to how hospital data is coded: the code (ICD-10-AM) used to identify mobility scooter hospitalisations is restricted to fall injuries and excludes motor vehicle collisions and crush injuries where no fall is involved.
- In Victoria alone there could be an additional 53 mobility scooter hospitalisations over the 2008/9 period. The above estimate of over 700 cases is based on an extrapolation of this estimate.
- Males and females were evenly represented among motorised mobility scooter fall injury hospitalisations in Australia, although males outnumbered females in certain age groups.
- Lower extremity injury was the most common type of injury across all age groups and fractures accounted for most injuries.
- Upper extremity injury was more common to the 60-69 age group than other age groups.
- The most common location for sustaining an injury was the road, street or highway followed by the home.
- In Victoria, the frequency of emergency department presentations has increased significantly over the last decade with an estimated annual increase of 13.5% and an overall estimated increase of 255% in 10 years. As this estimated increase is based on the mobility scooter *fall* hospitalisation data, increases in all mobility scooter hospitalisations may be greater.
- Analysis of the injury severity related to Victorian motorised mobility scooter hospitalisations suggests that a significant proportion of the injuries will have a serious effect on the patient in terms of persisting health problems and follow-up health care.

## **Fatalities related to motorised mobility scooters**

Fatality data were obtained through the National Coronial Information System (NCIS).

Key findings:

- There were 62 identified fatalities related to motorised mobility scooters from July 2000 to August 2010 in Australia plus another 14 likely cases that are currently under investigation.
- Men are significantly over represented in mortality data related to motorised mobility scooters.
- Most deaths related to motorised mobility scooters were the result of collisions with a motor vehicle and the most common cause of death was a head injury.
- The high prevalence of head injuries, particularly amongst fatalities and serious injury cases, indicates that improved head protection such as the wearing of helmets may warrant further consideration.
- The largest proportion of deaths in those aged 80 years and over were the result of being struck by motor vehicles whereas the largest proportion of deaths in those aged less than 80 years were a result of falls.
- A large proportion of deaths occurred when motorised scooter users were crossing a road, attempting to alight from the scooter and entering or approaching intersections.

## **Community perceptions**

Consultation with a range of interested people and organisations was undertaken between July and August 2010 by means of telephone interviews with key informant organisations and motorised mobility scooter users.

Key findings:

- Support for the ongoing use of motorised mobility scooters by older people and people with disabilities was strong.
- A significant proportion of the key informant groups expressed concern in relation to current gaps in assessment of new users of mobility scooters but there was little consensus on how to address this issue.
- Reassessment of existing mobility scooter user competencies was also raised as a specific area of concern given the rapid changes that can occur to general health (and in particular cognitive, visual, perceptual and motor skills) in older people. There were different views on how to achieve this.
- One option for assessment/reassessment - voluntary self assessment performed in conjunction with training - was supported by some key informants and mobility scooter users. However more formal assessment and certification of mobility scooter users raised some questions as to the cost and the potential to reduce access to motorised mobility.
- Training and education of users emerged as a primary factor contributing to the safety of mobility scooters. Both key informants and mobility scooter users suggested standardised training information both for distribution at point of sale and on an ongoing basis in the community. Safe motoring in areas of high

mobility scooter use was identified by informants as a topic that would benefit from further attention.

- Most mobility scooter users who participated in this survey had received some instruction and information from a salesperson at the specialist retailer where they purchased their scooter. The instruction and information received varied significantly between users, and some had not received any training at all.
- The design, quality and operation of motorised mobility scooters, including imported models and second hand scooters, was another dominant theme among key informants and mobility scooter users. The wide variability in design of mobility scooter models was believed to contribute to poor scooter selection by some older people.
- Most participants suggested that compliance with manufacturing and design standards would address a number of safety issues and ensure that safety features (such as speed capacity, reversing indicators, improved braking, flags and lights) are present on all motorised mobility devices.
- There was strong support for a standardised set of regulations governing the operation of motorised mobility scooters from the appropriate authority/authorities to provide clear and consistent operating rules and help to reduce confusion and conflict between mobility device users and other community members.
- The physical environment was identified as a powerful factor influencing safe motorised mobility scooter use by both key informants and mobility scooter users. Specifically, design and maintenance to footpaths and road safety was raised. This included high fencing restricting visibility of parked or reversing cars (e.g. from driveways).
- Access in and around shopping centres and on public transport was identified as challenging due to conflicts with pedestrians.

## **Opportunities Arising from the Research**

This Report represents an initial step in understanding the problems associated with motorised mobility scooters and determining where opportunities exist to prevent injury and death whilst minimising negative effects on mobility for older persons. Possible areas of focus for the ACCC, in partnership with other relevant stakeholders, could include:

### **1. Design standards**

- 1.1 Consult with Standards Australia on the possible development of standardised design and safety guidelines (in the form of a potential Australian Standard)

### **2. Education for Motorised Mobility Scooter Drivers and the Public**

- 2.1 Consider programs to alert mobility scooter users to the benefits of wearing helmets
- 2.2 Work with relevant stakeholders to develop public awareness about sharing the road and footpath

### **3. Assessment and Advice Prior to Sale**

- 3.1 Work with relevant stakeholders to develop consistent information for users, families, carers, health professionals and retailers that highlights the risks to older people and provides advice on how to avoid common injuries.

### **4. Data and research**

- 4.1 Continue to enhance data collection and analysis.
- 4.2 Identify and monitor the number of MMS in use in the Australian community
- 4.3 Consider undertaking research on design features of MMS (including: stability, errors in use of accelerator, reverse control, safe alighting, seatbelts and roll-bars) and identify safety enhancements.
- 4.4 Investigate safety benefits of increasing the visibility of motorised mobility scooters

## 2. Background

Motorised mobility scooters (MMS), also known as buggies and gophers, are three or four wheeled vehicles designed for people who are challenged when walking distances, and are a popular mode of transport that allows these people to maintain active, independent lifestyles. Power mobility has a strong impact on the quality of life of its users.

Research undertaken in Victoria in 2006<sup>1</sup> showed that motorised mobility scooters, a relatively new product, have had a rapid uptake by vulnerable populations (particularly the very old). There is a substantial emerging upward trend in related deaths and serious injuries among persons aged 60 years and over. The major problem, as with most product-related injuries, appears to be largely at the user/machine interface, though some actual product failures have also been reported.

Following various publications and media reports on the growing problem of motorised mobility scooter-related injuries, the Australian Competition and Consumer Commission (ACCC) called a national reference group meeting of key informant agencies in September 2009. The reference group agreed that currently mortality and injury data, in its present form, is too limited to gain an accurate understanding of the extent of the problems regarding motorised mobility devices.

Casual factors related to the number of deaths and injuries involving mobility scooters currently presents a critical gap in our understanding of the hazards associated with motorised mobility devices. This understanding is essential before determining the focus of strategies designed to minimise risks.

Monash University Department of Forensic Medicine and Accident Research Centre were therefore commissioned by the ACCC to conduct a targeted study of injury data involving motorised mobility devices.

### ***Aim***

The aim of the targeted study of injury data involving mobility scooters is to enhance our understanding of the problems associated with motorised mobility devices and to determine where injury prevention efforts need to be focused.

Specific objectives are to determine:

- the number of deaths and injuries associated with motorised mobility scooters from existing mortality and injury data sources;
- details of the causal factors associated with the deaths and injuries associated with motorised mobility scooters; and
- what measures are most likely to reduce the risk of the hazard for the user, supplier and/or other people in the environment where mobility scooters are used, the best time and place to deliver these measures and which organisations are best placed to deliver them.

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<sup>1</sup> Cassell E and Clapperton A. Consumer product-related injury(2): Injury related to the use of motorised mobility scooters. Hazard. 2006; 62.



### 3. Methods

The study is underpinned by the principle that most injuries are preventable by a systematic scientific approach driven by data. Such an approach has been highly successful in road safety and child injury prevention. Design, organisational and awareness solutions can eliminate or reduce problems associated with user behaviour and the environment, which appear to be important contributing factors to injuries related to motorised mobility scooters.

Data has been sourced from a number of agencies:

- 5 National Coroners Information System: deaths.
- 6 National Injury Surveillance Unit: hospitalisations data.
- 7 Victorian Injury Surveillance Unit: hospitalisations and emergency department presentations data.
- 8 Victorian Trauma Registry: high severity injury hospitalisations including additional information from notes that are not otherwise available and follow-up information 6 months post-injury.
- 9 Queensland Injury Surveillance Unit: emergency department presentations data.

In addition, key informant organisations and motorised mobility scooter users were surveyed to elicit some of the primary issues related to the use of MMS by older people from the perspective of these key stakeholders.

Ethics Committee approval was obtained from the Victorian Department of Justice Human Research Ethics Committee and covered access to mortality and morbidity databases for in-depth analysis and interviewing of key informants and mobility scooter users.

#### ***3.1 Hospital-treated injury data sources***

Analysis of data from a range of sources was undertaken to identify age groups and other demographic information, settings, causes and mechanisms of injury, body part injured and nature of injury and factors contributing to injury.

##### **3.1.1 Hospitalisations**

###### **National Injury Surveillance Unit (NISU)**

The National Injury Surveillance Unit (NISU) is the collaborating unit of the Australian Institute of Health and Welfare (AIHW) in the area of injury. Sections of this report are based on data made available by the AIHW. The report authors are responsible for the use made of the data in this report.

###### **National Hospital Morbidity Database (NHMD)**

The national data provided in this report have been extracted from the NHMD. The NHMD is compiled from data supplied by the state and territory health authorities. It is a collection of electronic confidentialised summary records for separations (that is, episodes of care) in public and private hospitals in Australia. Diagnoses, procedures and external causes of injury are recorded using the International Statistical Classification of Diseases and related Health Problems, Tenth revision, Australian Modification (ICD-10-AM). Almost all hospitals in Australia are included in the database: public acute and public psychiatric hospitals, private acute and psychiatric hospitals, and private free-standing day hospital facilities.

**Case selection criteria:**

- NHMD records having a date of separation between 1st July 2006 and 30th June 2008;
- Where age is 60+ years;
- That have a principal diagnosis injury code (range S00–T75 or T79);
- That have a first-listed external cause code of “fall involving other and unspecified pedestrian conveyance – fall involving powered scooter” (W02.9); and have a mode of admission that is not an inward transfer;
- Have a separation type anything other than death;
- Have an activity code anything other than U60.5 ‘Golf’.

**Data quality issues:**

Cases were selected if the first-listed external cause code was “fall involving other and unspecified pedestrian conveyance” (W02.9). *Fall involving powered scooter* is listed as the example under this code. As there is a possibility that some injuries resulting from using other types of pedestrian conveyances may have been coded to W02.9 case selection was limited to person aged 60 years and older as it was decided persons in this age demographic are less likely to be using ‘other pedestrian conveyances’. Records were then checked for any other information that might indicate the person was not using a powered scooter – for this reason cases with an activity code of U60.5 (golf) were excluded as it was presumed the person was using a golf buggy/cart. Falls involving electric wheelchairs, which were not included in this study, are coded separately under W05 “*fall involving wheelchair*” (including electric, non-powered, NOS, powered).

**Victorian Injury Surveillance Unit (VISU) dataset****Victorian Admitted Episodes Dataset (VAED) – injury subset**

Hospitalisations for injury and poisoning that contain an external cause code are extracted from the VAED by the Victorian Department of Health (DH) and supplied in unit record format to VISU every six months. The dataset covers admissions to all Victorian public and private hospitals. From July 1998 cases recorded on the VAED are coded to the ICD-10-AM, the WHO International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification. The external causes chapter of the ICD-10-AM describe the causes of injury, poisoning and adverse events (complications of medical and surgical care). Adverse events and sequelae (late effects) of external causes of morbidity and mortality are usually not included in VISU reports.

**Case selection criteria:**

- VAED records having a date of separation between 1st July 2008 and 30th June 2009
- Selection then followed the same criteria as listed for the NHMD.

**Data quality issues:**

See NHMD data quality issues.

**Further definitions:*****Injury severity***

To examine the severity of motorised mobility scooter injury hospital admissions, each hospital record was given an International Classification of Disease (ICD)-based Injury Severity Score (ICISS). The ICISS involves estimating probability of death using the ICD injury diagnosis codes recorded in a person’s hospital record. Determining which injuries are ‘serious’ involves calculating a survival risk ratio (SRR) for each individual injury. An SRR is the proportion of cases with a certain injury diagnosis in which the patient does not die, or in other words, a given SRR represents the likelihood that a

patient will survive a particular injury<sup>2</sup>. Each patient's final ICISS is the product of the SRRs associated with all the diagnoses listed on the patient hospital record. An injury is considered serious if the ICISS is less than or equal to 0.941, this is equivalent to a survival probability of 94.1% or worse – meaning the injured person has a probability of death (when admitted) of at least 5.9%.

### **Hospital costs**

The National Hospital Costs Data Collection (NHCDC)<sup>3</sup> is based on the principles of Casemix costing analysis which is a scientific approach to the classification of patient care whereby each hospital admission is assigned an Australian Refined Diagnosis Related Group (AR-DRG). AR-DRGs provide a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital. The NHCDC contains component costs per DRG and enables DRG Cost Weights and average costs for DRGs (National and state/territory specific) for acute in-patients to be produced. The types of component costs included are ward medical, ward nursing, non-clinical salaries, pathology, imaging, allied health, pharmacy, critical care, operating rooms, ED, ward supplies and other overheads, specialist procedure suites, on-costs, prostheses, hotel and depreciation. For this analysis the average Victorian cost per AR-DRG (for the relevant year of admission) was applied to each admission to estimate the hospital costs associated with motorised mobility scooter injury in Victoria.

## **3.1.2 Emergency Department Presentations**

### **Victorian Injury Surveillance Unit (VISU) dataset**

#### **Victorian Emergency Minimum Dataset (VEMD) – injury subset**

Emergency Department presentations for injury and poisoning are extracted from the VEMD by the Victorian Department of Health (DH) and supplied quarterly in unit record format to VISU. From January 2004, VEMD data are collected by all 38 Victorian public hospitals that provide a 24-hour ED service. The VEMD contains both admitted and non-admitted cases. Presentations that are treated and discharged from within the ED within 4 hours from the time patient management commences are classified as non-admissions and cases that are treated for 4 hours or more in the ED or a short stay ward attached to the ED or depart from the ED to an inpatient bed or are transferred to another hospital campus are classified as hospital admissions. Admissions for injury and poisoning recorded on the VEMD are not usually included in VISU injury surveillance reports if admissions are also being selected from the VAED because cases would then be over-counted. For the purpose of this report admissions are included in section 4.1.2 *Emergency Department Presentations (including subsequent admissions)* because the ICD-10-AM code allowing identification of falls from motorised mobility scooters (W02.9) was only introduced in July 2006.

#### **Case selection criteria:**

Selection of relevant motorised mobility scooter injury records involved the following process:

1. A text search for the descriptors 'scooter' and 'gopher' was conducted on case narrative data for all cases recorded between January 2000 and December 2009.
2. All case records that contained the word 'gopher' in the narrative were retained.
3. Case selection then varied depending on the age of the injured person:
  - If the injured person was aged 60 years and older and the case record contained the word 'scooter', the record was retained unless other information

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<sup>2</sup> Davie G, Cryer C & Langley J. Improving the predictive ability of the ICD-based Injury Severity Score. *Injury Prevention* 2008; 14; 250-255.

<sup>3</sup> National Hospital Cost Data Collection. Hospital Reference Manual Round 11 (2006-07), September 2007. Australian Government Department of Health and Ageing.

in the narrative indicated that the scooter was not a motorised mobility scooter.

