

Injury Prevention and Control

A Handbook for  
Undergraduate  
Medical Curriculum



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**Injury Prevention and Control**

**A Handbook for**

**Undergraduate Medical Curriculum**

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# Contents

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<b>Abbreviations</b>	<b>v</b>
<b>Preface</b>	<b>vii</b>
<b>Acknowledgement</b>	<b>ix</b>
<b>Introduction</b>	<b>1</b>
<b>Facilitator guide</b>	<b>3</b>
<b>Chapter 1: Epidemiology and essential concepts</b>	<b>9</b>
1.1 Important definitions and essential concepts	10
1.2 Burden of injury	13
1.3 Haddon’s Matrix for injury prevention	16
1.4 Approaches to injury prevention	19
1.5 Classification of injury	22
1.6 Safety promotion audit	27
1.7 Injury-related information	29
1.8 Role and scope of legislation	34
1.9 Ethical issues	35
1.10 Population-based programme on IPC	37
1.11 Summary	39
1.12 References	42
<b>Chapter 2: Prevention of specific injuries</b>	<b>45</b>
2.1 Road traffic injuries (RTI)	46
2.2 Fall-related injuries	54
2.3 Drowning	55
2.4 Burns	60

2.5	Poisoning	64
2.6	Occupational injuries and work safety	67
2.7	Violence	68
2.8	Other injuries	75
2.9	Summary	83
2.10	Check your progress	84
2.11	References	86
<b>Chapter 3: Essential skills</b>		<b>89</b>
3.1	Extrication and triage	91
3.2	Assessment and initial management of trauma patient	96
3.3	Communication, counseling and advocacy skills	108
3.4	Team and leadership skills	114
3.5	Suggested learning activities	118
3.6	Summary	119
3.7	Check your progress	121
3.8	References	125
<b>Glossary</b>		<b>128</b>
<b>Annex A: Burden of injury</b>		<b>134</b>
<b>Annex B: ICD-10 (2<sup>nd</sup> Ed, 2004): Classification of injury</b>		<b>135</b>
<b>Annex C: Safety promotion audit items</b>		<b>139</b>
<b>Annex D: Trauma score</b>		<b>144</b>
<b>Annex E: Injury prevention areas and strategies</b>		<b>148</b>
<b>Annex F: List of core group members</b>		<b>149</b>
<b>Annex G: List of participants</b>		<b>150</b>
<b>Annex H: Schedule for teaching-learning activities</b>		<b>152</b>

# Abbreviations

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AVPU	Alert, verbal response, response to pain, unresponsive
BAC	Blood Alcohol Concentration
BCC	Behavioural change communication
CIOMS	Council for International Organizations of the Medical Sciences
CPR	Cardiopulmonary resuscitation
CRAMS	Circulation, Respiration, Abdomen, Motor, Speech
CT	Computed tomography
DALYs	Disability-adjusted life years
ECG	Electrocardiogram
EHA	Emergency Humanitarian Action
EMS	Emergency medical service
GCS	Glasgow Coma Scale
GNP	Gross national product
ICD	International statistical classification of diseases and related health problems
ICU	Intensive care unit
IPC	Injury prevention and control
IV	Intravenous
LHMC	Lady Hardinge Medical College
LOC	Level of consciousness
LPG	Liquefied petroleum gas
MBBS	Bachelor of Medicine and Bachelor of Surgery
MCQ	Multiple choice questions
MIS	Management information system
NCD	Noncommunicable diseases
NGO	Nongovernmental organization
OSCE	Objective, structured clinical examination

OSPE	Objective, structured practical examination
OPD	Outpatient department
PFD	Personal flotation device
RR	Respiratory rate
RTI	Road traffic injury
RTS	Revised trauma score
SBP	Systolic blood pressure
SEA	South-East Asia
SEARO	South-East Asia Regional Office
SEQ	Structured essay question
SIB	Self-inflating bag
TEACH-VIP	Training, Educating and Advancing Collaboration in Health on Violence and Injury Prevention
TS	Trauma score
UCMS	University College of Medical Sciences
WHO	World Health Organization

# Preface

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Injuries constitute one of the priority health problems in the South-East Asia (SEA) Region and require urgent action. It has long been realized that the medical and nursing curriculum being followed in Member States of the Region does not teach enough about injury prevention and control (IPC). On the initiative of the WHO Regional Office for South-East Asia, an intercountry consultation on “Strengthening Injury Prevention and Control in Medical and Nursing Education Programmes in the Countries of the South-East Asia Region” was held to review the status of teaching/learning on IPC. The review revealed a number of deficiencies in the area of injury prevention in the undergraduate medical and nursing curriculum. It was therefore recommended that WHO should develop teaching/training modules on IPC for students and teachers associated with undergraduate medical and nursing education programmes.

Pursuant to the above-mentioned recommendations, the WHO Regional Office for South-East Asia initiated the project for developing a teaching module on IPC for undergraduate medical students. A core group of six experts from Member States of the SEA Region was constituted, which critically analysed the deficiencies in teaching/learning of IPC in medical education programmes. The core competencies required and the learning process needed to achieve the competencies were also identified. Following extensive deliberations and reviews, the core group prepared a draft handbook on IPC for undergraduate medical students.

An intercountry consultation for “Developing a Teaching Module on the Prevention and Control of Injury for Undergraduate Medical Education Curriculum” was subsequently held to scrutinize the draft module and also to make recommendations for its implementation. The draft module was peer-reviewed extensively, necessary amendments were made, and the module was finalized.

As there are variations in the contents and teaching methods in the current undergraduate medical courses being taught in Member States, the teaching handbook will need to be appropriately adapted/customized by countries according to their specific needs and requirements. However, the IPC skills need to be demonstrated practically by instructors to enhance

students' understanding of various procedures related to injury prevention and safety promotion. The handbook has already been piloted in two medical institutes of India and found to be very effective in improving undergraduate medical students' knowledge in violence and injury prevention. The summary of the project is also included in the handbook.

I am sure that the handbook will prove useful following its integration into the existing undergraduate medical curriculum.



Dr Samlee Plianbangchang  
Regional Director

# Acknowledgement

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# Introduction

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This handbook on injury prevention and control (IPC) is suggested to be incorporated in the teaching–learning programmes of medical undergraduates. It consists of three chapters preceded by a guide. As a facilitator of this learning experience, medical teachers have a critical role in developing a programme for integrating this book within the existing undergraduate teaching and examination system of their medical schools. The Guide is to help teachers in developing and conducting such a learning programme in their institution. It contains broad, generic guidelines that can be further evolved or customized to suite specific situations.

The chapters provide basic resources to the undergraduate learner in acquiring knowledge and skills in essential concepts, epidemiology and specific interventions in IPC. Chapter 1 is an introduction to the science of injury, which calls for a shift from the conventional understanding to that “injury as a preventable morbidity”. It explains the salient features of epidemiology applied to injury prevention. It also outlines some generic concepts that are essential to preventive interventions against injury. In Chapter 2, the emphasis is on specific injuries resulting from road traffic, falls, drowning, burns, occupation, animals, poisoning and violence. It deals with the magnitude of the problem, risk factors and preventive strategies against these categories of injury. Chapter 3 is devoted to skills involved in pre-hospital care, emergency/acute care, communication, and teamwork relevant to IPC. Some of the essential life-saving skills, including assessment of a critically ill/unconscious patient, control of airways, care of a patient whose breathing is inadequate, management of circulation, monitoring the effect of treatment, and transportation of the critically injured patient are covered in this Chapter.

The book is a culmination of the efforts of a team of experts who were aided by a vast body of data and information available from various WHO resources. “Training, educating and advancing collaboration in health on violence and injury prevention” (TEACH-VIP), a user’s manual developed by WHO and global experts in IPC is one such resource, which has been liberally quoted in the text. Sources of both web-based and print material used in preparing the book are cited under the references section at the end of each chapter.

Technical report on piloting of **"Injury Prevention and Control: A Handbook for Undergraduate Medical Curriculum"** at University College of Medical Sciences and Lady Hardinge Medical College, Delhi

"Injury Prevention and Control: A Handbook for Undergraduate Medical Curriculum" was piloted in University College of Medical Sciences and Lady Hardinge Medical College (LHMC), Delhi from September 2007 to March 2009 under an agreement between WHO-SEARO and University College of Medical Sciences (UCMS), Delhi, India.

Teachers of the two medical colleges reviewed the handbook for necessary adaptation in context of local needs and circumstances; 41 teachers from both medical institutes were trained for implementing the handbook. The teaching learning activities were from 2 to 5 hours per day spread over 8 days, and 8th semester (final year) MBBS students were taught the subject (total 30 hours). Pre- and post-course tests were conducted and students' feedback was obtained on IPC teaching learning programme. Following piloting of the handbook, there was positive feedback from the students as well as teachers regarding improvement of knowledge on injury prevention and control (refer Annex-H for training schedule piloted in India).

### **Students' knowledge on IPC markedly improved following the implementation of the handbook**

The pre-test and post-test in both medical institutes showed marked improvement of knowledge among students in the area of IPC. A post-implementation evaluation was done among students and 65% of students rated the programme (overall) either excellent or good. Only 3% of students rated the programme as poor. Following piloting of the handbook, the investigators recommended that the handbook could be implemented in any medical school in the SEA Region. Their recommendations were:

- It is recommended that WHO-SEARO may publish the "Teaching Module on Prevention and Control of Injury" and make it available to all the medical schools in the Region.
- WHO-SEARO may facilitate the process of securing the approval/concurrence of regulatory bodies in Member States for implementation of the teaching module to strengthen PCI components in undergraduate medical education curriculum across the Region.
- To ensure uniform applicability, it is also recommended to develop an ongoing formal mechanism for initiating and establishing PCI programmes among various medical schools across the Region. A core group of PCI education experts may be constituted to lead, organize, and monitor this ongoing exercise.

# Facilitator guide

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## Initiating an IPC teaching–learning programme in your institution

Ensuring commitment from the leadership of the organization may require ongoing advocacy and effort on your part. It may be better if the organization identifies a Coordinator for IPC teaching–learning from the beginning, to work with an interdisciplinary team. The following educational tasks may further be allocated within the team:

- Prioritize the core competencies to be acquired by students according to local learning needs in IPC.
- Identify core subjects (if you have a subject-oriented curriculum) or core systems (if you have a systems-oriented curriculum).
- Prepare a broad timetable for: (i) teaching–learning activities and (ii) students' assessment.
- Allot topic-specific time to cognitive (knowledge), psychomotor (skills) and affective (attitude and behaviour towards clients) domains of learning. The department-wise allocation of time should also be worked out, where integrated teaching–learning is not operational.
- Draw a detailed curricular plan, with specific learning tools.
- Incorporate this plan in the existing undergraduate programme.

## Learning tools/methods

To help the interdisciplinary team develop a curricular plan, units of learning need to be enumerated. Chapters 1–3 will help in making such a list. These units of learning/core competencies are to be prioritized according to local needs. The interdisciplinary team will then identify the most suitable learning tool/method for each. Suitability of a method will be decided by its appropriateness as well as feasibility. Some methods are suggested below, which may be modified, customized or further evolved to be fitted into an organization-specific time frame.

### **A. Classroom teaching (cognitive)**

- Lectures/structured interactive sessions
- Problem-solving tutorials/small group discussions
- Demonstrations (audiovisual)
- Multidisciplinary seminars
- Self-directed learning

### **B. Reality exposure/live demonstration (cognitive + psychomotor)**

- Problem-solving epidemiological/MIS exercises based on local data
- Facilitated visits to:
  - ◇ Emergency/outpatient wards/medical records departments
  - ◇ Safety audit sites
  - ◇ Primary and secondary health-care facilities
  - ◇ Police/traffic/fire/rescue facilities
- Self-directed learning

### **C. Hands-on exposure (psychomotor + affective)**

- Clinical exposure in emergency, outpatients' department (OPD) and indoor settings
- Mannequin-based learning /skill laboratories
- Simulated situations
- Role plays
- Self-directed learning

A broad framework of teaching–learning methods can be developed, as shown in **Table 1**:

**Table 1: Proposed framework of teaching – learning methods, with examples from each chapter**

Chapter	Learning methods			Hands-on exposure (psychomotor + affective)
	Class room teaching (cognitive)	Reality exposure/live demonstration (cognitive + psychomotor)		
<b>Chapter 1</b>				
Haddon's model for injury prevention	Tutorials/lectures, demonstrations (audiovisual)	Exercises, field visits		On-the-spot analysis of potential sites, simulated situations
Population-based programme on IPC	----	Facilitated visits to primary and secondary health-care facilities		----
<b>Chapter 2</b>				
Road traffic injuries	Tutorials/lectures demonstrations (audiovisual), multidisciplinary seminars	Facilitated visits to EMS/road Transport office/traffic parks, problem-solving exercises		Role play on behaviour modification
<b>Chapter 3</b>				
Assessment and initial management of trauma patients	Demonstrations (audiovisual)	Facilitated visits to EMS, critical care unit and operation theatre		"Do it yourself" exercises on mannequins

## Assessment of students

### Key Issues

- Integration in the existing reward system
- Quantitative weightage
- Tools/methods for objective assessment of knowledge and skills

For the students' evaluation system, more emphasis should be given to the formative assessments rather than depending heavily on terminal scores. A structure (timing and scoring system) of formative and summary assessments on IPC should be drawn in line with the existing assessment system in your medical school. The students can be evaluated using the following tools of assessments:

### *Cognitive knowledge*

- Structured essay question
- Multiple-choice questions

### *Psychomotor skills*

- Objective, structured practical examination (OSPE)

### *Psychomotor and affective skills and attitudes*

- Objective, structured clinical examination (OSCE)

## Evaluation of teaching–learning programme on IPC in your institution

### Key Issues

- Learners' feedback: qualitative and quantitative
- Facilitators' feedback: qualitative and quantitative
- Learners' performance: before and after

As the subject is new to all, it is advisable that the IPC teaching–learning programme is periodically evaluated for timely improvements within the training year. This evaluation can be internal as well as external.

After the training of initial batches, systematic feedback from the students and the facilitators should be generated and analysed. Improvements in training can be made immediately for the following batch. Such feedback must have both qualitative and quantitative components.

Simple tools, like the one given below, can be developed for the quantitative feedback of the students on various chapters of learning. Similar feedback can be generated on the general organization of the course. The learners should be assured, in advance, about the anonymity of the feedback.

**Table 2: Example of the learners' feedback tool**

*Please give a score on 0–10 scale (10 being the best) for each chapter of the learning Handbook:*

Chapter of learning (CoL)	Coverage of topic	Methods used	Facilitator's role	Student's participatory involvement
Chapter 1	9	5	8	2
Chapter 2	5	9	7	6
Chapter 3	9	9	9	9

While the quantitative markers (scores of the perceived success of the programme) will help you in comparing different academic components/sessions and seeing a trend, the feedback generated through qualitative methods may provide better insight and information that could be missed out by the quantitative report. Two separately conducted focus group discussions, one each for students and facilitators, may yield the quickest answers. Participants themselves may suggest feasible solutions, in case of problems. A quick "pre and post" assessment of the students' knowledge and skills on IPC will help you in evaluating the programme in terms of learners' performance. The interdisciplinary team should then identify problem areas, suggest solutions, and modify the programme for subsequent sessions.

**Chapter 1**

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# **Epidemiology and essential concepts**

The idea of injury has long been associated with accidents, as if injury is a result of a random phenomenon controlled by external factors beyond human control. The current science of injury, on the other hand, looks at the phenomenon with an evidence-based, systematic approach in which injury is regarded as a disease process. Injury is associated with factors within human control, and is thus preventable.

The present chapter is the first of a series of three, which broadly aim to introduce the science of injury to medical undergraduates. In this chapter, we deal with salient features of epidemiology involved in injury prevention. This chapter also outlines and explains some generic concepts that are essential to preventive interventions against injury.

## **Learning objectives**

After completion of this chapter, the learners should be able to:

- Define the essential concepts of injury prevention
- Describe the global and regional burden of injury
- Explain the ICD-10 classification of injury by causes and nature
- Apply Haddon's Matrix to analyse injury as a morbid process and identify preventive interventions
- Summarize the components of safety promotion audit and injury-related informatics
- Outline the role of legislation and ethical issues in IPC.

### **1.1 Important definitions and essential concepts**

Definitions may not be the best way to understand a phenomenon, yet they serve as a reference point in ensuring that terms are used and understood uniformly. The following are some of the most frequently used technical terms in IPC. You are also advised to refer to the glossary of the book for a detailed list of related terms.

**Injury:** Acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals and ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance. In some cases, injuries result from the sudden lack of essential agents such as oxygen or heat.<sup>1,2</sup>

**Trauma:** An injury (as a wound) to living tissue caused by an extrinsic agent.<sup>3</sup>

**Accident:** An unfortunate event resulting from carelessness, unawareness, ignorance or a combination of causes.<sup>3</sup>

**Violence:** The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, mal-development or deprivation.<sup>4</sup>

In this section, we will also discuss some generic concepts that need to be understood before addressing the IPC-specific epidemiology. If these aspects have already been covered elsewhere (e.g. community medicine curriculum), you simply need to browse through this subsection and proceed. The objective behind the reiteration of these concepts is to highlight the fact that injury, like any other disease, is the outcome of a pathological process. The principles involved in prevention and control of any other disease are applicable here as well. There has been a move away from use of the term “accident”, because of its connotations of inevitability and lack of apparent cause. On the other hand, the term “injury events” has been used to indicate that these are events that can be studied, understood and, therefore, prevented.<sup>5</sup>

### **Epidemiological triad and multifactorial causation**

Although injuries can be characterized using the concepts of infectious disease epidemiology, injury epidemiology lagged in development by decades. It was late in the twentieth century that the agents of injury were accurately identified as the various forms of energy – mechanical, thermal, chemical, electrical, ionizing radiation and that too little energy can be a cause, as in the case of asphyxiation.<sup>6</sup> This identification came from a psychologist, not an epidemiologist. Certain authors refer to motor vehicles, guns, and alcohol as “agents” of injury, but that is inaccurate in the epidemiologic sense of the concept of agent. Motor vehicles and guns

are vehicles of mechanical energy in epidemiologic parlance and alcohol contributes to injury by sometimes affecting behaviour in such a way as to place people at greater risk of injurious energy exposure.

Prior to these insights, the research on injury was primarily focused on human characteristics and human behaviour correlated with injury incidence and, more rarely, severity - with occasional studies of seasonal and geographical variations and the like. A few isolated researchers looked at human tolerance of mechanical energy.<sup>7</sup>

It is not that the characteristics of the energy were unknown. The leading source of injury by far is mechanical energy, the characteristics of which have been known since Sir Issac Newton's work on the laws of motion in the seventeenth century. Although Newton's laws of motion do not apply near the speed of light, they are applicable to moving motor vehicles and bullets or to falling human beings.

By the 1920s the leading source of mechanical energy leading to death was motor vehicles. Manufacturers deliberately supported the behavioural approach to divert attention from their vehicles, a tradition that continues to this day.<sup>8</sup> This is true for guns and other firearms. The National Rifle Association, the leading opponent of regulation of guns, coined the slogan "Guns don't kill people. People kill people". It is also obvious that lobbyists or the representatives of the car or motorcycle manufacturers have close contact with the parliamentarians, ministers and concerned official authorities. This is important to understand why working for road traffic safety is more difficult than for communicable diseases; "Mosquitoes don't have lobbyists, but motor vehicles and guns do".

## **Risk factors and risk groups**

It is observed quite often that certain attributes/determinants/exposures are consistently associated with one particular category of morbid events. These attributes or determinants are called risk factors. They may not necessarily be causal, but make the individual susceptible to the event.

Risk factors may be categorized as causative (such as "exposure to hot fluids" in burns) or contributory ("wearing synthetic clothes" in burns), but it is much more important to classify them as modifiable/mutable or non-modifiable/immutable. For example, in child pedestrian injuries, the nature and design of the road, levels of traffic monitoring and control, vehicular speed, and the skills of the driver are modifiable risk factors; but

the age, size and lack of experience of potential victims are non-modifiable risk factors. The identification of both these types of risk factor is important. While the modifiable can be removed or minimized, identification of the non-modifiable is essential for overall risk estimation. The awareness of a very high level of non-modifiable risk serves as a constant reminder for aggressive reduction of the modifiable risk.

While applying the concept of risk, we identify those individuals who are prone to or “at risk” for a particular type of injury and have one or more risk factors. When a number of such individuals are detected, they are designated as a risk group, which constitutes a more vulnerable section of people for that particular type of injury. Such individuals may need more attention or better promotive/preventive care. If resources are scarce, risk groups should be given higher priority during interventions.

## **1.2 Burden of injury**

### **Global**

Injuries account for 12% of the global burden of disease (in terms of disability-adjusted life years [DALYs] lost) and 9% of all deaths. They are among the leading causes of death throughout the world, and constitute a pandemic. Every year an estimated 5 million people die from injury, giving a global mortality rate of 837 per million per annum.<sup>9</sup> A majority of injuries belong to the unintentional category, of which the main are road traffic injuries – accounting for 25% of mortality and 22% of DALYs lost.<sup>9</sup>

According to 1990 estimates, road traffic injuries (RTI) rank ninth in terms of DALYs lost worldwide. They are projected to ascend to the third rank by 2020.<sup>10</sup> An estimated 1.6 million people died of violence in 2000, giving violence a prevalence of 288 fatalities per million.<sup>11</sup> In many parts of the world, the injury-related database is thin and the actual burden may be heavier than the estimates. For every injury-related mortality several thousand more require hospital treatment and result in impairments, frequently with disabling consequences (Fig. 1).<sup>12</sup>

Injury affects the productive workforce, youth and school-going children the most. Almost 50% of injury-related mortality is borne by the age group of 15–44 years. Children under five years of age account for 25% of all drowning deaths and over 15% of fire-related deaths.<sup>9</sup> Males bear the major brunt in all age groups, the gender difference being the highest in the age group of 15–

44 years. Mortality from RTI and interpersonal violence is about three times higher among males than in females.<sup>9</sup> Reducing the burden of injury is going to be one of the main public health challenges in this century.

## Regional

The burden of injury-related mortality and morbidity is comparatively very high in low- and middle-income countries, which account for over 90% of this burden.<sup>7</sup> Recent evidence suggests that victims of life-threatening injury have six times higher probability of death in a low-income setting.<sup>13</sup>

The World Health Organization's South-East Asia (SEA) Region alone bears 31% of the world's burden of injury and 27% of injury-related mortality.<sup>9</sup> Young people face the major brunt. Thousands of children in the Region, though successfully protected from infectious and nutritional diseases are killed or crippled by injury, demonstrating that injury is also a major public health challenge. RTI is the biggest offender in most of these countries; the total regional share in the global burden of RTI being 34%.<sup>9,14</sup> It is also estimated that the SEA Region accounts for 57% of the global burden of burn injury and 53% of burn mortality.<sup>9</sup> An estimated 320 000 persons from the SEA Region also lost their lives to violence (homicide, suicide and war) in 2000.<sup>15</sup> In Bangladesh and Thailand, drowning is the first leading cause of death in children. The burden of specific injuries in the Region, their global share, and prioritization among the Member States is given in Annex A (Tables 1, 2).<sup>9, 14</sup>

## Cost of injury

RTI alone costs 1%, 1.5% and 2% of the gross national product (GNP) of low-, middle-, and high-income countries, respectively. For low- and middle-income countries, this exceeds the total developmental aid received.<sup>10</sup> Assessment of direct and indirect costs of injury involves complex methods that are seldom free of limitations and compromises. What generates a great deal of discussion and debate is the question of economic quantization of human life. Placing a monetary value on pain and suffering is ethically unacceptable to many professionals and health workers. Nevertheless, several countries have been trying to develop pragmatic and objective tools to assess the economic cost of injury that can be widely applicable. These have great importance for the policy process, selecting cost-effective safety measures, and also justifying of specific expenditures. In broad terms, the economic burden of injury can be summarized into the following areas:

### **Direct costs:**

- **Medical costs:** pre-hospital care; transport; emergency medical services (EMS); hospitalization; investigations; pharmaceutical/ancillary/related treatment costs; rehabilitation; mental health; and administrative costs of medical care and processing payments.
- **Other resource costs:** police; legal; fire; funeral in case of death; and costs of damage to/loss of property.

