

WA Consumer Product Advocacy Network

Child Car Restraint Misuse and Motor Vehicle Accident Injury Research Report



Partner:



Government of **Western Australia**
Department of **Health**

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Suggested Citation:

Pawlowski, A, Skarin D. WA Consumer Product Advocacy Network, Child Car Restraint Misuse Research Report. Perth (WA): Kidsafe WA (AUS); 2021 Jul.

This report was produced by Kidsafe Western Australia in collaboration with members of the WA Consumer Product Advocacy Network.



Government of **Western Australia**
Department of **Health**



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Department of **Mines, Industry Regulation and Safety**
Consumer Protection



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About the WA Consumer Product Advocacy Network

The WA Consumer Product Advocacy Network (WA CPAN) was established in October 2014 in partnership with the Department of Health Western Australia. WA CPAN provides leadership to ensure ongoing and emerging injury issues associated with unsafe products are identified and minimised, with a focus on products used by children. The network consists of representatives from organisations involved in the regulation, safe use, injury prevention, treatment and sale of products for use by consumers. These organisations include:

- the Department of Health Western Australia, Public and Aboriginal Health Division
- the Perth Children's Hospital Emergency Department
- the WA Poisons Information Centre
- the Australian Competition and Consumer Commission
- the Burn Injury Research Unit - School of Surgery, University of Western Australia
- the Department of Mines, Industry Regulation and Safety – Consumer Protection
- Goodstart Early Learning
- Kidsafe Western Australia

Products identified through the network are prioritised according to the level of risk posed or safety concerns raised by WA CPAN members. A documented action plan then supports the ability to advocate for change. The network aims to explore solutions for identified unsafe products and ultimately reduce the number and severity of childhood injuries related to consumer products.

WA CPAN members meet every two months, with approximately six meetings per year. The members are also in regular email contact between meetings to deal with emerging issues promptly. Once a product safety issue is identified, appropriate actions are taken and typically led by the member who could have the most significant impact. Actions can include:

- Advocating for changes;
- Delivering workshops to provide injury prevention information;
- Monitoring products through injury surveillance and safety checks;
- Providing safety messages in media releases and newsletters;
- Providing a number of resources such as brochures, fact sheets, tools and videos, which are made available through websites and social media channels; and
- Enforcement of appropriate regulations or consumer law.

Perth Children's Hospital Injury Surveillance System

WA CPAN has identified incorrect child car restraint use as an area requiring attention. This report examines common child car restraint installation errors or misuse identified by Kidsafe WA Child Car Restraint Fitters during a checking appointment. Additionally, this report provides an overview of motor vehicle occupant injury presentations to Perth Children's Hospital Emergency Department (PCH ED). PCH is the only tertiary paediatric hospital in Western Australia, acting as a key referral source for childhood injury and disease within the state. The PCH Injury Surveillance System is an electronic database that involves the systematic collection of all ED injury data. Data is collected by triage nurses who initially assess the child presenting to ED. Basic clinical information and demographic details are recorded, together with the child's triage code, indicating the level of urgency based on the presenting complaint. Additional surveillance data is collected for those children presenting with an injury. A dedicated Injury Surveillance Officer then validates this data.

Childhood Injuries in Western Australia

On average, 27 Western Australian children die each year due to injury, with a further 7,000 children hospitalised¹. Between January 2015 and December 2020 there were more than 98,287 injury presentations to the PCH ED for children aged less than 16 years.

The most common injury factors associated with a presentation to PCH ED were house structures/building components (e.g. doors, walls, windows and floors) and furniture (e.g. chairs, sofas and tables). These two categories accounted for over 35% (n=1,829) of injury factors.

A triage category is assigned to each child presenting to PCH ED, dependant on the level of urgency of their injury (Table 1.).

When all presentations with an injury factor are examined, 78.5% (n=35,730) were triaged as semi-urgent, followed by 17.0% (n=7,748) being triaged as urgent, 3.9% (n=1,760) were triaged as an emergency, 0.5% were triaged as resus and 0.1% (n=47) were triaged as non-urgent.

In most cases (78.8%, n=54,437) disposal was recorded as discharged. A total of 20.2% (n=13,958) of presentations were either admitted to the short stay unit or a ward in PCH. A very small portion of 0.8% (n=540) did not wait, and even fewer patients left at their own risk (0.2%, n=117).

Table 1: Triage Category.