- If the injured person was aged less than 60 years the record was deleted if the narrative contained the words 'motorised scooter' but other information in the narrative indicated that the motorised scooter was unlikely to be a mobility scooter
- If the injured person was aged between 50 and 59 years the case record was deleted if the text description indicated that the motorised scooter was unlikely to be a mobility scooter
- If the injured person was aged less than 50 years, the case record was deleted if the narrative contained the words 'motorised scooter' without the word 'mobility' or other wording the indicated the scooter was a mobility aid.

#### **Data quality issues:**

Case identification is reliant on good data being provided by participating hospitals. Data are collected in busy emergency departments, so detailed data collection is not always achieved. Hence these data may be an underestimate of the true number of cases. Although the trend analysis includes only hospitals that have contributed to the VEMD over the entire 2000-2009 decade, variations in the quality of narratives over time may also influence the trend reported in section 4.1.2 *Emergency Department Presentations (including subsequent admissions)*.

#### **Queensland Injury Surveillance Unit (QISU)**

Since 1988 Queensland Injury Surveillance Unit (QISU) formerly known as Queensland Injury Surveillance Prevention Program (QISPP) has continuously collected urban injury data from seven hospitals in Brisbane's southside as well as periodically collecting rural data. In 1998 QISU expanded and upgraded its surveillance activity to include new sites and convert paper-based collections to electronic data. Ninety percent of data is now collected electronically.

QISU currently collects data from 17 hospitals in Queensland which comprise four sample regions: metropolitan (Brisbane); regional (Mackay and Moranbah Health Districts), tropical northern coast (Atherton, Mareeba, Tully and Innisfail) and remote (Mt Isa). Emergency departments provide data either electronically or on standardised forms which are then coded in accordance with the National Data Standard for Injury Surveillance (NDS-IS) and stored on the QISU database. Although participating hospitals represent urban, rural and remote areas of Queensland these data are estimated to be representative of only one-quarter of emergency presentations in Queensland.

#### **Case selection criteria:**

Relevant motorised mobility scooter injury records were selected using the same selection process as for the VEMD (listed above).

#### **Data quality issues:**

Case identification is reliant on good data being provided hence these data may be an underestimate of the true number of cases.

### **3.1.3 Victorian Trauma Registry**

#### **Victorian State Trauma Outcomes Registry (VSTORM)**

The Victorian State Trauma Registry captures information on all major trauma patients in Victoria in order to monitor the performance of the State's trauma system. The Registry reports on morbidity and mortality outcome measures at discharge and at six and twelve months post-injury. Data from VSTORM were accessed for severe hospitalisations as

narrative information is included on the registry for these cases and patients are contacted 6 months post-injury to provide information on longer-term outcomes.

### **3.2 Mortality Data**

#### **National Coronial Information System (NCIS)**

Deaths data were obtained through a search of the National Coronial Information System (NCIS). The NCIS is an electronic database of coronial information containing case detail from the coronial files of all Australian states and territories, except Queensland, dating back to 1 July 2000. Queensland data is contained from 1 January 2001.

#### **Case selection criteria – preliminary search:**

Previously there were no codes to separately identify motorised mobility scooter related coroners cases in the National Coronial Information System (NCIS). A specific code has recently been included.

Cases recorded on the NCIS between July 1 2000 and 16 August 2010 were identified in a preliminary search using multiple search strategies:

- a) Object coding for land vehicle – other land vehicle, means of land transport – mobility scooter, gopher (new coding category).
- b) Object coding for land vehicle - other land vehicle, means of land transport - other specified vehicle – free text (for reference to a motorised wheelchair, scooter, gopher).
- c) Object coding for land vehicle –motorised two or three wheeled vehicle – moped, scooter, vespa.
- d) Object coding for land vehicle –motorised two or three wheeled vehicle – three wheeled motor vehicle or scooter.
- e) Object coding for land vehicle –motorised two or three wheeled vehicle – other specified two or three wheeled motor vehicle.
- f) Key word search of coroners' findings for the terms: motorised mobility scooter; motor scooter; mobility scooter; electric scooter; motorised scooter; electric mobility scooter; and gopher.

#### **Case selection criteria – case confirmation:**

Ninety two closed cases were identified using the above search criteria. All relevant information on the NCIS website was used to confirm that cases related to motorised mobility scooter (MMS) use. Cases were initially coded as 'yes', 'no' or 'unsure'. Two coders were involved in the blind coding of MMS-relatedness. Assigned codes were compared and cases with differences then discussed to reach a final decision regarding eligibility for inclusion in the study. The following three eligibility criteria were used to guide this process:

- a) If a text search of narrative data in coroners' findings, police reports, autopsy reports and NCIS summaries elicited any of the following terms the cases were retained:
  - electric gopher
  - electric mobility scooter
  - electric scooter
  - gopher
  - medical scooter
  - motor scooter
  - motorised scooter
  - motorised 3 wheel scooter
  - motorised 4 wheel scooter

- motorised buggy
- motorised tricycle/scooter
- motorised wheelchair scooter

Case records containing the terms listed below were not included:

- adult tricycle
  - moped
  - electric push bike
  - electric wheelchair
  - motorised bicycle
  - motorcycle
  - micro scooter (child's scooter)
  - motorised wheelchair
  - battery operated bicycle
- b) If the deceased person was aged 60 years and older and the case record contained the word 'scooter' or 'gopher', the record was retained unless other information in the full narrative indicated that the scooter was not a motorised mobility scooter.
- c) If the deceased person was aged less than 60 years, the case record was deleted if the narrative contained the word 'scooter' but the scooter was not described as 'motorised' or 'mobility' or other information in the narrative indicated that the motorised scooter was unlikely to be a mobility scooter.

The characteristics of the 29 cases that were excluded are available in Appendix A.

### **Analyses**

In addition to analyses of coded data we performed a narrative text analysis of coroners' findings, police reports, autopsy reports and NCIS summaries for all eligible cases to provide detailed information that is not available from coded fields. A simple coding scheme was developed to capture important circumstances related to the fatalities. Incident characteristics of interest included: the activity engaged in at the time; the type of mobility scooter involved in the incident; and the mechanism of the fatal injury. Each incident was classified into one of 5 mechanism groups that emerged from the data: 1) struck by motor vehicle; 2) fall; 3) lost control; 4) fire; and 5) unknown. All cases were coded manually and the circumstances of each incident were recorded in a Microsoft Excel database.

Information obtained directly from standard fields in the NCIS included: age, gender, state/territory where incident occurred, date of incident, and cause of death.

## **3.3 Community consultation**

Consultation with a range of interested people and organisations was undertaken between Monday 5 July and Thursday 29 July 2010 by means of telephone interviews with key informant organisations and motorised mobility scooter users following an ethics committee approved process. At the beginning of each interview participants were given an explanation of the scope of the interview and told of their right to withdraw at any time. Informed consent was obtained at this time.

### **3.3.1 Key informants**

Interviews of key informants aimed to elicit primary issues associated with the use and safety of motorised mobility scooters by older people and potential actions to address those issues. In addition participants were asked to identify how mobility scooters are marketed to the public, patterns of usage, whether appropriate information and training

are provided at the point of sale to older persons, and whether any assessment is made of the person's ability to control the scooter.

## Survey Methods

Due to the exploratory nature of this part of the study and its focus on key informants' primary issues of concern and potential actions to address those issues, a qualitative method was employed. Semi-structured interview by telephone was selected as the data gathering tool in order to obtain rich detailed data about issues of concern to key stakeholders including motorised mobility scooter users.

## Participant Recruitment

To develop an understanding of the diversity of issues related to motorised mobility scooter participants from different key informant groups were recruited for the study. The ACCC has an established expert reference group related to motorised mobility scooters and key informants were recruited from this reference group in consultation with the ACCC. An e-mailed invitation was sent through the ACCC to selected reference group members inviting them to contact the research group if they were interested in participating in the project.

Where gaps were identified in key stakeholder coverage additional agencies identified by the researchers were also invited to participate. All volunteer participants confirmed their consent to be involved in the project verbally prior to the interview.

## Participants

Key informant groups included:

- Motorised mobility related researchers
- Road safety and transport experts
- Health and aging professionals and rehabilitation providers
- Mobility scooter suppliers
- Independent living group members

The sample target of 20 key informants was achieved with good representations from a range of different key informant groups (table 1).

Table 1 Demographic characteristics of key informants

| <b>Key Informant Demographics</b> | <b>n=20</b> | <b>%</b> |
|-----------------------------------|-------------|----------|
| <b><i>Gender</i></b>              |             |          |
| Female                            | 8           | 40%      |
| Male                              | 12          | 60%      |
| <b><i>Sector</i></b>              |             |          |
| Advocacy group members            | 2           | 10%      |
| Distributor/importer of MMS       | 2           | 10%      |
| Health sector professionals       | 5           | 25%      |
| Health equipment suppliers        | 1           | 5%       |
| Local government stakeholders     | 3           | 15%      |
| Transport professionals           | 5           | 25%      |
| University researchers            | 2           | 10%      |
| <b><i>Recruitment</i></b>         |             |          |
| ACCC                              | 13          | 65%      |

|                           |   |     |
|---------------------------|---|-----|
| ALGA*                     | 5 | 25% |
| Identified by researchers | 2 | 10% |

\* Australian Local Government Association

## Questionnaire

The interview guide for the semi-structured interviews was developed based on the research questions and themes of injury causation documented in the literature<sup>4</sup>. The guide was further modified following the pilot and early interviews. Participants were asked global questions to elicit broad responses for example:

- a. What motivated your organisation to become involved in the discussion regarding MMS use and safety?
- b. What safety issues associated with MMS are of most concern to you and what actions should be taken to address your identified issue/s of concern?

Participants were also asked to provide solutions to issues identified as being of concern to the use and safety of motorised scooters.

## Analysis

The interview data were analysed using a qualitative process of continual analysis of data throughout the research process. Key points raised in the interviews were recorded on the survey instrument and entered into a database after completion of the interview. Due to time limitations complete transcripts of interviews were unable to be recorded. Themes were identified from the interview data recorded into the database.

### 3.3.2 Motorised mobility scooter users

The telephone interviews of motorised mobility scooter users aimed to provide information to better understand the pattern of current motorised mobility scooter usage and safety issues.

## Survey methods

Users of motorised mobility devices aged over seventy were consulted by telephone interview to discuss their experience and perception of motorised mobility scooter use and safety.

## Participant recruitment

A cross-sectional convenience sample of motorised mobility scooter users aged over seventy years was recruited via a variety of general public sources, including the media (79%, n=26) and seniors newsletters (21%, n=7).

## Profile of participants

The sample target of 20 mobility scooter users was exceeded due to overwhelming interest. Thirty three volunteer scooter users aged over seventy years participated in the survey. Forty eight percent of participants were female (n=16) and 52% were male (n=17). Three quarters of the participants were aged between 75 and 89 years.

This group of older scooter riders predominantly resided in Victoria (82%, n=27) and most were born in Australia (73%, n=24). Most participants lived in their own home 58% (n=19) or a retirement village 30% (n=10). Thirty six percent of participants lived alone (n=12).

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<sup>4</sup> Cassell E and Clapperton A. Consumer product-related injury (2): Injury related to the use of motorised mobility scooters. Hazard. 2006; 62.



Among interviewed MMS users the most common medical condition affecting walking was arthritis; 45% (n=15) self reported having arthritis, and 76% (n=25) reported having more than one medical condition that affected their ability to walk.

Table 2 Demographic, health and mobility characteristics of motorised mobility scooter users

| <b>Demographics</b>                        | <b>n=33</b> | <b>%</b> |
|--------------------------------------------|-------------|----------|
| <b>Age</b>                                 |             |          |
| 70 - 74                                    | 5           | 15%      |
| 75 - 79                                    | 8           | 24%      |
| 80 - 84                                    | 8           | 24%      |
| 85 - 89                                    | 8           | 24%      |
| 86 - 90                                    | 1           | 3%       |
| 90+                                        | 3           | 9%       |
| <b>Gender</b>                              |             |          |
| Female                                     | 16          | 48%      |
| Male                                       | 17          | 52%      |
| <b>Living arrangements</b>                 |             |          |
| Alone                                      | 12          | 36%      |
| With Husband/Wife/Partner                  | 11          | 33%      |
| With one or more family                    | 2           | 6%       |
| With other residents/tenants               | 8           | 24%      |
| <b>Place of residence</b>                  |             |          |
| Ministry of housing flat                   | 1           | 3%       |
| Residential retirement village             | 10          | 30%      |
| Aged care facility                         | 3           | 9%       |
| Own home                                   | 19          | 58%      |
| <b>Main conditions affecting walking*</b>  |             |          |
| Arthritis                                  | 15          | 45%      |
| Heart condition                            | 9           | 27%      |
| Joint replacement                          | 7           | 21%      |
| Respiratory condition                      | 6           | 18%      |
| Spinal problem                             | 5           | 15%      |
| <b>Number conditions affecting walking</b> |             |          |
| One                                        | 8           | 24%      |
| Two                                        | 13          | 39%      |
| Three                                      | 9           | 27%      |
| Four                                       | 2           | 6%       |
| Six                                        | 1           | 3%       |

\*Participants were able to select more than one medical condition affecting their ability to walk.

### Questionnaire:

The survey instrument was adapted from a previous survey with permission from researchers at the University of Sydney<sup>5</sup>. The 6-page survey was administered over the phone to study participants.

<sup>5</sup> Edwards K and McCluskey A. A survey of adult power wheelchair and scooter users. Disability and Rehabilitation: Assistive Technology, 2010; Early Online, 1–9.

The survey instrument collected data on: user demographics; users' reasons for obtaining the scooter, including health status including medical conditions and disability; benefits of scooter use (new activities), source and selection of scooter and the assessment processes involved; access to and adequacy of training; driver licence status, usage patterns and maintenance schedule; reliability (mechanical and component failures) and after-sales service; the nature, location and mechanism (including trigger factor/s) of scooter mishaps and any associated injuries (including the site and type of injury, cost of treatment and long-term sequelae).

### ***3.4 Research literature review update***

Our Monash University literature review from 2006 was updated to identify and report on new research, exposure patterns and the ageing of the Australian population. This updated review also addressed problem definition and potential interventions, including both countermeasures and implementation strategies. A systematic review of studies in English language journals reporting on motorised mobility devices was undertaken. Searches of the following sources were performed: 1) electronic databases including PubMed (MEDLINE); 2) internet resources; and 3) reference lists contained in relevant articles and reviews.

## 4. Results

### 4.1 Motorised mobility scooter hospital-treated injury

#### 4.1.1 Hospitalisations (related to falls)

##### **HOSPITALISATIONS, AUSTRALIA 2006/7-2007/8**

Source: National Injury Surveillance Unit (NISU), National Hospital Morbidity Database (NHMD)

The hospitalisation data for Australia provided here have been extracted from the NHMD. Data were selected if the date of separation was between 1st July 2006 and 30th June 2008 and the external cause of injury was 'fall involving other and unspecified pedestrian conveyance – fall involving powered scooter' (W02.9). More detailed selection criteria are provided in section 3.1.1 *Hospitalisations*.

There were 442 motorised mobility scooter fall injury hospitalisations in Australia over the two year period July 1 2006 to June 30 2008. Table 3 shows hospitalisations by age group and year of hospitalisation. Fifty-five percent of mobility scooter fall injury hospitalisations occurred in 2007/08, 48 more injury cases than in 2006/7. In all age groups except for people aged 75-79 years, there were more cases in 2007/8 than in 2006/7. This may be due to better reporting at the hospital level.

Table 4 shows the gender of injured persons by age group. Overall, males and females were evenly represented (approximately 50% each), however there was a higher proportion of males in age groups 60-64 years (54%), 65-69 years (58%), 80-84 years (52%) and 90+ years (55%) and a higher proportion of females in age groups 70-74 (52%), 75-79 (56%), and 85-89 (52%).

Table 5 shows the body region injured by age group. Lower extremity injury was the most common type of injury overall (38%) and in most age groups except for age groups 60-64 years and 65-69 years where the upper extremity was the most commonly injured body region.

