

Road Traffic Accident Management System



Chadbunchachai W, MD
email : dr.bunchachai@gmail.com

Witaya Chadbunchachai, MD, FRCST¹

¹ Trauma and Critical Care Center, Khon Kaen Regional Hospital, Khon Kaen, Thailand.

Keywords:

road traffic accidents, traffic injury, strategy, Haddon Matrix, decade of action

Road traffic injuries in Thailand are becoming more critical and are the 2nd leading cause of death, second only to heart disease. In many provinces, traffic accidents rank as the leading cause of death. Furthermore, traffic injuries are the 1st leading cause of death among people aged below 40. This age group is the most economically productive and their loss has a great impact on their families and on national productivity.¹

Traffic injuries are responsible for more morbidities and disabilities, than any other cause. Moreover, they result in damage to goods and property and can cause a significant post-crash impact on the victim's family, public health, society, and the economy.²⁻⁵

Each year, more than 600,000 trauma patients are hospitalized, and more than 1,000,000 receive minor injuries from traffic accidents. Traffic injuries alone account for more than 10,000 deaths a year, whilst about 40,000 people become disabled a year, causing a heavy economic burden to family, society, and the country as a whole.^{1,6,7}

The Faculty of Engineering of Prince of Songkla University, with the support of the Department of Highways at the Ministry of Transportation conducted a study to assess the losses from road traffic injuries. They found that losses were a staggering THB168,000 million in 2006.⁸

Road traffic accidents in Thailand are still at a critical point

No matter whether young or old, male or female, students, workers or officers, almost everyone has to use the road to get to their destination and back home at least twice a day.

At present, there are many drivers who do not obey the rule of the road and are at risk of being in or causing a serious traffic accident. Road users increase their chance of being involved in an accident if:

- Driving while drunk
- Acting carelessly or acting aggressively
- Suffering from personality disorders
- Inexperienced, underage or badly trained
- Not paying attention

These everyday factors mean that nobody is safe on our roads. A traffic accident can happen in a second.

It is not hard to list the different possible causes of road traffic accidents. It is much harder to implement successful and effective preventive measures that involve multiple government agencies and individuals. The Thai public health sector is well aware of the grave losses from injuries and fatalities, but lacks the requisite experience and technical expertise to overcome multiple obstacles. The reduction of traffic accidents is not just a matter for the public health service, it also involves multiple agencies. A great number of individuals just do not realize the importance of taking responsible steps to avoid traffic accidents. Furthermore, there needs to be coordination and effective cooperation between agencies to synchronize activities to maximize their effectiveness. The failure of government agencies and individuals to deal with this issue has resulted in an increasing number of injuries recorded.

Moreover, there is a false belief that road traffic safety measures exist in Thailand. Furthermore there are falsely held beliefs about the reason for so many accidents:

- It is widely believed that a traffic accident is down to fate or the will of God despite being preventable.
- Many organizations campaign for the prevention of road traffic injuries. But this is only done with poster campaigns, to affect behaviour change with too little focus on the strategy of policy development and law enforcement. Furthermore, most campaigns are reserved for New Year and Songkran festivals only. Campaigns should be ongoing, year round.
- There are many people who still believe that the best way to solve the number of traffic accident injuries is to raise awareness through campaigns and education programs aimed at school goers and the general public.
- Many people agree to being driven by a drunk driver.

- Many people are too frightened to ask a driver to slow down, or even to get out of the vehicle if the driver persists in speeding.

Principles of Injury Prevention and Road Safety Control Measures²

Injury prevention and road safety control measures can be developed systematically.

In 1937, Godfrey adopted an epidemiological model in his analytical study of traumatism and achieved a systematic planning of injury control.

In 1949, Gordon proved that a detailed epidemiological classification was viable for injury as well as for other sudden or chronic diseases.

In 1978, the very famous epidemiologist William Haddon Jr. (1926-1985) from the Insurance Institute for Highway Safety of the United States, promoted injury control measures (Table 1). The proposed approach was a matrix in which the human, vehicle and environmental factors of a crash are shown interacting with the three phases of a crash – pre crash, during the crash, and post crash – to form a nine-cell matrix, which became known as the Haddon matrix. This was then used as a planning tool for road traffic injury prevention worldwide. Each cell in this matrix offers opportunities for intervention or countermeasures to reduce fatalities caused by motor vehicle accidents.

Based on Haddon’s Matrix, we can develop a systematic program of injury prevention and control and cover all phases by implementing the required interventions placed in each cell of the matrix.

Table 1: Injury Control Measures Classified According to Three Factors and Three Phases

| Phases | Education | Environment | Enforcement |
|------------|-----------|-------------|-------------|
| Pre crash | 1 | 2 | 3 |
| Crash | 4 | 5 | 6 |
| Post crash | 7 | 8 | 9 |

From “To Prevent Harm” Washington, D.C.: Insurance Institute for Highway Safety, 1978

The following are examples of preventive measures based on Haddon's Matrix.