Category	Seen within (mins)
(1) Resus	0
(2) Emergency	10
(3) Urgent	30
(4) Semi-Urgent	60
(5) Non-Urgent	120

Kidsafe WA Child Car Restraint Fitting and Checking Service

Kidsafe WA offers a cost-effective service for those who require assistance with installing a child car restraint or would like the installation of their child car restraint checked. This service operates six days a week from several metropolitan locations, including the Kidsafe WA office in West Leederville, Joondalup Bunnings, the City of Melville, mobile fitting service and other special events as requested. The service is staffed by a team of qualified and experienced fitters, who have all undertaken the Nationally Recognised Training Course 52862WA Course in Type 1 Child Car Restraint Fitting.

During a check appointment, the Kidsafe WA Fitter thoroughly inspects the Child Car Restraint installation against the manufacturer's guidelines, including checking that the child car restraint is adjusted appropriately for the size and age of the child. Details of each child restraint check are digitally recorded using an iPad at the time of inspection. Recorded details include car and child restraint manufacture details, restraint position in the car, error details and rectification and a photograph of the adjusted seat. The record is stored in Kidsafe WA's Client Management System (CMS), and a copy of the report is emailed to the client.

Common Installation Errors

Methods

It is important to note that the error statistics discussed below exclude any check conducted by Kidsafe WA where Auto-lock has been recorded as an error. Auto-lock refers to an inbuilt feature present in some vehicles. A proportion of checks that denote auto lock as an error are inaccurate and instead are a record of a fitting check where auto-lock was not a vehicle feature. Consultation with the Kidsafe WA Fitting Manager determined that this is not a genuine error as not all cars possess auto-lock. These errors have been excluded from the data to maintain the accuracy and validity of the data.

Data is available from 1st July 2016 to 30th June 2020, with 4,716 checks being carried out during this period.

Results

From 1st July 2016 to 30th June 2020, 44.1% (n=2,082) of child car restraints checked by Kidsafe WA had at least one installation error, with some child car restraints having up to six installation errors. As

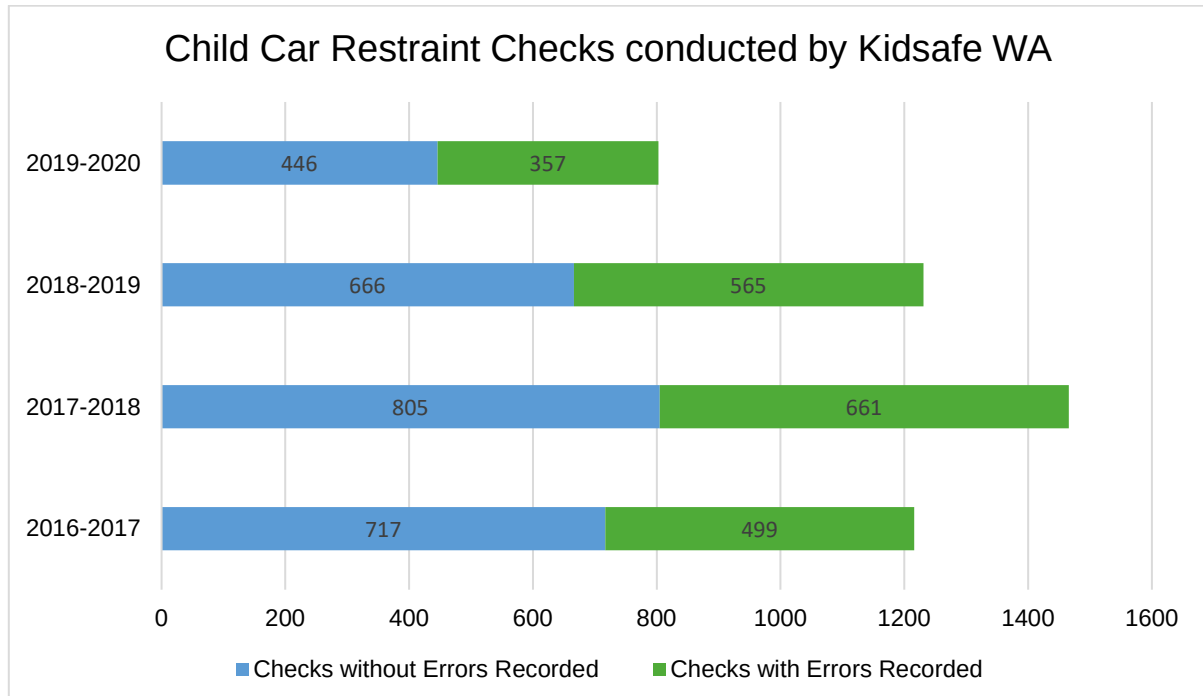
a result, the total number of installation errors identified during the period was 3147. Table 2 summarises the number of checks with multiple errors.