Fractures accounted for most cases, (53%, n=233), followed by open wounds (13%, n=56) and superficial injuries (10%, n=42) (Table 6). This pattern of injury type was consistent across most age groups, although dislocations were more common than superficial injuries and open wounds in persons aged 60-64 years.

Activity at the time of injury data were not informative as almost all hospitalisations were coded to 'other or unspecified' activity (91%). [Table 7](#).

Around one-third of all hospitalisations were coded to 'unspecified' place of occurrence (34%, n=148). The road/street and highway was the most common location of injury accounting for around one-quarter of hospitalised cases overall (26%, n=113) and between 22% and 33% of cases in each 5-year age group. The home was the second-most common location of injury overall and in each age group except 85-89 year olds. Not surprisingly, almost 20% of hospitalisations in persons aged 85-89 years and 90 years and older occurred in residential institutions. (Table 8)

Overall, more than half of injured persons were discharged to their place of usual residence (56%, n=249) but there was some variation with age as around two-thirds of patients in the younger age groups (60-74 years) were discharged to their place of usual residence. Twenty-eight per cent of hospitalisations were transferred to another acute

hospital (range 18% to 40% across the 5-year age groups). Overall, 5% of patients were transferred to nursing homes, all aged 80-89 years. (Table 9)

**Table 3 Motorised scooter fall injury hospitalisations, year of separation by age group, Australia 2006/7-2007/8**

|        | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|--------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| 2006/7 | 11          | 39.3 | 13          | 39.4 | 20          | 38.5 | 34          | 50.0 | 44          | 44.4 | 52          | 51.0 | 23        | 38.3 | 197   | 44.6 |
| 2007/8 | 17          | 60.7 | 20          | 60.6 | 32          | 61.5 | 34          | 50.0 | 55          | 55.6 | 50          | 49.0 | 37        | 61.7 | 245   | 55.4 |
| ALL    | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 4 Motorised scooter fall injury hospitalisations, gender by age group, Australia 2006/7-2007/8**

|         | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|---------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Males   | 15          | 53.6 | 19          | 57.6 | 25          | 48.1 | 30          | 44.1 | 51          | 51.5 | 49          | 48.0 | 33        | 55.0 | 222   | 50.2 |
| Females | 13          | 46.4 | 14          | 42.4 | 27          | 51.9 | 38          | 55.9 | 48          | 48.5 | 53          | 52.0 | 27        | 45.0 | 220   | 49.8 |
| ALL     | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 5 Motorised scooter fall injury hospitalisations, body region by age group, Australia 2006/7-2007/8**

|                 | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|-----------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Head            | *           | *    | *           | *    | 10          | 19.2 | 10          | 14.7 | *           | *    | 16          | 15.7 | 9         | 15.0 | *     | *    |
| Trunk           | *           | *    | *           | *    | 11          | 21.2 | 15          | 22.1 | 19          | 19.2 | 25          | 24.5 | 11        | 18.3 | 92    | 20.8 |
| Upper extremity | 12          | 42.9 | 13          | 39.4 | 13          | 25.0 | 20          | 29.4 | 30          | 30.3 | 20          | 19.6 | 8         | 13.3 | 116   | 26.2 |
| Lower extremity | 9           | 32.1 | 8           | 24.2 | 18          | 34.6 | 23          | 33.8 | 38          | 38.4 | 41          | 40.2 | 32        | 53.3 | 169   | 38.2 |
| Other           | 0           | 0.0  | *           | *    | 0           | 0.0  | 0           | 0.0  | *           | *    | 0           | 0.0  | 0         | 0.0  | *     | *    |
| ALL             | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 6 Motorised scooter fall injury hospitalisations, injury type by age group, Australia 2006/7-2007/8**

|                                     | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|-------------------------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Superficial (excluding eye)         | *           | *    | *           | *    | 5           | 9.6  | 7           | 10.3 | 7           | 7.1  | 9           | 8.8  | 6         | 10.0 | 42    | 9.5  |
| Open wound (excluding eye)          | *           | *    | *           | *    | 9           | 17.3 | 5           | 7.4  | 11          | 11.1 | 15          | 14.7 | 14        | 23.3 | 56    | 12.7 |
| Fracture (excluding tooth)          | 16          | 57.1 | 17          | 51.5 | 24          | 46.2 | 45          | 66.2 | 51          | 51.5 | 51          | 50.0 | 29        | 48.3 | 233   | 52.7 |
| Dislocation                         | 5           | 17.9 | *           | *    | *           | *    | 0           | 0.0  | 5           | 5.1  | *           | *    | 0         | 0.0  | 14    | 3.2  |
| Sprain/strain                       | 0           | 0.0  | 0           | 0.0  | *           | *    | 0           | 0.0  | *           | *    | 0           | 0.0  | *         | *    | 7     | 1.6  |
| Blood vessel                        | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *           | *    | 0         | 0.0  | *     | *    |
| Muscle/tendon                       | 0           | 0.0  | *           | *    | 0           | 0.0  | 0           | 0.0  | *           | *    | 0           | 0.0  | *         | *    | *     | *    |
| Internal organ                      | 0           | 0.0  | *           | *    | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *           | *    | 0         | 0.0  | *     | *    |
| Eye injury (excl.foreign body)      | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *           | *    | *         | *    | *     | *    |
| Intracranial (including concussion) | *           | *    | *           | *    | 5           | 9.6  | *           | *    | *           | *    | *           | *    | 0         | 0.0  | 19    | 4.3  |
| Other specified nature of injury    | 0           | 0.0  | *           | *    | 0           | 0.0  | *           | *    | 5           | 5.1  | *           | 8.0  | 0         | 0.0  | 10    | 2.3  |
| Unspecified nature of injury        | *           | *    | *           | *    | 6           | 11.5 | 7           | 10.3 | 12          | 12.1 | 14          | 13.7 | 5         | 8.3  | 50    | 11.3 |
| ALL                                 | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 7 Motorised scooter fall injury hospitalisations, activity by age group, Australia 2006/7-2007/8**

|                                       | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|---------------------------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Sporting activity                     | *           | *    | 0           | 0.0  | *           | *    | 0           | 0.0  | *           | *    | *           | *    | 0         | 0.0  | *     | *    |
| Leisure                               | *           | *    | 0           | 0.0  | *           | *    | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *         | *    | *     | *    |
| Other types of work                   | 0           | 0.0  | 0           | 0.0  | *           | *    | *           | *    | *           | *    | *           | *    | *         | *    | 12    | 2.7  |
| While resting, sleeping, eating, etc. | *           | *    | *           | *    | *           | *    | *           | *    | 5           | 5.1  | *           | *    | 5         | 8.3  | 21    | 4.8  |
| Other specified activity              | *           | *    | *           | *    | 10          | 19.2 | 14          | 20.6 | 21          | 21.2 | 24          | 23.5 | 12        | 20.0 | 91    | 20.6 |
| Unspecified activity                  | 21          | 75.0 | 23          | 69.7 | 36          | 69.2 | 49          | 72.1 | 71          | 71.7 | 70          | 68.6 | 40        | 66.7 | 310   | 70.1 |
| ALL                                   | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 8 Motorised scooter fall injury hospitalisations, place of occurrence by age group, Australia 2006/7-2007/8**

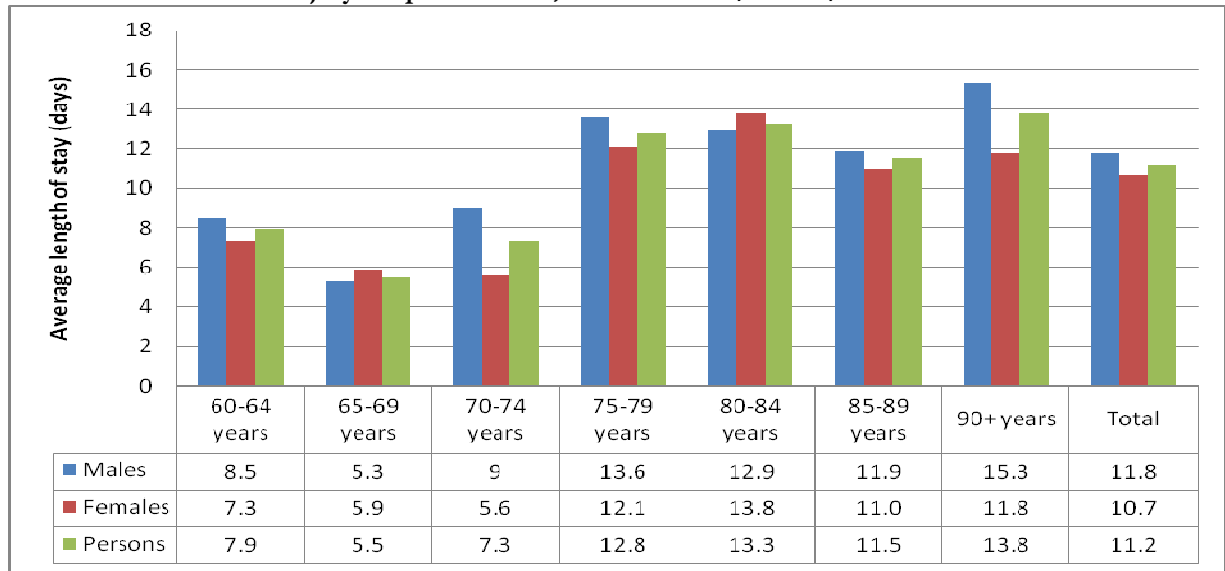
|                                                          | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|----------------------------------------------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Home                                                     | 5           | 17.9 | 7           | 21.2 | 12          | 23.1 | 10          | 14.7 | 26          | 26.3 | 15          | 14.7 | 12        | 20.0 | 87    | 19.7 |
| Residential institution                                  | *           | *    | *           | *    | *           | *    | *           | *    | *           | *    | 20          | 19.6 | 11        | 18.3 | 42    | 9.5  |
| Health Service area                                      | *           | *    | 0           | 0.0  | 0           | 0.0  | *           | *    | *           | *    | *           | *    | *         | *    | 5     | 1.1  |
| Other specified institution & public administrative area | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *           | *    | *           | *    | *           | *    | 0         | 0.0  | *     | *    |
| Sports and athletics area                                | *           | *    | 0           | 0.0  | *           | *    | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | 0         | 0.0  | *     | *    |
| Street and highway                                       | 8           | 28.6 | 11          | 33.3 | 13          | 25.0 | 18          | 26.5 | 27          | 27.3 | 23          | 22.5 | 13        | 21.7 | 113   | 25.6 |
| Trade and service area                                   | *           | *    | *           | *    | *           | *    | 5           | 7.4  | 7           | 7.1  | 6           | 5.9  | 5         | 8.3  | 32    | 7.2  |
| Other specified place of occurrence                      | *           | *    | 0           | 0.0  | *           | *    | *           | *    | *           | *    | *           | *    | *         | *    | 8     | 1.8  |
| Unspecified place of occurrence                          | 8           | 28.6 | 10          | 30.3 | 21          | 40.4 | 28          | 41.2 | 31          | 31.3 | 33          | 32.4 | 17        | 28.3 | 148   | 33.5 |
| ALL                                                      | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

**Table 9 Motorised scooter fall injury hospitalisations, separation type by age group, Australia 2006/7-2007/8**

|                                   | 60–64 years |      | 65–69 years |      | 70–74 years |      | 75–79 years |      | 80–84 years |      | 85–89 years |      | 90+ years |      | Total |      |
|-----------------------------------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-------------|------|-----------|------|-------|------|
| Transfer to other acute           | 5           | 17.9 | 8           | 24.2 | 14          | 26.9 | 27          | 39.7 | 24          | 24.2 | 30          | 29.4 | 17        | 28.3 | 125   | 28.3 |
| Transfer to nursing home          | 0           | 0.0  | *           | *    | 0           | 0.0  | *           | *    | 8           | 8.1  | 7           | 6.9  | *         | *    | 21    | 4.8  |
| Transfer other health facility    | *           | *    | 0           | 0.0  | 0           | 0.0  | 0           | 0.0  | *           | *    | *           | *    | *         | *    | *     | *    |
| Statistical discharge–type change | *           | *    | *           | *    | *           | *    | 5           | 7.4  | *           | *    | 12          | 11.8 | 8         | 13.3 | 38    | 8.6  |
| Discharge at own risk             | *           | *    | 0           | 0.0  | *           | *    | *           | *    | 0           | 0.0  | *           | *    | 0         | 0.0  | *     | *    |
| Other–usual residence             | 18          | 64.3 | 21          | 63.6 | 33          | 63.5 | 34          | 50.0 | 61          | 61.6 | 51          | 50.0 | 31        | 51.7 | 249   | 56.3 |
| ALL                               | 28          | 100  | 33          | 100  | 52          | 100  | 68          | 100  | 99          | 100  | 102         | 100  | 60        | 100  | 442   | 100  |

The average length of stay was 11.2 days. Length of stay generally increased as age increased with the exception of age group 60-64 years in which the length of stay was longer than age group 65-69 and 70-74 years. Also, persons aged 85-89 years had a shorter average length of stay than those aged 75-79 years and 80-84 years.

**Figure 1 Average length of stay (days) by gender and age group, motorised mobility scooter fall injury hospitalisations, Australia 2006/7-2007/8**



### Estimate of additional National hospitalisations

The ICD-10-AM code used to identify mobility scooter injury cases in the NHMD is specific to falls from mobility scooters. To estimate the additional number of cases that result from other causes of injury the ratio of falls to the other causes identified in the limited number of hospital admissions captured in the VEMD data was used (see section 3.1.2 *Emergency Department Presentations*). Assuming a similar distribution in cause of injury across different jurisdictions in Australia (the distribution is similar in Victoria and Queensland, see Table 14 and Table 16) then it is likely that hospitalisations related to motorised mobility scooters nationally would be closer to 713 over two years including; 442 falls, 107 collisions with motor vehicles, 50 collisions with other objects, 7 unspecified collisions, 43 roll/tip overs and 64 other and unknown causes. These estimates are based on the distribution of mechanisms of injury identified for admitted cases in Victorian Emergency Department data (see Table 14 in section 4.1.2 *Emergency Department Presentations*).

## HOSPITALISATIONS, VICTORIA 2008/9

Source: Victorian Injury Surveillance Unit (VISU), Victorian Admitted Episodes Dataset (VAED)

At the time of writing this report national hospitalisations data was not available for the 2008/9 financial year. A summary of Victorian data for 2008/9 data is provided here to supplement national data provided for 2006/07 and 2007/08.

Table 10 summaries the pattern of injury for Victorian hospitalisations in 2008/9 (n=86).

- Females are over-represented in mobility scooter fall injury hospitalisations (55%).
- Half of all hospitalisations occurred in person aged 85 years and older (31% in those aged 85-89 years and 19% in persons aged 90 years and older)
- Hospitalisations were most commonly for lower extremity injury (40%), followed by injury to the head/face/neck (23%). The trunk and upper extremity each account for a further 19% of hospitalisations.
- Fractures accounted for half of hospitalisations (50%). Open wounds (13%), superficial injuries (11%) and intracranial injuries (8%) were also common.
- Ninety-four percent of hospitalisations were coded to 'other or unspecified' activity so activity information is not provided in Table 10.
- More than one-quarter of incidents occurred on the road, street and highway (26%), a further 21% occurred in the home and 15% in residential institutions.