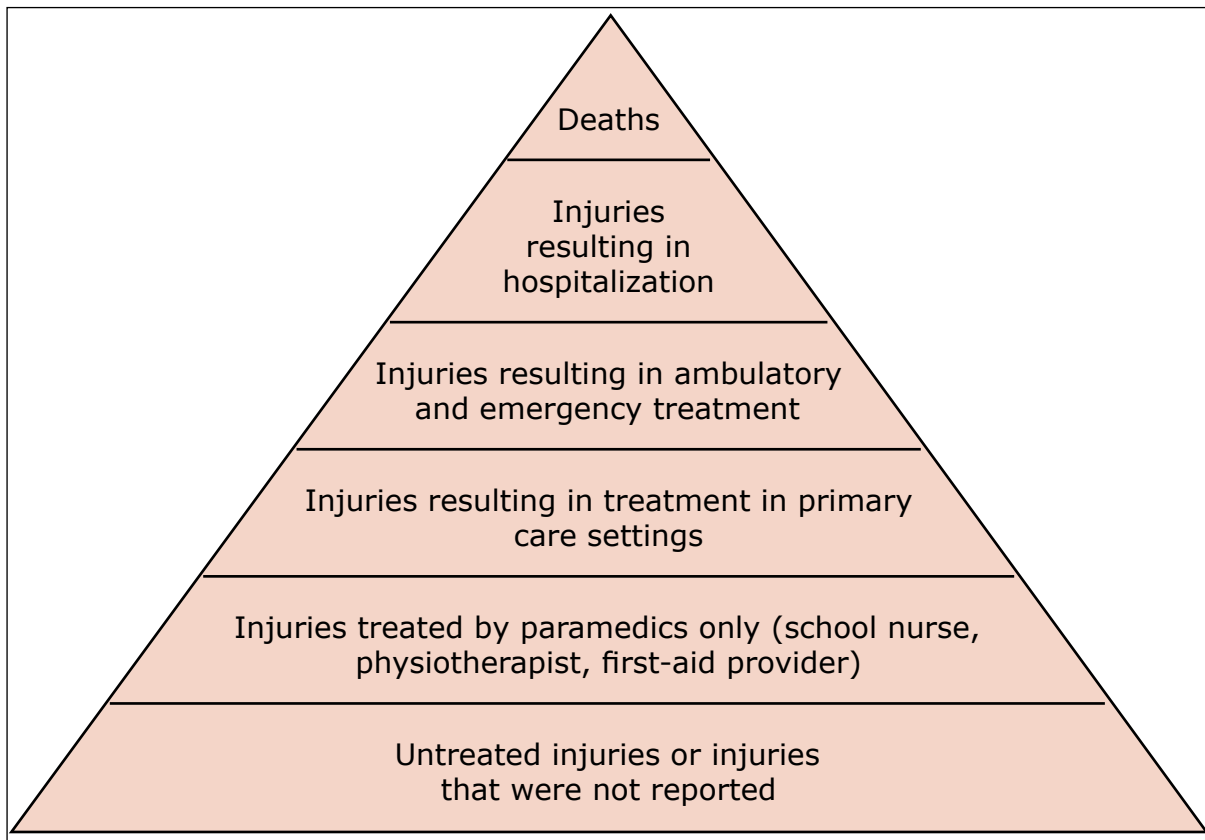
### **Indirect costs:**

- **Lost productivity:** lost wages of victims; replacement cost of lost household work; administrative costs of processing compensation/insurance/welfare schemes; productivity losses by families/friends involved in care; travel delay for uninjured travelers that results from road crashes; productivity losses of employers on account of hiring and training replacement workers.
- **Cost in terms of quality of life:** economic value of pain and suffering; disability; death; quality of life lost for victims/families/friends.

## **Injury experience of a population**

The injury experience of a population can be better understood as a pyramid based on the level of medical treatment, a crude surrogate for injury severity (Fig. 1.1).<sup>12</sup> The apex represents the number of injury deaths (relatively smaller), and the broader, lower parts of the pyramid show more numerous injuries of lesser severity. In descending level of severity, but increasing magnitude, we can identify injuries that require hospitalization, ambulatory treatment, injuries that are not emergencies, mild forms of injuries treated by paramedics, and the commonest ones, which go unreported.

**Figure 1.1: Injury pyramid**



Source: TEACH-VIP, WHO

### **1.3 Haddon's Matrix for injury prevention**

In the 1960s, William Haddon, Jr. a public health physician with the New York State Health Department, tried to systematically address injury prevention.<sup>2, 16, 17</sup> Initially he was interested in road crashes, but later his model was applied to other injuries as well. He extended the epidemiological triad further to add another dimension to it: the "event sequence". Haddon argued that the interplay between human, vehicular and environmental factors needs to be examined in the context of three temporal phases: before, during and after the event. Circumstances surrounding these three phases determine the outcome. Based on this phase-factor analysis, he proposed the Haddon Matrix in 1968. This was used as a broad framework for planning, strategy identification, and resource allocation, as well as development of specific interventions against injury.

The basic Haddon Matrix has nine cells, representing nine areas of analysis and potential interventions. For example, a summary analysis of road crashes would be as follows:

**Figure 1.2: Haddon’s Matrix**

	<b>Human</b>	<b>Vehicles and equipment</b>	<b>Environment*</b>
<b>Pre-crash</b>	Alcohol, fatigue	Faulty brakes	Low coefficient of friction on road surface
<b>Crash</b>	Tolerance of human body to the force	Susceptibility to damage of fenders and exterior structure	Tree too close to road, ditches
<b>Post-crash</b>	Bleeding from injury	Entrapment, fire	Slow emergency response

\*Later versions divide environmental factors into two separate columns—physical environment and social environment—and make a 12-cell matrix.

Haddon suggested that all injuries are attributable to the release of energy in one of the five forms: kinetic, chemical, thermal, electrical and radiation. The pre-event phase was thus explained in terms of the build-up of uncontrolled energy, and the event phase in terms of transfer of energy; the post-event phase elucidated the person/agent/environment factors that affect the impact of energy. Later, to make the concept more operational, the word “energy” was sometimes replaced by “hazard”.

It needs to be underlined here that Haddon’s analysis is a proactive approach towards injury. Even the post-event interventions will have to be “in place” and working before an injury event actually occurs. Based on these concepts, Haddon proposed ten basic strategies of injury prevention. These strategies are listed below, with some of the corresponding interventions, also referred to as “countermeasures”. Several measures cover more than one strategy and there can be an obvious overlap.

**Table 1.1: Injury prevention measures**

<b>1</b>	<b>Prevent the development of the energy form: Do not create the hazard</b> (e.g., stop producing fireworks)
<b>2</b>	<b>Reduce the amount of energy/hazard</b> <ul style="list-style-type: none"> <li>• adjustment of thermostat in hot-water heater to decrease water temperature</li> <li>• limiting the number of pills per container and per each sale</li> <li>• speed limit on roads</li> </ul>

<b>3</b>	<b>Prevent release of the energy/hazardous agent</b> <ul style="list-style-type: none"> <li>• automatic circuit-breakers to prevent electrical sparks</li> </ul>
<b>4</b>	<b>Alter the rate of energy release from its source: Modify release of the hazardous agent</b> <ul style="list-style-type: none"> <li>• automobile airbags</li> </ul>
<b>5</b>	<b>Separate susceptible person from the source of energy release by space or time</b> <ul style="list-style-type: none"> <li>• use sidewalks to separate pedestrians from automobiles</li> <li>• evacuation before cyclone or tsunami</li> </ul>
<b>6</b>	<b>Place a physical barrier between the released energy and susceptible structures</b> <ul style="list-style-type: none"> <li>• driving helmets</li> <li>• welding glasses</li> <li>• insulated electrical cord</li> </ul>
<b>7</b>	<b>Modify surfaces and structures</b> <ul style="list-style-type: none"> <li>• make crib slat spacing too narrow to strangle a child</li> <li>• impact-absorbing interiors for cars</li> </ul>
<b>8</b>	<b>Strengthen structures/increase resistance to persons susceptible to damage from energy transfer</b> <ul style="list-style-type: none"> <li>• earthquake-proof building technologies</li> <li>• improve host's musculoskeletal condition against injury through appropriate nutrition and exercise</li> </ul>
<b>9</b>	<b>Prevent the extension of existing damage</b> <ul style="list-style-type: none"> <li>• effective pre-hospital care</li> </ul>
<b>10</b>	<b>Carry out intermediate and long-term repair and rehabilitation</b> <ul style="list-style-type: none"> <li>• acute care and rehabilitation</li> <li>• self-care training after treatment</li> </ul>

Some of the Haddon's co-workers and subsequent researchers have carried his work forward. They underline the distinct strengths in Haddon's Matrix:

- identifies injury as a process;
- employs a systematic multidisciplinary approach;
- helps to develop a range of strategies; and
- creates room for creative solutions.

However, they also argue that the model does not help in making an informed choice among multiple available interventions. To address this limitation, some researchers have added a third dimension to each of the conventional Haddon Matrix cells. This new dimension helps programme managers in structuring the decision-making process while considering issues such as effectiveness, cost, freedom, equity, stigmatization, preferences and feasibility of each of the available options.<sup>18</sup>

Another model for understanding how injuries occur especially in violence is known as the ecological model. This model has been particularly useful in understanding the causes of violence.<sup>9</sup> Each level in the model represents a level of risk, and each level in the model can also be used as a key point for preventive intervention. The ecological model is discussed in detail in Chapter 2, Section 2.9.1.

## 1.4 Approaches to injury prevention

There are several methods to categorize injury prevention efforts: for example, according to the temporal phase of the injury event, or the target group of interest, or the involvement of target group in prevention efforts.<sup>12</sup>

Of the three major approaches to injury prevention, the temporal approach closely relates to the natural history of injury. Contrary to general belief, the role and scope of injury prevention does not stop at preventing crashes and other unforeseen occurrences. Each phase in the natural history of injury provides us an opportunity for intervention to avoid, arrest and possibly revert the morbid process of injury and disability. The timing or the temporal placement of such opportunities in the natural history of disease is referred to as levels of prevention.

### 1.4.1 Primary prevention

This involves either preventing the injury event from occurring or preventing it from leading to injury.<sup>16</sup> Primary prevention involves two modes of intervention:

- a. **Health promotion** aims to improve the general capacity of individuals and the community to guard against vulnerability to injury. Some of the major areas of promotive activities are:
  - Educating the public regarding dangerous behaviour and environment through behavioural change communication (BCC).
  - Environmental modification: safe, well-lit roads; non-fragile posts for roadside lighting; pool fencing; barriers around heavy machines in factories and workshops, and the like.
  - Legislation enforcement: driving speed limits, random breathalyzer test for alcohol levels, tougher standards for buildings in cyclone and earthquake-prone regions and less taxation on manufacturers of safety equipment.

- b. Specific protection** includes specialized devices/modalities for prevention of specific injuries, e.g. the use of eyeglasses for welding, protective gloves and clothing for handling chemicals, and personal protective equipment to protect against radiation.

### 1.4.2 Secondary prevention

The objective of secondary prevention is to arrest or impede the progression of disease at an early stage and prevent complications. This involves early diagnosis and appropriate management of an injury.<sup>19</sup> Secondary prevention comes into operation immediately after the occurrence of injury. Examples of secondary prevention strategies include first aid at the scene; pre-hospital care; transport; and comprehensive hospital care to the victim.

### 1.4.3 Tertiary prevention

This includes all efforts aimed at preventing further complications and improving the final outcome. Restoration of bodily functions as far as possible, minimizing the disability, and rehabilitation are important components. The preventive measures in this level may include the activities mentioned below:

- **Disability limitation:** These efforts are to ensure that impairments caused by trauma do not progress to the form of a disability or handicap. In cases of severe trauma, effective management of complications and rehabilitation can prevent many of the likely disabilities or handicaps.
- **Rehabilitation:** Includes medical rehabilitation (restoration of bodily functions), psychological rehabilitation (restoration of self-esteem and healthy personality), social rehabilitation (restoration of societal and community relationships), and vocational rehabilitation (restoration of capacity to earn a livelihood).

Injury prevention efforts can also be classified on the basis of the target group of interest. Universal interventions are aimed at groups or the general population without consideration of individual risk. Selective interventions are aimed at those who are considered at higher risk of injury or violence; for example, driving education for young or elderly drivers, or training in parenting for low-income, single parents. Indicated interventions are directed at those who have demonstrated risky behaviour.

Injury prevention interventions that do not require any active participation by the individual are categorized as passive interventions (e.g. deployment of airbags on impact). These interventions are independent of human behaviour. Active interventions, on the other hand, require active involvement of individuals for their success (e.g. use of seatbelts or helmets). In preventing unintentional injuries, passive interventions are more likely to be successful than active interventions.<sup>9</sup>

The strategies for injury prevention can be classified into the “Four E’s” of injury prevention:<sup>20</sup> **Engineering** can modify products and the environment to make them safer for people, **enforcement** refers to formulation and enforcement of laws and regulations that modify individual behaviour or stipulate standards for products, **education** is aimed at increasing public awareness of hazards and changing behaviour patterns to reduce injuries and decrease the level of damage/losses; **economic** strategies for injury prevention create financial incentives to implement injury prevention measures.

#### 1.4.4 Public health approach

The public health approach to solving health problems has the following characteristics:<sup>11</sup>

- It is population-based.
- It is multidisciplinary.
- It is evidence-based and adopts scientific methods.
- It emphasizes collective action.
- It emphasizes prevention.

The public health approach to injury and violence prevention is based on a rigorous scientific method.<sup>12</sup> There are four key steps involved in the process of moving from problem to solution (see Box 1.1).

### **Box 1.1: Public health approach to injury prevention: Key steps**

- Surveillance: to determine the magnitude, characteristics and trends of the problem.
- Risk factor identification: to identify the factors that cause or increase the risk of injury or violence, and to determine which factors are modifiable.
- Develop and evaluate interventions: to assess measures that can be taken to prevent the problem with the help of available information on causes and risk factors; to design, pilot test, and evaluate interventions.
- Implementation: to implement the most promising interventions on a broad scale.

## **1.5 Classification of injury**

Injury data can be categorized and analysed in many different ways for different purposes. It is difficult to capture all of the important aspects of injuries in a simple classification system. However, to classify injuries by intention (accidental or intentional) and mechanisms (e.g. crash, fall, burn) will provide adequate first-line information on situation and policy or prevention. In addition to classification by intent or mechanism, injury can also be usefully classified by:

- setting (e.g. home, school, workplace, road)
- activity (e.g. working, recreation)
- severity (level of medical treatment required)
- nature and site of injury (e.g. fracture of skull, cut on left forearm)

For international comparison, a systematic classification developed by WHO and a widely accepted system of disease classification is the ICD-10 (International Statistical Classification of Diseases and Related Health Problems, tenth revision).<sup>21-22</sup>

The purpose of ICD-10 is to permit the systematic recording, analysis, interpretation and comparison of mortality and morbidity data collected in different countries or areas and at different times. The ICD is used to

translate diagnoses of diseases and other health problems from words into an alphanumeric code, which permits easy storage, retrieval and analysis of the data.

In practice, the ICD-10 has become the international standard diagnostic classification for all general epidemiological and many health management purposes. These include the analysis of the general health situation of population groups and the monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables, such as the characteristics and circumstances of the individuals affected. However, the ICD-10 is neither intended nor suitable for diagnosing the cases as per clinical presentations since the information is not adequate, (e.g., no left or right side indicated).

The ICD can be used to classify diseases and other health problems recorded on many types of health and vital records. Its original use was to classify causes of mortality as recorded at the registration of death. Later, its scope was extended to include diagnoses in morbidity. It can therefore be used to classify data recorded under headings such as “diagnosis”, “reason for admission”, “conditions treated” and “reason for consultation”, which appear on a wide variety of health records from which statistics and other health-situation information are derived.<sup>22</sup>

The core classification in ICD-10 provides a three-character alphanumeric code (mandatory for international reporting on vital mortality) for every specific disease category. This code has a letter in the first position and numbers in the second and third positions.

Two chapters of ICD-10—Chapter XIX, “Injury, poisoning and certain other consequences of external causes” and Chapter XX “External causes of morbidity and mortality”—cover most of the injury events (see Annex B). Most cases of injury will have two ICD codes, for the nature of injuries and the causes, and both need to be mentioned to capture the entire picture.

Chapter XIX contains 21 blocks of disease categories<sup>21</sup> (Annex B). It provides a code for types of injuries for each site of injury.

Site (3 character code)	Type of injury
<ul style="list-style-type: none"> <li>• Head (S00-S09)</li> <li>• Neck (S10-S19)</li> <li>• Thorax (S20-S29)</li> <li>• Abdomen, lower back, lumbar</li> <li>• Spine and pelvis (S30-S39)</li> <li>• Shoulder and upper arm (S40-S49)</li> <li>• Elbow and forearm (S50-S59)</li> <li>• Wrist and hand (S60-S69)</li> <li>• Hip and thigh (S70-S79)</li> <li>• Knee and lower leg (S80-S89)</li> <li>• Ankle and foot (S90-S99)</li> </ul>	<ul style="list-style-type: none"> <li>• Superficial injuries</li> <li>• Fractures</li> <li>• Dislocation, sprain and strain</li> <li>• Injuries to nerves and spinal cord</li> <li>• Injuries to blood vessels</li> <li>• Injuries to muscles and tendons</li> <li>• Crushing injuries</li> <li>• Traumatic amputation</li> <li>• Injury to internal organs</li> </ul>

Chapter XX gives a code for causes and circumstances (see Annex B).

Chapter XX contains codes between V01 to Y98. The first axis for coding is the intent:

- Accidents V01-X59
- Intentional self-harm X60-X84
- Assault X85-Y09
- Event of undetermined intent Y10-Y34
- Legal intervention and operations of war Y35-Y36
- Complication of medical and surgical care Y40-Y84
- Sequelae of external causes of morbidity and mortality Y85-Y89
- Supplementary factors related to causes of morbidity and mortality classified elsewhere Y90-Y98

**Intent takes precedence over mechanism. Therefore, the coder must first determine the intent (e.g. intentional self-harm) before assigning the mechanism (e.g. fall/jump).**

Accidents (V01-X59) have large subgroups such as transport accident (V01-V99) and other external causes of accidental injuries (W00-X59), which are stated below:

- Transport accident (V01-V99)
  - ◇ Pedestrian injured in transport accident (V01-V09)
  - ◇ Pedal cyclist injured in transport accident (V10-V19)

- ◇ Motorcycle rider injured in transport accident (V20-V29)
- ◇ Occupant of three-wheeled motor vehicle injured in transport accident (V30-V39)
- ◇ Car occupant injured in transport accident (V40-V49)
- ◇ Occupant of pick-up truck or van injured in transport accident (V50-V59)
- ◇ Occupant of heavy transport vehicle injured in transport accident (V60-V69)
- ◇ Bus occupant injured in transport accident (V70-V79)
- ◇ Other land transport accidents (V80-V89)
- ◇ Water transport accidents (V90-V94)
- ◇ Air and space transport accidents (V95-V97)
- ◇ Other and unspecified transport accidents (V98-V99)
- Other external causes of accidental injuries (W00-X59)
  - ◇ Falls (W00-W19)
  - ◇ Exposure to inanimate mechanical forces (W20-W49)
  - ◇ Exposure to animate mechanical forces (W50-W64)
  - ◇ Accidental drowning and submersion (W65-W74)
  - ◇ Other accidental threats to breathing (W75-W84)
  - ◇ Exposure to electric current, radiation and extreme ambient air temperature and pressure (W85-W99)
  - ◇ Exposure to smoke, fire and flames (X00-X09)
  - ◇ Contact with heat and hot substances (X10-X19)
  - ◇ Contact with venomous animals and plants (X20-X29)
  - ◇ Exposure to forces of nature (X30-X39)
  - ◇ Accidental poisoning by and exposure to noxious substances (X40-X49)
  - ◇ Overexertion, travel and privation (X50-X57)
  - ◇ Accidental exposure to other and unspecified factors (X58-X59)

Chapter XX has added provisions, wherever applicable, for coded information related to the place of occurrence (as the fourth character code) applicable to Codes W00–Y34 except Y06–Y07, and activity associated with injury (as fifth character code) applicable to Codes V01–Y34 (see Annex B–Tables 3, 4).<sup>21</sup>

### Exercise 1:

A report from an emergency room (ER) of a community hospital is below:

Five leading causes of injuries, ER, May 2008

	<b>Number</b>	<b>%</b>
1) Transport accidents	43	31.4
2) Intentional self-harm	24	17.5
3) Accidental falls	11	8.1
4) Fractured femur	5	3.6
5) Work-related injuries	4	2.9
6) Others (include unknown)	50	36.5
<b>Total</b>	<b>137</b>	<b>100</b>

Is this classification correct according to ICD 10, external causes? If not correct, give your reason(s) and your classification of the above data available.

### Answer

The above classification is not correct. According to ICD 10, Chapter XX for other external causes of morbidity and mortality, No. 4 is not a cause of injury; No. 5 may describe the environmental attributes and circumstances of the injury, whereas the first and second axis of ICD 10 (Chapter XX) is intention and mechanism of injuries. The correct classification is therefore:

Three leading causes of injuries, ER, May 2008

	<b>Number</b>	<b>%</b>
1) Transport accidents	43	31.4
2) Intentional self-harm	24	17.5
3) Accidental falls	11	8.1
4) Others (include unknown)	59	43
<b>Total</b>	<b>137</b>	<b>100</b>

## Exercise 2:

Procure ICD-10 from your library. Refer to Chapters XIX and XX, and find appropriate codes for the following case:

***"On a highway, a taxi-driver collides with a bus while he was going to pick up his customer, and sustains a head injury. Radiological investigations reveal a fracture at the base of the skull."***

## How to go about it:

Procure ICD-10 from your library. Refer to Chapters XIX and XX, and find appropriate codes for the following case:

ICD-10: Chapter XIX

### Steps:

head injury: S00–S09  
fracture skull: S02  
fracture, base of skull: S02.1

ICD-10: Chapter XX

### Steps:

1. transport accident: V01–V99  
2. car occupant: V40–V49  
3. collision with bus: V44  
4. driver: V44.5  
5. while working for income: V44.52

ICD-10 Codes: **S02.1** and **V44.52**

## 1.6 Safety promotion audit

A safe environment at home, school, the playground, workplace and other public utilities is essential for the prevention of injuries. The safety promotion audit is an anticipatory process of information generation for quick interventions, which helps in ensuring a secure and injury-free environment. The audit in this context is an independent, objective and systematic review of safety management, and thus different than routine inspections and departmental reviews.<sup>23, 24</sup> Since safety is everyone's responsibility, the audit involves several stakeholders in the process.