Table 2: Checks with multiple installation errors

Number of errors	Number of checks
1	1388
2	415
3	209
4	55
5	9
6	6

For the duration of the data set, the proportion of child car restraints with at least one installation error remained relatively stable, with the lowest installation error rate occurring in 2016/17 with 41% (n=499) of the 1216 checks conducted having an installation error. Installation errors peaked in 2018/19 with 45.9% (n=565) of the 1231 checks conducted having an installation error. The number of checks without an error recorded and the number of checks with a recorded error is summarised below in Figure 1.

Figure 1. Child Car Restraint Checks conducted by Kidsafe WA from 1st July 2016 – 30th June 2020.



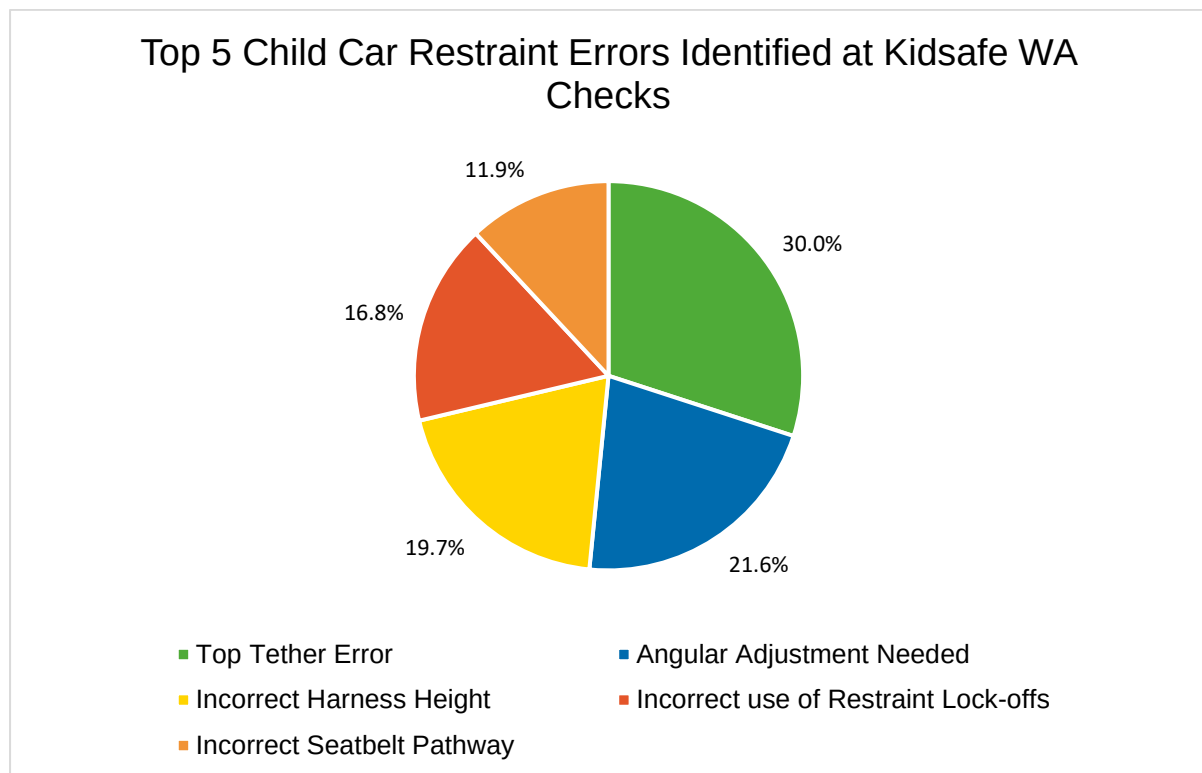
The top five errors identified during Kidsafe WA child car restraint checks were:

- Top tether error
- Angular Adjustment needed
- Incorrect harness height
- Restraint lock-offs used incorrectly
- Incorrect seatbelt pathway

The top five errors identified during Kidsafe WA child car restraint checks are displayed below in Figure 2. The most common error identified during checks carried out by Kidsafe WA relates to the use of the top tether strap, accounting for 21.3% (n=668) of errors. The second most common error was the child car restraint needing an angular adjustment, accounting for 15.5% (n=480) of errors. Incorrect harness height requiring adjustment was the third most common error, accounting for 14.0% (n=439) of errors.