**Table 10 Pattern of motorised mobility scooter fall injury hospitalisations, Victoria 2008/9**

|                              | Hospital separations |      |
|------------------------------|----------------------|------|
|                              | n=86                 | %    |
| <b>Gender</b>                |                      |      |
| Male                         | 39                   | 45.3 |
| Female                       | 47                   | 54.7 |
| <b>Age group</b>             |                      |      |
| 60-64yrs                     | *                    | *    |
| 65-69yrs                     | 5                    | 5.8  |
| 70-74yrs                     | 5                    | 5.8  |
| 75-79yrs                     | 11                   | 12.8 |
| 80-84yrs                     | 18                   | 20.9 |
| 85-89yrs                     | 27                   | 31.4 |
| 90+yrs                       | 16                   | 18.6 |
| <b>Body region</b>           |                      |      |
| head/face/neck               | 20                   | 23.3 |
| trunk                        | 16                   | 18.6 |
| upper extremity              | 16                   | 18.6 |
| lower extremity              | 34                   | 39.5 |
| <b>Injury type</b>           |                      |      |
| fracture                     | 43                   | 50.0 |
| open wound                   | 11                   | 12.8 |
| superficial injury           | 9                    | 10.5 |
| intracranial injury          | 7                    | 8.1  |
| dislocation, sprain & strain | *                    | *    |
| other & unspecified injury   | 13                   | 15.1 |
| <b>Location</b>              |                      |      |
| Road, street & highway       | 22                   | 25.6 |
| Home                         | 18                   | 20.9 |



|                          |           |              |
|--------------------------|-----------|--------------|
| Residential Institution  | 13        | 15.1         |
| Trade & service area     | 5         | 5.8          |
| School, public buildings | *         | *            |
| Other specified places   | *         | *            |
| Unspecified places       | 25        | 29.1         |
| <b>ALL</b>               | <b>86</b> | <b>100.0</b> |

## Further analysis of Victorian data

### Estimate of additional Victorian hospitalisations

The ICD-10-AM code used to identify mobility scooter injury cases in the VAED is specific to falls from mobility scooters. To estimate the additional number of cases that result from other causes of injury the ratio of falls to the other causes identified in the limited number of hospital admissions captured in the VEMD data was used (see section 3.1.2 *Emergency Department Presentations*). There were 86 fall hospitalisations recorded for the 2008/9 year and we would expect there to be at least another 53 mobility scooter hospitalisations over the 2008/9 year, comprising 21 collisions with motor vehicles, 9 collisions with other objects, 2 unspecified collisions, 8 roll/tip overs and 13 other and unknown causes.

### Average length of stay

Overall, the average length of stay for 2008/9 mobility scooter fall injury hospitalisations in Victoria was 11 days (9.0 days for males and 12.5 for females).

### Injury severity

To examine the severity of motorised mobility scooter injury hospitalisations each hospital record was given an International Classification of Disease (ICD)-based Injury Severity Score (ICISS). The ICISS involves estimating the probability of death ('threat-to-life') using the ICD injury diagnosis codes recorded in a person's hospital record. An injury is defined here as 'serious' (high threat-to-life) if the ICISS score is less than 0.941. Injury of this severity is likely to have a large effect on the patient in terms of persisting health problems and need for follow-up health care (see section 3.1.1 *Hospitalisations* for further information).

Overall, 36% of motorised mobility scooter hospitalisations were categorised as 'serious'. This is a much higher rate of 'serious' hospitalisations than found for all unintentional injury causes combined (16%) and also higher than for all types of injury in the 60 years and older age group (30%).

### Hospital costs

Each hospitalisation was assigned an Australian Refined Diagnosis Related Group (AR-DRG) which is a patient classification system that provides a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital. The National Hospital Costs Data Collection (NHCDC) produces average costs for each AR-DRG by state (for further information see section 3.1.1 *Hospitalisations*).

The total hospital costs of mobility scooter fall injury hospitalisations in Victoria over the 2008/9 financial year were \$487,232. The average (mean) cost per hospitalisation was \$5,665 (range: \$1,058 to \$37,056). Overall, females had a higher average cost than males (\$6,136 compared to \$5,099).

#### 4.1.2 Emergency Department Presentations (including subsequent admissions), 2000-2009

##### VICTORIAN ED PRESENTATIONS

Source: Victorian Injury Surveillance Unit (VISU), Victorian Emergency Minimum Dataset (VEMD)

The following data have been extracted from the Victorian Emergency Minimum Dataset (VEMD) which is a record of Emergency Department (ED) presentations to 38 major Victorian hospitals. See section 3.1.2 *Emergency Department Presentations* for a description of the dataset and the case selection criteria for this report.

The VEMD probably records only two-thirds of injury ED presentations in Victoria. Relevant cases could only be identified from narrative text as there is no specific code for MMS in VEMD data. However only around 30% of VEMD cases have a good quality narrative such as would likely identify relevant cases. The numbers reported here are therefore likely to be a gross underestimation of the true number of cases.

There were at least 429 ED presentations in Victoria related to motorised mobility scooters over the 10-year period 2000 to 2009, 46% (n=197) of which resulted in the injured person being admitted to hospital. These numbers are underestimates due to data completeness and quality issues (see section 3.1.2 *Emergency Department Presentations*). Table 11 shows the year of presentation by departure class for the 429 injury cases.

**Table 11 Emergency Department presentations for mobility scooter injury: year of presentation by departure class, Victoria 2000-9**

|      | Admissions |      | Presentations |      | Hospital-treated |      |
|------|------------|------|---------------|------|------------------|------|
|      | n          | %    | n             | %    | n                | %    |
| 2000 | 9          | 4.6  | 11            | 4.8  | 20               | 4.7  |
| 2001 | 6          | 3.0  | 10            | 4.4  | 16               | 3.7  |
| 2002 | 10         | 5.1  | 10            | 4.4  | 20               | 4.7  |
| 2003 | 15         | 7.6  | 18            | 7.9  | 33               | 7.7  |
| 2004 | 15         | 7.6  | 24            | 10.5 | 39               | 9.1  |
| 2005 | 23         | 11.7 | 25            | 10.9 | 51               | 11.9 |
| 2006 | 27         | 13.7 | 38            | 16.6 | 65               | 15.2 |
| 2007 | 28         | 14.2 | 36            | 15.7 | 64               | 14.9 |
| 2008 | 31         | 15.7 | 26            | 11.4 | 57               | 13.3 |
| 2009 | 33         | 16.8 | 31            | 13.5 | 64               | 14.9 |
| ALL  | 197        | 100  | 229           | 100  | 429              | 100  |

*Note (1) - 3 injury cases had missing departure status so the combined number of admissions and presentations does not add up to the total number of hospital-treated cases.*

*Note (2) – Some hospitals have been added to the VEMD collection over the 10 year period*

While it appears that the number of hospital-treated cases is increasing this may be due to the increase in the number of hospitals contributing to the VEMD over the decade or better reporting. The following section examines the trend in injury cases taking into account the changes in the VEMD over the 10-year period 2000-2009.

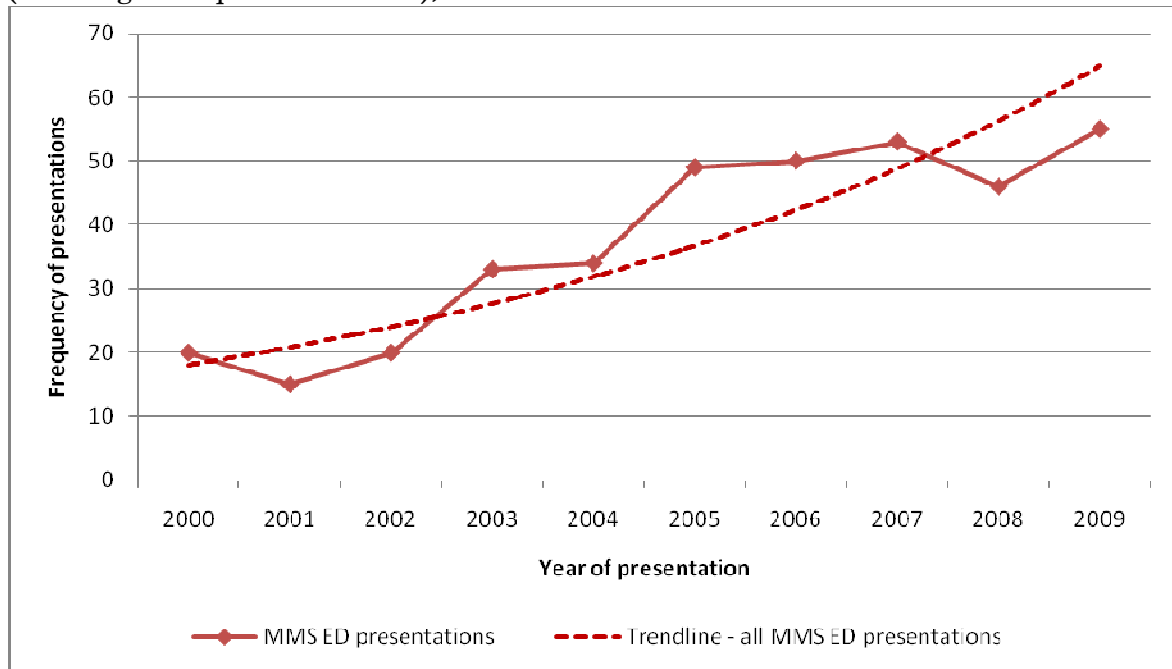
##### **Trend in motorised mobility scooter injury, Victoria 2000-2009**

In examining the trend only data from hospitals that have contributed to the VEMD for the entire 10 year period have been included – this reduces the number of cases from 429 to 375.

Although the frequency of cases may be previously under-counted it is likely that this problem with data has been fairly consistent over time and the trend is therefore likely to be reliable.

Figure 2 shows the trend in the frequency of motorised mobility scooter injury ED presentations (including subsequent admissions) in Victoria between January 1 2000 and December 31 2009. The frequency of ED presentations (including subsequent admissions) increased significantly over the decade from 20 in 2000 to 55 in 2009, representing an estimated annual increase of 13.5% (95% confidence interval +7.4% to +17.9%) and an overall estimated increase of 255% (+104% to +421%).

**Figure 2 Trend in the frequency of motorised mobility scooter injury ED presentations (including subsequent admissions), Victoria 2000-2009**



*Note (1) analysis includes only hospitals that have contributed to the VEMD over the entire 2000-9 decade.*

Table 12 shows the age group and gender of injured person by departure class:

- Females are over-represented in mobility scooter injury admissions (52%) but under-represented in non-admitted cases (45%).
- The age pattern is fairly similar in non-admitted and admitted cases except in four age groups: 60 to 64 year olds (16% of non-admissions, 6% of admissions); 70 to 74 years olds (15% of non-admissions, 10% of admissions); 75 to 79 years olds (15% of non-admissions, 20% of admissions); and persons aged 90 year and older (10% of non-admissions, 13% of admissions).

**Table 12 Emergency Department presentations for mobility scooter injury: age group and gender by departure class, Victoria 2000-9**

|                  | Admissions |      | Presentations (non-admissions) |      | Hospital-treated |      |
|------------------|------------|------|--------------------------------|------|------------------|------|
|                  | N          | %    | n                              | %    | n                | %    |
| <b>GENDER</b>    |            |      |                                |      |                  |      |
| Male             | 95         | 48.2 | 125                            | 54.6 | 223              | 52.0 |
| Female           | 102        | 51.8 | 104                            | 45.4 | 206              | 48.0 |
| ALL              | 197        | 100  | 229                            | 100  | 429              | 100  |
| <b>AGE GROUP</b> |            |      |                                |      |                  |      |
| <50              | 1          | 0.5  | 4                              | 1.7  | 5                | 1.2  |
| 50-54            | 4          | 2.0  | 3                              | 1.3  | 7                | 1.6  |
| 55-59            | 1          | 0.5  | 2                              | 0.9  | 3                | 0.7  |
| 60-64            | 12         | 6.1  | 35                             | 15.3 | 48               | 11.2 |
| 65-69            | 21         | 10.7 | 23                             | 10.0 | 44               | 10.3 |
| 70-74            | 20         | 10.2 | 34                             | 14.8 | 54               | 12.6 |
| 75-79            | 39         | 19.8 | 34                             | 14.8 | 74               | 17.2 |
| 80-84            | 40         | 20.3 | 37                             | 16.2 | 77               | 17.9 |
| 85-89            | 33         | 16.8 | 35                             | 15.3 | 68               | 15.9 |
| 90+              | 26         | 13.2 | 22                             | 9.6  | 49               | 11.4 |
| ALL              | 197        | 100  | 229                            | 100  | 429              | 100  |

*Note (1) - 3 injury cases had missing departure status so the combined number of admissions and presentations does not add up to the total number of hospital-treated cases.*

Table 13 shows the body region injured and nature of injury by departure class:

- Among admitted cases, lower extremity injuries were most common (40%, n=79), followed by upper extremity injuries (17%, n=33) and injuries to the trunk (15%, n=30).
- Among non-admitted cases, the most commonly injured body regions are the upper extremity (31%, n=71), followed by the head/face/neck (25%, n=58) and lower extremity (23%, n=53).
- Fractures accounted for more than half of the admitted cases (54%). Open wounds (25%) and superficial injuries (23%) were the most common types of injury among non-admitted cases.

**Table 13 Emergency Department presentations for mobility scooter injury: body region injured and nature of injury by departure class, Victoria 2000-9**

|                             | Admissions |      | Presentations |      | Hospital-treated |      |
|-----------------------------|------------|------|---------------|------|------------------|------|
|                             | n          | %    | n             | %    | n                | %    |
| <b>BODY REGION</b>          |            |      |               |      |                  |      |
| Head/face/neck              | 20         | 10.2 | 58            | 25.3 | 78               | 18.2 |
| Trunk                       | 30         | 15.2 | 16            | 7.0  | 46               | 10.7 |
| Upper extremity             | 33         | 16.8 | 71            | 31.0 | 106              | 24.7 |
| Lower extremity             | 79         | 40.1 | 53            | 23.1 | 132              | 30.8 |
| Multiple body regions       | 26         | 13.2 | 25            | 10.9 | 52               | 12.1 |
| Other specified body region | 6          | 3.0  | 4             | 1.7  | 10               | 2.3  |
| Unspecified body region     | 3          | 1.5  | 2             | 0.9  | 5                | 1.2  |
| ALL                         | 197        | 100  | 229           | 100  | 429              | 100  |
| <b>NATURE OF INJURY</b>     |            |      |               |      |                  |      |
| Fracture                    | 106        | 53.8 | 28            | 12.2 | 135              | 31.5 |
| Dislocation, sprain &       | 19         | 9.6  | 41            | 17.9 | 60               | 14.0 |

|                            |     |      |     |      |     |      |
|----------------------------|-----|------|-----|------|-----|------|
| strain                     |     |      |     |      |     |      |
| Open wound                 | 21  | 10.7 | 58  | 25.3 | 79  | 18.4 |
| Superficial injury         | 7   | 3.6  | 53  | 23.1 | 61  | 14.2 |
| Multiple injuries          | 19  | 9.6  | 10  | 4.4  | 30  | 7.0  |
| Injury to muscle or tendon | 3   | 1.5  | 11  | 4.8  | 14  | 3.3  |
| Intracranial               | 6   | 3.0  | 3   | 1.3  | 9   | 2.1  |
| Other specified injury     | 12  | 6.1  | 16  | 7.0  | 28  | 6.5  |
| Unspecified injury         | 4   | 2.0  | 9   | 3.9  | 13  | 3.0  |
| ALL                        | 197 | 100  | 229 | 100  | 429 | 100  |

*Note - 3 injury cases had missing departure status so the combined number of admissions and presentations does not add up to the total number of hospital-treated cases.*

Table 14 shows the cause of injury by departure class:

- Falls was the most common cause of injury among admissions (62%) and non-admissions (60%).
- Injuries sustained as a result of collisions with motor vehicles were more likely to result in admission than injuries from other causes (53% of ED presentations for injuries from motor vehicle crashes were subsequently admitted, n=30/56).