### 1.6.1 Planning:

A safety audit team should consist of experts (one or two) and representatives from clients, the local administration, and law enforcement and maintenance agencies. It should neither be too small (< 3) nor too big (> 6). To ensure

objectivity and neutrality, team members should not audit their own facility. This can be ensured by rotating the members off and on the team, depending on the facility being audited. The facility should be informed in advance. It needs to be explained to the facility’s leadership that this exercise is an opportunity to learn and improve, and not an inspection for administrative reward or penalty. Their participatory involvement during on-site visits as well as follow-up is essential in minimizing disruption to the audit process and attaining the final objectives.

### 1.6.2 On-site visits

The audit team should schedule an on-site visit well in advance in consultation with the administration of the facility to be audited. At least one full day should be dedicated to the visit. Specific activities during the visit should include:

- (1) Meeting with the leadership of the facility.
- (2) A detailed walk-through for assessment of various audit items.
- (3) Informal audit interviews with stakeholders (including clients).
- (4) A brief exit interview with the leadership.

For the assessment of various audit items during the walk-through, a facility/environment-specific list of audit items should be prepared. Based on these items, a structured schedule should be developed, pre-tested and used. In this schedule, with each audit item in a separate row:

**Table 1.2: Home safety audit items**

Safety promotion audit item (Home safety)	Observation				Action required	
	In place		Not in place	NA	Modify	Initiate/ install
	Functioning	Not functioning/ sub-optimal				
<b>Structural:</b> More than one exit		√			√	
<b>Electrical:</b> Load-compatible voltage supply and connection			√			√
<b>Household items:</b> Sharps not in reach of children			√			√

The list of audit items for the home, school and workplace is given in Annex C. Several organizations have developed and tested their own checklists.<sup>24, 25</sup> These lists are to be used only as a model and additional

locally determined components should be incorporated as and when necessary. Similar lists can be prepared for other safety environments such as road/rail/water/air traffic and sports.

The informal interviews are largely qualitative in nature. They are conducted to ascertain the information that various stakeholders have regarding the level of safety within their facilities and to compare safety perceptions among stakeholders.

### **1.6.3 Follow-up to on-site visit**

Following the visit, the audit team should prepare a written report to be submitted to the administration of the facility. The report should highlight safety-related strengths and weaknesses of the site, with a special section on the last two columns (action required) of the schedule. The facility should respond to the audit-based recommendations and prepare an “action taken” report. Both these reports should be available at the site.

## **1.7 Injury-related information**

The strength of safety promotion audits lies in their being anticipatory. However, they are unable to provide event-based information. For this we need to tap different injury data sources. The following are some common sources of such information:

- Mortality—emergency room records, death certificates, verbal autopsies, vital statistics registries, reports from mortuaries, mortality surveys.
- Morbidity—emergency room records, trauma centres records, medical records of general hospitals and clinics, morbidity surveys and surveillance.

### **1.7.1 Trauma registry and trauma audit**

A trauma registry is a system of data collection for injured patients in a trauma care facility. Traditionally the systems of trauma registry and audit have been used for quality assurance and improvement of patient care. However, there have been attempts to evolve trauma registry as an information base that can also be a surveillance system. Some countries, such as Thailand, have developed models wherein trauma registry also works as a data source for surveillance. Myanmar and Sri Lanka have similar systems. In order to be a surveillance database as well, trauma registries,

besides recording socio-demographic information, should also record date and time when the injury occurs, injury event location (place of occurrence), causes of injury (such as motorcycle crashes, self-harm by knife, etc.), risk factors (such as alcohol consumption) and safety equipment used (such as motorcycle helmet). The trauma registry-cum-injury surveillance system usually has pre-hospital assessment and treatment, emergency assessment and hospitalization, complete diagnosis and treatment, especially the patient outcome.

A trauma audit is an exercise of systematic analysis and quality assurance in trauma care. The process and outcome standards of the care provided to all trauma cases are periodically reviewed for appropriateness by a team of independent experts. All negative outcomes (deaths, complications and re-admissions), difficult/questionable/interesting cases and outstanding “saves” are listed and reanalysed intensively. Whenever any deviation from prescribed standards (process or outcome) is detected, the care provider searches for solutions and develops a plan of correction. These systems of trauma registry-cum-injury surveillance and trauma audit when combined (Fig. 1.3) can be used at local and higher levels for<sup>26-28</sup>:

- assessment of injury trends;
- prioritization of interventions relating to injury prevention;
- evaluation and improvement of quality of trauma care;
- comparing patient outcomes across service areas and provider groups;
- developing data for clinical benchmarking; and
- identification of excessively hazardous environments.

Trauma registry and audit are largely dependent on institution-based information, and can be done only in hospitals with high potentials.

### **1.7.2 Injury surveys and injury surveillance**

A survey is generally a one-time event but surveillance is a continuous process. However, in certain situations, a well-planned series of surveys can be used for surveillance. Injury survey or surveillance can be of the whole population, samples or specific settings.<sup>29</sup>

Surveillance is defined as “the ongoing systematic collection, analysis and dissemination of surveillance information essential to the concerned authorities for appropriate planning, implementation and evaluation of

preventive interventions”. Timely dissemination of information data to those who need to know is an important characteristic of the system. The final link of the surveillance chain is in the application of these data to prevention and control.<sup>19</sup>

Injury surveillance can be active or passive, depending on the systems. In **active surveillance**, injury cases are sought out and interviewed for data. The surveillance system reaches out to the primary data source to collect information. In **passive surveillance**, relevant data is collected in the course of doing other routine tasks. The generation of data is not necessarily the primary function of the system that yields the data.

A special method of surveillance can be employed which is called “**sentinel surveillance**”.

Sentinel surveillance is the collection and analysis of data by designated institutions selected for their geographic location, medical specialty, and ability to accurately diagnose and then report high-quality data. Sentinel surveillance is an effective tool for planning, monitoring and evaluation of disease control interventions in developing countries, and would give some measure of injuries in the absence of good nation-wide, institution-based surveillance, and without having to resort to a large expensive survey. Since low- and middle-income countries and also least-developed countries in both South-East Asia and Western Pacific regions could not afford nation-wide injury surveillance, there is no choice but to institutionalize sentinel surveillance.

Sentinel surveillance can be briefly summarized as follows:

- It can be active or passive surveillance, or a mix.
- The completeness of information has to be sacrificed to greater reliability, speed and sometimes economic.
- It would cover a selected sample of health-care facilities as data sources with wide geographical and demographic distribution, and must be reliable.

A few selective criteria for choosing sentinel sites are:

- The site must have enough caseload to identify a rare event;
- There is trained staff for diagnosis and data processing;
- The information recorded must be reliable and reporting must be timely; and,

- The staff has to have the willingness to be involved in the system.

Advantages of sentinel surveillance are that it may be used to cross-check with routine reporting, the staff has a higher motivation to report accurately and on time, and it is relatively inexpensive to set up and operate.

Disadvantages are that:

- The data is not representative of the entire population at risk;
- Data may not be, in some places, of sufficient volume to generate rates/ratios;
- Populations served by sentinel sites may change and hence may provide invalid trends (follow-up information is needed on "market share").

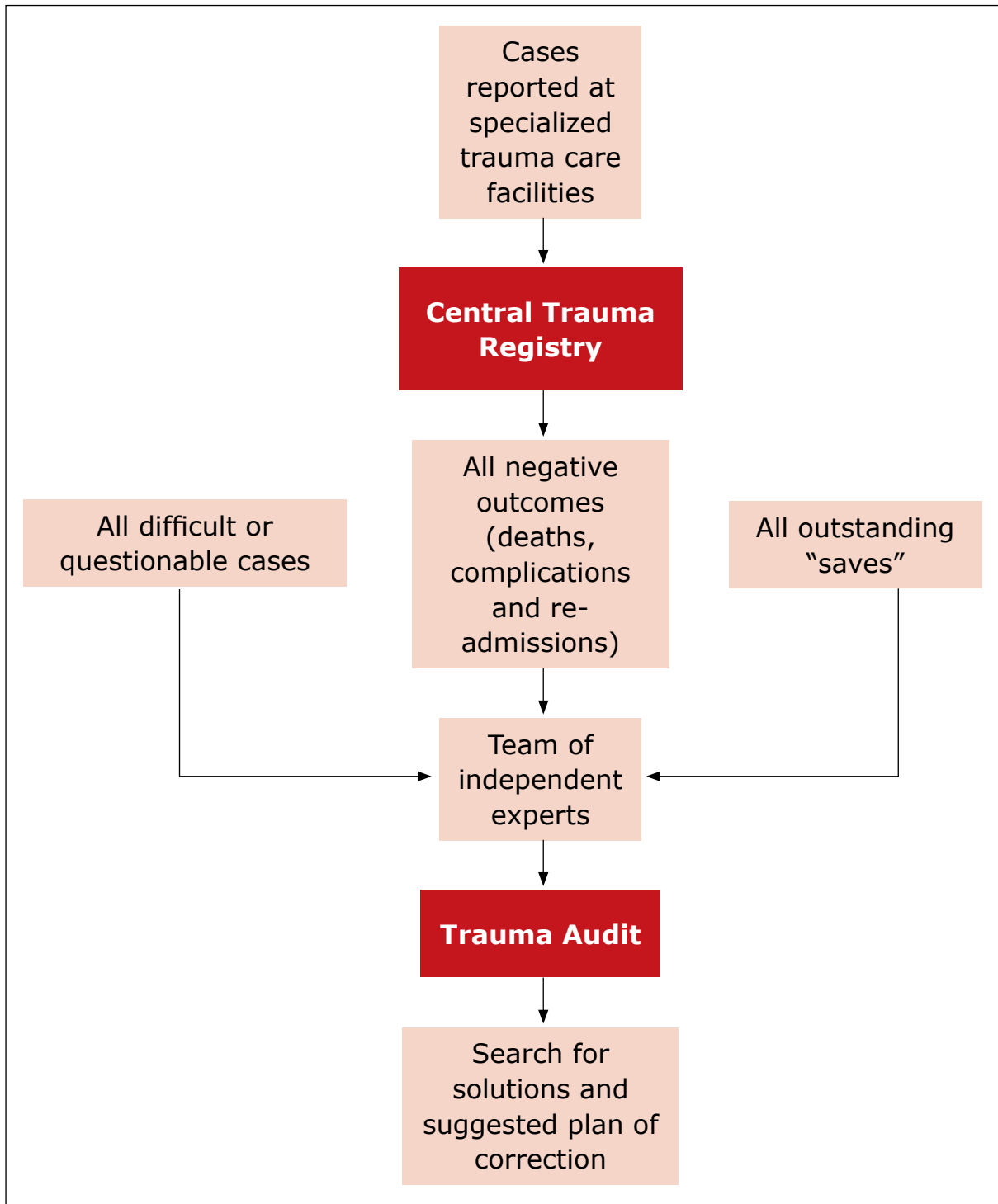
The involvement of the sentinel hospitals on trauma registry is usually voluntary; there should be a commitment to run the system for at least one year in each site at the same time. This would provide basic information on injury for each locality and may be for the whole country too.

A sentinel injury surveillance system using modified trauma registries is less costly to set up and easier to administer, but needs a lot of attention by the central coordinating unit. Analysis and interpretation of data in the context of nation-wide application of results requires more skills.

While sentinel injury surveillance can give adequate individual case data on injuries risk, circumstances and outcome, this type of surveillance cannot provide the total national number of deaths and severe injury or generate rates of injury mortality and morbidity. Hence, while setting up sentinel injury surveillance, the death registry and national hospital admissions data system should be improved at the same time so that a complete picture of injuries in the country can be provided.

The broad principles of injury surveillance being taught here, e.g. methods in IPC, are not different from those taught in epidemiology. The quality and timely availability of such data, which usually is a weak link in most of the settings, is essential for the evaluation of and improvements in trauma management systems and programmes.

**Figure 1.3: The system of trauma registry and trauma audit**



### **1.7.3 Management information system (MIS)**

Instead of providing technical answers to injury-related questions, the MIS makes managerial answers available for monitoring, problem-solving and improvement of the programme. While a safety audit is essentially a pre-event exercise and trauma registry and audit relate to event-based information, the MIS—besides taking imports from all these methods—develops a dynamic database regarding managerial issues such as availability, utilization, resources involved, timeline and operational cost of injury-care services. Such an information system involves identification, collection, classification, processing, communication, interpretation, and storage and retrieval of relevant data on an ongoing basis. The entire information network is interlinked according to the needs of implementing supervisors. This involves partnerships among various agencies and a great deal of teamwork.

Such an information system is not available in most settings. A broad scheme of developing a network through various agencies is discussed in Section 1.10 (population-based programme on IPC), which includes the framework for IPC-MIS as well.

## **1.8 Role and scope of legislation**

The legal disciplines make a significant contribution to the prevention of injury through the formulation and development of appropriate legislation. Legislation may relate to standards of products or the environment, or the regulation of behaviours. It also establishes modes of punishment for the perpetrators and rehabilitation schemes for the victims of crimes.<sup>30</sup>

There can be two basic types of strategies in law-making and enforcement for the purpose of injury prevention: prohibitive and promotive. However, in practice, most legal interventions have some elements of both.

A good legislation/enforcement system anticipates and responds to the optimum safety needs and develops innovative legal interventions to reduce road crashes, other injuries and related mortality. This cannot be accomplished without building better community relations and a police–people partnership. The behaviour of law enforcing officials (real or perceived) directly influences the relationship between law enforcement and the people.<sup>31</sup> In this context, promotive strategies, besides being

anticipatory and proactive, must also develop supportive roles for people at risk and the victims. The following are some examples that illustrate different roles of legislation/enforcement in a single area of intervention:

**Table 1.3: Different roles of legislation in a single area of intervention**

Prohibitive role	Promotive, anticipatory and supportive role
Identify and punish impaired driving (e.g. drunk driving).	Educate drivers as well as the public against impaired driving.
Identify and punish aggressive drivers.	Provide helpful tips to road-users on "What to do when you see or confront an aggressive driver?"
Identify and fine motorists not using seatbelts and bike-riders without crash helmets.	Ask manufacturers to make cars that cannot be started without engaging the seatbelt. Educate motorcycle riders to always wear a helmet and if driving, never accept anyone as a passenger if the person does not wear a helmet.
Enforce speed limits by impounding erring vehicles.	Build speed breakers before accident-prone sections of roads.
Enforce strict licensing and permit systems for drivers and public transporters.	Provide prosecutor, adjudication and insurance services for crash victims.
Not allow schools to open without authorized safety audits.	Assist schools in conducting safety audits and facilitate corrective measures.
Not allow builders to sell dwelling units without the stipulated fire/flood/earthquake clearances.	Facilitate builders to take prescribed anti-fire/flood/earthquake measures that begin at the planning stage itself.
Strict licensing for swimming pool operators.	Safety and first-aid training for pool users.

Legislation should aim at making the "culture of safety" an integral part of civilized living. However, the pressure of a burgeoning population on an overstretched infrastructure as well as on the enforcement machinery poses a huge threat to the safety of people in developing countries. To tackle the paradoxical issue of "survival versus safety" in rural areas and urban slums is an enormous challenge not only for legislators but also more broadly in the area of governance.

## 1.9 Ethical issues

At the professional level, the physician has certain ethical responsibilities related to IPC. These include:

- **Responsibilities to society:** Provision of benefits, creation of public trust, avoidance of conflicts of interest, and promotion and practice of impartiality.
- **Responsibilities to subjects/patients:** Protecting the welfare of subjects/patients, ensuring informed consent and respect for privacy and confidentiality, disclosure and understanding/comprehension of information regarding research processes and risks and benefits of research, and voluntaries of research participants.
- **Responsibilities to professional colleagues:** Accurate reporting of methods and results, and compulsory reporting of unacceptable conditions and behaviours.

Such ethical commitments have been embodied in specific codes of conduct for professional practice. In research, they are articulated in the International Guidelines for Ethical Review of Biomedical Studies developed by the Council for International Organizations of the Medical Sciences (CIOMS).<sup>32</sup> Ethics committees at the organizational level ensure that these principles are followed in practice.

Some specific ethical issues arise while dealing with vulnerable individuals such as children, the disabled or the elderly. In many circumstances of child abuse, for example, in dealing with issues of treatment or rehabilitation the external parties may be forced to act on behalf of the child when the caretakers are causing the child harm. The risk of psychological distress when answering questions relating to intentional injuries is potentially high, particularly in children and adolescents. In these cases, special considerations of risks and benefits should be taken into account.<sup>33</sup> A victim of violence is to be treated with special care. WHO has developed guidelines for research on domestic violence against women.

Certain ethical issues acquire critical importance in specific injury-related settings, some of which are listed below:

- **Suicide, sexual violence:** psychological support, respect for privacy and confidentiality, and sensitivity to social taboos and beliefs.
- **Intentional injury, child abuse, and occupational injury:** confidentiality to guard the safety of informants and researchers.
- **Persons with severe trauma to the brain:** issues of life support and euthanasia.

- **Unattended subjects with altered sensorial/cognitive impairment:** issues of informed consent.
- **Occupational injury:** workers' rights to safe occupational environments.

Occasionally, clear solutions are difficult to come by. Ethics committees at the organizational level have a responsibility to develop professional guidelines for such situations.

Almost all ethical issues relate to respect for human rights. The concept of the "right to safety" has been suitably represented in the Delhi Declaration.<sup>34</sup> This declaration was adopted in New Delhi on 8 March 2000 after the Fifth World Conference on Injury Prevention and Control. It states that "**Safety is a condition where as many hazards that can be controlled should be controlled. Freedom from such hazards is imperative for effective injury and violence prevention.**" Efforts to encourage institutions to adopt and implement this declaration are ongoing.

## 1.10 Population-based programme on IPC

Governments that improve IPC services benefit from reduced injury-related burdens as compared to similarly resourced governments that do not. With an improved and systematic response towards IPC, the range of reduction in the mortality alone will bear incremental rewards. The benefits, in terms of DALYs saved, will be manifold. Such a national response to the problem of injury is yet to materialize in many developing countries. The rationale to initiate a population-based national programme on IPC is strong; it just needs to be effectively advocated.

### Stakeholders

Advocacy to initiate and sustain a population-based programme begins with the identification of stakeholders. A felt need for such a programme on IPC needs to be generated so that the programme gains the widest possible acceptance and support. The major stakeholders in terms of injury prevention are as follows:

- **Clients/beneficiaries**
  - ◇ Road users: users of public/private transport, pedestrians
  - ◇ Drivers and other staff of public/private transport

- ◇ Schoolchildren/parents, factory workers, and other at-risk employees
- ◇ People vulnerable to violence (children, housewives, the elderly)
- ◇ Users of sports facilities
- **Service providers (governmental as well as nongovernmental)**
  - ◇ Health care, EMS and pre-hospital care
  - ◇ Fire and rescue services
  - ◇ Transport and ambulance services
  - ◇ Police, traffic police and legal help
  - ◇ Telecommunications
  - ◇ Weather forecast services
  - ◇ Insurance and compensation
- **Mass media: print as well as electronic**
- **Employers and managers of schools/sports facilities**
- **Constructors/maintainers of road/rail/water/air transport systems**
- **Manufacturers/dealers/service providers of vehicles/spares**
- **Governance at the top**
  - ◇ Legislative agencies, parliaments and assemblies
  - ◇ Executive agencies: Ministries in the government (health, transport, railways, education, labor, industry, finance, law, home, etc.)
  - ◇ Planning and advisory agencies: planning commission

### **Intersectoral partnership, coordination and teamwork**

The framework of any population-based programme on IPC will be a graphic representation of partnerships and teamwork. No systematic public health response can be sustained without effective networking and collaboration between various providers and beneficiaries. In case of IPC, the nature of networking and teamwork is much more complex since it involves agencies from diverse sectors such as transport, health, the police and fire departments.

## Conceptual framework of organization

While Figure 1.4 outlines the conceptual framework of a national IPC programme. There may be several other significant actors and agencies as part of this network. This collaborative teamwork will be most visible at the district and subdistrict levels.

As proposed in the figure, the national IPC programme should start at the primary care level. At the district level, the district IPC mission/society should work with two wings—The district IPC training centre and district injury surveillance centre. While the district IPC mission/society takes responsibility for initiatives, supervision, partnerships and teamwork, the training centre takes care of human resource development and technical inputs. The surveillance centre develops as a nodal chapter of IPC informatics and MIS, going beyond a conventional documentation centre.

The mission/society at the district level should have a multisectoral team, including representatives from the police, traffic police, road/rail transport, fire/rescue services, and nongovernmental organizations, as well as legal/insurance services. The district-level mission should be a part of a nationwide network and be fostered by corresponding institutions at the national level that maintain a liaison with the concerned ministries in the government.

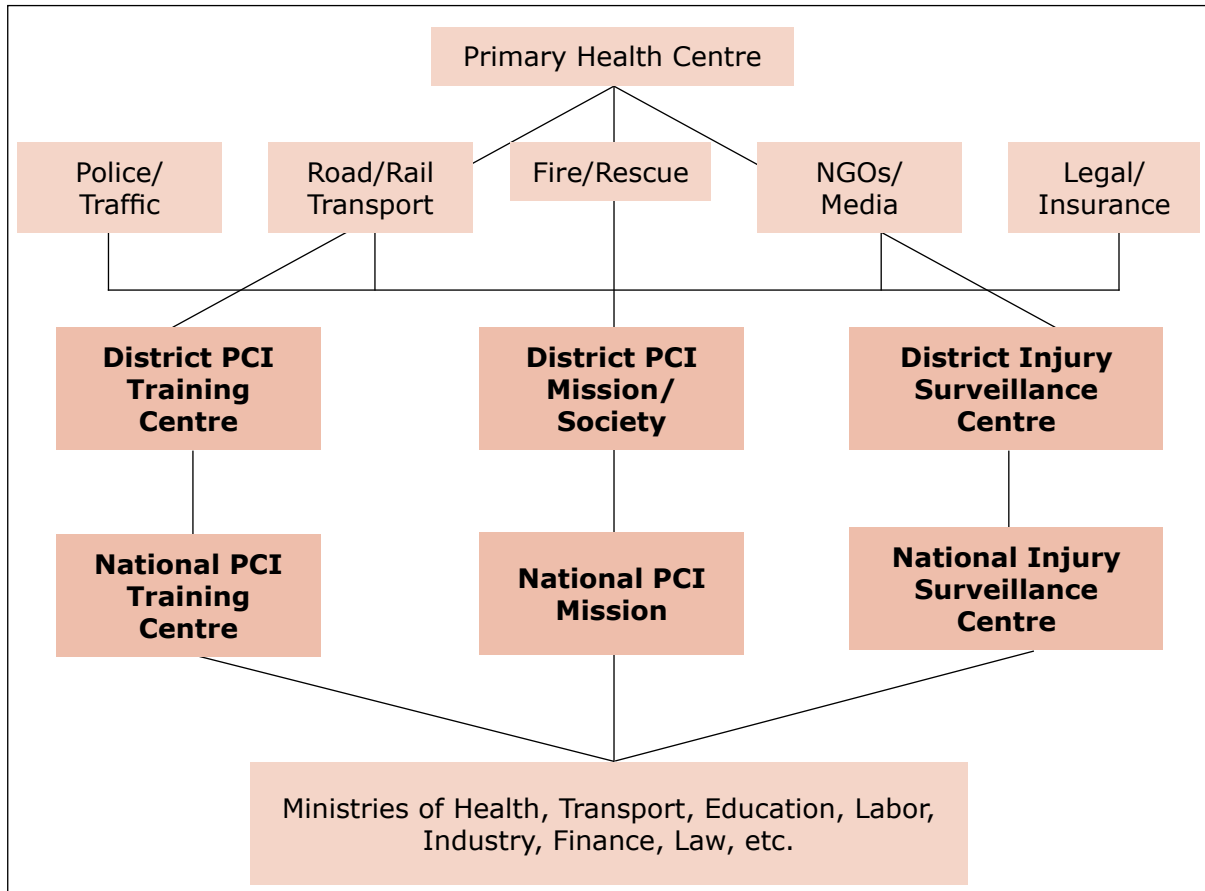
### 1.11 Summary

This chapter has shown how to analyse injury as a morbid process. The principles involved in the prevention and control of any other disease are applicable to injury as well. Each phase in the natural history of injury provides an opportunity for intervention to avoid, arrest and possibly revert the morbid process of injury and disability.