Phase 1: Primary Prevention - Pre Crash Prevention Refers to Preventing the Crash from Happening

| | Cell number 1: Education | Cell number 2: Engineering | Cell number 3: Enforcement |
|------------------|---|---|---|
| Principle | - Launch an educational campaign to prevent injuries caused by road traffic accidents targeted at the general public and school-going children. | - The manufacturing of vehicles, regular vehicle servicing, road maintenance and construction all play an important role in the prevention of road traffic injuries. | - Strict enforcement of rules of the road is a key factor to enhancing the efficiency and effectiveness of injury prevention and control. |
| Method | - Educate the public on injury prevention through the mass media. - Incorporate road safety rules into school health education curriculums. - Carry out specific road safety awareness campaigns during major festivals. | <i>Road</i> - Safety must be a major component in the design of any new road. - Improvements and proper maintenance of road surfaces, street lighting as well as traffic lighting are essential. <i>Vehicle&Transportation system</i> - The effective management of a mass transportation system has been shown to have a big impact in reducing injuries from road traffic accidents. - Safety should be a major component in the design of motor vehicles and vehicle standards should be agreed on and enforced. | - Enforce the law comprehensively, continuously, covering all areas. |
| Example | - Knowledge should be transferred to the target group and should include: <i>Pedestrian</i> - Children under 9 should never cross a road alone, and should be accompanied by an adult. - Cross at a marked crosswalk, zebra crossing or overpass. - Stop, look and listen, and look both ways, before crossing. - Walk towards oncoming traffic when there are no sidewalks (i.e. walk on the right-hand side of the road if traffic is on the left-hand side). - Wear bright or light-colored clothing (red, yellow, white colors) when walking in dusk or darkness and wear reflective bands when cycling. - Goods should not be sold on the pavement, obstructing the way for pedestrians. <i>Bicycle</i> - Bicycles should be bright colors such as yellow or white. - Reflectors should be attached to the wheel rim, front and rear mudguard. | - All road construction and vehicle manufacturing should take safety measures into account <i>Road</i> - Traffic islands can prevent head-on collisions. - Bridges over intersections can prevent collision at intersections - Freeways should have an acceleration lane. - Slopes at sharp bends can lessen the centrifugal force. - A bicycle lane and sidewalk can protect cyclists and pedestrians. - A wide parking lane. - Adequate street lighting. - Accurate traffic signals and signs. - Humps and roundabouts to reduce speeds and rumble strip to warn of hazards on the road. <i>Vehicle</i> - ABS brakes. - Radial tire for preventing explosions. - Headlights with a high and low beam. | - In 1997, policemen in Victoria, Australia, operated an alcohol breath test up to 2.8 million times. 1.3 million drivers were given random breath testing. - A high level of enforcement in 3 areas : speed limits of 100 km/h, enforcing the use of seat belts and identifying illegal blood alcohol concentration levels (0.05 mg%) in drivers. As a result of these measures, Australia, witnessed 3 times fewer traffic related deaths over a period of 20 years. |

| | Cell number 1: Education | Cell number 2: Engineering | Cell number 3: Enforcement |
|----------------|--|--|----------------------------|
| Example | <p><i>Motorcycle</i></p> <ul style="list-style-type: none"> - Ride motorcycles in accordance to traffic regulations. - Wear good quality appropriate helmets, with visors, chin guards and straps. - Never drink and ride - Obey the speed limit. - Always turn on the indicator when turning right or left. - Slow down at intersections. - Ensure the motorcycle goes for regular servicing. - Have the headlight and rear light on at night. <p><i>Motor Car</i></p> <ul style="list-style-type: none"> - Don't drink and drive. - Don't take drugs or medication that can impair performance before driving. - Stop and take a rest when feeling drowsy or very fatigued. | <ul style="list-style-type: none"> - Speeding warning light. - Sensors for alcohol detection in the car. - etc. | |

Phase 2: Secondary Prevention - Injury Prevention Refers to Preventing an Injury when The Crash Occurs.