**Table 14 Emergency Department presentations for mobility scooter injury: cause of injury by departure class, Victoria 2000-9**

|                              | Admissions |      | Presentations |      | Hospital-treated |      |
|------------------------------|------------|------|---------------|------|------------------|------|
|                              | n          | %    | n             | %    | n                | %    |
| Fall                         | 122        | 61.9 | 137           | 59.8 | 261              | 60.8 |
| Collision with motor vehicle | 30         | 15.2 | 26            | 11.4 | 56               | 13.1 |
| Collision with object        | 12         | 6.1  | 16            | 7.0  | 28               | 6.5  |
| Collision unspecified        | 3          | 1.5  | 6             | 2.6  | 9                | 2.1  |
| Roll/tip over                | 11         | 5.6  | 16            | 7.0  | 27               | 6.3  |
| Other & unknown              | 19         | 9.6  | 28            | 12.2 | 48               | 11.2 |
| ALL                          | 197        | 100  | 229           | 100  | 429              | 100  |

*Note (1) - 3 injury cases had missing departure status so the combined number of admissions and presentations does not add up to the total number of hospital-treated cases.*

## Further detail on circumstances of injury by cause

### (1) Falls

Sixty-one percent of incidents were the result of falls (n=261). Most descriptions simply stated that the injured person fell from motorised scooter with no further details of the circumstances. The following records provided some additional information regarding the circumstances of these incidents:

- *Injury to the head/scalp following a fall off motorised scooter, had been drinking heavily*
- *Fell off mobile scooter, laceration to forehead, had been drinking*
- *Ejected and fell from scooter when accelerator was inadvertently pushed*
- *Fell from upright position when trying to get on electric scooter*
- *Fell out of scooter whilst bending over to pick something from footpath*
- *Fell off scooter on foot path*
- *Fell from scooter in church*
- *Absconded from seniors' village on a motor-scooter and had a fall*
- *Laceration left leg, large full thickness wound and skin tear to elbow, fall*

- from motorised scooter which then ran her over*
- Lost control of mobility scooter - fallen off*
- Outside unit in retirement village doing riding motorised scooter (not registered) caused by scooter with missed kerb & toppled out*
- Misjudged kerb while driving motorised scooter - fell off*
- Electric scooter hit bump causing patient to fall out injuring right elbow & wrist*
- Shopping using motorised scooter, accidentally hit reverse lever and fell off onto left side,*
- Fall from motorised scooter- handle bars striking lower ribs with pain on breathing*
- Accidentally pushed accelerator on scooter, slipped and fell onto shoulder*
- Laceration to lower leg post falling off scooter and landing on concrete planter box*
- Fell out of scooter attempting to retrieve shoe*
- Fall off scooter in supermarket*
- Injury - leg (femur and upper leg) post fall off motor scooter going over pothole*
- Falling off electric scooter, smells of alcohol- slurred speech*
- Fell out of scooter on uneven concrete*
- Getting out of electric scooter fell onto right side landing on wrist and hip*
- Riding scooter - went over bump, fell off, injury to right hip*
- Riding mobility scooter when fell out of it after striking the gutter*
- Fell out of scooter whilst bending over to pick something from footpath*
- Feel off scooter post drinking alcohol today.*
- On footpath in electric scooter and fell down rock-wall impacting on sand*

## **(2) Collision with motor vehicles**

Thirteen percent of incidents were the result of a collision between a scooter and a motor vehicle (mostly cars) (n=56). Most descriptions simply stated that the scooter and motor vehicle collided with no further details of the circumstances. The following records provided some additional information regarding the circumstances of these incidents:

- Hit car bumper while driving electric scooter laceration to left elbow*
- Failed to give way hit by oncoming car at speed of less than 50kms, travelling on motorised scooter*
- Driving a motorised scooter when hit from behind by car*
- Knocked off scooter by truck*
- Riding on motorised scooter on footpath when hit by a car backing out causing fractured neck of femur*
- Crossing road on motorised scooter. Hit by car at low speed*
- Truck reversed into scooter*
- Grazes & haematoma to left foot & calf post being knocked off scooter by a 4 wheel-drive reversing in driveway*
- Hit by car on electric scooter at intersection*
- Injury - multiple sites post being knocked off motorised scooter by van*
- Painful right) foot and arm, post collision with car, was on scooter crossing road.*
- Pedestrian in motorised scooter hit by truck*
- Riding in motorised scooter when hit by bus at low speed & knocked from scooter onto right side*
- Driving scooter on road, another car turned into scooter*
- Riding a mobility scooter on the footpath when a car backed out of their*

driveway

### **(3) Collisions with other objects**

Incidents commonly occurred as a result of a collision with other objects (n=28, 7%). The following records provided some additional information regarding the circumstances of these incidents:

- *Degloving of finger as a result of crashing gofer/scooter into a bush*
- *Driving motor scooter at 8km/hr, collided with fence, foot became entangled, scooter kept going leaving patient behind, externally rotating right ankle and knee*
- *Laceration to forehead and neck pain post hitting head on low lying branch, patient was on motorised scooter*
- *Hit by automatic door whilst shopping- riding in motorised scooter, sustained a fracture of the right tibia and fibula*
- *On scooter at home when front wheel got caught in garden bed, patient attempted to release scooter but accidentally reversed, she was thrown off and hit cement wall*
- *Back pain, low lumbar, was pushed by motor scooter against wall*
- *Riding scooter; ran into tree*
- *Riding motorised scooter down hill when hit head on guard rail*
- *Lacerated right leg injury sustained when electric scooter ran into bush*
- *Riding scooter/wheelchair banged into fence*
- *Patient shopping-had collision with a pram and was knock off her motorised scooter*
- *Accident on motorised scooter when ran into a signpost*
- *Sitting on motorised scooter knocked knee on wall – laceration to left knee small amount of fresh bleeding*
- *Ran into garage door on scooter*

### **(4) Collisions with unspecified objects**

Some incidents occurred as a result of a collision with other objects (n=9, 2%). No records provided useful additional information regarding the circumstances of these incidents.

### **(5) Roll overs**

Rolling the scooter or being tipped from it accounted for an additional 6% of incidents (n=27).

- *Scooter incident, overbalanced and rolled to gutter from footpath*
- *Using battery scooter chair on uneven ground and it rolled, pain to right shoulder unable to raise arm*
- *Riding scooter, tipped over when getting out of it*
- *Large skin tear to forearm, after overbalancing gopher, hitting arm on a door*
- *Head injury without loss of consciousness when scooter she was on turned over & went on top of her.*
- *Over balanced on motorised scooter falling and hitting head in supermarket*
- *Picking something up while sitting in the gopher - caused by lost balance*
- *On roadside driving mobility scooter caused by uneven ground, scooter overbalanced*
- *Took a corner and scooter slipped -fell onto shoulder*

### **(6) Other**

The remaining 11% of records (n=48) did not provide any further details on the circumstances of the injury event.

Table 15 shows the activity being engaged in at the time of injury and location of the injury event by departure class:

- The pattern of activity and location when injured were consistent across admitted and non-admitted cases. Leisure was the most common recorded activity (47% of admissions and 53% of non-admitted cases) and the road, street and highway the most common location of injury (56% of admissions and 50% non-admitted cases).

**Table 15 Emergency Department presentations for mobility scooter injury: activity and location of injury by departure class, Victoria 2000-9**

|                                           | Admissions |      | Presentations |      | Hospital-treated |      |
|-------------------------------------------|------------|------|---------------|------|------------------|------|
|                                           | n          | %    | n             | %    | n                | %    |
| <b>ACTIVITY</b>                           |            |      |               |      |                  |      |
| Leisure                                   | 93         | 47.2 | 122           | 53.3 | 217              | 50.6 |
| Vital activity, resting, sleeping, eating | 18         | 9.1  | 18            | 7.9  | 36               | 8.4  |
| Other specified                           | 48         | 24.4 | 60            | 26.2 | 108              | 25.2 |
| Unspecified                               | 38         | 19.3 | 29            | 12.7 | 68               | 15.9 |
| ALL                                       | 197        | 100  | 229           | 100  | 429              | 100  |
| <b>LOCATION</b>                           |            |      |               |      |                  |      |
| Road, street or highway                   | 111        | 56.3 | 115           | 50.2 | 229              | 53.4 |
| Home                                      | 38         | 19.3 | 69            | 30.1 | 107              | 24.9 |
| Place for recreation                      | 3          | 1.5  | 9             | 3.9  | 12               | 2.8  |
| Residential institution                   | 6          | 3.0  | 5             | 2.2  | 11               | 2.6  |
| Other specified places                    | 22         | 11.2 | 22            | 9.6  | 44               | 10.3 |
| Unspecified places                        | 17         | 8.6  | 9             | 3.9  | 26               | 6.1  |
| ALL                                       | 197        | 100  | 229           | 100  | 429              | 100  |

*Note - 3 injury cases had missing departure status so the combined number of admissions and presentations does not add up to the total number of hospital-treated cases.*



## QUEENSLAND ED PRESENTATIONS, 2000-2009

Source: Queensland Injury Surveillance Unit (QISU)

The Queensland Injury Surveillance Unit (QISU) collects and analyses data from ED injury presentations on behalf of Queensland Health. Although participating hospitals represent urban, rural and remote areas of Queensland these data are estimated to be representative of only one-quarter of emergency department presentations in Queensland.

Due to the different capture rates of the Victorian and Queensland injury surveillance systems, there were fewer cases recorded on the Queensland data system than the Victorian system over the decade 2000-2009 (see section 3.1.2 *Emergency Department Presentations* for explanation of data completeness and quality issues). Only 42 ED presentations related to motorised mobility scooters were identified on the QISU dataset, with 12 of these incidents resulting in admission to hospital (29%).

The pattern of injury among Queensland ED presentations is summarised in Table 16.

- The small number of mobility scooter injury cases recorded on the QISU dataset makes trend analysis difficult. However, it does appear that there has been an increase in mobility scooter cases considering that 13 of the 42 cases (31%) occurred in the first 5 years of the decade (2000-4) whereas 29 (69%) occurred in the final 5 years of the decade (2005-9).
- Females were over-represented in mobility scooter injury admissions (58%) but not ED presentations (50%).
- Almost all injury cases occurred in persons aged 60-89 years (n=35, 83%), with just 3 hospital-treated injury cases recorded for persons aged less than 60 years and 4 recorded for persons aged 90 years or older.
- Lower extremity injury, upper extremity injury and injuries to multiple body regions each account for 25% of admitted cases (n=3 each). Among non-admitted cases injuries were most commonly to the upper extremity (30%), followed by the lower extremity (23%) and multiple body regions (20%).
- Fractures accounted for half of the admissions (50%) whereas open wounds (30%) and superficial injuries (27%) were the most common types of injury among non-admitted cases.
- Falls was the most common cause of both admitted (75%) and non-admitted cases (67%).
- More than half of all hospital-treated injury cases were coded to 'other or unspecified' activity (n=24, 57%) and 26% were coded to leisure (n=11). This pattern was consistent across admitted and non-admitted cases.
- The road, street and highway was the most common location of injury (58% of admissions and 50% of non-admitted cases), followed by the home (17% and 20%).

Table 16 Pattern of hospital-treated motorised mobility scooter related injury, Queensland 2000-2009

|                      | Admissions |      | Presentations |     | Hospital treated |     |
|----------------------|------------|------|---------------|-----|------------------|-----|
|                      | n=12       | %    | n=30          | %   | n=42             | %   |
| YEAR OF PRESENTATION |            |      |               |     |                  |     |
| 2000                 | 1          | 8.3  | 0             | 0.0 | 1                | 2.4 |
| 2001                 | 2          | 16.7 | 1             | 3.3 | 3                | 7.1 |

|                                        |   |      |    |      |    |      |
|----------------------------------------|---|------|----|------|----|------|
| 2002                                   | 1 | 8.3  | 3  | 10.0 | 4  | 9.5  |
| 2003                                   | 0 | 0.0  | 1  | 3.3  | 1  | 2.4  |
| 2004                                   | 2 | 16.7 | 2  | 6.7  | 4  | 9.5  |
| 2005                                   | 1 | 8.3  | 5  | 16.7 | 6  | 14.3 |
| 2006                                   | 3 | 25.0 | 3  | 10.0 | 6  | 14.3 |
| 2007                                   | 0 | 0.0  | 5  | 16.7 | 5  | 11.9 |
| 2008                                   | 1 | 8.3  | 5  | 16.7 | 6  | 14.3 |
| 2009                                   | 1 | 8.3  | 5  | 16.7 | 6  | 14.3 |
| <b>GENDER</b>                          |   |      |    |      |    |      |
| Male                                   | 5 | 41.7 | 15 | 50.0 | 20 | 47.6 |
| Female                                 | 7 | 58.3 | 15 | 50.0 | 22 | 52.4 |
| <b>AGE GROUP</b>                       |   |      |    |      |    |      |
| <60 years                              | 0 | 0.0  | 3  | 10.0 | 3  | 7.1  |
| 60-69 years                            | 2 | 16.7 | 10 | 33.3 | 12 | 28.6 |
| 70-79 years                            | 4 | 33.3 | 7  | 23.3 | 11 | 26.2 |
| 80-89 years                            | 5 | 41.7 | 7  | 23.3 | 12 | 28.6 |
| 90+ years                              | 1 | 8.3  | 3  | 10.0 | 4  | 9.5  |
| <b>BODY REGION INJURED</b>             |   |      |    |      |    |      |
| Head/face/neck                         | 1 | 8.3  | 4  | 13.3 | 5  | 11.9 |
| Trunk                                  | 2 | 16.7 | 2  | 6.7  | 4  | 9.5  |
| Upper extremity                        | 3 | 25.0 | 9  | 30.0 | 12 | 28.6 |
| Lower extremity                        | 3 | 25.0 | 7  | 23.3 | 10 | 23.8 |
| Multiple body regions                  | 3 | 25.0 | 6  | 20.0 | 9  | 21.4 |
| Other specified body region            | 0 | 0.0  | 1  | 3.3  | 1  | 2.4  |
| Unspecified body region                | 0 | 0.0  | 1  | 3.3  | 1  | 2.4  |
| <b>INJURY TYPE</b>                     |   |      |    |      |    |      |
| Fracture                               | 6 | 50.0 | 5  | 16.7 | 11 | 26.2 |
| Open wound                             | 2 | 16.7 | 9  | 30.0 | 11 | 26.2 |
| Superficial injury                     | 1 | 8.3  | 8  | 26.7 | 9  | 21.4 |
| Dislocation, sprain & strain           | 2 | 16.7 | 3  | 10.0 | 5  | 11.9 |
| Multiple injuries                      | 0 | 0.0  | 1  | 3.3  | 1  | 2.4  |
| Intracranial                           | 1 | 8.3  | 0  | 0.0  | 1  | 2.4  |
| Other specified injury                 | 0 | 0.0  | 3  | 10.0 | 3  | 7.1  |
| Unspecified injury                     | 0 | 0.0  | 1  | 3.3  | 1  | 2.4  |
| <b>CAUSE OF INJURY</b>                 |   |      |    |      |    |      |
| Fall                                   | 9 | 75.0 | 20 | 66.7 | 29 | 69.0 |
| Collision with motor vehicle           | 2 | 16.7 | 3  | 10.0 | 5  | 11.9 |
| Collision with object                  | 1 | 8.3  | 2  | 6.7  | 3  | 7.1  |
| Roll/tip over                          | 0 | 0.0  | 2  | 6.7  | 2  | 4.8  |
| Other & unknown                        | 0 | 0.0  | 3  | 10.0 | 3  | 7.1  |
| <b>ACTIVITY</b>                        |   |      |    |      |    |      |
| Leisure                                | 3 | 25.0 | 8  | 26.7 | 11 | 26.2 |
| Vital activity, resting, sleeping, eat | 2 | 16.7 | 5  | 16.7 | 7  | 16.7 |
| Other specified                        | 6 | 50.0 | 12 | 40.0 | 18 | 42.9 |
| Unspecified                            | 1 | 8.3  | 5  | 16.7 | 6  | 14.3 |
| <b>LOCATION</b>                        |   |      |    |      |    |      |
| Road, street or highway                | 7 | 58.3 | 15 | 50.0 | 22 | 52.4 |
| Home                                   | 2 | 16.7 | 6  | 20.0 | 8  | 19.0 |

|                         |           |            |           |            |           |            |
|-------------------------|-----------|------------|-----------|------------|-----------|------------|
| Residential institution | 2         | 16.7       | 0         | 0.0        | 2         | 4.8        |
| Place for recreation    | 0         | 0.0        | 1         | 3.3        | 1         | 2.4        |
| Other specified places  | 0         | 0.0        | 5         | 16.7       | 5         | 11.9       |
| Unspecified places      | 1         | 8.3        | 3         | 10.0       | 4         | 9.5        |
| <b>ALL</b>              | <b>12</b> | <b>100</b> | <b>30</b> | <b>100</b> | <b>42</b> | <b>100</b> |