The fourth most common error identified during Kidsafe WA checks was the non-use of the restraint lock-offs 11.9% n=373. It is important to note that not all child car restraints have this feature, and there is no difference in the level of safety between seats with and without this feature. Finally, the incorrect seatbelt pathway was the fifth most common error identified, accounting for 8.4% (n=266).

Figure 2. Top Five Child Car Restraint Errors Identified at Kidsafe WA Checking Appointments from Jan 2015 to Dec 2020.



Motor Vehicle Occupant Injury Presentations to Perth Children's Hospital Emergency Department in Western Australia

Methods

PCH ED injury surveillance data for the period January 2015 to December 2020 was reviewed. A total of 613 cases were identified with *Motor Vehicle Occupant* as the identified Injury Cause. In addition, the data was refined to include only cases with *Other Specified Activity* as the Injury Activity. This meant that injuries sustained due to participation in motorsports, use of a motorcycle or all-terrain vehicles were excluded. This resulted in 509 cases being identified as actual motor vehicle occupant injuries.

Results

Between January 2015 and December 2020, there were 509 motor vehicle occupant injury presentations to PCH ED. The 1st July 2018 to 30th June 2019 accounted for the highest number of presentations with 22.2% (n=113). This was followed by 1st July 2015 to 30th June 2016 which accounted for 21.6% (n=110), then 1st July 2019 to 30th June 2020 making up 19.6% (n=100). 1st July 2016 to 30th June 2017 accounted for 19.3% (n=98) of motor vehicle occupant injury presentations and with the remaining 17.3% (n=88) occurring from 1st July 2017 to 30th June 2018.

Motor Vehicle Accident Injury Presentations by Day of Injury and Day of Triage

The two most common days of the week for motor vehicle accident injuries were Saturday at 16.1% (n=82) and Sunday at 16.5% (n=84). Thursday was the third most common day of injury, occurring at 14.9% (n=76), followed by Monday at 14.5% (n=74). Days of triage for motor vehicle accident injuries aligned with the day of injury, with Sunday being the most common day for triaging a motor vehicle accident injury at 16.9% (n=86), followed by Saturday at 15.9% (n=81), Thursday and Monday both accounted for 15.7% (n=80) respectively. Day of triage for motor vehicle accident injury presentations is summarised in Table 3.

Table 3: Day of Triage for Motor Vehicle Accident Presentations to Perth Children's Hospital.

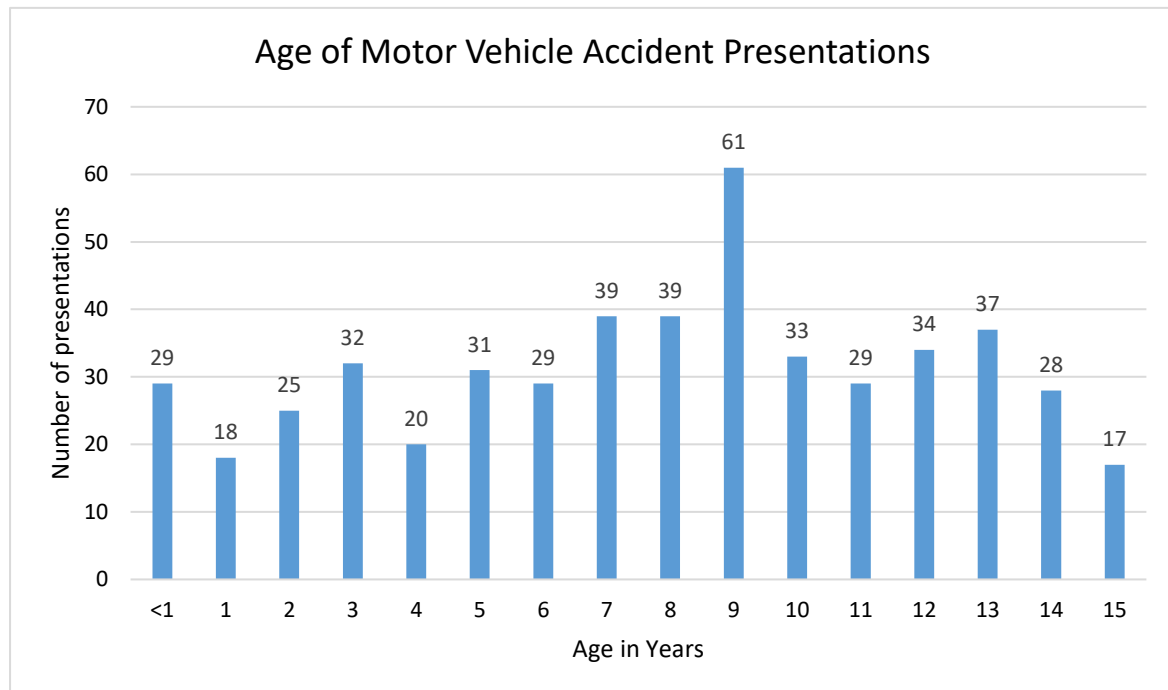
Day of Triage	Number of Presentations
Monday	81 (15.9%)
Tuesday	51 (10%)
Wednesday	72 (14.1%)
Thursday	80 (15.7%)
Friday	58 (11.4%)
Saturday	81 (15.9%)
Sunday	86 (16.9%)