Injuries account for 16% of the global burden of disease and 9% of deaths. They figure among the leading causes of death throughout the world, and constitute a pandemic. Every year an estimated 5.8 million people die from injury. South-East Asia alone bears 30.3% of the world's burden of injury and 28.7% of injury-related mortality. Young people face the major brunt.

The Haddon Matrix is a tool of phase-factor analysis of injury. The basic matrix has nine cells, representing nine areas of analysis and potential interventions. Haddon's model also provides ten basic strategies of injury prevention, with corresponding interventions or "countermeasures".

**Figure 1.4: Conceptual framework of a national IPC programme**



We have familiarized ourselves with the ICD-10 system of injury classification. Two chapters of ICD-10—Chapters XIX and XX—cover most of the injury events. Injury recording should contain information for both the chapters, resulting in two ICD codes, one for each chapter; both need to be mentioned to be useful for prevention and planning.

Data collection for problem-solving and prompt action is an integrated component of any systematic response to the problem of injury. Methods used for collection and analysis of information related to injury events (e.g. incidence, prevalence, mortality, and variables associated with injury and its outcome) are: trauma registry; trauma audit; injury surveys; and injury surveillance. Safety audit is the most proactive approach in this regard. It is a tool to document the safety profile of a given facility and identify areas that need improvement. MIS is a dynamic database that makes managerial answers available for monitoring, problem-solving and improvement of the programme.

In this chapter we have also seen that there can be two basic types of strategies in legislation, regulation and enforcement for injury prevention—

“prohibitive” and “promotive”. At the ethical level, we have learnt about our responsibilities towards society, subjects/patients and professional colleagues.

We have also drawn a conceptual framework of a population-based programme on IPC while outlining various stakeholders and highlighting the multisectoral partnership involved in such a programme.

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**Chapter 2**

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# **Prevention of specific injuries**

People are injured on the road, in workplaces, in homes and during leisure activities. The aim of this chapter is to focus on specific injuries that carry a heavy burden of disease in terms of morbidity or mortality, with particular reference to the South-East Asia Region. The magnitude of these injuries is tabulated in Annex 1. In this chapter, the emphasis will be on the risk factors and prevention of such injuries.

## Learning objectives

After completion of this chapter, the learner should be able:

- To describe the risk factors and preventive measures of unintentional injuries related to road traffic, falls, drowning, burns, poisoning, occupation and animals.
- To outline the do's and don'ts in first aid management of burns, poisoning and animal bites.
- To define violence and classify injuries due to violence.
- To explain the etiological factors of violence based on the "ecological model of violence" and, accordingly, outline the approach to prevention.
- To define mass trauma, delineate its classification and outline steps for disaster preparedness.

## 2.1 Road traffic injuries (RTI)

Road transport is a complex and potentially dangerous element of our daily lives. Road traffic injuries (RTI) are unique because the damage to cells and organs occurs immediately on account of a rapid transfer of energy. Realizing the importance and vast potential benefit of preventing such injuries, the World Health Organization declared "Road Safety" as the theme for World Health Day 2004.<sup>1</sup>

**Definition:** A road traffic injury is any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road.<sup>2</sup>

**Magnitude of the problem:** Road traffic crashes account for one fourth of the total deaths related to injury across the globe, killing 1.2 million people worldwide per annum. The figure is expected to increase to 2.3 million annually by 2020. Besides this, non-fatal road traffic mishaps injure

another 20 million to 50 million people per annum globally (WHO, 2002). It is projected that road traffic injuries will move up to the third position by the year 2020 among leading causes of the global disease burden.<sup>3</sup>

Motorcyclists, pedestrians and cyclists are the most vulnerable to road traffic injuries due to their large numbers on the roads and thoroughfares. Rapid urbanization, motorization, lack of appropriate road engineering, poor awareness levels, and non-existent injury prevention programmes have contributed to the burden of RTI in the South-East Asia (SEA) Region.<sup>4</sup>

### 2.1.1 Risk factors

The risks associated with road traffic injury are many and can exist in combination.

- (1) **Motor vehicles:** A rapidly increasing number of motor vehicles is one of the main factors contributing to the increase in global road traffic injury. Apart from the number of vehicles on the road, overcrowding of vehicles, and inadequate safety design and crashworthiness of vehicles play a significant role. Larger vehicles constitute a higher risk both for pedestrians and for smaller vehicles.
- (2) **Speed:** Crash risk increases with speed, especially at road junctions and while overtaking. The probability of fatal injuries for car occupants increases from near zero to almost 100% as the change of speed during the impact increases from 20 kilometers per hour to 100 kilometers per hour.<sup>5</sup> Pedestrians have a 90% chance of surviving car crashes at 30 kilometers per hour or below, but a less than 50% chance of surviving impacts at 45 kilometers per hour or above.<sup>6,7</sup>
- (3) **Alcohol:** The risk of being involved in a crash rises significantly if the blood alcohol concentration (BAC) of the driver exceeds 0.04 grammes per deciliter.<sup>8</sup> Alcohol consumption by drivers also places pedestrians and riders of motorized two-wheelers at risk.
- (4) **Driver fatigue and sleepiness:** Major factors associated with driver fatigue and increased risk of crash include male drivers, drivers aged below 25 or above 50 years, night shifts, sleep deprivation before a trip and monotonous roads.

- (5) **Hand-held mobiles:** The risk of crash among those using mobile telephones while driving is four times higher than those who do not use them.<sup>9</sup> Driver performance while using a mobile telephone particularly affects maintenance of correct lane position and distance between two vehicles.
- (6) **Non-use of helmet by two-wheeler users:** Head trauma contributes up to 75% of all crash deaths and morbidity among motorized two-wheeler users. Use of properly secured and good-quality helmets reduces fatal and serious head injuries by 20% to 45%.<sup>10</sup> Bicycle helmets also reduce the risk of head and brain injuries for bicycle riders, by between 63% and 88%.<sup>11-13</sup>
- (7) **Non-use of seatbelts.** Use of seatbelts by front-seat occupants reduces fatal collisions and all other injuries by 40%–65%. The protective effect of the seatbelt is maximum in roll-over crashes (77%) followed by rear (49%) and frontal (43%) crashes.<sup>14</sup>
- (8) **Improper usage of roads:** In many Asian cities the road network is used by at least seven categories of motorized and non-motorized vehicles of varying size and speed along with pedestrian, placing them all at increased risk of collision. These vehicles include bicycles, handcarts, mopeds, motorcycles, vans, cars, trucks and buses in different proportions. The absence of adequate and separate pedestrian and cyclist facilities (such as footpaths or cycle tracks) results in a disproportionately large number of pedestrian and cyclist crashes.<sup>15</sup>
- (9) **Inadequate visibility:** It is important to see and be seen on the road.<sup>1</sup> Inadequate visibility occurs due to poor eyesight, poor lighting, broken headlights or rear lights, fog, glare, inadequately lighted rear of the vehicle and camouflaging of the vehicle or pedestrians.
- (10) **Road-related factors:** Crashes tend to occur in greater numbers along roads passing through residential areas; near schools; areas lacking segregation of pedestrians and high-speed traffic; and without median barriers. Inattention to safety provisions while designing roads, safety defects in existing roads and lack of remedial action at high-risk crash sites contribute to the increased risk of RTI.
- (11) **Roadside objects:** Impact between vehicles leaving the road and solid roadside objects such as trees, poles and road signs are a major road safety problem worldwide.

## 2.1.2 Preventing road traffic injuries

Road traffic injury should be considered alongside noncommunicable diseases (NCDs) such as heart disease, cancer and stroke that are amenable to prevention strategies. Building on Haddon's insights, these strategies include interventions that Haddon referred to as "countermeasures".<sup>16</sup> These countermeasures span all activities, from primary prevention of injury to rehabilitation after injury.

### A. Reducing traffic injuries by managing exposure

Eliminating the need or desire to travel is not possible, but the length and intensity of exposure to types of road traffic that put people at risk can be reduced.

- (1) **Promoting efficient patterns of land use.** Places where people live, work, go to school, shop and find opportunities for recreation and entertainment should be close together.
- (2) **Providing shorter, safer routes for vulnerable road users.** Most pedestrians and cyclists take shorter and easier paths, even if these are less safe. A road traffic system should ensure that the shorter routes are also the safer ones for vulnerable road users.
- (3) **Discouraging unnecessary trips.** Cutting down on the number of vehicular trips can reduce the risk of injury. Cars carrying two or more occupants need to be given priority by providing them with their own lanes. This will limit the number of vehicles on the road at any given point.
- (4) **Encouraging use of safer modes of travel.** Providing convenient and affordable public transport by rail, bus or coach, can reduce the gross distances traveled by higher-risk modes of transport. Providing affordable fares, park-and-ride facilities, taxi stands, bicycle storage areas, pedestrian approaches, waiting areas and an extensive public transport network are also important.
- (5) **Restricting access to parts of the road network.** Preventing pedestrians, cyclists and slow-moving farm and construction vehicles from accessing high-speed motorways can reduce road traffic injuries.

- (6) **Specifying and enforcing the legal age for driving.** Enforcing an evidence-based recommended legal minimum age for driving can help reduce the total number of accidents on the road.

## **B. Preventing vehicular crashes/injuries**

- (1) *Setting road safety rules and securing compliance*

- ◇ **Setting and enforcing speed limits:** Residential access roads should have speed limits of no more than 30 kilometer/hour. Similarly, the speed limit for transition roads, rural roads and higher-speed roads should be set according to the function and design of the road. Speed limits that road users perceive as realistic and those that are self-enforcing have the greatest chance of achieving compliance.<sup>1</sup> Speed-monitoring cameras and radars and speed-limiting governors in vehicles are useful devices in enforcing the speed limit.
- ◇ **Setting and enforcing alcohol limits:** Upper blood alcohol concentration (BAC) limits of 0.05 grams/deciliter for mature drivers of four-wheeled vehicles are now common in Europe. A BAC limit of 0.02 gram/deciliter has been set for young drivers and for all riders of motorized two-wheelers in several countries. Breath-testing devices that provide objective evidence of BAC are effective enforcement tools. Mass media campaigns against drinking and driving have an important role in publicizing enforcement.
- ◇ **Banning drivers from using hand-held mobile telephones:** About 35 countries have already banned the use of hand-held mobile telephones by the operator of the vehicle while driving.
- ◇ **Behaviour modification (educating and empowering road users):** Public education and information improve knowledge about the rules of the road and safer vehicles, and creates a climate of concern about road safety to increase public acceptance of effective interventions.<sup>1</sup>

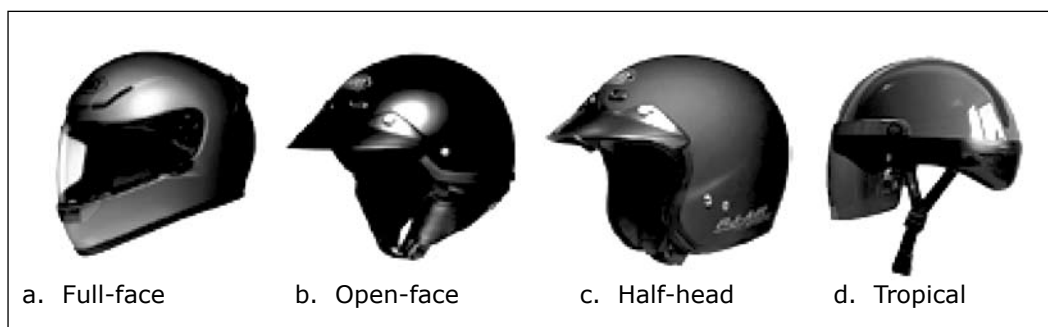
- (2) *Helmets for two-wheeler riders*

Motorcyclists are about 26 times more likely to die in a crash than someone riding in a passenger car, and 5 times as likely to be injured.<sup>17</sup> Wearing of helmets should be mandatory for both the driver and the pillion-rider of a two-wheeler and also

bicyclists, similar to requirements in the United States.<sup>18</sup> The helmet used should meet the established safety standards and the manufacturers' advice regarding its working life (date of expiry) should be followed.

A standard helmet should neither obstruct vision nor impair hearing. It should be light in weight and not cause fatigue due to wearing. It should have a thick padding to absorb the shock of a crash; the crushable liner should be between 1.5 to 3.0 cm in thickness. The lining of the helmet should not be irritating or allergic to the skin. Materials used in the construction of a helmet should not degrade over time, or through exposure to weather, nor should they be toxic or cause allergic reactions. Currently, the plastic materials commonly used are Expanded Poly-Styrene (EPS), Acrylonitrile Butadiene Styrene (ABS), Poly Carbon (PC) and Poly Propylene (PP). While the material of the helmet shell generally contains PC, PVC, ABS or fibreglass, the crushable liner inside the shell is often made out of EPS – a material that can absorb shock and impact and is relatively inexpensive.<sup>19</sup> Standards often set the minimum coverage of a helmet (see Module 3). Half-head helmets offer minimal coverage. Full-face helmets should ensure that the wearer's peripheral vision and hearing are not compromised. A full-face helmet is safer and protects the chin, lower part of the forehead and the temple from being struck.<sup>20</sup> However, for young children from 2 to 5 years of age, the tropical/half-shell helmet is suggested due to neck muscle, which is not so strong. For younger children (less than 2 years old), it is very important to educate their parents and care-takers that there is no protection for children of this age group, and hence they have to avoid riding on motorcycles for the sake of their own safety.

**Figure 2.1: Different types of helmets**



(Source: Helmets: A road safety manual for policy-makers and practioners. WHO 2006)

## How to secure a helmet

It is essential to wear a well-fitting helmet for the effective working of the chinstrap system. To test if the helmet fits your head properly, tightly fasten the chinstrap and then pull the helmet forward by gripping the rear and pulling. The strap must be threaded correctly so that the buckle locks the strap when it is pulled from the side of the chin. The strap must be pulled under the chin as tightly as is bearable.<sup>20</sup>

### (3) *Seatbelts for cars*

It should be **mandatory to wear seatbelts both for the front and rear occupants of the car. The safety belt holds you back in case of sudden deceleration and prevents** smashing of the head against the windscreen, of the body against the steering wheel or dashboard, crushing of the legs in the under-steering area, and being thrown out of the car during high-velocity impact. It is important to wear a seatbelt correctly; the shoulder belt should be worn as closely fitted to the body as possible, over the shoulder but never under the arm.

### (4) *Child restraints*

Children of any age should not be seated in the front seat and should have child restraints. Children above the age of 10 years can sit with the safety belt strapped on. For younger children and infants, rear-facing, front-facing or booster seats—as appropriate for the weight and height of the child—should be used.<sup>21</sup>

### (5) *Remedial action at high-risk crash sites*

Adding skid-resistant surfaces; improving lighting; providing central refuges or islands for pedestrians; adding lucid signs or markings; improving mobility at junctions with signals or roundabouts, and adding pedestrian bridges can improve traffic management at busy intersections or high-risk crash sites.

### (6) *Crash-protective roadsides*

Keeping roadsides clear of trees, boulders, steel and concrete pillars and posts, and similar rigid objects is important on roads where vehicles travel at high speeds. Safety barriers such as guard fences and rails can be used to contain motor vehicles within lanes, preclude head-on or side collisions, and to prevent

them from leaving roads. These barriers can be rigid, semi-rigid or flexible.

(7) *Safety-conscious design of roads*

Higher-speed roads (highways) should have restricted access; horizontal and vertical curves of large radius; crashworthy shoulders; median barriers; and grade-separated junctions with entry and exit ramps. Low-speed roads should have periodic lanes for overtaking and for turning across oncoming traffic; median barriers to prevent overtaking in hazardous stretches; lighting at junctions; roundabouts; speed-limit signs; and no roadside hazards such as trees and utility poles. Connecting roads should have features (rumble strips, speed bumps and visual warnings) to encourage drivers to slow down in good time.

(8) *Improving the visibility of vehicles and vulnerable road users*

Seeing and being seen are fundamental to the safety of all road users. Visibility can be improved by using daytime running lights for motorized vehicles (reduces crashes by 10–15%); using high-mounted stop lamps (reduces rear-end collisions by 15–50%); and mandating front, rear and wheel reflectors and lights on bicycles (reduces bicycle crashes by 30%).<sup>22</sup>

(9) *Designing crash-protective vehicles*

The most frequent cause of pedestrian injury in collisions with cars is impact between the pedestrian and the car bonnet or windscreen frame that results in head, chest and lower limb trauma. Laws are needed to mandate improvement of the front side of buses, trucks, vans and other heavy vehicles. For the safety of occupants, the vehicle should be so designed that the passenger compartment does not collapse in a crash and should also not have any element that can cause or accentuate injury. There should be in-built restraints to prevent ejection or tumbling of the occupants. The vehicle should have frontal and side impact protection (e.g., air bags).

### ***C. Delivering care after crash***

The aims of care after a crash are to avoid preventable death and disability; limit the severity and suffering caused by the injury; ensure optimal functioning of the crash survivors and their reintegration into the community. Accomplishing

these aims should include involving first responders, emergency rescue; access to the emergency care system; and trauma care and rehabilitation (See Chapter 3 for details on pre-hospital care).

### **D. Risk communication**

Use every opportunity in your daily practice to communicate important risks and preventive measures in traffic injuries to your clients.

## **2.2 Fall-related injuries**

**Definition:** A fall is an event that results in a person coming to rest inadvertently on the ground or floor. It can occur on the same level or from a height. Falls in this context means unintentional falls. Falls due to assault, intentional self-harm, from animals, burning buildings and transport vehicles, and falls into fire, water and machinery are excluded.<sup>23</sup>

### **2.2.1 Causes**

Globally falls were the second leading cause of unintentional injury, after road traffic injuries in 2000.<sup>3</sup> Falls on the same level (such as on wet floor) and from trees (for example children and workers picking coconut or other fruits, or tapping toddy), rooftops (children falling from rooftops); balconies, windows and staircases are common in South-East Asia. Factors specific to the Region are related to environment and occupations (high incidence of falling from trees, mountains in rural areas and falls among construction and forestry and orchard workers); absence of protective devices (at the workplace or in leisure activities); certain economic practices (e.g. subsistence agriculture), and the poor design of the urban environment. Other places where falls commonly occur are dried wells and in street holes (manholes). Environmental hazards include deep ditches, poorly designed or illuminated stairways and areas without railings. Falls are more common while climbing ladders; walking with something in the hand/s; when in a hurry; and while wearing inappropriate footwear.<sup>2, 4</sup>

Falls among the elderly are the most common type of fall in the developed world. As life expectancy increases in countries of the SEA Region the incidence of falls among the elderly is assuming greater proportions. Contributing factors include impaired vision and increased reaction time; impaired alertness; alcohol consumption; substance abuse; illness or medications; and impaired mobility. Inappropriate design and construction

of stairs and steps, especially wet floors in shower rooms, are also important. The most common fracture among the elderly is that of the hip, followed by those of vertebrae, forearm, leg, ankle, pelvis, upper arm and hand.<sup>24</sup>

### **2.2.2 Preventing falls and related injuries in the SEA Region**

- (1) Encouragement/evolution of safer working techniques: This includes harnesses (ropes, fences, scaffolding) for construction workers, tree-climbers and window-cleaners who work at heights; use of protective devices in occupational settings such as wearing helmets or using long poles to avoid climbing trees; and providing good lighting.
- (2) Guidelines and standards for safer furniture and household design for children, the elderly and disabled, including non-slippery surfaces for the home; use of protective rails for stairways in homes and offices; and adequate lighting and visibility in homes and on the streets.
- (3) Sensitization of architects, builders and masons to safer design of stairs, balconies and rooftops, such as provision of appropriate railings, grab bars and landings.
- (4) Safer playground design and enactment of safety regulations for playgrounds, which includes the use of mud and sand surfaces instead of hazardous paving for playgrounds.
- (5) Designing additional physical aids for the physically impaired.

## **2.3 Drowning**

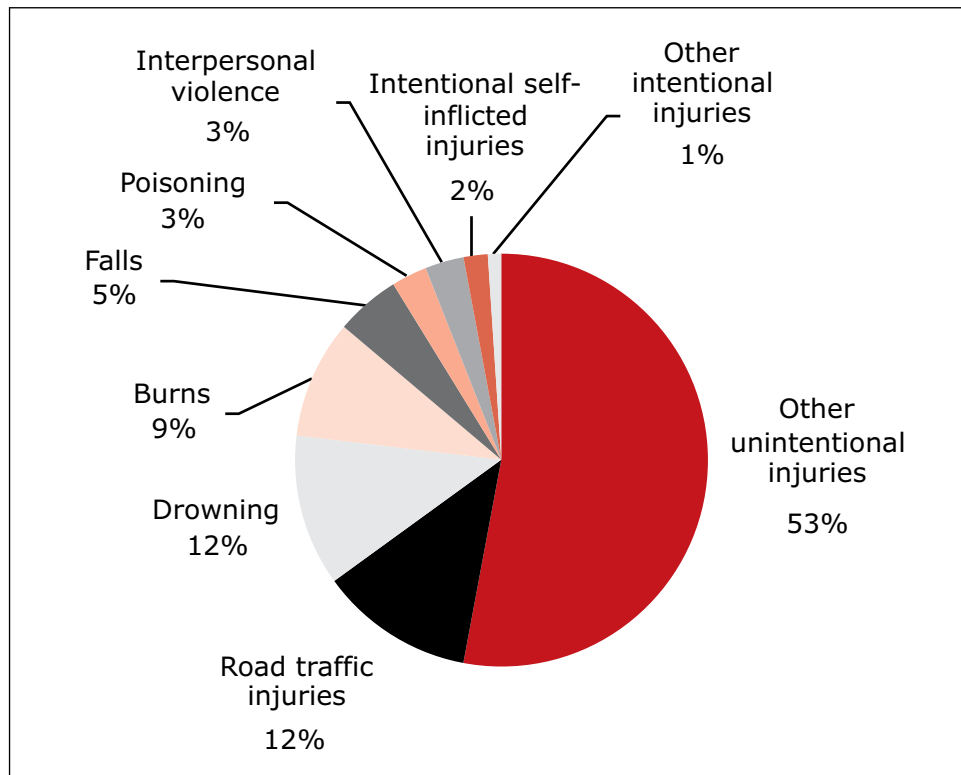
**Definition:** Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid. Drowning outcomes are classified as death, morbidity and no morbidity.<sup>25</sup> This definition of drowning was adopted by the 2002 World Congress on Drowning.

### ***Drowning in the Member States of SEA Region***

Most of the incidences of drowning in the Member States of SEA Region take place in ponds, rivers, seas and oceans during swimming, boating, hunting and fishing. Very few of them occur in swimming pools. In a few Member States, where water transport is used frequently because of the need to cross the numerous waterways in the delta region, there are frequent reports of boats capsizing with passengers and vehicles on board.<sup>4</sup>

Comprehensive data on drowning in most countries are unavailable. However, it is revealed from the available data that drowning is a major cause of mortality in Bangladesh, Indonesia, Myanmar and Thailand. *Global burden of disease study 2004 update* shows that drowning was responsible for 12% of injury mortality among 0-14 year-old children in the SEA Region (Figure 2.2). In Bangladesh, drowning was identified as the leading cause of death among children 1-17 years old (28.6/100 000 children per year.<sup>26</sup> According to *National Household Health Survey* of Indonesia in 2001, drowning was one of the major causes of injury. In Myanmar, the national survey conducted in 2007 reported drowning as the leading cause of injury mortality (34%) followed by road traffic injury (25%). In Thailand, drowning (4 666 – 7.5%) was the second-leading cause of death following RTIs (10 421 – 17%) during 2006 (data based on country death statistics). As per death certificate, drowning (10.7-11.5/100 000 children per year) was the leading cause of death among children less than 15 years of age in Thailand during 2004-2006. Due to geographical context, people in India, Maldives and Sri Lanka are at greatest risk of drowning in the Region. But no data from these countries are readily available.