## Further detail on circumstances of injury by cause

### (1) Falls

Most incidents were caused by falls (n=29, 69%). Half of the case narratives provided useful additional information on the circumstances of the fall:

- *Fell from motorised scooter onto brick ground*
- *At nursing home driving motorised scooter fell off*
- *Riding motor scooter at 20 kph / fell off*
- *Riding motorised scooter on path tripped when getting off*
- *Consciousness altered level rode motor scooter down 8 or 9 steps staff not sure of mental state prior to laceration left ear nil other obvious injuries*
- *Riding motorised scooter on dirt road lost control fell off wearing helmet*
- *Sided chest rib pain motor scooter landing on medium strip on wet road*
- *At home in yard trying to turn on house light fell from electric scooter chair*
- *Painful elbow fell from electric scooter caught wheel on concrete edging on pedestrian crossing*
- *Riding motorised wheelchair on bitumen road fell off landing on road*
- *Outside getting into scooter pulled over by an electric scooter and thrown to the ground landing heavily and hitting concrete*
- *Riding motorised scooter on road lifted hand to sneeze and fell off*
- *Muscular dystrophy patient on scooter went into reverse by accident, patient fell off landing on back and injuring knee*
- *Fall at shopping centre off motorised scooter on uneven ground - walking speed*

### (2) Collisions with motor vehicles

Twelve percent of incidents were the result of a collision between a motor vehicle (mostly cars) and the scooter (n=5). The following records provided some additional information regarding the circumstances of the incident:

- *Pedestrian crossing road in motorised wheelchair struck by car*
- *Riding motorised wheelchair scooter on road ran into moving car*
- *Low speed impact hit by car when riding motorised scooter*
- *Patient was driving a scooter collided with a taxi at low speed*

### (3) Collisions with other objects

Three incidents occurred as a result of a collision with other objects (7%).

- *Laceration to right foot following driving electric scooter into parked pushbike which fell onto foot*
- *At home in motorised scooter hit arm on door- jammed*
- *On main road in a motorised scooter veered into a pole*

### (4) Roll overs

Rolling the scooter or being tipped from it accounted for 2 cases (5%).

- *Riding motorised scooter to bowls club scooter slipped sideways on wet road when attempting to avoid collision with car*

## (5) Other

The remaining 7% of records (n=3) did not provide any further details on the circumstances of the injury event.

### 4.1.3 Victorian Trauma Registry Data

Twenty-two cases of major trauma from motorised mobility scooter injury were identified in the Victorian State Trauma Registry (VSTR) for the period July 2001 to March 2010. MMS cases account for 0.12% of all major trauma cases in the Registry for the same period. Thirty two percent of the motorised mobility scooter injury cases (n=7) occurred in 2007.

Table 17 shows the characteristics of the 22 identified cases. The majority were male (73%, n=16) and most cases were aged over 80 years (68%, n=15). More than half sustained a head injury (55%, n=12). Other affected body regions included multiple injuries, face, chest, spinal and isolated orthopaedic injury. Over half (59%, n=13) of the major trauma injury cases were related to falls, while 36% (n=8) were related to being struck by a motor vehicle. Thirty-two percent (n=7) of cases with major trauma from mobility scooter injury died in hospital.

Table 17 Major trauma cases related to motorised mobility scooters (n=22)

| Variable                        | Frequency<br>(n=22) | %    |
|---------------------------------|---------------------|------|
| <b>Gender</b>                   |                     |      |
| Male                            | 16                  | 73%  |
| Female                          | 6                   | 27%  |
| <b>Age Group</b>                |                     |      |
| Other age groups                | 7                   | 33%  |
| >80                             | 15                  | 68%  |
| <b>Injury Type</b>              |                     |      |
| Blunt                           | 22                  | 100% |
| <b>Body Region</b>              |                     |      |
| Isolated Head Injury            | 12                  | 55%  |
| Other body regions <sup>6</sup> | 10                  | 48%  |
| <b>Cause</b>                    |                     |      |
| Fall                            | 13                  | 59%  |
| Struck by motor vehicle         | 8                   | 36%  |
| Other                           | *                   | *    |
| <b>Location</b>                 |                     |      |
| Road, street, or highway        | 18                  | 82%  |
| Other                           | *                   | *    |
| <b>Discharge Status</b>         |                     |      |
| Rehabilitation                  | 9                   | 41%  |
| Death                           | 7                   | 32%  |
| Home                            | 5                   | 23%  |
| Other                           | *                   | *    |
| <b>Length of Stay</b>           | <b>Days</b>         |      |

<sup>6</sup> Other body regions cannot be reported separately due to small cell frequencies.

|         |     |
|---------|-----|
| Average | 9.6 |
| Median  | 5.3 |

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\*values less than 5 are not documented.

## 4.2 National Coroners Information System

### 4.2.1 Closed Coroners' Cases

A detailed search of the National Coroners Information System (NCIS) identified sixty two fatalities related to motorised mobility scooters in Australia over the period July 1 2000 to 16 August 2010. See section 3.2 *Mortality Data* for a description of the selection criteria for this report. The number of deaths peaked in 2005/2006 (n=13 each year) and has been declining since then, however at the time of writing this report there were 14 open coroners cases potentially related to motorised mobility scooters (see section 4.2.2 *Open Coroners' Cases*).

#### Demographic characteristics

The demographic characteristics of the 62 identified cases are presented in Table 18. All jurisdictions in Australia reported at least one case to the NCIS. The majority of fatalities reported or recorded as MMS-related occurred in: Victoria (39%, n=24); Western Australia (18%, n=11); and South Australia (15%, n=9). Most cases were male (74%, n=46), and aged 80 years or older (71%). Where values are less than three the actual result is not documented.

Results are unable to be stratified by age categories due to small cell numbers, however males account for 50% or greater of each separate age category.

Table 18 Demographic Characteristics of MMS Fatalities

| Variable                     | Frequency<br>(n=62) | %   |
|------------------------------|---------------------|-----|
| <b>Age categories</b>        |                     |     |
| <70                          | 8                   | 13% |
| 70-74                        | 4                   | 6%  |
| 75-79                        | 6                   | 10% |
| 80-84                        | 13                  | 21% |
| 85-89                        | 13                  | 21% |
| 90+                          | 18                  | 29% |
| <b>Sex</b>                   |                     |     |
| Female                       | 16                  | 26% |
| Male                         | 46                  | 74% |
| <b>State</b>                 |                     |     |
| Victoria                     | 24                  | 39% |
| Western Australia            | 11                  | 18% |
| South Australia              | 9                   | 15% |
| New South Wales              | 8                   | 13% |
| Queensland                   | 5                   | 8%  |
| Australian Capital Territory | <3                  | *   |
| Tasmania                     | <3                  | *   |
| Northern Territory           | <3                  | *   |
| <b>Year of incident</b>      |                     |     |
| 2001                         | <3                  | *   |
| 2002                         | 6                   | 10% |
| 2003                         | 8                   | 13% |

|      |    |     |
|------|----|-----|
| 2004 | 6  | 10% |
| 2005 | 13 | 21% |
| 2006 | 13 | 21% |
| 2007 | 6  | 10% |
| 2008 | 5  | 8%  |
| 2009 | <3 | *   |
| 2010 | <3 | *   |

### Mechanism of injury

The three most common mechanisms of fatal injury were being struck by a motor vehicle (48%, n=30), falling (44%, n=27) and losing control of the scooter (5%, n=3). Details regarding the activity being engaged in at the time of the fatal incident were not recorded in 31% (n=19) of cases. In 29% (n=18) of the total cases the activity being undertaken at the time of the incident was crossing a road (Table 19) and in 10% (n=6) of cases the activity involved an attempt to alight from the mobility scooter.

**Table 19** Mechanism of fatal injury and activity being engaged in at time of injury

| <b>Mechanism</b>                    | <b>n=62</b> | <b>%</b> |
|-------------------------------------|-------------|----------|
| Struck by a motor vehicle           | 30          | 48%      |
| Falls                               | 27          | 44%      |
| Loss of control                     | 3           | 5%       |
| Fire                                | <3          | *        |
| Unknown                             | <3          | *        |
| <b>Activity</b>                     |             |          |
| Unknown                             | 19          | 31%      |
| Crossing road                       | 14          | 23%      |
| Attempting to alight                | 6           | 10%      |
| Entered intersection                | 5           | 8%       |
| Crossing road – pedestrian crossing | 4           | 6%       |
| At home                             | 3           | 5%       |
| Travelling along road               | 3           | 5%       |
| Travelling down the path            | 3           | 5%       |
| Travel from footpath to road        | <3          | *        |
| Crossing driveway                   | <3          | *        |
| In park                             | <3          | *        |
| Travel down driveway                | <3          | *        |

The mechanism of injury and activity being undertaken at the time of injury follow a similar trend across different age categories and genders. Table 20 shows the mechanism of fatal injury by age group, a larger proportion of those in 80-84 year and 90 and older age groups were struck by a vehicle whereas a larger proportion of those in the younger age groups and the 85-89 year age group sustained a fatal injury as a result of a fall.

**Table 20** Mechanism of fatal injury by age group

| <b>Mechanism</b> | <b>Age Categories</b> |              |              |              |              |            | <b>Total</b> |
|------------------|-----------------------|--------------|--------------|--------------|--------------|------------|--------------|
|                  | <b>&lt;70</b>         | <b>70-74</b> | <b>75-79</b> | <b>80-84</b> | <b>85-89</b> | <b>90+</b> |              |
| Fall             | 4(50%)                | <3           | 3(50%)       | 5(38%)       | 7(53%)       | 6(33%)     | 27           |

|                         |        |    |        |        |        |         |    |
|-------------------------|--------|----|--------|--------|--------|---------|----|
| Fire                    |        |    |        | <3     |        |         | *  |
| Struck by motor vehicle | 3(38%) | <3 | 3(50%) | 7(53%) | 6(46%) | 10(55%) | 30 |
| Loss of control         | <3     | <3 |        |        |        | <3      | *  |
| Unknown                 |        |    |        |        |        | <3      | *  |
| Total (100%)            | 8      | 4  | 6      | 13     | 13     | 18      | 62 |

## Further details on circumstances of death by mechanism of injury

### (1) Struck by a motor vehicle

Forty-seven percent of MMS-related deaths were the result of a collision between a mobility scooter and a motor vehicle (mostly cars, n=30). Most case narratives simply stated that the scooter and motor vehicle collided with no further details of the circumstances. The following records provided some additional information regarding the circumstances of these incidents:

- *Drove up the inside of a left turning truck while it was stopped at an intersection and was struck*
- *Hit by an oncoming motor vehicle whilst attempting to cross road, seen to be travelling quite quickly*
- *Car reversed into victim*
- *Struck by a car when attempting to cross a pedestrian crossing*
- *Struck by a vehicle whilst crossing a pedestrian crossing*
- *Drove motorised scooter through a stop sign into the path of another vehicle*
- *Driving a motorised scooter on the road when struck by a vehicle turning left at an intersection*
- *Crossing a road and moved into the path of an oncoming vehicle*
- *Rode scooter onto a roadway without giving way to vehicles*
- *Failed to observe oncoming vehicle and was struck as entered carriageway*
- *Struck by a vehicle reversing from the driveway*
- *Passed pedestrians who were waiting at the pedestrian crossing due to a red 'don't walk' signal and proceeded into the path of a vehicle*
- *Crossing a lined pedestrian crossing of a roundabout when struck by a vehicle*
- *Entered pedestrian crossing without looking for any approaching traffic and struck by a vehicle*
- *Struck by a motor vehicle at about 50 km/h.*
- *Collision with a motor vehicle while on or crossing the roadway*
- *Attempting to cross the road to enter the driveway of a nearby property*
- *Struck by a car whilst crossing the road*
- *For unknown reasons moved into the path of oncoming traffic*
- *Crossed into the path of a truck.*
- *Crossing a road*

### (2) Falls

Forty-four percent of MMS-related deaths were the result of falls (n=26). Most descriptions simply stated that the injured person fell from motorised scooter with no further details of the circumstances. The following records provided some additional information regarding the circumstances of these incidents:

- *Fell backwards from mobile scooter*
- *Stepping from mobile scooter and stumble and fell striking head*
- *Fell getting out of motorised scooter*
- *Fell while riding in the park*
- *Got off scooter to close the gate fell*



- *Driving down driveway and ran off edge causing fall*
- *Attempting to alight and accidentally hit the accelerator causing fall*
- *Became unbalanced on the path and tipped sideways*
- *Attempting to travel from the footpath to the road*
- *Fell from scooter inside hostel*
- *Fell from her scooter at a nursing home*
- *Tripped and fell whilst alighting from motorised scooter in the garage*

### **(3) Loss of control**

A number of incidents also occurred as a result of losing control of the motorised mobility scooter (n=3, 5%). The following records provided some additional information regarding the circumstances of these incidents:

- *Lost control going down a hill*
- *Lost control of electric scooter and went down a hill at excessive speed and crashed at the bottom*
- *Lost control of the scooter and collided with the gutter*

### **Cause of Death**

The cause of death was recorded for all MMS-related cases, identified in the NCIS coded field 'Medical Cause of Death 1A' (see Table 21). Thirty-nine percent of cases (n=23) had sustained a head injury which was commonly documented as either a subdural haematoma, cerebral haemorrhage, intracranial haemorrhage, cranio-cerebral blunt trauma or a severe head injury. Other common causes of death were cardiac and respiratory failure with or without limb fractures and multiple injuries.

**Table 21 Cause of Death**

| <b>Cause of death</b>                | <b>Frequency<br/>(n=62)</b> | <b>%</b>    |
|--------------------------------------|-----------------------------|-------------|
| Head injury                          | 23                          | 37%         |
| Cardiac failure                      | 11                          | 18%         |
| Multiple injuries                    | 6                           | 10%         |
| Respiratory failure                  | 3                           | 5%          |
| Pneumonia                            | 3                           | 5%          |
| Multi Organ Failure                  | <3                          | *           |
| Airway disease                       | <3                          | *           |
| Airway disease and fractured arm     | <3                          | *           |
| Cardiac failure and fractured hip    | <3                          | *           |
| Chest injuries                       | <3                          | *           |
| Ischemic brain injury                | <3                          | *           |
| Natural causes                       | <3                          | *           |
| Pneumonia and chest injury           | <3                          | *           |
| Pneumonia and fractured arm          | <3                          | *           |
| Pneumonia and fractured pelvis       | <3                          | *           |
| Pulmonary embolism                   | <3                          | *           |
| Pulmonary embolism and fractured leg | <3                          | *           |
| Renal failure                        | <3                          | *           |
| Sepsis                               | <3                          | *           |
| Smoke inhalation                     | <3                          | *           |
| <b>Total</b>                         | <b>62</b>                   | <b>100%</b> |

#### **4.2.2 Open Coroners' Cases**

A search of the NCIS identified fourteen fatalities reported to an Australian Coroner between 1 July 2000 and 28 July 2010 related to motorised mobility scooters that are currently open on the NCIS. It should be noted that these cases are yet to have the coronial investigation completed and details surrounding the circumstances of these incidents may be subject to change.