In terms of all presentations with an injury mechanism (n= 45503), Sunday was the most common day for any injury to occur at 17.1% (n=7,801), followed by Saturday at 16.6% (n=7,579). Day of injury was not recorded in four cases (<1%). Similarly, the triage day for all presentations with an injury mechanism followed the same pattern as motor vehicle accidents, with Sunday being the most common day of triage at 17.6% (n=7,865). The second most common day of triage for all injuries was Saturday (15.6%, n=7,104).

Motor Vehicle Accident Injury Presentations by Age

Children aged seven or older accounted for 62.3% (n=317) of motor vehicle accident injury presentations to PCH ED. The most common age for motor vehicle occupant injury were nine-year olds, accounting for 12.0% (n=61) of presentations. This was followed by seven-year-old children accounting for 7.6% (n=39) of injury presentations. Eight-year-old children presented at the same rate accounting for 7.6% (n=39) of injury presentations. Children aged 13 made up 7.3% (n=37) of injury presentations, followed by children aged ten accounting for 6.5% (n=33) of injury presentations and children three years of age accounted for 6.3% (n=32) of presentations. The number of motor vehicle accident injury presentations by age is presented in Figure 3.

Figure 3. Age of Motor Vehicle Accident Presentations to Perth Children's Hospital from Jan 2015 to Dec 2020.



It must be noted that there were no injury presentations to PCH ED for children aged 16 years of age or older, and within the data set, there were 8 cases (1.6%) with age errors.

Safety Equipment

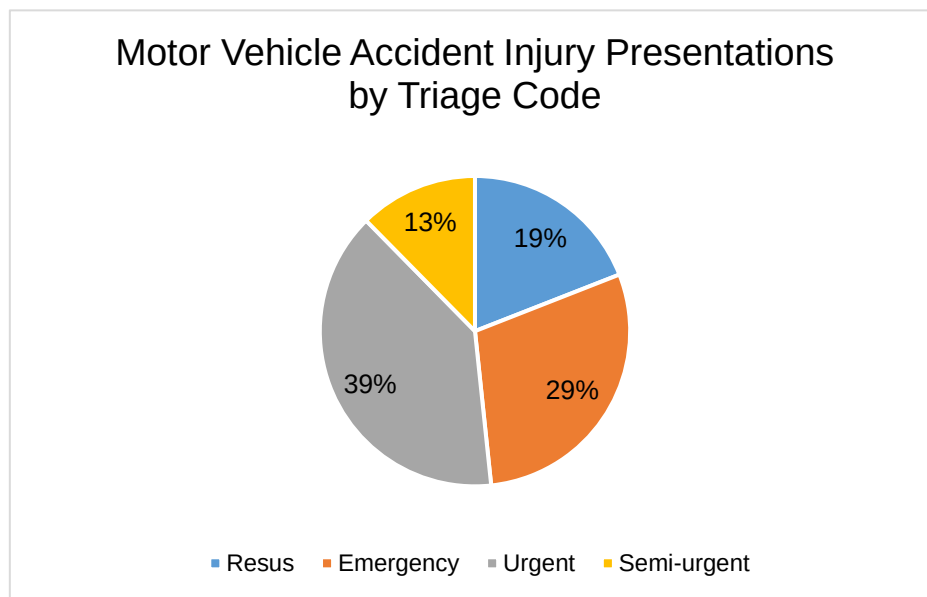
Five categories of safety equipment were identified during the analysis of PCH ED motor vehicle occupant injury presentations. The five safety equipment categories were:

- Approved Child Restraint (n=69, 13.6%)
- Unknown/inadequate description (n=234, 46%)
- Seatbelt (n=137, 26.9%)
- Not Applicable (n=1, 0.2%)
- No Safety Equipment (n=68, 13.4%)

Motor Vehicle Accident Injury Presentations by Triage Code

A significant proportion of motor vehicle occupant injury presentations to PCH ED were triaged as urgent, with 39.3% (n=200). This was followed by 29.3% (n=149) of presentations coded as an emergency and 19.1% (n=97) coded as resuscitation. Compared to all presentations with an injury mechanism, motor vehicle accident injury presentations received more urgent triaging.