**Figure 2.2: Distribution of child (0-14 years) deaths in SEA Region, 2004**



(Source: The Global Burden of Disease Study 2004 update)

### 2.3.1 Risk factors

- (1) **Age and sex.** Children under five years of age have the highest drowning mortality rates worldwide.<sup>3</sup> Drowning in young children is often associated with a lapse in supervision. Children can drown in as little as one inch of water and are therefore at risk of drowning in wading pools, bathtubs, buckets, toilets, spas and hot tubs. Approximately 10% of all cases of childhood drowning take place in bathtubs in the absence of adult supervision.<sup>27</sup>

Males have higher drowning rates than females due to increased exposure to water and risky behaviours such as swimming in the absence of adult supervision, intoxication and boating in a drunken state.
- (2) **Occupation.** Communities dependent on water bodies for their living (e.g. fishermen) have a high risk of drowning.
- (3) **Access to water.** Unfenced homes in proximity to bodies of water increase the risk of drowning. The presence of inadequately fenced residential pools, farm dams, irrigation channels and wells are also important risk factors for the drowning of children. Infants left alone or with other children in an adult bathtub are at significant risk of drowning.
- (4) **Floods.** A large number of drowning deaths are associated with floods in the SEA Region, especially in Bangladesh and India.
- (5) **Transportation.** Marine vessels that are unsafe or overcrowded and poor weather conditions contribute to drowning deaths. Unavailability and lack of awareness of personal floatation devices (PFDs) on a transport vessel are also major risk factors.
- (6) **Alcohol.** Alcohol is a risk factor for drowning among both adolescents and adults. It may also impair parental supervision of children near water.
- (7) **Epilepsy.** Epileptic children are at significantly greater risk of drowning in bathtubs and pools. Children with epilepsy are at significantly greater risk of bath and pool drowning, compared to children without epilepsy.
- (8) **Socioeconomic status.** Higher drowning death rates are observed in communities who have limited opportunities to learn to swim. In Bangladesh, children whose mothers have

only primary education are at significantly greater risk of drowning compared with children whose mothers have received secondary or higher education.

### 2.3.2 Prevention of drowning

Victims of drowning have a very slim chance of survival after immersion. The victim loses consciousness after approximately two minutes of immersion and irreversible brain damage can take place after 4 to 6 minutes. Therefore, prevention<sup>28</sup> strategies assume importance. Different prevention strategies are needed to address different situations. In the SEA Region, a majority of drowning fatalities are not associated with recreation or leisure but with everyday activities.

- (1) **Remove the hazard.** Drain unnecessary accumulations of water (pools, ponds, buckets).
- (2) **Create barriers.** Implement and enforce mandatory isolation fencing for swimming pools. If possible, build fences around rural fish ponds, construction ditches (when filled with rainwater) and other bodies of accumulated water around houses and in the community. Encourage fencing around rural homes in proximity to water and the use of grills over water wells. Build flood control embankments in flood-prone areas.
- (3) **Protect those at risk.** Promote “learn-to-swim” and “water-safety skills” programmes for children of primary schools.
  - (i) Increase access to public swimming pools to promote learning to swim.
  - (ii) Increase awareness of the need to supervise children, people with disabilities and people with epilepsy both in and outside the home, and establish parent groups or other child care mechanisms in rural communities, especially around harvest times.
  - (iii) Instruct children to avoid entering fast-flowing streams, and not to swim alone.
  - (iv) Educate and/or legislate against consuming alcohol while boating or around large bodies of water.
  - (v) Increase education on boat safety regulations as well as awareness of the need for personal flotation devices when boating.

- (vi) Check all boats and larger vessels regularly for safety measures and devices, and never exceed the maximum passenger capacity for which craft were designed.
  - (vii) Train lifeguards for regular deployment in supervised swimming locations.
  - (viii) Harmonize internationally the flags and symbols used for beach safety.
- (4) **Counter the damage.** Train members of the general community in resuscitation. Timely resuscitation initiated by bystanders increases the survival prospects of drowning victims.

### Box 2.1: Water safety: Do's and Don'ts<sup>28</sup>

#### Do

- Swim only if there is a lifeguard or a grown-up gives you permission to swim.
- Take swimming lessons.
- Swim with a friend.
- Wade into the water feet first if you are swimming in a lake, pond or river.
- Wear a personal flotation device (PFD) when you are in a boat.
- Get out of the water right away if you hear thunder or see lightning.
- Check with a grown-up before playing or skating on ice.

#### Do not

- Stand up in a boat.
- Sit or stand on the edge of a boat or let your arms hang over the edge.
- Eat candy or chew gum when you are swimming.
- Dive if you are not familiar with the waterbodies.
- Consume alcohol before swimming or diving.
- Swim if you are tired.
- Dive off piers or rocks.
- Run around a swimming pool, dock or pier.

- (5) **Risk communication:** Use every opportunity to communicate risks for drowning to parents of children from newborn up to ten years old, and advocate for appropriate environmental modification to community leaders for actions.
- (6) **Role of public health:** Public health professionals can contribute in preventing drowning in many ways:

- (i) To describe the magnitude of the problem by collecting data on drowning deaths and morbidity.
- (ii) To identify vulnerable populations and address their needs.
- (iii) To undertake research to identify risk factors, protective factors and exposure measures.
- (iv) To identify the economic impact of drowning in order to provide a basis for cost-benefit analysis for safety improvements.
- (v) To promote, facilitate and catalyse the implementation of drowning prevention measures and policies.
- (vi) To monitor and evaluate interventions.
- (vii) To advocate for more attention to drowning prevention.
- (viii) To strengthen emergency response services.

## 2.4 Burns

**Definition:** A burn occurs when some or all of the different layers of cells in the skin are destroyed by a hot liquid (scald), a hot solid (contact burns), or a flame (flame burns). Skin injuries due to ultraviolet radiation, radioactivity, electricity or chemicals, as well as respiratory damage resulting from smoke inhalation, are also considered to be burns (International Society for Burn Injuries).<sup>29</sup> Burns can cause swelling, blistering, scarring and, in serious cases, shock and even death. They also can lead to infections because they damage the skin's protective barrier.

### 2.4.1 Magnitude of the problem

As per the global burden of disease study 2004 update, burns are the third leading cause of injury mortality (9%), among children in the SEA Region following road traffic injuries and drowning (Figure 2.2). South-East Asia accounts for more than 50% of fire-related (burns) deaths worldwide; females in this Region have the highest fire-related burn mortality rates globally. Most burns occur in an urban setting. However, adverse consequences, morbidity and disabilities are more common in rural areas due to inadequate pre-hospital care.<sup>3,4</sup> The patterns, mechanism and consequences of burns differ according to the sociocultural and demographic context. Table 2.1 below shows the comparison of mortality due to burns among all regions of the WHO.

**Table 2.1: Comparison of estimated number of deaths and mortality rate due to burns among the Regions\* of the WHO, 2002**

	Africa	America		Eastern-Mediterranean		Europe		South-East Asia	Western-Pacific		Global
	Low / middle	High	Low-middle	High	Low-middle	High	Low-middle	Low-middle	High	Low-middle	
Burn deaths x 1000	39.2	3.9	4.5	0.0	31.9	2.8	35.4	184.0	2.3	17.5	321.8
Death rate per 100 000	5.8	1.2	0.8	0.6	6.4	0.7	7.4	11.6	1.1	1.2	5.2
% of global mortality due to fires	12.2	1.2	1.4	0.0	9.9	0.9	11.0	57.2	0.7	5.4	100

(Source: Fact sheet on burns, World Health Organization, Geneva, Switzerland, 2002)

\* WHO Regions do not correspond exactly with geographic regions.

### 2.4.2 Where do burns occur

Fire-related burns occur mainly in the home or in the workplace. The kitchen is the most common place where children and women sustain burns. The risk factors associated with burns include cooking on open fires; explosion of pressure stoves; instability of small stoves; use of open fires to keep warm during winters; and use of inflammable material in houses and furnishings. Home and clothing fires are the most severe fire accidents but are not as frequent as scalds.

Men are more at risk from burns at the workplace from fire and flames, scalds, chemical burns and electrical burns due to high-voltage currents. Factors associated with these burn injuries include substance abuse, violence, medical co-morbidities and other social, economic and cultural factors.

### 2.4.3 Specific patterns of burn incidence in the South-East Asia Region

Particular region burn issues include occupational burn injuries (India, Sri Lanka and Thailand); acid-throwing (Bangladesh); dowry deaths and fireworks-related injuries during festivals and celebrations (India); and natural and forest fires and volcanic eruptions (Indonesia, Myanmar and Thailand). Those regional patterns indicate the determinants of burn injuries in South-East Asia, which are different from other regions.

## Box 2.2: First aid in burns<sup>29</sup>

### **Do**

- Stop the burning process by removing clothing.
- Apply cold water or allow the burned area to remain in contact with cold water for some time.
- In flame injuries, extinguish the flames by allowing the patient to roll on the ground, or by applying a blanket, or using water or other fire-extinguishing liquids.
- In chemical burns, remove or dilute the chemical agent by profusely irrigating with water.

### **Do not**

- Commence first aid before ensuring your own safety.
- Apply paste, oil, turmeric or raw cotton to the burnt area.
- Open blisters.
- Apply any material directly to the wound, as this increases the risk of infection.
- Apply topical medication immediately until seen by a physician.

### **Application of cold water is the best first aid for burns**

#### **2.4.4 Risk factors**

Risk factors associated with fire-related burns include occupation, age-sex, substance abuse, violence, medical co-morbidity (epilepsy) and other socioeconomic and cultural factors.

#### **2.4.5 Preventing burns**

Primary prevention remains the best way of coping with the problem. Efforts should be directed at (i) improving environmental safety; (ii) changing risky behaviours; and (iii) legal sanction.<sup>2,4,29</sup>

- (1) Improving environmental safety
  - (i) Enclose open fires and limit the height of open flames in homes.
  - (ii) Promote the use of safer stoves, and replace pressure-cooking stoves with more efficient wick stoves and gas stoves.

- (iii) Introduce more stable stands for lamps and stoves.
- (iv) Use less hazardous fuels.
- (v) Conduct fire drills for evacuation from large buildings and public places.
- (vi) Install fire and smoke alarms in public buildings.
- (vii) Ban the use of dangerous fireworks and encourage public displays of firecrackers rather than private use.
- (viii) Apply thermostatic temperature regulation (less than 54 °C) in water-heaters.
- (ix) Promote greater use of flame-retardant fabrics and materials.
- (x) Promote the use of cold water for first aid of burns.

(2) Changing risky behaviours

Physicians can collaborate with other members of the community in the following activities:

- (i) Encouraging persons not to smoke; increasing public awareness of fire-related injury and prevention through the media; and working with fire departments and schools to educate people about fire prevention as well as distributing and installing smoke alarms; and counseling parents about fire and burn prevention.
- (ii) Promote adequate supervision of children; use of smoke alarms; preparing escape plans; safe behaviour in fires; and initial treatment of burns. Provide information for families with children with special needs.

(3) Legal sanction

Legislation to reduce the use of cigarettes and other smoked substances should be promoted. Laws can be enacted to improve and enforce fire-preventive building codes and the widespread installation of smoke alarms and sprinkler systems.

(4) Patients' intention

Provide adequate information in your diagnosis depends on the intention of the patients, whether intentional self-harm or accidental. This is lacking very much in the SEA Region in spite of great value in planning processes for prevention.

### 2.4.6 Role of public health

Role of public health professionals in managing and preventing burns are illustrated below:

- Ensuring appropriate pre-hospital and acute care in the hospital;
- Describing the burden of the problem by collecting and compiling data on mortality and morbidity of burns;
- Conducting epidemiologic research as well as exploring the economic impacts of burns;
- Promoting safety education;
- Monitoring and evaluating burn prevention programmes; and
- Advocating for policy development for burn prevention.

## 2.5 Poisoning

**Definition:** Poisoning refers to all unintentional poisoning-related deaths and non-fatal outcomes caused by exposure to noxious substances.<sup>30</sup> Intentional and other causes diagnosed by physicians as undetermined as well as those resulting from drug reactions are excluded from the ICD-10 criteria. However, if the diagnosis has not specified intention, it will be assumed automatically to be unintentional, according to ICD 10, Chapter XX.

### *Poisoning in countries of the South-East Asia Region*

The most common agents responsible for poisoning are pesticides, kerosene, prescription drugs and household chemicals.

Pesticides are widely used in countries where agriculture is a major and important part of the economy. Reports from India, Indonesia, Sri Lanka and Thailand indicate that the common availability and widespread use of toxic pesticides is responsible for intentional and unintentional morbidity and mortality.<sup>4</sup>

Many countries also report accidental ingestion of kerosene as a leading cause of poisoning, especially among children.<sup>31</sup> Another study from Thailand reported that 54% of cases of poisoning among preschool children involved therapeutic drugs.<sup>32</sup>

### 2.5.1 First aid

The faster you act, the better is the prognosis of the affected person. You should perform certain very important activities without panicking or distressing the poisoned individual.

#### ***Poisoning first aid: Do's, or suggested actions***<sup>33</sup>

##### **General measures**

- (1) Check and monitor the victim's airway, breathing and circulation.
- (2) If necessary, begin rescue breathing and cardiopulmonary resuscitation (CPR).
- (3) Try to ascertain that the victim has indeed been poisoned. If possible, identify the poison.
- (4) ALWAYS CALL YOUR LOCAL POISON CONTROL CENTRE FOR ADVICE.

##### **In case of ingested poisons**

- (1) Remove the poison from the source or area of entry. Wipe the affected area gently. Rinse with fresh water. Remove the clothes of the victim. Wash the eyes of the victim with fresh water and dry gently.
- (2) Provoke vomiting only if the victim is conscious and the poison control centre tells you to do so.
- (3) If the victim vomits, protect the airway. Save the vomitus to allow identification of the poison.
- (4) If the victim starts having convulsions, administer convulsion first aid and give protection from injury.
- (5) Reassure the victim, make them comfortable. Position them on their left side while getting or awaiting medical help.

##### **In case of poisoning by inhalation**

- (1) Hold a wet cloth over your nose and mouth. Take several deep breaths of fresh air, and then hold your breath as you go in.
- (2) Open windows and doors to remove the fumes.
- (3) Take out the affected person from the toxic area to a place where fresh air is available. Call for emergency help. Never attempt to rescue a victim without notifying others first.

- (4) Avoid lighting a match as some circulating gases may ignite.
- (5) Perform first aid for skin burns, eye injuries or convulsions as is necessary.
- (6) If the victim vomits, protect the airway.
- (7) Get medical help even if the victim seems fine.

### **Poisoning first aid: Don'ts**

- (1) Do not give an unconscious victim anything by the mouth.
- (2) Do not induce vomiting unless you are told to do so by the poison control centre or a doctor.
- (3) Do not try to neutralize the poison with lemon juice or vinegar or any other substance, unless you are told to do so by the poison control centre or a doctor. Do not apply any kind of potentially harmful herbal or folk remedies.
- (4) Do not use any "cure-all" type antidote.
- (5) Do not wait for symptoms to develop if you suspect that someone has been poisoned.

### **2.5.2 Measures to control poisoning**

- (1) Restricting the availability of the most hazardous pesticides.
- (2) Promoting alternative non-chemical methods of pest control.
- (3) Packaging pesticides and insecticides safely, and making it difficult to ingest these chemicals accidentally or intentionally.
- (4) Dyeing kerosene blue and treating it with bitter agents to distinguish it from edible drinks.
- (5) Selling therapeutic drugs only in blister packs or child-resistant containers.
- (6) Educating medical practitioners, health workers, clients and the community in general on effective antidotes to poisons that are common in the community.
- (7) Improving mental health and introducing stress management among the members of the community.
- (8) Establishing poison control centres.

## 2.6 Occupational injuries and work safety

There are approximately 580 million workers in the South-East Asia Region. About 60%–80% of these workers are employed in agriculture, fisheries, construction, transportation, production, home-based industry and small-scale business. Occupational injuries result in an estimated 120 million cases of injury and 200 000 deaths every year in the SEA Region.<sup>4</sup>

Nearly 1% of all deaths and 10% of permanent impairments result from agricultural injuries.<sup>34</sup> Of these, serious injuries are caused by mechanized equipment due to a lack of adequate safety devices/practices. Other occupations that involve a significant amount of manual labour such as mining, building construction and manufacturing can also be very hazardous. Injuries during fishing include drowning, wounds and envenomation.

“Two distinguishing features that are common to most workplaces in the Region are a high level of deployment of manual, including child, labour and an unsafe degree of man-machine interaction. In addition, though there is greater emphasis on attempts to change workers’ behaviour, designs that provide protection automatically are ignored. Children and people who are physically or mentally challenged are at a greater risk of encountering occupational injuries<sup>4</sup>.”

### ***Preventing occupational injuries***

The following strategies could reduce death and disability due to occupational injuries:

- (1) Routine reporting of injuries and a systematic evaluation of work practices.
- (2) Review and evaluation of the physical environment (hazards correction); safety promotion interventions and practices including the establishment of surveillance and research.
- (3) Training on hazardous or dangerous procedures, and ensuring built-in and cost-effective protection measures.
- (4) Enforcing safety regulations and safe and optimum occupational standards.
- (5) Introducing no-fault insurance schemes for all workers and/or other equitable modes of workers’ compensation.
- (6) Creating awareness among policy-makers on the possibility of introducing economically effective safety measures.

- (7) Sensitizing workers' organizations about their right to safety and the implication of injuries on their lives.
- (8) Communicate important risks and appropriate prevention to your clients in the most vulnerable occupations.

## 2.7 Violence

**Definition:** The World Health Organization defines violence as “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community that either results in, or has a high likelihood of resulting in, injury, death, psychological harm, mal-development or deprivation”.<sup>35</sup>

A violent act can be physical, sexual, mental or psychological or involve deprivation or neglect that compromises the well-being of individuals, families and communities.

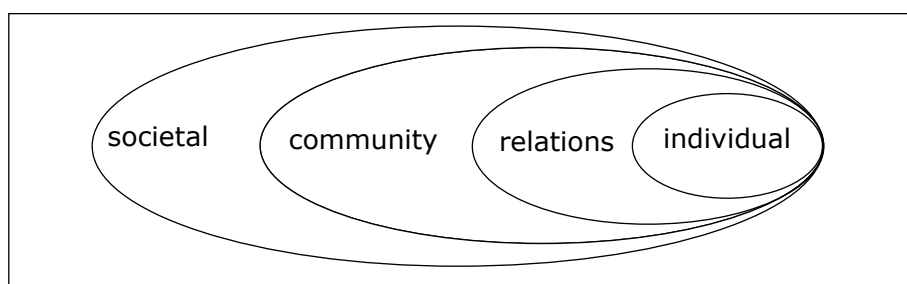
### 2.7.1 Classification of violence

- (1) **Self-directed violence** (*violence that a person inflicts upon himself or herself*): Includes *suicidal behaviour* and *self-abuse* such as self-mutilation. Suicidal behaviour ranges from merely thinking about ending one's life to planning it, finding the means to do so, attempting to kill oneself, and completing the act.
- (2) **Interpersonal violence** (*violence inflicted by another individual*):
  - (i) *Family and intimate partner violence*: This violence occurs within the family, usually at home, and includes the abuse of children and the elderly and inter-partner violence.
  - (ii) *Community violence*: Community violence occurs between unrelated individuals who may or may not know each other; it generally occurs outside the home. This includes youth violence; random acts of violence; rape or sexual assault by strangers; and violence in schools, workplaces and other institutions.
- (3) **Collective violence** (*violence inflicted by a group*): Includes armed conflicts within or between states, civil war, repression, human rights abuses, terrorism, crimes, etc.

## 2.7.2 Factors responsible for violence

Violence is an extremely complex phenomenon arising from the interaction of many factors, including biological, social, cultural, economic and political. A range of reactions and effects are responsible for violent acts. There is no single factor to explain why one person and not another behaves in a violent manner. The *World Report on Violence and Health* uses an ecological model to understand the multifaceted nature of violence.<sup>36</sup> The model categorizes the factors that increase the likelihood of violence into four levels (Fig. 2.3):

**Fig. 2.3: Ecological model of causation of violence**



- (1) **Level 1: Role of *individual factors***

The first level identifies personal factors that increase the likelihood of individuals becoming a victim or perpetrator of violence. These factors include demographic characteristics (age, education, income); personality traits; substance abuse; and a history of behaving aggressively or experiencing abuse.
- (2) **Level 2: Role of *relationships of individuals***

The second level looks at close relationships with family, friends, partners and peers, and their contribution to violent acts. In youth violence, for example, having friends who engage in or encourage violence may increase a young person's risk of being involved in violence.
- (3) **Level 3: Role of *the community in individual relations***

The third level explores the characteristics of the community that increase the risk of violence. These factors may be operating in schools, workplaces and neighborhoods. Risk may be influenced by population density, unemployment levels, or the existence of a local drug trade.
- (4) **Level 4: Role of *societal factors influencing the community***

The fourth level looks at the broad societal factors that help create a climate in which violence is encouraged or inhibited. Violent acts are more common in societies that give priority to parental rights over child welfare; regard suicide as a matter of individual choice instead of a preventable act; entrench the perception of male dominance over women and children; support the use of excessive force by the police against citizens; support political conflict; or that are deprived of adequate facilities for the provision of health, employment, education and social interaction.

### ***Interaction at the four levels***

Factors that increase the likelihood of violence at each level are reinforced or modified by similar factors at another. This is illustrated by the overlapping rings in the model. For example, someone with an aggressive personality is more likely to act violently in a family or community that habitually resolves conflict through violence. Similarly, mistreatment of the elderly may be influenced both by societal factors (for example, less respect for the elderly in general) and relationship factors (friends and family members). Thus, it is necessary to address risk factors at individual, community and societal levels and their interplay in order to prevent violence.

## **2.7.3 Understanding the dynamics of violence**

### ***A. Youth violence***

Youth violence typically involves children, adolescents and young adults between the ages of 10 and 24. The young person can be the victim or the perpetrator or both.<sup>37</sup> The majority of young people engage in transient violent behaviour merely for excitement, and their violent acts are often committed in the company of a group of friends. Involvement with alcohol, drugs or weapons enhances the likelihood of death or injury. Exposure to violence and family conflict, low emotional attachment to parents or caregivers, poor academic performance, lack of involvement in conventional activities, diminished economic opportunity, peer pressure, exposure to violence through the media all contribute to youth violence. Rates of youth violence also increase in times of armed conflict and repression, or in societies where a culture of violence prevails.<sup>38</sup>

## ***B. Violence against intimate partners***

Violence against intimate partners includes physical aggression, sexual coercion and psychological abuse; it is mostly perpetrated by men and directed at women. Events that trigger violence in abusive relationships include disobeying or arguing with the man, questioning him on issues involving money or girlfriends, not having food ready on time, not caring adequately for children or the home, refusing to have sex, and the man suspecting the woman of infidelity.<sup>39</sup>

Males who have witnessed such events in their own families tend to behave in a similar fashion with their partners. Inter-partner violence is characterized by multiple acts of more than one type of abuse and occurs over a period of time.