Cases were retained if the police narrative contained any of the following keywords: scooter; buggy; gopher; moped; motorised; motorized; mobility and drive; mobility and riding; cycle and motor; and electric and powered. A manual review of selected cases was undertaken in order to confirm that the cases were of relevance. Any cases where the description of the vehicle being ridden was given as a wheelchair or moped (where the moped was being driven on the road) were not included.

The results reflect the trends seen in the closed coroners' cases. Of the fourteen identified open cases, 65% (n=9) were aged 80 years or older, 85% (n=12) were male and 57% (n=8) had been struck by a car (the other 43% were the result of a fall). Seven of these cases had occurred in 2009, 4 occurred in 2010, 2 occurred in 2008 and one case remained open from 2005.

## **4.3 Key informant interviews**

From the existing literature<sup>7</sup> four broad classes of contributory factors leading to motorised mobility scooter injury are apparent. These include engineering/equipment factors, environmental factors, occupant factors and system factors. The key informant interviews were analysed within this framework to elicit the primary issues of concern to stakeholders, see section 3.3.1 *Key Informants* for further detail. Support for the ongoing use of motorised mobility scooters was strong.

### **4.3.1 System factors contributing to MMS injury**

Issues related to system factors were the most prevalent. Analysis of the data revealed seven main themes related to system factors which closely reflect those identified by the ACCC reference group meeting conducted previously.

#### **Supply of motorised scooters**

Five participants expressed concern about how motorised scooters are supplied to the Australian market in general and in particular to potential users. Of these 5 participants some questioned whether motorised scooters were being supplied for their intended purpose and felt the unregulated nature of the industry was contributing to this. They expressed the view that if all mobility scooters manufactured in, or imported into, Australia were registered with the Therapeutic Goods Administration (TGA) it would improve the suppliers' understanding of motorised mobility devices and the disabling conditions that lead to MMS use.

Other actions suggested by participants to improve the supply of safe motorised scooters included the development of an industry body to provide governance, banning of internet sales of mobility scooters and education of retailers to ensure that new users receive the appropriate mobility device for their needs and that the limitations of the device are adequately discussed.

#### **Policy related to motorised scooters**

Three participants noted the general lack of policy related to mobility scooters and felt that incorporating mobility scooter use into planning, transportation and aging policy documents could foster awareness and action in this area. It was suggested that State environmental planning policy could play a role in assisting developers and builders to incorporate scooter friendly design features into the urban and building environments. It was noted that a national policy framework incorporating motorised mobility scooters is currently being developed by Austroads (the association of Australian and New Zealand road transport and traffic authorities).

#### **Regulations and standards**

Eight participants expressed concern over the lack of clarity in current definitions of motorised mobility scooters and the rules and regulations related to them. Most of them felt that there is a lot of confusion at all levels in the community regarding the

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<sup>7</sup> Cassell E and Clapperton A. Consumer product-related injury(2): Injury related to the use of motorised mobility scooters. Hazard. 2006; 62.

appropriate use of mobility scooters. Most participants felt that a standardised set of operating regulations from a governing body would lead to clear and consistent operating rules and help to define those most likely to benefit from using a mobility scooter. Most participants also supported a set of internationally-based Australian standards that address both design and safety features, incorporating (in particular) speed capability, mass limits, transportation of scooters in vehicles and fire safety.

## **Insurance**

Five participants identified insurance as an issue of concern. The different approach to insurance across jurisdictions in Australia was identified as the primary issue. It was suggested a small levy could be collected at the point of sale to contribute towards a national third party insurance scheme. It was also suggested that standardised information relating to third party insurance should be incorporated into education material provided to the new mobility scooter user.

## **Assessment of occupants**

The assessment of users of motorised mobility scooters was expressed as an issue of concern by 10 of the key informant group. Many of these participants felt that the 'who and how' of user assessment required further consideration. Some participants supported the prescription of mobility scooters by a health professional while others suggested a system of voluntary self assessment. The provision of alternative transport solutions for those that might fail a scooter assessment and re-assessment of older users were specific issues of concern.

## **Education**

Eleven participants identified current scooter training and education as a primary factor contributing to the safety of mobility scooters. Of these 11 participants most identified the inconsistent nature of information provided to users at the point of sale as the primary issue, particularly for users that purchase a scooter privately. Most participants supported the development of standardised training information for distribution at point of sale. Specific educational requirements included: road rules; sharing public space; common reasons for accidents; skills required to prevent accidents; and information in a variety of languages. Participants felt that general community awareness of mobility scooter safety was poor and that safe motoring in the vicinity of scooters should be encouraged.

Actions to improve education material focused on: consistent information; increased availability of information and training; community demonstrations such as "scooter musters"; a DVD distributed at point of sale; working with sponsors to increase educational funding; and incorporating user perspectives into any new educational material.

## **Research**

Two participants identified the need for further research to be able to understand: 1) the type and mechanism of MMS injuries; and 2) the broader transportation needs of older people.

### **4.3.2 Engineering/equipment factors contributing to MMS injury**

Analysis of the data revealed three main themes related to engineering or equipment factors.

#### **Scooter quality**

Six participants raised issues relating to the quality of motorised mobility scooters, including the quality of imported models and second-hand scooters. It was suggested that compliance with manufacturing and design standards would address this issue. One participant was concerned that removal of less expensive models of motorised scooters from the market would reduce access to motorised mobility for people with lower socio-economic status.

#### **Design and model variability**

Fourteen participants expressed concerns relating to the design of motorised mobility scooters. The primary design concerns were: the stability of 3 wheeled models; the lack of safety features such as flags, lights, reversing indicators and seatbelts on all models; the poor visibility of scooters; steering; braking; speed; and the size of mobility scooters. A number of participants felt that the variability in design of different models contributed to the confusion amongst users and the potential to select a mobility scooter that did not meet their needs.

Actions to address the issues of scooter design primarily involved: compliance with national design standards; specific innovations such as speed regulating switches, use of highly reflective materials and restraint points on all scooters. In addition, participants suggested that potential scooter users should receive information and education to ensure they are aware of necessary safety features.

#### **Scooter maintenance**

Three participants identified ongoing maintenance of mobility scooters as a safety issue because: 1) maintenance costs are often not considered when a device is purchased; 2) people are not aware that ongoing maintenance is required; and 3) equipment purchased over the internet can be difficult to get serviced or repaired.

### **4.3.3 Occupant factors contributing to MMS injury**

Analysis of the data revealed three main themes related to occupant factors.

#### **Operating skills**

Six participants identified occupant attributes and skills as factors contributing to mobility scooter safety. The need for well-developed attributes/skills in these areas was identified: depth of vision; hearing; cognitive function; physical strength; decision making; and driving. Most participants felt that referral to an occupational therapist or other health professional would help to ensure that new users possessed the necessary skills. Other suggestions to address this issue included involving family members in the purchasing and training process, holding rights and responsibility sessions for users and supporting a retailer code of practice that advises retailers to ensure that the client is matched with the right product.

### **Misuse and occupant error**

The inappropriate use of motorised mobility scooters was identified as a significant safety issue by key informants. Thirteen participants expressed concern over the misuse of mobility scooters. The most common occupant errors or areas of misuse were felt to include: speeding; driving on the road; inappropriate use such as driving long distances; aggressive behaviour; carrying large loads; towing other objects; and making modifications to mobility scooters. The primary action suggested by participants to address the issue of occupant misuse was behaviour modification through education.

Other actions to address some of the occupant errors include nationally articulated rules and targeted speed control in settings such as shopping centres and libraries. Additionally it was suggested that an association of mobility scooter users may help to provide consistent information and model appropriate behaviour.

### **Occupant vulnerabilities**

It was noted by 2 participants that older people seeking motorised mobility devices are potentially vulnerable and that ethical sales techniques should be incorporated into a code of practice. It was also noted that the benefit of using motorised mobility should be weighed against the risk of injury.

## **4.3.4 Environmental factors contributing to MMS injury**

The final safety factor identified by participants was the environmental conditions for operating motorised scooters. Analysis of the data revealed three main themes related to environmental factors.

### **Footpaths**

The surface of, and access to, footpaths was identified by 11 participants as a key environmental safety concern. Suggested actions to address this issue included: investment in infrastructure that will occur over time; the development of 'best routes' similar to bicycle routes that alert users to the safest route; incorporation of MMS into standard urban design; education of scooter users about environmental hazards; separation of MMS from other forms of transport; and a hazard reporting hotline operated by local council.

### **Parking and charging**

Two participants identified parking and re-charging as potential safety issues.

### **Barriers to use**

Four participants identified other potential safety issues including weather conditions, public transport and interaction with pedestrians and reversing cars.

## **4.3.5 General support for common MMS injury prevention actions**

At the conclusion of the key informant survey participants were asked specifically if they supported a range of actions that have been suggested to improve the safety of motorised mobility scooters. Table 22 shows the level of support for 5 suggested actions, however many key informants offered more detailed comments to accompany these responses.

Table 22 Level of support for a range of suggested actions to improve safety of MMS

| <b>Suggested action</b>                                                                                           | <b>Frequency<br/>(n=20)</b> | <b>%</b> |
|-------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|
| <b><i>Compulsory assessment of prospective users by a health professional as a condition of community use</i></b> |                             |          |
| strongly support                                                                                                  | 7                           | 35%      |
| support                                                                                                           | 7                           | 35%      |
| undecided                                                                                                         | 4                           | 20%      |
| against                                                                                                           | 2                           | 10%      |
| <b><i>Compulsory training for prospective users as a condition of community use</i></b>                           |                             |          |
| strongly support                                                                                                  | 6                           | 30%      |
| support                                                                                                           | 10                          | 50%      |
| undecided                                                                                                         | 4                           | 20%      |
| <b><i>Compulsory scooter driving skills assessment and certification as a condition of community use</i></b>      |                             |          |
| strongly support                                                                                                  | 1                           | 5%       |
| support                                                                                                           | 8                           | 40%      |
| undecided                                                                                                         | 6                           | 30%      |
| against                                                                                                           | 5                           | 25%      |
| <b><i>The development of a mandatory safety standard for motorised mobility scooters</i></b>                      |                             |          |
| strongly support                                                                                                  | 13                          | 65%      |
| support                                                                                                           | 6                           | 30%      |
| against                                                                                                           | 1                           | 5%       |
| <b><i>Bicycle helmet wearing in public places</i></b>                                                             |                             |          |
| yes                                                                                                               | 6                           | 30%      |
| no                                                                                                                | 9                           | 45%      |
| Other                                                                                                             | 2                           | 10%      |
| undecided                                                                                                         | 3                           | 15%      |

## 4.4 MMS Users Interviews

### 4.4.1 Scooter selection

Seventy-three percent of surveyed MMS users (n=24) had purchased their scooter privately. Table 23 lists the other sources of funding including health insurance, government funding such as Department of Veterans Affairs, TAC and Polio Services Australia. Most participants (55%, n=18) reported that their scooter had been supplied through a specialist retailer. Other supply sources included a funded provider (15%, n=5), a second hand dealer (15%, n=5), an internet site (9%, n=3) and 6% of participants (n=2) had been given a scooter.

Most participants (70%, n=23) chose to use a 4-wheeled motorised scooter. Seventy percent of participants had a current drivers licence or had previously had a driver's licence. Twenty-seven percent (n=9) of participants had never had a licence to drive a motor vehicle.

Only 33% (n=11) of participants sought advice about motorised mobility scooters prior to purchase; of those eleven participants most of the advice was received from an occupational therapist (n=4) or a sales representative (n=4). Twenty one participants received instruction or training before purchasing their scooter, of those twenty one participants that received instruction or training in most cases (71%, n=15) it came from a salesperson.

**Table 23 Scooter Selection Characteristics**

| <b>Scooter selection</b>                    | Frequency<br>(n=33) | %   |
|---------------------------------------------|---------------------|-----|
| <b><i>Funder</i></b>                        |                     |     |
| Department of Veterans Affairs              | 1                   | 3%  |
| Health insurance                            | 1                   | 3%  |
| My family bought the device                 | 1                   | 3%  |
| Polio services Australia                    | 1                   | 3%  |
| Private funds                               | 24                  | 73% |
| Supplied by PADP* or Government agency      | 4                   | 12% |
| Victorian Transport Accident Commission     | 1                   | 3%  |
| <b><i>Supplier</i></b>                      |                     |     |
| Internet site                               | 3                   | 9%  |
| Given to me                                 | 2                   | 6%  |
| Gov funded supplier                         | 5                   | 15% |
| Second hand or donated                      | 5                   | 15% |
| Specialist retailer                         | 18                  | 55% |
| <b><i>Type of scooter</i></b>               |                     |     |
| 3 wheels                                    | 10                  | 30% |
| 4 wheels                                    | 23                  | 70% |
| <b><i>Drivers licence</i></b>               |                     |     |
| No                                          | 9                   | 27% |
| Yes                                         | 14                  | 43% |
| Expired                                     | 10                  | 30% |
| <b><i>Advice prior to purchase</i></b>      |                     |     |
| No                                          | 22                  | 67% |
| Yes                                         | 11                  | 33% |
| <b><i>Advice</i></b>                        | (n=11)              |     |
| GP                                          | 1                   | 9%  |
| Occupational therapist                      | 4                   | 36% |
| Other medical staff                         | 1                   | 9%  |
| Physiotherapist                             | 1                   | 9%  |
| Sales Representative                        | 4                   | 36% |
| <b><i>Instruction prior to purchase</i></b> |                     |     |
| No                                          | 12                  | 36% |
| Yes                                         | 21                  | 64% |



| <b>Instruction</b>                     | (n=21) |     |
|----------------------------------------|--------|-----|
| Health Professional                    | 1      | 5%  |
| Occupational Therapist                 | 2      | 10% |
| Occupational Therapist and Salesperson | 2      | 10% |
| Salesperson                            | 15     | 71% |
| Staff at the Independent Living Centre | 1      | 5%  |

\* Program of Aids for Disabled People in NSW

#### 4.4.2 Scooter use

The majority of participants (67%, n=22) reported difficulty walking as the primary reason for using a motorised mobility scooter (Table 24). Forty-two percent (n=14) of participants had owned their scooter for 3 years or more and almost half (48%, n=16) of the participants reported using their scooter daily in the 2 weeks prior to the survey.

The majority (91%, n=30) of participants used their scooter to do shopping. Other commonly mentioned activities were: just getting out of the house; visiting family and friends; and attending medical appointments.

Most participants (n=28) reported challenges or worries associated with mobility scooter use. The majority (75%, n=21) of those challenges or worries were associated with the environment in which the scooter was used. Fourteen percent (n=4) were worried about their safety, 7% (n=2) were worried about the attitudes from others and one person was worried about their lack of skills. Over half of the concerns associated with the environment were related to the suitability or condition of footpath surfaces for driving a scooter. Other environmental challenges included cars, high fences, hills, pedestrians and access to public transport and maxi cabs.

Seventy percent (n=23) of participants reported witnessing inappropriate driving behaviour in other scooter users. The most common inappropriate behaviours were reported to be speeding (n=9), driving on the road (n=6) and bad etiquette (n=5).