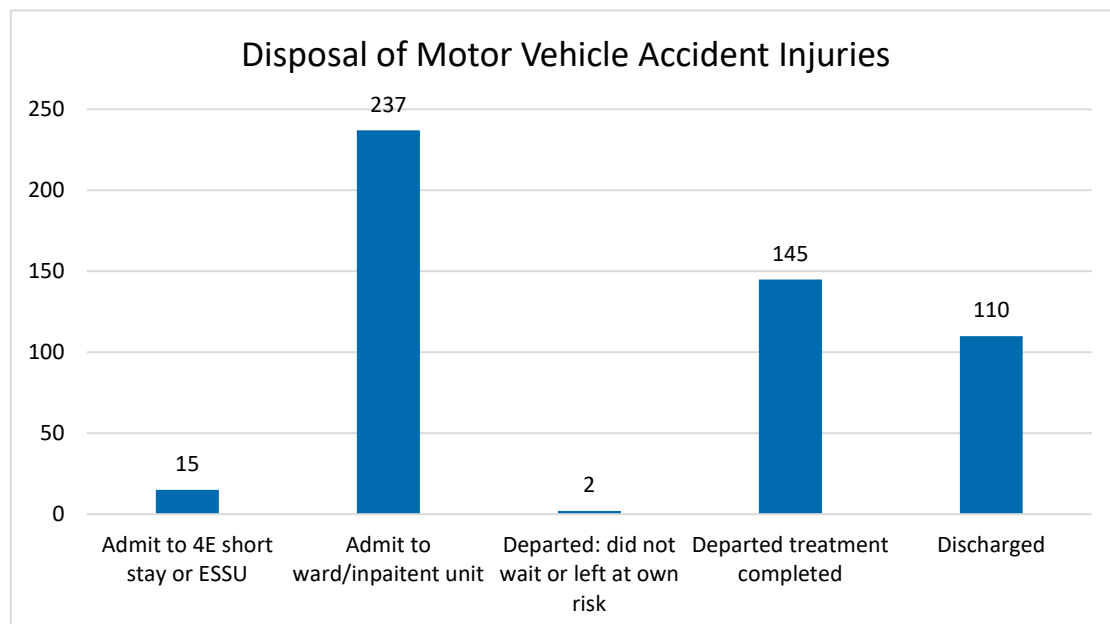
Figure 4. Motor Vehicle Accident Injury Presentations by Triage Code Allocation from Jan 2015 to Dec 2020.



Motor Vehicle Accident Injury Presentations by Disposal

Looking at treatment of motor vehicle accident occupant injury presentations to PCH, 49.5% (n=252) of injuries required admission to PCH. Admission includes individuals admitted to the short stay unit or admitted to a ward or inpatient unit. Over a quarter of presentations departed PCH ED with treatment completed (28.5%, n=145), with 21.6% (n=110) discharged, 0.2% (n=1) departed: at own risk, and 0.2% (n=1) departing: did not wait.

Figure 5. Disposal of Motor Vehicle Accident Injuries from Jan 2015 to Dec 2020.



Motor Vehicle Accident Injury Presentations by Injury Diagnosis

The most common injury diagnosis following a motor vehicle accident was bruise/contusion accounting for 24.0% (n=122). Fractures were the second most common diagnosis at 14.5% (n=74), followed by no injury (10.6%, n=54), abrasions (8.4%, n=43), head injury (8.3%, n=42) and neck/c-spine (7.3%, n=37). The remaining diagnoses comprised different injury types, including psychological, whiplash, multiple regions, upper limb, and observation, among others (27.0%, n=137).

Motor Vehicle Accident Injury Presentations by Location

The vast majority of children presenting to PCH ED following a motor vehicle accident lived in the metropolitan area (79.2%, n=403). Those living in regional Western Australia accounted for 15.7% (n=80) of presentations and overseas visitors accounted for 1.8% (n=9) of presentations. A small portion (0.4%, n=2) were recorded as unknown and even fewer interstate presentations (0.4%, n=1). A small amount of presentations (2.8% n=14) contained postcode information that could not be allocated. Aboriginal and Torres Strait Islander (ATSI) children account for 10.8% (n=55) of motor vehicle occupant injury presentations to PCH ED.