## ***C. Child abuse***

Children can be abused and neglected by their parents or other caregivers. The resultant injuries can be physical, sexual or psychological. Parents may whip, hit, kick or beat their children to discipline them. Globally, about 20% of women and 5-10% of men have suffered sexual abuse as children.<sup>40,41</sup> Child abuse is more common in poor households.

Young children are most vulnerable to physical abuse whereas sexual abuse is more common in adolescents. Boys are usually victims of physical punishment while girls are at higher risk of infanticide and sexual abuse.

Children raised by a single parent are at higher risk of abuse. Non-existent or violent inter-parental and family relationships are the major risk factor for child abuse. Having unrealistic expectations for the child also increases the likelihood of abuse.<sup>42</sup>

## ***D. Abuse of the elderly***

The elderly may be abused physically, sexually, psychologically or economically. Available data suggest that between 4% and 6% of elderly people experience some form of abuse in the home.<sup>43</sup> The main reasons are: (i) strained family relationships due to the dependence of the elderly for accommodation or financial support; and (ii) weakening of the family structure that had once supported older generations.

Mistreatment in institutions for the elderly includes physically restraining patients, depriving them of dignity and choice over their

daily affairs, or providing insufficient care. Abuse is more likely to occur in institutions where staff are poorly trained or overworked; interaction between staff and residents is difficult; the physical environment is deficient; or where policies operate in the interests of the institution rather than of the residents.<sup>44</sup>

### **E. Sexual violence**

Sexual violence includes rape; molestation; forced sex in marriage; demands for sexual favours; sexual abuse of children; forced prostitution and sexual trafficking; child marriage; female genital mutilation; and obligatory inspections for virginity.<sup>45</sup>

Most acts of sexual violence are experienced predominantly by females and perpetrated by males. Mortality associated with sexual violence may occur through suicide, HIV infection or murder. Sexual violence has a profound impact on the physical and mental health of the victims.

### **F. Self-directed violence**

This category encompasses intentional and harmful behaviour directed at oneself, with suicide being its most severe manifestation. Other non-lethal forms are suicide attempts, self-mutilation and self-destructive behaviour. Rates for suicide tend to increase with age and are higher for males. Stressful events predisposing to self-harm include poverty, unemployment, financial debt, loss of loved ones, arguments with family or friends, a breakdown in relationships, and legal or work-related problems.<sup>46</sup>

## **2.7.4 Prevention of violence**

Violence is not inevitable. Table 2.2 details the strategy for and approach to prevention of violence targeted at the four levels of the ecological model of violence causation.<sup>35,36</sup>

- (1) *Individual approach*: The aim is to instill and build up healthy attitudes and behaviour in children as they grow up, and change the attitudes of individuals who are already prone to violence. The strategy ensures that people can resolve differences and conflicts without resorting to violence.
- (2) *Relationship approach*: The aim is to influence the relationships that victims and perpetrators have with the people with whom they most regularly interact, and focus on problems within families and the negative influences of peers.

- (3) *Community-based efforts:* Such efforts are geared towards raising awareness, stimulating community action, and providing care and support to victims of violence.
- (4) *Societal approach:* The societal approach emphasizes changes in legislation, policies, and the social and cultural environment so that violence in different settings can be reduced.

### **Key messages to prevent violence:**

- Modify individual risk behaviour.
- Create healthy family environments.
- Provide professional help and support for dysfunctional families.
- Monitor public places to address problems that might lead to violence.
- Address gender inequality and adverse cultural attitudes and practices.
- Identify and modify the cultural, social and economic factors contributing to violence.
- Ensure equitable access to health, education, services and opportunities.

### **Table 2.2: Approaches for modifying risk factors for violence**

#### ***At the individual level***

- (1) *Educational programmes:* To provide complete secondary schooling and vocational training for underprivileged youths and young adults.
- (2) *Social development programmes:* To develop social skills; manage anger; resolve conflicts; and develop a moral perspective.
- (3) *Therapeutic programmes:* To provide counseling for victims of violence and behavioural therapy for psychiatric disorders.
- (4) *Treatment programmes:* To provide medical treatment for those suffering from psychiatric disorders or those with a known history of violent activity.
- (5) *Counseling programmes:* For those with a history of attempted suicide.

### ***At the relationship level***

- (1) *Training in parenting:* To improve the emotional bonds between parents and their children.
- (2) *Mentoring programmes:* To match a young person, particularly one at risk of developing antisocial behaviour, with a caring adult from outside the family who can act as a positive role model, mentor and guide.
- (3) *Family therapy programmes:* To improve communication and interaction between family members.
- (4) *Home visitation programmes:* Regular visits from a health professional to families with an identified risk of child maltreatment. Interventions can include counseling, training and referrals.
- (5) *Training in relationship skills:* Bringing together mixed groups of men and women with a facilitator to explore gender and relationship issues that play a part in violence.

### ***At the community level***

- (1) Public education campaigns in schools, workplaces and other institutions.
- (2) Extracurricular activities for young people such as sports, drama, art and music.
- (3) Training for police, health and education professionals, and employers to make them better able to identify and respond to the different types of violence.
- (4) Community policing to create effective partnerships between the police and the community.
- (5) Coordinated community interventions through networking and multisectoral cooperation involving community health and social workers, members of women's groups, staff of schools, and the local religious and political authorities.

### ***At the societal level***

- (1) Formulation of domestic laws against sexual violence, violence by intimate partners, child abuse and abuse of the elderly at home.
- (2) International treaties and conventions for advocacy and setting standards on prevention of violence.
- (3) Policy changes to reduce poverty and inequality, and improve support for families.
- (4) Efforts to change social and cultural norms.
- (5) Implementing disarmament at the international level.

## **2.8 Other injuries**

### **2.8.1 Animal-related injuries**

Animals can be involved in injuries in diverse situations. The most common animal-related injuries are envenomation by snakes, scorpions, spiders and sea creatures; and attack/bite by dogs, crocodiles, sharks, bulls or other animals. Injuries can also occur as a result of a fall from an animal that is being ridden (most commonly horses) or being crushed by it. Animal-related injuries may result in disease that is carried by the attacking animal, such as rabies, or include allergic responses such as after bee/wasp stings.<sup>2</sup>

#### ***Snake-bite***

Risk factors for snake-bite include rural areas, the rainy season, agricultural and rain-forest workers and being male. Snakes generally do not bite unless provoked or cornered. The bite may occur when the snake is inadvertently touched or trodden upon, usually in the evening or at night or in undergrowth. Of all snake-bites, envenomation is reported in less than 20% of bites and mortality varies by countries in the SEA Region between 1% and 15%. Incidence of snake-bite and the resultant mortality in the SEA Region is higher than other regions because of the following factors:

- Non-mechanized farming methods;
- Non-use of protective footwear and clothing;
- Non-availability of antivenom;
- Poor access to medical care; and
- Poor community awareness of snake-bite management.

### ***Dog bite***

Risk factors identified for dog bites and dog attacks relate to the victim or the dog or the environment. Children are particularly vulnerable to dog attacks due to their small height and the consequent proximity of their face to that of the dog. Dog attacks are frequently associated with prior interaction, which may be provocative.

### ***Large animal related injuries***

Injuries caused by domesticated animals such as the horse, donkey, cow, bull, ox and buffalo are not uncommon, particularly in rural areas.

Most horse-related injuries occur while the horse is being ridden (equestrian injuries), while the rest occur during horse-handling or unrelated activities around horses. Most horse-related injuries are falls. The likelihood of injury in a fall is increased by the height of the animal, which is generally more than one metre. Fractures of the upper limb are the most common form of injury.

Cattle-horn injuries can be caused by domesticated or stray animals. The abdomen, perineum and lower limbs are most commonly affected in such injuries.

### ***Other animal-related injuries***

Scorpion envenomation affects the cardiovascular and central nervous systems and deaths tend to occur within 30 minutes of the sting. Lower limbs are the most frequent site for bites to children. Bee stings and bites can result in anaphylactic reaction and death. Animal-borne transmission of infectious disease is considered a major public health problem but the subject is beyond the scope of this chapter.

### ***Prevention***

Both fatal and non-fatal animal-related injuries are under-recognized public health hazards. Improved collection of data and reporting of deaths and hospital-treated cases is fundamentally important to prevention and monitoring.

### ***Snake-bite prevention***

Sturdy over-the-ankle boots, loose clothing, and responsible behaviour offer excellent protection from snakebites while in wilderness areas.<sup>47</sup> While walking, more emphasis on foot steps similar to marching, generate enough sounds and vibrations to warn the snake and allow it to flee from the area. It is advisable not to reach blindly into hollow logs, flip over large rocks, or enter old cabins or other potential snake hiding-places. It is advisable to use one's common sense and avoid drinking alcohol while handling snakes.

Snakes often reach residential areas while chasing their prey. Effective pest-control measures may eliminate the menace from dwellings. Culling or eradication of snakes in high-risk areas is also an option.<sup>2</sup> If you run into a snake, stop moving for several minutes. If the snake has not yet fled, slowly back away from the area. Avoid handling snakes that appear to be dead or pick up a severed snake-head, as a dangerous bite is still possible.<sup>47</sup> Antivenom for poisonous snake and scorpion bites and stings should be available for high-risk populations, and public education is required for the seeking of prompt and appropriate medical treatment.

### ***Dog bite prevention***

Dog attacks can be prevented by controlling the population of stray dogs and enforcing dog regulations such as compulsory registration and use of a leash. To reduce the frequency of attacks by dogs, it is important to educate adults and children regarding what dogs may perceive to be provocative human behaviour; recognize signs of an impending dog attack and basic safety measures (see Table 2.3);<sup>48-50</sup> animal training; selective breeding of animals for correct temperament; and avoiding contact with dangerous animals.

### ***Large animal related injuries***

Horse-related injuries can be reduced by using correctly designed helmets, stirrups, shoes and tack; adult supervision of young children; and training of horses, riders and horse-handlers.<sup>2</sup> To prevent cattle-horn injuries one should be careful while feeding, milking, handling or passing by a horned animal. When attacked, it is wise to run in a zig-zag pattern to dodge the animal and prevent it from catching up.<sup>51</sup> Popularizing disbudding and dehorning is an effective preventive measure.<sup>52</sup>

**Table 2.3: Animal related injury: risk factors and safety measures**

**Provocative human behaviour<sup>48</sup>**

- Attacking a dog or its companions, or acting in a manner that the dog perceives as an attack (for example, a sudden enthusiastic hug or inadvertently stepping on any portion of the dog's anatomy such as a paw or the tail).
- Attempting to take food away from a dog, or moving towards a dog's food or between a dog and its food, even inadvertently.
- Threatening a puppy in the presence of an adult dog, especially its mother.
- Looking a dog directly in the eyes.
- Approaching a sick or injured dog.
- Failure to recognize a dog showing signs of insecurity or fear, and continuing with whatever behaviour is causing the dog's anxiety to increase to the point that "fear biting" occurs.
- Running away from a dog.
- Jerking one's hands upwards away from an inquisitive dog.
- Ignoring "Beware of dog" signs.
- Startling or suddenly waking a resting or sleeping dog.
- Entering a dog's "domain" or "territory" and behaving in an unfamiliar pattern; or being unfamiliar to the dog.
- Attempting to disrupt a fight between dogs.

**Warning signs of impending attack by dogs<sup>49</sup>**

- Hard stare
- Growling, snarling
- Teeth bared and mouth shut tight
- Ears flat against the dog's head
- Hackles raised
- Stiff body/freezing posture
- Tail lowered, backward-leaning posture

### **Basic safety measures<sup>48,50</sup>**

Teach children the rules of basic safety around dogs, which include:

- Do not approach an unfamiliar dog.
- Always ask the owner if you can pat their dog.
- Do not run from a dog and scream.
- Approach the dog from the front.
- Remain motionless (e.g. “be still like a tree”) when approached by an unfamiliar dog.
- If knocked over by a dog, roll into a ball and lie still (e.g. “be still like a log”).
- Do not play with a dog unless supervised by an adult.
- Refrain from making jerky movements.
- Immediately report stray dogs or dogs displaying unusual behaviour to an adult.
- Avoid direct eye contact with a dog.
- Do not disturb a dog that is sleeping, eating or caring for puppies.
- Do not pat a dog without allowing it to see and sniff you first.
- If bitten, immediately report the bite to an adult.

### ***Other animal-related injuries***

Professional removal of beehives and destruction of wasp nests in residential environs is indicated. The nests are removed during the night when the insects are not active. A flying-insect killer is used liberally to soak the nest before and during removal. One must not stand below a nest that is being removed because the falling insects may sting painfully.

Warning signage needs to be put up in known wild animal habitats. Wearing of protective gloves, footwear and clothing is recommended when handling fish.

## **First aid for snake-bite<sup>53</sup>**

First-aid treatment should be carried out immediately or very soon after the bite, before the patient reaches a dispensary or hospital.

Most of the traditional, popular, available and affordable first-aid methods have been proven to be useless or even dangerous. These methods include making local incisions or pricks/punctures (“tattooing”) at the site of the bite or in the bitten limb; attempting to suck the venom out of the wound; use of (black) snake stones; tying tight bands (tourniquets) around the limb; administering electric shock; topical instillation or application of chemicals, herbs or ice packs.

First aid should be aimed at retarding the systemic absorption of venom; preserving life and preventing complications in the period before the patient can receive medical care; controlling distressing or dangerous early symptoms of envenoming; and transporting the patient to a place where appropriate medical care can be administered.

### **Do**

- Reassure the victim, who may be very anxious.
- Keep the bitten limb below the victim’s heart level so as to minimize blood returning to the heart and other organs of the body.
- Immobilize the bitten limb with a splint or sling since any movement or muscular contraction increases absorption of venom into the bloodstream and lymphatic system.
- Consider pressure—immobilization for bites by neurotoxic elapid snakes—including the king cobra, kraits or sea snakes—to prevent life-threatening respiratory paralysis. The aim is to contain the lymphatic spread of the venom. This is done by bandaging that begins two to four inches above the bite; winding around in overlapping turns and moving up towards the heart, and then back down over the bite and past it towards the hand or foot. The bandage is bound as tightly as for a sprained ankle but not so tightly that the peripheral pulse (radial, posterior tibial, dorsalis pedis) is occluded or that a finger cannot easily be slipped between its layers.
- Once a pressure bandage has been applied, it should not be removed until the patient is transported to a health facility.

### **Do not**

- Consider pressure immobilization for viper and certain cobra bites, because of the danger of increasing the local effects of the necrotic venom.
- Apply tight (arterial) tourniquet.
- Interfere with the bite wound as this may introduce infection, increase absorption of the venom and increase local bleeding.
- Attempt to kill the snake, because this may be dangerous. However, if the snake has already been killed, it should be taken to the dispensary or hospital with the patient so that it can be identified.
- Handle the snake with your bare hands as even a severed head can bite!

Also, remember that release of a tight tourniquet or compression bandage may result in the dramatic development of severe systemic envenoming.

## **2.8.2 Mass trauma and disaster preparedness**

**Definition:** Mass trauma is defined as the injuries, death, disability and emotional stress caused by a catastrophic event such as a large-scale natural disaster or a terrorist attack.

### **Classification**

**Natural disasters:** This includes floods, tsunamis, earthquakes, fires, hurricanes, volcanoes, wildfires, landslides and debris flow, thunderstorms and lightning, tornadoes, extremes of temperatures and winter storms.

**Technological disasters:** Examples are hazardous material incidents, household chemical emergencies and nuclear power plant emergencies.

**Terrorism:** This can include explosions, biological threats, chemical threats, nuclear blasts, and radiological dispersion device events.

**Other:** Major transportation accidents; civil disorders and demonstrations.

## **Managing disaster<sup>54,55</sup>**

The key to minimizing or controlling the cost and death toll of disasters is prevention. This can be done by designing and executing programmes to evaluate preparation for, and ability to reacting to and minimizing damage from emergencies and disasters.

### **Preparing for a mass trauma/disaster event**

- (1) The key is pre-planning and preparation, and to develop an action plan.
- (2) Prior to developing an action plan, the following should also be done: identify the risks (both natural and other); analyse structural preparedness; coordinate with local authorities/agencies concerned with disaster preparedness; and eliminate, minimize, and shift risks.
- (3) The action plan should be translated in to simple terms and the exact role of the public and professionals should be defined.
- (4) Leaders and focal persons from the government sector and community should be selected and trained to execute the plan in case of mass trauma.
- (5) Doctors and hospitals should be notified in advance about the kinds of injuries to expect.
- (6) Partnerships with local and district hospitals should be established to develop protocols for rapid assessment, casualty prediction, hospital capacity information, and patient care.
- (7) The first-aid management protocol as developed under the action plan should be communicated to health-care professionals, the media and the general public.
- (8) A complete drill/rehearsal of the planned activities must be carried out frequently in a simulated situation.

### **During the event**

- (1) The most severe injuries in mass trauma events are fractures, burns, lacerations and crush injuries. The most common injuries are eye injuries, sprains, strains, minor wounds and ear damage. Anyone who is in the area surrounding a mass trauma event is at risk for these injuries, including rescue workers and volunteers.

- (2) In the event of mass trauma, clinicians, hospitals and public health agencies should be prepared to treat a large number of injuries, disabilities and psychosocial (individual and community) stress.
- (3) Public health and medical care systems (including physical and mental health, public information and social services) are encouraged to develop and review protocols for the treatment of mass trauma.

### ***After the event***

- (1) In the days following a mass trauma event, all health-care facilities are often overstressed. Health departments can contact area and regional hospitals to assess their capacity to care for new patients. Publicize more specific information about where people should go for medical care.
- (2) Work with the news media to release information that encourages all injured persons to seek medical treatment, because these injuries can have a lasting effect and can get infected if not treated properly and promptly.
- (3) Restoration of normality in regular health-care delivery at the earliest.

## **2.9 Summary**

Injuries account for 9% of the world's deaths annually. These may be unintentional (due to road traffic injuries, falls, drowning, burns, poisoning, occupational hazards and animals) or intentional (caused by interpersonal, self-inflicted or collective violence).

Deaths and injuries from road traffic crashes are preventable by improving road user behaviour, road infrastructure and vehicular design; enforcing rules and legislation to control important risks; and improving the availability and quality of immediate post-injury medical care. Prevention has a very high cost benefit ratio compared to medical care. However, both measures are needed.

In the SEA Region, injuries due to falls are more commonly related to the rural environment, and children are especially affected. Injuries could be prevented by close supervision of younger children properly and with implementation of safer designs at home and in the workplace.

Drowning is the leading cause of child mortality after infancy in the SEA Region. Apart from environmental modification (such as fencing all sides and covering of water-bodies); keeping the child in a playpen; teaching survival swimming and water safety education are the well-established interventions to address drowning.

Women are the most vulnerable group for burns in the SEA Region and a majority of incidents happen in the kitchen. Improved and safer design of burners and behavioural change communication (BCC) are considered major strategies for prevention of burn injuries.

Pesticides, kerosene and medicine are the most common agents responsible for poisoning in the Region. First aid includes basic resuscitation and removal of the poison or its source, as directed by the poison control centre concerned. Universal antidotes are discouraged.

Bites by snakes or dogs are the most common animal-related injuries in the Region. Bitten areas should be treated with plenty of water; avoid the practice of application of tourniquets for snakebite.

About 1.6 million deaths occur every year in the Region due to interpersonal, self-directed and collective violence. Risk factors for violence may lie at the level of individuals; their relationships; the settings in which these relationships take place; and society. A few of the risk factors common to all forms of violence include lack of emotional bonding and support; growing up in a violent or broken home; substance abuse; social isolation; rigid gender roles; poverty and income inequality; poor behavioural control and low self-esteem; and personality and conduct disorders. Prevention programmes should be planned only after understanding the context of violence and its specific risk factors in the targeted population.

Disasters (natural, technological and terrorism-related) are responsible for injuries on a large scale. It is important to be prepared for mass trauma events by developing an action plan that includes the community as an important partner.

## **2.10 Check your progress**

Having completed Chapters 1 and 2, it is now time to synthesize the information provided in the two chapters and apply it in the practice of injury prevention and control. Here is a small exercise.

Refer to Section 1.6 of Chapter 1, entitled “Haddon’s Matrix”. Read it once again and familiarize yourself with the concept of the three phases (pre-event, event and post-event) and three factors (agent, host and environment) in the matrix. See how this nine-cell matrix was applied to analyse the risk factors for a road crash injury. It should be emphasized that this model can be applied to all types of injuries.

You are now also familiar with the risk factors and preventive strategies for different types of injuries. The task before you is to prepare a nine-cell matrix for each of the specific injuries discussed in this chapter, namely: falls, drowning, violence, burns, poisoning and animal-related injury. Also suggest preventive or remedial action for each risk factor.

Following this exercise, discuss your work with the course facilitators and your peer group.

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**Chapter 3**

# **Essential skills**

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Medical practitioners have a unique opportunity to practice primary prevention of injury while interacting with patients, their friends, families, and the community, and by alerting them to unsafe or risky environments or behaviour.

Skills such as the rapid assessment of the critically ill and/or unconscious patient; control of the airway; care of the patient whose breathing is inadequate; management of circulation; monitoring the effect of treatment; and transportation of the critically injured patient are now recognized as essential for all doctors who deal with unconscious or critically ill patients. These skills are also essential for providing prompt and appropriate acute care to trauma victims, both in pre-hospital and emergency departments in hospital settings, so as to minimize the severity/consequences of injury once it has occurred (secondary prevention).

Problem-solving, communication, counseling, advocacy and team management are other important skills that need to be acquired by the medical undergraduate for facilitating prevention and control of injuries.

All these skills are covered in this chapter. A few case scenarios are included as problem-solving exercises to check the progress of the students.

## **Learning objectives**

After completion of this chapter, the learner should be able:

- To explain the principles of extrication of casualties and triage, and demonstrate the ability to triage a group of trauma patients.
- To maintain personal and team safety during a rescue mission.
- To demonstrate the skills for establishing and maintaining the airway, assisting breathing, chest compressions and control of external bleeding.
- To apply the logistics of safe transport of trauma victims.
- To demonstrate appropriate skills for communication, counseling, and advocacy for practicing prevention and control of injury.
- To demonstrate the ability to function as an effective team member for the prevention and control of injury.

## 3.1 Extrication and triage

### 3.1.1 Extrication of a casualty

Injury victims require first aid at the scene of an accident to prevent unnecessary death and disability before pre-hospital care. Quick measures such as extinguishing fire and removing the patient from water or electrical wires should be taken to secure the patient from further hazards. In the case of a road crash, ongoing traffic should be warned by putting up a red triangle or hazard-warning lights, or by other means. Cigarettes and other fire hazards should be extinguished and drivers asked to switch off their engines.

The rescue team should observe personal safety precautions against contamination by blood and other potentially infectious material; exposure to toxic substances; unstable surfaces or structures; and violence.

Injured people should be taken to a place of safety and then sent to the appropriate health facility, hospital or trauma centre. While extricating the injured, special care should be taken to stabilize the neck and to allow minimal movement of the spine. The log-rolling technique<sup>1</sup> (the spinal column along with head and pelvis will be moved together) could be followed during extrication of the injured victims. Three or more rescuers, controlled by the rescuer at the head, concurrently roll the patient, in one piece, on to the uninjured side. A board is slid underneath, and the patient is rolled face up onto the board. The head, chest and pelvis of the patient are secured to the board. Use of the cervical collar/spinal board prevents exacerbation of spinal injuries.