Table 24 Patterns of Scooter Usage

| <b>Patterns of use</b>        | Frequency<br>(n=33) | %   |
|-------------------------------|---------------------|-----|
| <b>Reasons for use</b>        |                     |     |
| Difficulty walking            | 22                  | 67% |
| I stopped driving             | 6                   | 18% |
| Inability to walk             | 1                   | 3%  |
| Poor health                   | 3                   | 9%  |
| Serious illness               | 1                   | 3%  |
| <b>Length of ownership</b>    |                     |     |
| 1 year but less than 3 years  | 11                  | 33% |
| 3 years or more               | 14                  | 42% |
| 6 months but less than 1 year | 4                   | 12% |
| Less than 6 months            | 4                   | 12% |
| <b>Frequency of use</b>       |                     |     |
| 2-3 times per week            | 6                   | 18% |

|                                          |        |     |
|------------------------------------------|--------|-----|
| 4-6 times per week                       | 6      | 18% |
| Daily                                    | 16     | 48% |
| More than once a day                     | 1      | 3%  |
| Once a week or less                      | 4      | 12% |
| <b>Challenges/worries</b>                | (n=28) |     |
| Environment in which driving the scooter | 21     | 75% |
| Attitudes from others                    | 2      | 7%  |
| Safety of the scooter                    | 4      | 14% |
| Skills/Training                          | 1      | 4%  |
| <b>Have you seen bad behaviour</b>       |        |     |
| No                                       | 10     | 30% |
| Yes                                      | 23     | 70% |
| <b>Types of behaviour</b>                | (n=23) |     |
| Bad driver etiquette                     | 5      | 22% |
| Driving on road                          | 6      | 26% |
| Other                                    | 3      | 13% |
| Speeding                                 | 8      | 35% |
| Speeding and driving on road             | 1      | 4%  |
| <b>Common activities undertaken*</b>     |        |     |
| Bank/newsagents                          | 5      | 15% |
| Just to get out of the house             | 22     | 66% |
| Shopping                                 | 30     | 91% |
| Church/community meetings                | 2      | 6%  |
| Medical appointments                     | 8      | 24% |
| Visiting family or friends               | 12     | 36% |
| Walking the dog                          | 1      | 3%  |
| Golf/park                                | 2      | 6%  |

\* Participants reported one or more common activity undertaken in their scooter

#### 4.4.3 Scooter accidents and injury

A reasonably high proportion (36%, n=12) of participants reported having an accident or incident whilst using their mobility scooter in the last 12 months. One person had had an injury as a result of an accident at a pedestrian crossing involving a motor vehicle which resulted in bruising to the face, a broken leg, head laceration requiring stitches and a grazed leg. Fifteen percent of participants (n=5) reported that their family were concerned about their safety whilst using a motorised mobility scooter.

Of the 12 participants that did report an accident/incident the largest proportion of these accidents/incidents (58%, n=7) were related to a motor vehicle or a near miss with a motor vehicle as shown in Table 25.

Table 25 Self-reported accidents in scooter users

| <b>Self reported accidents</b> | Frequency<br>(n=33) | % |
|--------------------------------|---------------------|---|
| <b>Accidents or Incidents</b>  |                     |   |

|                      |        |     |
|----------------------|--------|-----|
| No                   | 21     | 64% |
| Yes                  | 12     | 36% |
| <b>Type accident</b> | (n=12) |     |
| Fell off scooter     | 2      | 17% |
| Struck by vehicle    | 4      | 33% |
| Collision pedestrian | 2      | 17% |
| Near miss - car      | 3      | 25% |
| Near miss - object   | 1      | 8%  |

#### 4.4.4 Participant perceptions of scooter use and safety

An overwhelming 82% (n=27) of participants perceived their scooter as 'extremely important' to their daily life, the remaining participants reported the scooter as 'somewhat important' to their daily life. One participant exclaimed that;

***"It is the best thing I ever did, I think they are easy as long as you are careful as you need to overcome difficulties that might come in your path".***

As reflected in the findings related to patterns of scooter use, comments from the participants suggest that concerns over the safety of the environment have a greater influence in shaping scooter activity and participation than concerns over the safety of the scooter. One participant stated that:

***"My wife (who also drives a scooter) does not understand how people can die using a scooter. I feel they are very safe".***

Whilst another participant advised that;

***"No need to get [the scooter] maintained. There is nothing that could go wrong with them".***

At the conclusion of the user survey participants were asked broadly if they had any suggestions on how to improve the safety of motorised scooters for users. Table 26 shows the responses after categorisation into broad themes. A significant proportion of participants (24%, n=8) suggested that users of motorised mobility scooters could improve safety by using 'common sense' whilst operating the scooter. Mandatory safety features such as flags, bells and lights were suggested by 18% (n=6) of participants, more frequent and improved training was suggested by 18% (n=6) of participants and 15% (n=5) of participants specifically suggested better footpaths would improve safety for scooter users.

Table 26 Suggestions for improving safety for users

| <b><i>Suggestions for improving safety</i></b> | Frequency<br>(n=30) | %   |
|------------------------------------------------|---------------------|-----|
| Use 'common sense'                             | 8                   | 24% |
| Safety features mandatory                      | 6                   | 18% |
| Training                                       | 6                   | 18% |
| Footpath maintenance                           | 5                   | 15% |

|                           |   |    |
|---------------------------|---|----|
| Brakes                    | 2 | 6% |
| Rules for driving         | 2 | 6% |
| Use 4 wheel scooter model | 1 | 3% |
| Helmet wearing            | 1 | 3% |
| Surfaces and markings     | 1 | 3% |
| Nothing required          | 1 | 3% |

## 4.5 Literature review

### 4.5.1 Injury and accidents

Our literature search found no new published studies exclusively focused on motorised mobility scooter injury and death, than those covered in our earlier review. A number of studies have described accidents involving users of motorised mobility scooters. A recent Australian cross-sectional study<sup>8</sup> of 202 power wheelchair and scooter users reported that one fifth of participants aged 18-98 years had had an accident using their mobility device in the last year. No statistical difference was observed between motorised wheelchair and scooter users and the most common accidents were running into doors and walls, tipping over, being hit by a car or colliding with objects. Eleven percent of this sample population had been hospitalised for broken bones, lacerations or bruising sustained in a motorised mobility device accident.

In the only randomised controlled trial involving motorised scooters to date the authors compared scooter use to usual care to investigate the effects of providing motorised scooters on physical performance and mobility<sup>9</sup>. A scooter and lift were provided to 22 older men and women with arthritis in the intervention group for a period of 3 months. Performance and mobility were assessed at baseline, 1 and 3 months using; 1) 6 minute walk test; 2) self reported mobility questionnaire; 3) self report of scooter accidents; and 4) satisfaction survey. There was no evidence of any change in physical performance over time between groups. Eighteen percent (n=4) of scooter users reported an accident in the 3 month period, details of the accidents were not documented.

In developing and reporting on a driver competency test for new users of motorised scooters, another recent Australian study assessed scooter driving skills in 50 able bodied adults who had never driven a motorised mobility device<sup>10</sup>. Participants in this study were predominantly aged in their twenties and undertook the test using a motorised scooter. A high number (66%) of participants failed one or more items on the test; a sub-group of 10 people were tested 3 times and showed improvement demonstrating the complexity associated with learning to drive a scooter. Skills such as weaving, multi-tasking, zigzagging, stopping suddenly and negotiating a curb cut-

<sup>8</sup> Edwards K and McCluskey A. A survey of adult power wheelchair and scooter users. Disability and Rehabilitation: Assistive Technology, 2010; Early Online, 1–9.

<sup>9</sup> Hoening H, Pieper C, Branch LG, Cohen HJ. Effect of motorized scooters on physical performance and mobility: a randomized clinical trial. Arch Phys Med Rehabil 2007;88:279-86.

<sup>10</sup> Nitz J. Evidence from a cohort of abled bodied adults to support the need for driver training for motorized scooters before community participation. Patient Education and Counseling. 2008; 70; 276-280.

out were shown to be the most difficult, particularly for the participants who had never driven a car before.

#### 4.5.2 Outcomes of power mobility

A number of studies demonstrate the potential outcomes of power mobility. Auger and colleagues<sup>11</sup> conducted a systematic review of 19 English or French language studies published between 1996 and 2007 involving mixed methods for assessing the outcomes of powered mobility device (PMD) use for adults aged over 50. The types of PMD varied across studies – one was restricted to 4-wheeled scooters, 5 involved a mix of PMD that included scooters and the others did not relate to scooters. Fewer studies relating to an older group of users were available therefore the inclusion criteria were expanded to include middle age to older adults. Only 3 studies had low to moderate levels of evidence, in the other studies the quality of evidence was very low. Additionally one randomised controlled trial (cited above) of 4-wheeled scooter users demonstrated no significant short term de-conditioning as a result of PMD use. No conclusive findings about the outcomes of power mobility were able to be presented due to the poor strength of existing evidence.

Similarly Salminen and colleagues<sup>12</sup> conducted a systematic review of the effectiveness of mobility device interventions (including powered mobility scooters) in terms of activity and participation for people with mobility limitations. Eight studies were included, however no general conclusion about the effectiveness of mobility device interventions were able to be drawn due to the lack of high quality evidence. The findings suggest that mobility devices contribute to improving the user's activity and participation and increase mobility.

A Danish cross sectional study of 111 power wheelchair users over the age of 65 included 85 '*scooter-type powered wheelchair*' users<sup>13</sup>. The study aimed to describe frequency of use and the user's perception of the importance of the powered device, secondly the authors wished to investigate the activities carried out with the scooters and barriers to accomplishing these activities. The results highlight the importance of the independence that motorised mobility devices afford people with less impairment than might be traditionally considered a good reason for use of a scooter. The main barriers to use of a scooter to undertake prioritised activities were long distances and environmental barriers.

Whilst developing a client centred guideline for power mobility use, rehabilitation practitioners in Canada conducted a qualitative study<sup>14</sup> of experiences and interpretations of the meaning of powered mobility and safety concerns identified by 19 participants from 8 stakeholder groups at 3 separate aged care facilities including powered mobility users; relatives of users; non power mobility residents; their relatives; nurses; power mobility prescribers; and management staff. Four main

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<sup>11</sup> Auger C, Demers L, Gelinas I, Jutai J, Fuhrer M and DeRuyter F. Powered Mobility for Middle-Aged and Older Adults – Systematic Review of Outcomes and Appraisal of Published Evidence. *Am J Phys Med Rehabil*. 2008; 87; 666-680.

<sup>12</sup> Salminen A. Mobility Devices to Promote Activity and Participation: A Systematic Review. *Journal Of Rehabil Med*. 2009;41(9);697-706.

<sup>13</sup> Brandt A, Iwarsson S, Stahle A. Older people's use of powered wheelchairs for activity and participation. *J Rehabil Med*. 2004; 36:70-77.

<sup>14</sup> Mortenson W; Miller W; Boily J; Steele B; et al. Perceptions of power mobility use and safety within residential facilities. *The Canadian Journal of Occupational Therapy*; Jun 2005; 72, 3; pg. 14.

themes emerged from the data; 1) the meaning of power mobility; 2) learning the rules; 3) concerns about safety; and 4) solutions.

A recent American single-centre, retrospective, cohort study assessed the effect of motorised scooter use on patient perceived quality of life<sup>15</sup>. The study was also designed to examine how these devices, which have the potential to reduce the level of physical activity, affected cardiovascular risk factors. One hundred and two participants who had received medical approval for, and subsequently received, a motorised wheelchair participated. Medical records for each patient from the 12-month period before and the 12-month period after the date the patient had received a motorised scooter were reviewed and relevant cardiovascular data were collected, including bodyweight and body mass index, cholesterol profile, office blood pressure measurement, and fasting glucose level.

The medical indications for scooter use by decreasing frequency were disabling arthritis (39%), chronic lung disease (25%), neurologic disorders (18%), and heart failure (14%). Twenty eight percent of participants completed the quality of life survey; a statistically significant, self-perceived improvement was noted in all quality-of-life facets tested. An increase in fasting glucose and the prevalence of diabetes was seen after acquiring a scooter however interpretation of this finding is limited by the short period of time for assessing changes in cardiovascular risk factors and the lack of a control group.

#### **4.5.3 Assessment of scooter users**

A number of authors have developed training or motorised mobility device assessment tools that could potentially enhance driving performance, improve safety and increase functional mobility. Nitz and colleagues<sup>16</sup> report on a driver competency test for new users of motorised scooters that could be applied by a prescribing health professional prior to community use. The content of the test was based on the opinion of allied health professionals and current research evidence regarding driving and mobility. The test was piloted with 50 able bodied men and women, the pilot demonstrated that basic driving skills including: weaving; steering in reverse and traffic; and multiple tasking, require extra practice. Current drivers of MMS were not involved in the development of the test but have subsequently been involved in testing the psychometric properties of the test, however these results have not yet been published.

A Canadian study<sup>17</sup> recently compared two power mobility training protocols in different aged residential facilities in Toronto. The two protocols differed in the number of sessions and the time frame over which the sessions were offered however they both used the Power-Mobility-Indoor-Driving-Assessment (PIDA) tool to assess powered wheelchair and scooter driving performance. While the determinants of post-training driving performance were difficult to specify in this sample of older residents the results did suggest that training is one factor that can have a significant impact on optimal power mobility driving performance. A similar

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<sup>15</sup> Brian W. Zago, and Richard A. Krasusk. Effect of Motorized Scooters on Quality of Life and Cardiovascular Risk *Am J Cardiol* 2010;105:672– 676.

<sup>16</sup> Nitz J. Reply to Letter to the Editor. *Patient Education and Counseling*. 2008;26 June.

<sup>17</sup> Hall K, Partnoy J, Tenenbaum S, and Dawson D. Power Mobility Driving Training for Seniors: A Pilot Study. *Asst Technology*. 2005; 17:47-56.

test, the Power-Mobility-Community-Driving-Assessment (PCDA) has also been developed to enhance access to power mobility devices by potentially unsafe drivers.<sup>18</sup>

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<sup>18</sup> Letts L, Dawson D, Kaiserman-Goldstein E. Development of the Power-Mobility Community Driving Assessment. Canadian Journal of Rehab. 1998. 11;3:123-129.

## 5. Appendix A

### Analysis of cases not included in the NCIS dataset

Ninety two closed coroners' cases potentially related to mobility scooter use were identified in the NCIS. All relevant information on the NCIS website was used to confirm that cases related to motorised mobility scooter (MMS) use. Cases were initially coded as 'yes', 'no' or 'unsure'. Two coders were involved in the blind coding of MMS relatedness. Assigned codes were compared and cases with differences then discussed to reach a final decision regarding eligibility for inclusion in the study. Table 27 shows the characteristics of the 29 cases not included in the MMS analysis.

Table 27 Characteristics of rejected cases

| Variable                 | Frequency<br>n=29 | %           |
|--------------------------|-------------------|-------------|
| <b>Sex</b>               |                   |             |
| Female                   | 7                 | 24%         |
| Male                     | 22                | 76%         |
| <b>Type of scooter</b>   |                   |             |
| Black Yamaha scooter     | <3                | *           |
| Child's scooter          | <3                | *           |
| Electric wheelchair      | <3                | *           |
| Moped                    | <3                | *           |
| Motorcycle               | 4                 | 14%         |
| Motorised bicycle        | <3                | *           |
| Motorised peddle bike    | <3                | *           |
| Motorised scooter        | <3                | *           |
| Motorised tricycle       | <3                | *           |
| Motorised trolley        | <3                | *           |
| Motorised wheelchair     | 11                | 40%         |
| Battery operated bicycle | <3                | *           |
| Wheelchair               | <3                | *           |
| (blank)                  | <3                | *           |
| <b>State</b>             |                   |             |
| NSW                      | 6                 | 21%         |
| QLD                      | 3                 | 10%         |
| SA                       | 3                 | 10%         |
| TAS                      | <3                | *           |
| VIC                      | 13                | 45%         |
| WA                       | 3                 | 10%         |
| <b>Age categories</b>    |                   |             |
| <70                      | 12                | 41%         |
| 70-74                    | 4                 | 14%         |
| 75-79                    | 3                 | 10%         |
| 80-84                    | 3                 | 10%         |
| 85-89                    | 6                 | 21%         |
| 90+                      | <3                | *           |
| <b>Total</b>             | <b>29</b>         | <b>100%</b> |