The location public roadway, footpath, cycleway accounted for 94.7% (n=482) of motor vehicle occupant injuries. Other place made up 4.3% (n=22) with public parking area, transport facility (0.4%, n=2), farm, primary production area (0.4%, n=2) and school or education area (0.2%, n=1) accounting for the remaining injury locations.

Motor Vehicle Accident Injury Presentations by Gender

Unlike the traditional 3:2 male to female ratio seen in other injury presentations, for motor vehicle occupant injuries, the ratio was almost 1:1. Females accounted for 50.5% (n=257) of motor vehicle injury presentations with males accounting for 49.5% (n=252).

Motor Vehicle Accident Injury Presentations by Intent

The vast majority of motor vehicle occupant injuries were classified as unintentional (98.2%, n=500), with a minor portion being classified as intentional self-harm (1.2%, n=6) and even less having an intent that was undetermined or other (0.6%, n=3).

Discussion

Globally motor vehicle accidents are a significant cause of death and injury to children. The correct use of a child car restraint can reduce injury risk and severity by up to 70% compared to an unrestrained child². However, a child car restraint's protective features and safety benefits are dependent on the restraint being fitted correctly and used appropriately³. For example, the top tether strap of the child car restraint provides a rigid attachment from the top of the child car restraint to the vehicle's interior, reducing the likelihood of the child's head contacting the vehicle's interior in both frontal and side impacts⁴. Therefore, incorrect use of the top tether strap would have a significant impact on the safety and injury prevention features of the child car restraint.

An Australian study conducted by Brown et al.⁵ (2006) examined the injuries sustained by children between 2 and 8 years of age following involvement in a motor vehicle accident and found no serious or fatal injuries in children who were optimally restrained. However, 30% of sub-optimally restrained children sustained a serious or fatal injury. Of PCH ED presentations where seatbelt use was recorded (n=276), 24.6% (n=68) of cases with no safety equipment received a triage code of resus, emergency, urgent or semi-urgent. Additionally, of this same group, 10.9% (n=30) were triaged as resus or emergency. It is important to note that for a significant portion of motor vehicle accident presentations safety equipment use was unknown (45.8%, n=233).

The top five injury diagnosis (excluding a diagnosis of no injury) for motor vehicle accident presentations to PCH were bruise/contusion (24.0% n=122), fracture (14.5%, n=74), abrasion (8.4%, n=43), head injury (8.3%, n=42) and neck/c-spine (7.3%, n=37). These findings are consistent with research conducted by Frieden et al.⁶ (2015), who found contusions to be the predominant injury diagnosis for children involved in a motor vehicle accident, with head, face or neck injuries and open wounds rounding out the three most common injury diagnosis.

The most common age range for a presentation to PCH ED following a motor vehicle accident is seven to nine years of age, accounting for 27.3% (n=139). This is of note as legally in Western Australia, children aged seven and older are allowed to ride in the front passenger seat and be restrained by only a seat belt. However, the National Best Practice Guidelines Safety of Children in Motor Vehicles, developed by Kidsafe and NeuRA, states children should remain in the backseat of a vehicle and in a booster seat for as long as they fit, irrespective of age. Therefore, this increase in motor vehicle accident presentations in children aged seven to nine years of age may be due to children transitioning into the next seat or restraint too early. This is consistent with previous research

finding that parents may become less vigilant regarding correct child car restraint use as their child gets older⁷. Additionally, research conducted in Canada found that more than 53% of parents incorrectly believe that their child is ready to use only a seatbelt by six⁸.

Fitting data collect by Kidsafe WA is consistent with the most common child car restraint misuse or inappropriate use identified by Koppel and Charlton (2009). Koppel and Charlton found that of 1995 restraints checked, the five most common child car restrain installation or use errors were:

- Harness strap errors
- Seatbelt errors
- Incorrect fitting of the gated buckle
- Inappropriate seat for the size of the child
- Anchor errors

Top tether strap errors accounted for 21.2% (n=668) of errors found during a Kidsafe WA check. Top tether strap errors include the top tether strap being too tight, loose, twisted or inappropriately anchored. This figure is higher than data collected by Koppel & Charlton (2009)³, who found that top tether errors and anchorage of the top tether accounted for 12% of errors during child car restraint installation checks. Angular adjustment required accounted for 15.3% (n=480) of errors at checks conducted by Kidsafe WA. As some vehicle seats have a greater rearward slope than others, the child car restraint may sit too upright. Some child car restraints have built-in features to counteract this; however, some restraints will need to be manually repositioned and stabilised with a firmly rolled up towel⁸. While this is a less commonly error reported across the literature, the position of the child car restraint on the vehicle seat plays is essential for two reasons. Firstly, the angle of the restrain plays a significant role in ensuring the child car restraint is effective at reducing injuries should a collision occur. Secondly, the angle of the seat also plays a vital role in ensuring the child's head is held in a position that maintains an open airway⁹.