#### Box 3.1: Triage: Key points

- Sort the injured according to the severity of injury and likelihood of survival, and the availability of skill, personnel and resources.
- The aim is to provide maximum benefit to the greatest number.
- The most clinically experienced member of the team is to triage the injured.
- The triage category of an individual may change with time.
- Use the four-colour code system for categorization of trauma victims according to the priority of transfer/treatment.

### 3.1.2 Triage: Concepts

Triage means sorting and treating patients according to priority, which is usually determined by medical need and the availability of personnel and resources.<sup>2</sup> Triage consists of rapidly categorizing the injured on the basis of the severity of their injuries and likelihood of their survival with prompt medical attention. Triage also takes into consideration the available skill, personnel, infrastructure and other resources.

Pre-hospital/field triage at the site of an incident is an important strategy in management of the injured. The purpose of triage of the single-trauma victim is to rapidly and accurately identify those victims whose severity of injury warrants the resources of a trauma centre to decrease morbidity and mortality.

In mass casualty events, the number and severity of the injuries overwhelm the capacity of the health-care system. The principle of “first come, first treated” is not expedient for managing disaster victims. A different approach to medical treatment is required to ensure that maximum benefit is provided to the greatest number of the injured. Treatment of the victims must be prioritized through mass casualty triage so that the victims with most urgent needs receive the earliest definitive care. The resources should be directed towards victims with the greatest possibility of survival.<sup>3</sup> Moribund patients who need a great deal of attention and resources with questionable benefit get a lower priority.

Triage helps to identify the level of care required for the victim and the appropriate mode of transport for transferring. In locations with several alternative hospitals at varying levels of trauma capability, the more severely injured patients would be taken to the better equipped and more suitable nearest hospital and not necessarily the geographically closest hospital.

Occasionally, inter-hospital triage becomes necessary after admission of the patient, when it becomes clear that the hospital is unable to provide the required level of care.<sup>4</sup> The need to transfer the patient may arise due to deterioration in the condition of the patient, or type of injuries or level of severity of injuries that require care in a better-equipped hospital.

Trauma centres have the capacity to provide expert care to a limited number of seriously injured victims. All efforts must be made to minimize unnecessary transport victims of minor trauma to the trauma centres.<sup>3</sup>

### 3.1.3 Triage decision

The clinical assessment of the victim includes the general impression of the patient; level of consciousness; ascertaining status of the airway, breathing and circulation; and a rapid assessment of the head, neck, chest, abdomen, pelvis and extremities. Initial assessment should take less than one minute. The assessment should be interrupted for prompt intervention if airway obstruction or cardiac arrest is apparent.

The triage decision must be made rapidly on the basis of information that may be available at the scene of triage. This information includes physiological data, anatomy of injury, mechanism of injury, age of patient, associated diseases and environmental conditions. Several scoring systems—trauma score, CRAMS scale, Glasgow coma scale and Revised trauma score—have been devised to facilitate the triage decision (Annex D). Certain criteria can help the rescuer to identify seriously injured patients who require the resources of a trauma centre (Table 3.1).<sup>5</sup> During triage, a survivability factor is also figured. A triage tag is affixed to the patient as soon as triage is completed.

The responsibility for undertaking triage should rest with the most clinically experienced member of the team. The person doing the triage does not render any treatment to a patient<sup>6</sup>; other rescue workers carry out the treatment.

### 3.1.4 Triage categories

The most commonly practiced categorization is based on the four-colour code tag system (Table 3.2).<sup>6</sup> Critical patients, whose prognosis is likely to be markedly improved by available facilities, are assigned high priority for transport and treatment. Patients requiring intensive attention and resources and those assessed to have little chance of survival get a lower priority.

Geographical triage<sup>7</sup> is an alternative to the colour-code tag system. In this system, the patients belonging to each category are segregated into separate geographical areas at the scene of triage.

**Table 3.1: Criteria for identifying the critically injured**

**Physiological impact of trauma (see Annex D):**

- Glasgow coma score <13
- Systolic blood pressure <90 mmHg
- Respiratory rate <10 or >29 per minute
- Revised trauma score <11

**Anatomical extent of injuries:**

- All penetrating injuries to head, neck, trunk and extremities proximal to elbow and knee
- Flail chest
- Trauma with burns of more than 10% or inhalation injury
- Two or more proximal long bone fractures
- Amputation proximal to wrist/ankle
- Pelvic fractures
- Limb paralysis

**Mechanism of injury:**

- Initial speed >64 kilometres/hour
- Deformity of the vehicle >50 centimetres
- Intrusion into passenger compartment >30 centimetres
- Death in same passenger compartment
- Ejection from vehicle
- Extrication time >20 minutes
- Roll-over crash
- Pedestrian hit by motorized vehicle
- Motorcycle crash > 32 kilometres/hour or with separation of rider and bike
- Fall >6 metres

**Demographic and other factors:**

- Age <5 and >55 years
- Known associated medical conditions

**Table 3.2 Triage categories**

Color code	Priority for transfer/treatment	Patients' characteristics
Red	Priority 1	Critical condition, unstable but salvageable
Yellow	Priority 2	Serious condition, potentially unstable
Green	Priority 3	Stable condition, minor injuries
Black	Priority 4	Dead or alive but not salvageable

The triage category of the patient may change over time<sup>3</sup> as the physiological parameters of the patient may change. When the pre-treatment phase is prolonged, the victims should be re-evaluated and the triage categories may be reassigned as often as necessary. On arriving at hospital, the triage category should be reassigned again.

***Triage: Suggested activities for students***

- (1) Observe assessment and resuscitation of trauma victims in the accident and emergency departments/wards of your hospital.
- (2) Familiarize yourself with the trauma scoring systems being used in your country.
- (3) Organize a small group exercise wherein you visualize and list possible limitations of resources—in terms of skill, personnel and infrastructure—at various hospitals in your town, and prepare a plan for the transfer of victims of a major rail or road accident.
- (4) Organize a small group exercise wherein you construct an imaginary accident situation and triage dummy trauma patients based on their clinical data; justify the category assigned. For example, the clinical data of two patients is printed below:

Patient ID: K106	Patient ID: K226
9-year-old boy; inside car	35-year-old man; sitting on road
Level of consciousness (LOC)—unresponsive	LOC—alert
Skin—Pale/cold	Skin—warm/normal
Airway—partial obstruction	Airway—open, self-maintained
Breathing—gaspings	Breathing—20/min
Circulation—absent	Circulation—radial pulse 100/min
Miscellaneous—open head injury	Miscellaneous—Chest pain, breath sound diminished on left side.
<b>(Category: Red; Priority 1)</b>	<b>(Category: Yellow; Priority 2)</b>

- (5) Organize a debate to discuss the merits and demerits of allocating a lower priority to moribund patients during mass casualty triage, with the aim to understand and appreciate the ethical issues involved.
- (6) Draw a disaster management plan for your hospital taking into account the local circumstances.

## **3.2 Assessment and initial management of trauma patient**

Prompt assessment with appropriate and adequate resuscitation of trauma patients goes a long way to limit morbidity and mortality. The “ABCDE” of resuscitation is a simple scheme to identify and treat what is killing or may kill the patient:

- A** Airway with cervical spine protection
- B** Breathing
- C** Circulation with control of bleeding
- D** Disability (neurological status)
- E** Exposure and control of environment

You must learn and practice the important skills used in resuscitation of trauma patients.

Advanced resuscitation of the patient requires specific equipment and drugs, and a team of trained medical, nursing and paramedical personnel. The essential equipment includes: suction catheters, suction pumps, oropharyngeal/nasopharyngeal airways, laryngoscope, Magill’s forceps, endotracheal tube, needle and syringes, bag and mask system, oxygen supply, drugs, electrocardiogram (ECG) machine, cardiac monitor, defibrillator, chest drainage tube and underwater seal drainage system.

### **3.2.1 Airway and cervical spine protection**

Assess the airway patency. The airway is not immediately threatened if the patient can speak. Signs of airway obstruction include:

- Snoring or gurgling
- Stridor or abnormal breath sounds
- Agitation

- Using accessory muscles of ventilation
- Paradoxical chest movements
- Cyanosis

In view of the ever-present danger of cervical spine injury, measures to establish patent airway must be taken while protecting the cervical spine. The patient's airway is cleared by removing blood, vomit and foreign bodies from the mouth/pharynx. Gloves are worn and a two-finger sweep is used to clear solid material from the mouth and pharynx. When a suction apparatus is available, it should be used with a rigid suction catheter of Yankauer type to remove fluid and debris under direct vision.

The essential measure to provide a patent airway in an unconscious patient is to ensure that the tongue and the epiglottis are lifted forward and maintained in that position. The modified jaw-thrust without head tilt technique or the jaw lift technique<sup>8</sup> is used to open the airway in a trauma patient. The head and the cervical spine of the patient are stabilized in neutral position. The jaw-thrust/jaw lift is applied without tilting the head (Fig. 3.1). Attention is paid to protecting the cervical spine by the use of a well-fitting semi-rigid neck brace, or sand bags and forehead strapping. Modern spine boards are equipped with neck restraint pads and straps, which may be used in place of sand bags and forehead strapping.

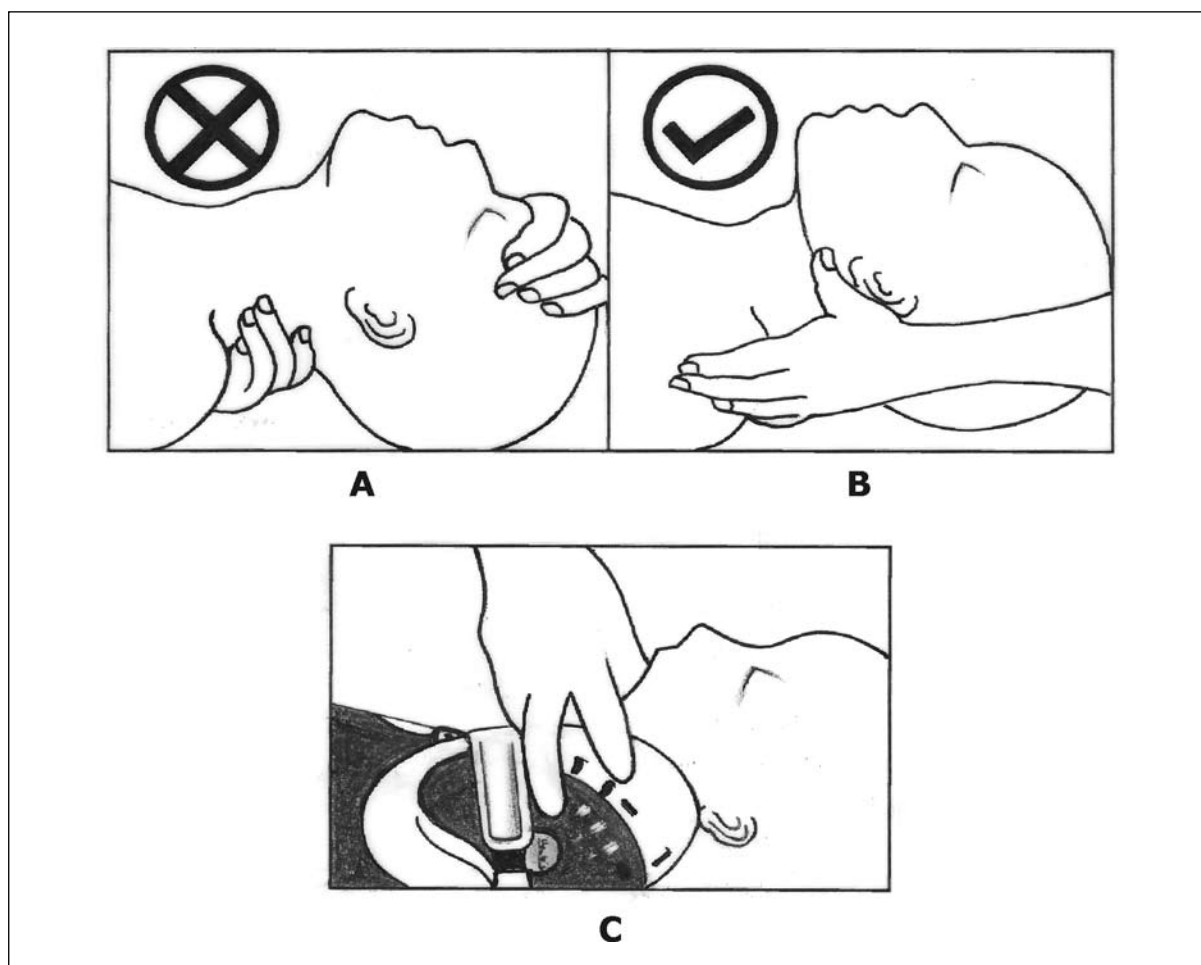
### ***Choking and first aid***

Choking occurs when a foreign object becomes lodged in the throat or windpipe, blocking the air flow. A piece of food or aspirated small objects such as a coin or button are usually the cause of choking. The universal sign for choking is hands clutched to the throat.<sup>9</sup> The victim is unable to talk, cough or breathe.

#### ***Clearing airway of a choking adult***

The abdominal thrust or the Heimlich manoeuvre should be used if the simple method of delivering quick blows between the victim's shoulder blades several times is not possible or has been tried and failed.<sup>10</sup> The manoeuvre can be applied when the patient is sitting, standing or lying in supine position.<sup>9-11</sup> For patients in sitting or standing position, one may proceed as follows: Position yourself behind the patient, and wrap your arms around the victim's waist. Make a fist and place the thumb side of your fist against the victim's upper abdomen, below the xiphoid process and

**Figure 3.1: Technique for opening the airway in trauma patients: (A) never extend neck to open airway; (B) the modified jaw-thrust technique; (C) the jaw lift technique.**



above the navel. Grasp your fist with your other hand and press into the upper abdomen with a quick upward and inward thrust. Repeat until object is expelled. To accomplish this manoeuvre in a supine patient, straddle the patient and apply your hands to the upper abdomen, just below the xiphoid process and above the navel in the midline. With the heels of your palm apply quick, firm pressure upwards and inwards. Repeat this manoeuvre several times until the obstruction is removed.

Some authors recommend the modified Heimlich manoeuvre, wherein the compression is applied to the chest in the mid-sternal/lower sternal region in place of the upper abdomen.<sup>11</sup>

Chest thrusts are also recommended for clearing the airway in a pregnant woman or obese person.

To perform the Heimlich manoeuvre on yourself: Place a fist slightly above your navel. Grasp your fist with the other hand and bend over a hard surface—chair, porch railing, and countertop, edge of a bedpost or sink. Shove your fist inward and upwards.

### *Clearing the airway of a choking infant*

Abdominal thrusts are not recommended for infants. For clearing the airway of a choking infant, assume a seated position.<sup>9</sup> Hold the infant face down on your forearm, which is resting on your thigh, the head of the infant being lower than the trunk. Deliver four back blows forcefully with the heel of your other hand between the infant's shoulder blades. Immediately turn the infant on its back, head lower than trunk, and using two fingers deliver four chest thrusts in the sternal region. Repeat the back blows and the chest thrusts till the foreign object is expelled.

(Video demonstration and illustrations of the techniques of clearing the airway of a choking adult/infant will help to understand more).<sup>12,13</sup>

### ***Helmet management***

In road accidents, the helmet of an unconscious patient should be left in place until injury to the cervical spine is excluded by appropriate radiographs. Whenever an inadequate airway necessitates early removal of the helmet, a two-man technique<sup>1, 14</sup> should be used. Face masks and eyeglasses are removed first. One rescuer stands above or behind the victim, and stabilizes the head and neck by placing hands on the side of the helmet and fingers on the mandible. Then the other rescuer positions himself on the side of the patient, and assumes in-line stabilization of the cervical spine by placing one hand under the occipital region and the other hand in front of the neck, with four fingers on the angle of the mandible on one side and the thumb on the other side of the mandible. The first rescuer then removes the helmet by expanding it laterally to clear the ears and tilting it backwards to clear the nose. After removal of the helmet, the first rescuer again replaces his hands on either side of the head of the patient with palms over the ear to stabilize the neck. The second rescuer then applies a suitable cervical collar.

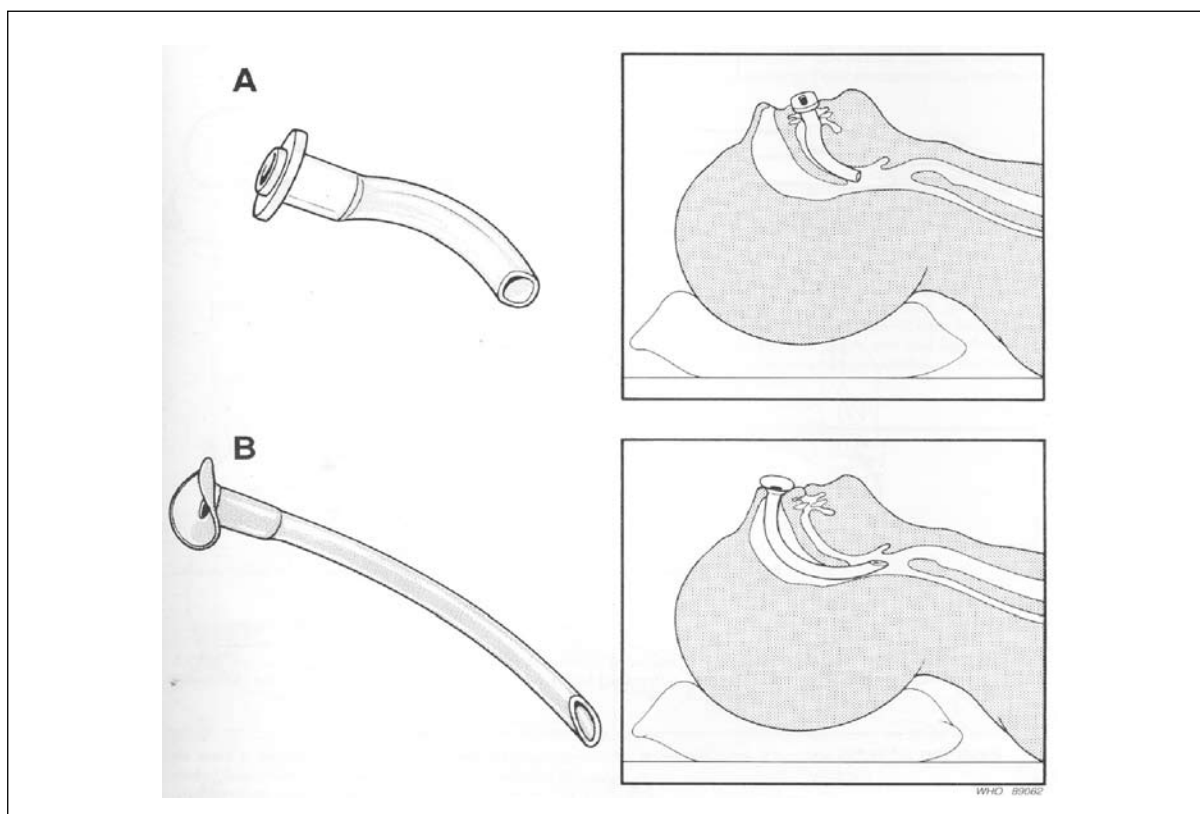
## Airways

Oropharyngeal/nasopharyngeal airways, when available, are used to maintain the airway in unconscious or semiconscious patients (Fig. 3.2).

**Oropharyngeal airway (oral airway):** The proper size of the airway is determined by placing the airway next to the face of the patient in a way that the flange is at the level of the central incisors of the patient. The airway should extend from the angle of the mouth to the angle of the mandible. The oral airway is inserted via the side of the mouth in an upside position (figure 3.2). After passing the crest of the tongue, it is rotated into proper position so that it lies along the posterior wall of the oropharynx.

**The nasopharyngeal airway (nasal airway):** The device varies from 17 cm to 20 cm in length and 12 to 36 French in size. An airway of appropriate length can be chosen by measuring the distance between the tip of the patient's nose and the tragus of the ear. The nasopharyngeal

**Fig. 3.2: The use of oropharyngeal (A) and nasopharyngeal airways (B)**



Source: Dobson MB. *Anesthesia at District Hospital*. Geneva, World Health Organization, 2000.

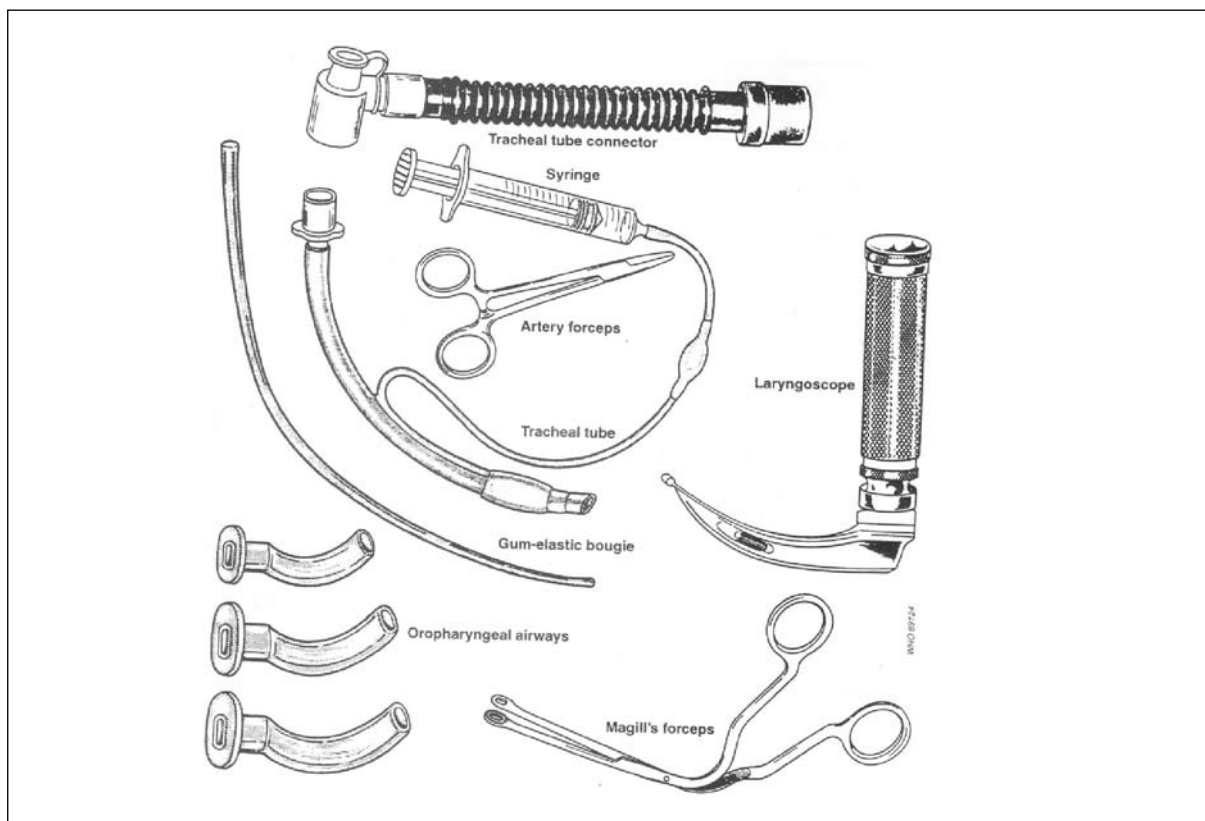
airway should be lubricated with an anaesthetic gel before passing it into the nasal passage. The nasal airways are contraindicated in patients with fractures of the base of skull and facial bones due to the risk of intracranial placement.