| | Cell number 4: Education | Cell number 5: Engineering | Cell number 6 : Enforcement |
|------------------|---|---|---|
| Principle | <ul style="list-style-type: none"> - Educate the target group to practise preventing injury when traffic accidents take place. | <ul style="list-style-type: none"> - Road and vehicle design can prevent injury of passengers in a car when a road accident takes place. | <ul style="list-style-type: none"> - The strict enforcement of the law is a key factor in enhancing the efficiency and effectiveness of injury prevention during road traffic accidents. |
| Method | <ul style="list-style-type: none"> - Educate the public on injury prevention when accidents take place through mass media campaigns. - Incorporate road safety rules into the health education curriculums of schools. - Carry out campaigns during major festivals. | <ul style="list-style-type: none"> - Safety equipment or components should be incorporated in road and vehicle design to prevent injuries when traffic accidents take place. | <ul style="list-style-type: none"> - Enforce the law comprehensively, continuously, covering all areas. |
| Example | <p>The target group should be aware of the following:</p> <ul style="list-style-type: none"> - Wear a helmet while riding a motorcycle (rider or passenger). - Wear a seat belt while driving a car (or travelling as a passenger in the back). - Place children in protective car seats (avoid car seats in seats with airbags) - Practise guidelines in emergency situations such as; <ul style="list-style-type: none"> • Car slipping and falling into a ditch. • Burst tyres. • Driving in adverse weather conditions such as heavy rain or through environmental hazards such as steep roads. | <p><i>Road</i></p> <ul style="list-style-type: none"> - Shoulder with a gentle slope. - Trees not too close to the road. - Hollow lampposts. - Curves with guard-rail. - etc. <p><i>Vehicle</i></p> <ul style="list-style-type: none"> - Strong Global Outstanding Assessment (GOA) body. - ABS brakes. - Windshields made of safety glass. - Seatbelts and air bags. - Helmets and leg guards for motorcycles. | |

Phase 3: Tertiary Prevention – Post Crash Prevention Refers to Preventing Fatalities when an Injury Occurs.

| | Cell number 7: Education | Cell number 8: Engineering | Cell number 9: Enforcement |
|------------------|--|--|--|
| Principle | - Educate students, and the general public, first on the scene volunteers and policeman about first aid, primary assessment and the safe transportation of injured people. | - Manufacture good quality resuscitation equipment and well equipped ambulances ready for use. | - Strict enforcement of penalties for offenders who cause road traffic accidents. |
| Method | - Educate the public on how to prevent injuries through mass media campaigns. - Incorporate road safety knowledge into health education curriculums in schools. | - Conduct research to develop better quality medical devices to help road traffic accident victims. - Improve and maintain these devices and keep ready for use at all times. | - Enforce the law comprehensively, continuously, and cover all areas aspects of road safety. |

The above systematic concept enables all agencies involved to apply these measures of injury prevention and control to cover all phases of road traffic accidents. After the strategies are determined, the next step is to consider how to implement them.

The International Association of Traffic and Safety Science has stipulated four major principles in injury prevention:¹

1. Multi-sectorial approach
2. Multidisciplinary approach
3. Internationality
4. Practicality

The most significant principle is the multi-sectorial approach due the complexity of the problem and the need to involve several government and civic agencies. Therefore, all agencies involved have to work together to reach sensible solutions.

The World Health Organization (WHO) Collaborating Center on Safe Community, Karolinska Institute, Sweden proposed the following principles for a safer community:¹

1. The project implementation must be multidisciplinary.
2. There must be good information systems for project monitoring and evaluation.

3. Communities should participate and support the activities.
4. The selection of activities is a decision-making process which must be based on the problem and possible solutions to the problem.
5. Implementation must be based on all a range of actions which are acceptable to the community.

Based on the above concept and principles, the United Nations announced the Decade of Action for Road Safety 2011-2020. Its strategies for preventing road traffic injuries are as follow:⁹

1. Build road safety management capacity.
2. Influence safety road design and network management.
3. Influence safety vehicle design.
4. Influence road user behavior.
5. Improve post road traffic accident care.

Thailand needs to implement a wide range of programmes and initiatives before we can expect to travel safely on our roads. Only by working together will we be able to prevent road traffic injuries from increasing year on year.

References

1. Chadbunchachai W, Suphanchaimai W, Srimahawong S. Traffic Accident Prevention, Khon Kaen Province 1997. Khon Kaen Press, Khon Kaen:1997.
2. Mohan's D. Basic Principles of Injury Control. Proceeding of an international Course Organized by the John Hopkins University School of Hygiene and Public Health and the World Health Organization Baltimore: 1983.
3. Mock C. Injury Control Overview : Policy Issues to address in Strengthening Surveillance, Injury Prevention and Trauma Treatment. International Conference on Road Traffic Injuries and Health Equity. Massachusetts: 2002.
4. Peden M et al., eds. World report on road traffic injury prevention. Geneva, WHO, 2004. Downloaded from www.who.int/violence_injury_prevention/publication/road_traffic/world_report/en/index.html.
5. World Health Organization, Global status report on road safety: time for action. Geneva, World Health Organization, 2009. Downloaded from www.who.int/violence_injury_prevention/road_safety_status/2009.
6. Trauma and Critical Care Center, Khon Kaen Regional Hospital, 13 Years Anniversary Trauma Registry, 1997-2008.
7. Thai Road Foundation. Thailand road traffic injury statistics 200: 2009.
8. Faculty of Engineering, Prince of Songkla University supported by Department of Highways, Ministry of Transportation, The study of Traffic Accident Costs in Thailand, 2006.
9. Department of Disaster Prevention and Mitigation, Directing Center for Road Safety, Strategic map: Strategic map for decade of action 2011-2020, 2011.