Incorrect harness height was the third most common error identified during a Kidsafe WA check, accounting for 14.0% (n=439) of errors. Incorrect harness height can refer to both the harness being too high above the child's shoulders or too low down below the child's shoulders. Ideally, the harness should be positioned no less than 25mm below the child's shoulders. Koppel and Charlton found that harness errors were prevalent, accounting for 38% of the errors identified in their study. The significant difference in harness error rates between this study and Kidsafe WA's data is most likely due to the broader classification of a harness error, whereby harness strap errors included incorrect positioning and the straps being faulty, requiring adjustment or twisted.

Seatbelt pathway errors accounted for 8.4% (n=266) of errors during Kidsafe WA checks. Seatbelt pathway errors include incorrect routing of the seatbelt through the restraint and the seatbelt being twisted or slack. This type of error identified at Kidsafe WA checks, and its prevalence is consistent with other Australian research that found seatbelt errors were common but not the most prevalent error in child car restraint installation⁵.

The frequency of incorrect or non-use of the restraint lock-off was lower in Kidsafe WA's checks than in other industry research. Kidsafe WA found incorrect or non-use of the restraint lock off in 11.9% (n=373) of checks¹⁰. The restraint lock-off is a built-in feature of the child car restraint that provides extra stability to the child car restraint. As previously mentioned, seats that do not have this feature are not any less safe. One possible reason this error is more prevalent is that it is not a standard feature in all child car restraints and as such, the parent or caregiver has not encountered the feature before and is unsure of its purpose. This uncertainty of how to use the feature may even be a driving factor in deciding to have the child car restraint reviewed by Kidsafe WA.

Recommendations

- Invest in additional educational materials or modes of delivery to increase knowledge of the Best Practice Guidelines Safety of Children in Motor Vehicles
- Develop new methods, such as short informative videos, for delivering information on how to avoid the most common child car restrain installation errors for parents, carers and those responsible for transporting children
- Work with PCH ED staff to improve recording of safety equipment factors in motor vehicle accident presentations

- Investigate ways to have information or resources provided to parents and carers following a PCH ED visit with a child involved in a motor vehicle accident on best practice guidelines for travelling on roads
- Explore the potential of developing a referral service between PCH and Kidsafe WA. This referral service would see parents or caregivers bringing a child to PCH following a motor vehicle accident be encouraged to attend Kidsafe WA. This would allow Kidsafe WA to check the child car restraint involved in an accident for installation errors before removing the seat from the vehicle. Collecting this data may help establish linkages between installation error type and injury type.
- Continue to promote the Best Practice Guidelines Safety of Children in Motor Vehicles to parents, caregivers and those responsible for transporting children

Limitations

The data used in this report has some limitations. First, the data analysed in this report is limited to child car restraints where the parent or guardian has proactively sought an expert review of the seat, generally indicating a higher care factor that the child car restraint is fitted correctly. The actual number of child car restraints being used with one or more fitting errors is likely to be higher.

Additionally, the data for paediatric injuries quoted in this report only reflects injuries where the child presented to PCH ED. Care may be sought from other hospitals throughout Western Australia or by a general practitioner. Therefore, injury rates and patterns at these other healthcare providers may differ from the trends identified at PCH.

Further, the accuracy of this report's data relies on parental recollection under stressful circumstances, sound triage recording and data validation by the Injury Surveillance Officer.

WA Consumer Product Advocacy Network's Role

It is crucial WA CPAN raise community awareness of the importance of correct child car restraint use and the best practice approach to child car restraint use. This includes promoting safety messages and recommendations within the WA community through education, data dissemination, advocacy, digital media and regulation. Members of the network may also influence relevant Australian Standards Committees.

In addition, WA CPAN will continue to identify other unsafe products and advocate for change to reduce the number and severity of child injuries associated with consumer products. WA CPAN will use its network to:

- Identify emerging child product safety issues through data collection and research;
- Continue to monitor existing child product safety issues;
- Advocate for appropriate product safety measures in children's products;
- Raise public awareness of child product safety concerns; and
- Collaborate to achieve the best outcome for Western Australian children.

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Child Accident Prevention Foundation of Australia
Western Australia

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