### **Tracheal intubation**

The insertion of a tracheal tube provides a clear airway and protects the patient's lungs against the aspiration of vomit or blood. You will need a trained assistant and the following basic equipment: laryngoscope and spare bulbs; suitably sized tracheal tube; Magill's intubating forceps; suction apparatus; anesthetic face mask; and self-inflating bag or bellows (SIB) (Fig. 3.3). Before starting intubation, check that all your equipment is in working order and that suction is ready and running.

Patient's breathing during the process of intubation is likely to be impaired; therefore, first give the patient oxygen from a closely fitting face mask for 3-4 minutes. If the patient is not breathing, gently inflate

**Fig. 3.3: Some of the equipment needed for tracheal intubations**



Source: Dobson MB. *Anesthesia at District Hospital*. Geneva, World Health Organization, 2000.

the lungs using a face mask and a SIB. If the first attempt at intubation fails, withdraw the tube and oxygenate the patient before trying again. The details of the technique of tracheal intubation are provided in *Anesthesia at District Hospital*<sup>15</sup> published by the World Health Organization.

### ***Surgical cricothyroidotomy***

Surgical cricothyroidotomy should be conducted in any patient where intubation has been attempted twice and failed and/or the patient cannot be ventilated. It has the advantage of speed and ease, and requires little equipment. In absolute emergencies, a 14-gauge intravenous catheter may be inserted percutaneously through the cricothyroid membrane in midline and directed caudally. It is connected to a high-pressure oxygen source/jet ventilator.

(More information and skills will be obtained from the surgical ward session which is provided routinely in every medical school.)

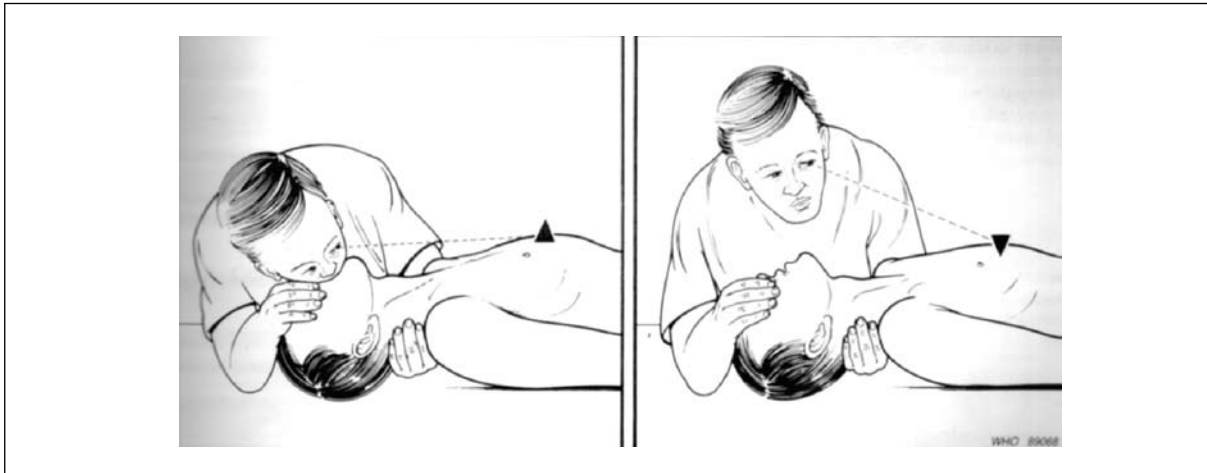
### **3.2.2 Breathing**

Once the airway is established, it is important to ensure that breathing is present. If the patient is not breathing spontaneously—one cannot see or feel the chest rising and cannot hear or feel air movement—you must assist the patient's breathing.

#### ***Ventilation with expired air***

This can be most rapidly done by mouth-to-mouth breathing (expired air resuscitation). The expired air contains 16 – 17% oxygen, which is sufficient to oxygenate blood in an emergency. To ventilate, you should kneel down on one side of the patient's head and pinch the patient's nostrils closed. Inhale a deep breath. Seal your mouth over the patient's mouth, which should be slightly open. Exhale into the patient's mouth until the chest rises and resistance is produced by the expansion of the patient's lungs (Fig. 3.4). Allow passive exhalation by breaking contact with the patient's mouth. The process should be repeated, providing a full ventilation of 1.5–2 seconds duration every five to six seconds. If you cannot perform mouth-to-mouth breathing you may perform mouth-to-nose breathing by holding the mouth of the patient closed and breathing into the patient's nose.

**Fig. 3.4: Ventilation with expired air.**



Source: Dobson MB. *Anesthesia at District Hospital*. Geneva, World Health Organization, 2000.

### **Ventilation with bag and mask system**

A bag-and-mask system is very useful to improve considerably the efficiency of lung ventilation. The components of the system are a SIB, breathing valve and a face mask of appropriate size. The bag can be connected to an oxygen cylinder with a connecting tube. The bag can either be used with a mask to ventilate patients or with mask removed; it can be connected to a tracheal tube to allow ventilation of lungs with oxygen-enriched air.

### **3.2.3 Urgent surgical management of chest lesions affecting ventilation**

Following injury to the chest, lesion-like tension pneumothorax, haemothorax, flail chest and fractured ribs can seriously affect breathing. Persistent agitation, cyanosis, use of accessory muscles and/or presence of tracheal shift, a sucking chest wound, restricted chest expansion, surgical emphysema and/or broken ribs suggest the presence of these lesions.

Sucking chest wounds need urgent closure/sealing. If you suspect tension pneumothorax, introduce a wide-bore needle into the pleural cavity through the second intercostal space in the mid-clavicular line to decompress the tension and allow time for placement of an intercostal chest tube.

If respiratory distress exists in a patient with chest trauma, an intercostal chest drainage tube is inserted as a matter of priority, and before chest X-ray, to drain the pleural cavity of air and blood.

### 3.2.4 Circulation with control of bleeding

Once airway and breathing are ensured, you must check for the presence of carotid pulse. When you cannot detect a pulse, provide circulation by chest compressions.

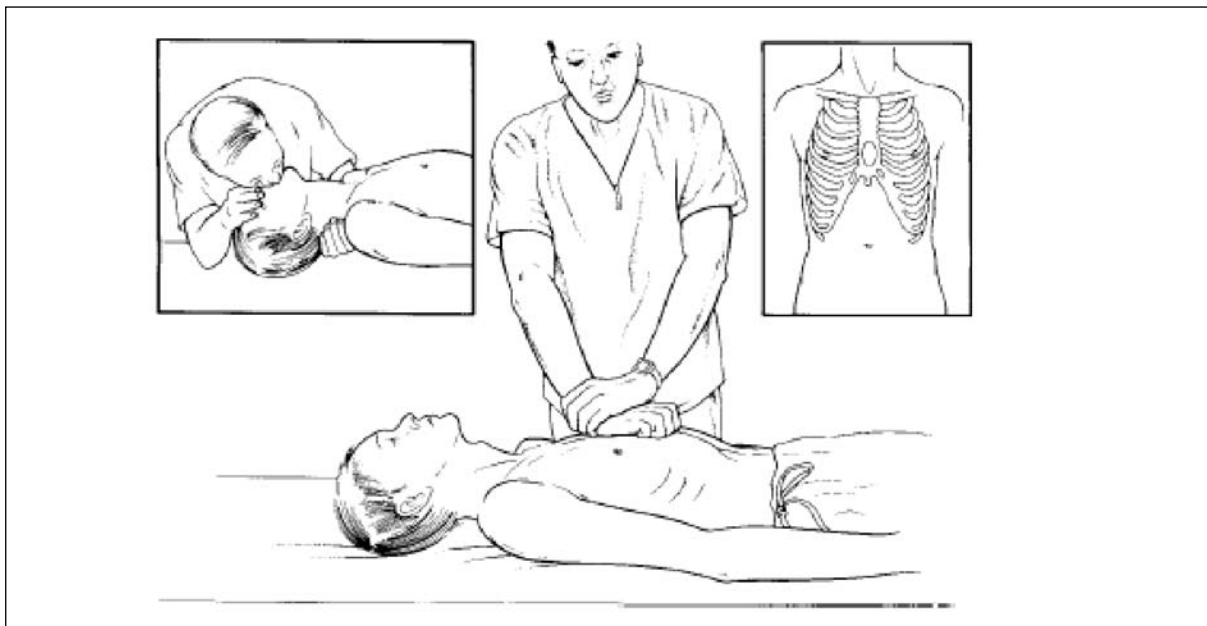
#### **Chest compressions**

The patient should be lying in supine position on a firm surface. Slightly separate your knees and keep them close to the patient. Keep your shoulders parallel with the axis of the patient's body. Place the heel of one hand on the sternum two-finger breadths above the xiphoid process. Place the other hand on top of the first hand locking the fingers. Keep your arms straight and elbows locked. Compress the chest by giving steady, downward thrusts to the sternum, depressing it by 1.5–2 inches or to a depth sufficient to produce a palpable carotid or femoral pulse (Fig. 3.5).

The ratio of the chest compressions to the breaths is 30:2 when a single person is doing resuscitation and 15:2 when two persons are available. The compression rate should be 80-100 per minute.

The oval mark on the sternum in the drawing on the right shows where pressure should be applied.

**Fig. 3.5: Expired-air resuscitation and external cardiac massage.**



Source: Dobson MB. *Anesthesia at District Hospital*. Geneva, World Health Organization, 2000

Assess the patient's circulation. If inadequate, you may need to:

- Control the bleeding by raising an injured limb; by applying local pressure to a wound; or by pressing the proximal artery against a pressure point.
- Establish two large-bore IV lines (14 or 16 G) if possible, and administer fluids, if available.

### **Control of external haemorrhage**

Effective control of haemorrhage can critically influence outcome. The blood loss should be minimized by controlling external bleeding by applying pressure over the bleeding area until bleeding stops or help arrives. The key to success in control of bleeding is to apply pressure firmly and for a long time. The blood volume should be restored by infusing appropriate fluid.

First aid for external bleeding from a wound is by application of manual pressure on gauze or other clean and soft cloth placed over the bleeding source. Alternately, an elastic bandage is firmly wrapped over the gauze to hold it in place with pressure. In case of continued bleeding, more pressure is applied with more gauze. Severe bleeding from high-energy penetrating injuries can be controlled by sub-facial gauze placement. Careful splintage of long-bone fractures, femur or tibia, can reduce blood loss from the fracture site.

The operative procedure involves exploration of the wound and identification of the source of the bleeding. Depending on the source, the bleeding is controlled by coagulation, ligation or repair of the vessels. Sometimes the responsible organ may have to be excised. A variety of styptic agents (fibrin foam, gelatin sponge, etc.) are available in the form of local applications for controlling bleeding.

### **3.2.5 Disability (neurological status)**

Checking for neurological damage is an important component of the initial assessment of the trauma patient. AVPU is a simple scale for rapid initial assessment of level of consciousness (A–Alert, V–Verbal response, P–response to Pain, U–Unresponsive). Brief neurological examination includes assessment of the level of consciousness on the Glasgow coma scale;

the pupils; signs of cerebral herniation (unconsciousness, dilated pupil(s), hypertension, bradycardia, posturing), and sensation and movements in fingers and toes.

### **3.2.6 Exposure to and control of the environment**

The patient should be undressed completely and the posterior surface of the body should be examined by “log-rolling” the patient while protecting the spine. This is to ensure that other injuries have not been missed. *Any deformity, contusion, abrasion, penetration, burns, tenderness, laceration or swelling on the posterior side of the patient should be noted.* To turn a patient with suspected spinal injury, three or more rescuers are required. The patient is turned in one piece, like a log, allowing minimal movement of the spine.

The trauma patient can rapidly become cold; hence it is important to maintain optimum body temperature with the use of blankets.

### **3.2.7 Transporting the patient**

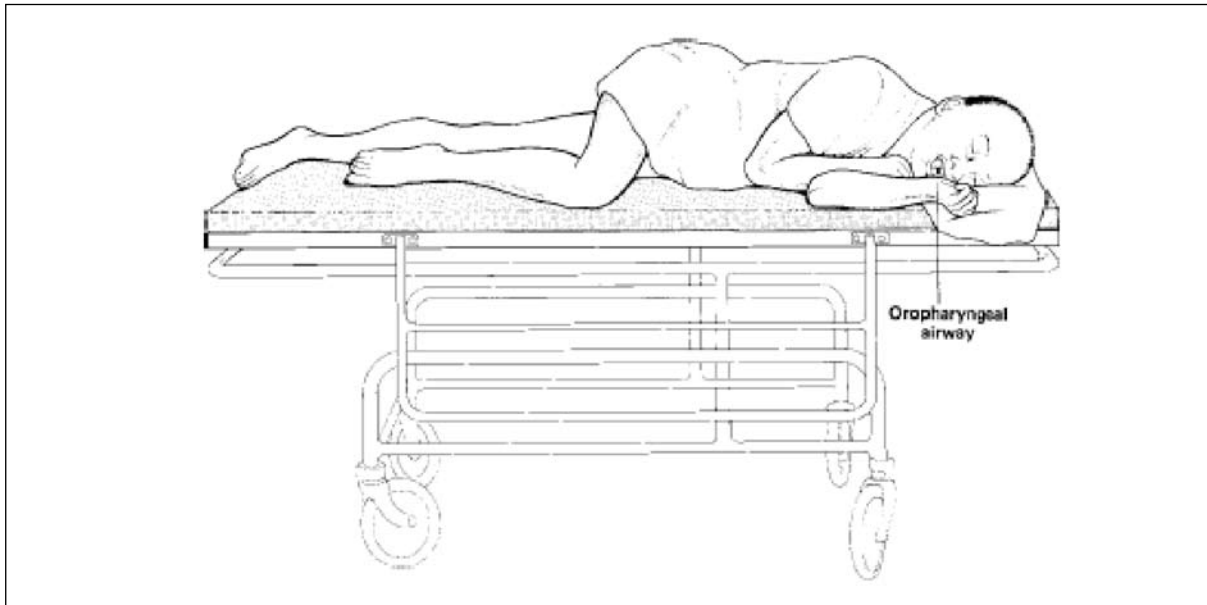
Transporting a patient involves risks. Proper planning is required for the safe transport of patients. The planning and preparation for transporting a patient include consideration of the mode of transport; personnel to accompany the patient; equipment and drugs required during transportation; possible complications; and constant monitoring of the patient.

There should be effective communication between the referring centre, receiving centre, transport service, escort(s), the patient and relatives of the patient.

Effective stabilization of the patient before transportation may require prompt initial resuscitation. Control of haemorrhage and maintenance of circulation, immobilization of fractures, and analgesia are very important steps before transportation of patient.

While transporting, place the patient in recovery position (Fig. 3.6). Transporting an unconscious patient on his back without proper attention to his airway is a major cause of unnecessary death. Immobilize the joints on either side of a fracture until the patient reaches the hospital to minimize pain, bleeding, shock and further damage to the tissues.

**Fig. 3.6: Recovery position for transporting trauma patient.**



Source: *Surgical care at the district hospital. Geneva, World Health Organization, 2003.*

### 3.2.8 Suggested learning activities

- (1) Familiarize yourself with the resuscitation equipment, its assembling, handling and maintenance. You must make yourself aware of the range of sizes of airways, suction tubes and tracheal tubes. You must be able to select the appropriate size for a particular patient.
- (2) Learn various resuscitation techniques by observing, assisting and performing the techniques under supervision. Video films and mannequins/dummies may be used to facilitate learning and acquisition of skill.
- (3) Seek the opportunity to observe a skilled anaesthesiologist intubating patients prior to surgery. It will help you to learn the minute details of the procedure, and to know how to manage various difficulties that may be faced at the time of intubation.
- (4) Familiarize yourselves with the modifications in techniques that may be required in different situations; for example, in infants and children or in patients with suspected spinal injury.
- (5) Practice surface marking of the cricothyroid membrane.

## 3.3 Communication, counseling and advocacy skills

This section is designed to help you to improve your ability to communicate effectively with trauma patients, their families and friends, colleagues, community leaders, and government authorities. Clear and effective communication is essential for success in professional and personal relationships.

### 3.3.1 Basic concepts of communication skills

Communication is a process in which messages—thoughts and feelings—are sent and received between two or more persons. The purpose of communication is to create meaning/understanding, and often to influence the other person to effect some change.<sup>16</sup> The messages have two components: verbal and non-verbal. The verbal component includes words and the way words are spoken. Non-verbal messages are sent through eye movements, facial expressions, gestures and body language.

An effective communicator has the following attributes:

- Listens.
- Speaks clearly so that others will be able to comprehend.
- Confirms understanding and asks others to do the same.
- Does not use jargon.
- Asks for questions and encourages others to speak.
- Is patient.
- Presents information precisely.
- Does not overwhelm others.

There are several factors that can either facilitate or act as barrier to effective communication: for example, privacy, familiarity, status, physical distance between persons, seating arrangement, body movement, posture and language.

**The setting:** Adequate privacy, good lighting, comfortable seats, unhurried time, prevention of interruptions, and control of noises from outside are conducive to good interaction. The seating arrangement is important. Arranging chairs around the corner of the table that puts the persons in a neutral position is preferable to seating facing each other across a desk.

**Touch:** Touching the patient—shaking hands; placing a hand on the arm or around the shoulder—may help to establish rapport, and to reassure the patient/relatives. However, you have to be aware of the cultural sensitivities regarding physical touch in the society concerned and respect the traditions.

**General remarks:** You should introduce yourself to the patient and explain the purpose of the interview/meeting. You should assure the patient about the confidentiality of the conversation.

**Eye contact:** Eye contact helps to establish rapport and demonstrates involvement of the persons. Breaks in eye contact by either person may indicate embarrassment or difficulty with the topic under discussion. You must not stare at the patient; a five-second duration of eye contact at a time is appropriate.

**Body posture:** You should look relaxed and natural while interacting with the patient. A slight forward lean indicates interest and attentiveness.

**Language and speech:** Using the patient's words instead of jargon; repeating the last few words of the patient; avoidance of interruptions or sudden changes in topic; and asking the patient to tell you more are some ways to convey to the patient your interest in the interaction. A good communicator uses clear and concise speech and speaks firmly, positively and genuinely.

**Use of signals:** You should indicate to the patient if you want to change the topic, or if you are about to end the interview.

**Getting the information right:** Repeating to the patient what you believe is the main thought or idea expressed; reflection of the feeling conveyed by the patient; and summarizing the salient issues at the end of the discussion are helpful in understanding the thoughts and feelings of the patient more precisely.

### 3.3.2 Breaking bad news

Any news that drastically and negatively alters the patient's view of her or his future is defined as bad news.<sup>17</sup> Breaking bad news is an important component of the overall communication skills of medical practitioners. The following steps<sup>18</sup> are recommended for organizing a physician's approach to breaking bad news:

**Advance preparation:** Arrange adequate time and privacy, confirm medical facts, review relevant clinical data, and emotionally prepare for the encounter. Be prepared to provide basic information about prognosis and treatment options.

**Building a therapeutic relationship:** Identify the patient's preferences regarding the disclosure of the bad news, such as what and how much they want to know. Have family members or other supportive persons present according to the patient's wishes. Introduce yourself and ask for names and their relationship to the patient. Use touch when appropriate. Assure the patient that you are available.

**Communicating well:** Determine the patient's knowledge and understanding of the situation, proceed at the patient's pace, and avoid medical jargon or euphemisms. Foreshadow the bad news with phrases such as "I am sorry but I have bad news". Give information in small chunks. Allow for silence and tears, and encourage and answer questions. At the conclusion summarize and make follow-up plans.

**Dealing with patient and family reactions:** Assess and respond to emotional reactions and empathize with the patient. Be aware of cognitive coping strategies (e.g., denial, blame, intellectualization, disbelief and acceptance).

**Encouraging/validating emotions:** Offer realistic hope based on the patient's goals.

While providing primary care to trauma victims, one may often encounter situations requiring the communication of bad news regarding disability, critical condition, or death to the patients and/or their families. The understanding and practice of the technique for conveying bad news enables the practitioner to handle such situations.

### 3.3.3 Injury counseling

The goal of injury prevention counseling is to alert individuals, parents and children to unsafe or risky environments and behaviour so that appropriate changes can be made to decrease the number or severity of injuries. Major professional bodies have recommended that age-specific safety counseling should be a part of routine well-child care.<sup>19</sup> Evidence in several different settings strongly suggests that counseling by health-care professionals is effective.<sup>20,21</sup> Primary-care providers, paediatricians, emergency physicians,

family physicians and surgeons are in direct contact with patients/parents. Hence, they are in a position to provide counseling regarding safety and injury prevention, often at a time when many injured patients and their family members are more receptive.

Counseling is a way of helping or assisting others to make their own decisions and adjustments in the face of life's problems. The term "counseling" includes several functions: for example, information-giving; an opportunity to reflect on the problem and various courses of action; allowing the release of emotions; providing advice and guidance; and helping activities. As a counselor you should:

- Show concern and a caring attitude, and build a good rapport with the client.
- Listen carefully and develop empathy (understanding and acceptance) for the client's feelings and NOT have an attitude of sorrow or pity.
- Do not try to persuade the client to accept your advice.
- Respect the privacy of people and do not reveal information given by them.
- Share information and guide over resources.
- Be honest, open and dedicated.

The core conditions required of a counselor are an unconditional positive regard, genuineness in human relationships, empathy, warmth, congruence and therapeutic relationship.

Counseling sessions can be held as one-to-one counseling or group counseling. A list of injury prevention areas and prevention strategies,<sup>19</sup> provided in Annex E, indicates the scope of injury prevention counseling.

### **3.3.4 Advocacy for injury prevention**

Advocacy is one of the important major strategies for achieving health promotion objectives. The policy and advocacy activities of health professionals and others have led to the implementation of several injury prevention measures, for example compulsory seat-belt use, legislation against drinking and driving, improved vehicle safety standards, vehicle speed limits, smoke detection systems, and poolside fencing.

The World Health Organization describes advocacy as “a combination of individual and social actions designed to gain political commitment, policy support, social acceptance, and system support for a particular goal or programme”.<sup>22</sup> Advocacy is also defined as “a strategy to influence policy-makers when they make laws and regulations, distribute resources, and make other decisions that affect peoples’ lives”.

The principal aims of advocacy are to create policies, reform policies and ensure that policies are implemented. Several advocacy strategies can be used to influence the decisions of policy-makers, such as discussing problems directly with them, delivering messages through the media, or strengthening the ability of local organizations to advocate. The main purposes of advocacy for injury prevention are: (i) to narrow the gap between what is known to be effective in injury prevention and what is practiced, with due consideration being given to practicality, cost and public acceptability; and (ii) to overcome major structural barriers which interfere with the implementation of effective policies and measures.<sup>23</sup>

Advocacy is necessary whenever the required policy support is lacking due to inertia in policy-makers, opposition from powerful sources, and media indifference. Political decision-making on any intervention is not made merely on the basis of evidence about potential injury prevention. Policy-makers take account of many factors in making decisions about policy. These factors include the opinion of opposition groups; the compatibility of the proposal with overall economic and regulatory policies of the government; framing of the issue; media opinions and coverage; public opinion; and the degree of commitment of the political leadership.

Advocacy involves framing or presenting issues in the media, developing or building a network of pressure groups and dealing with powerful opposition. Effective advocacy requires a planning process<sup>23</sup> comprising several steps:

- detect and identify the priority issue;
- identify and engage supporting partners;
- identify and engage political/opinion leaders;
- identify likely sources of opposition, anticipate their framing of the issue;
- seek media support;

- identify barriers;
- develop an advocacy strategy; and
- evaluate the impact.

The barriers to the implementation of evidence-based, cost-effective, publicly acceptable injury prevention interventions include: political philosophies that undermine health because of economic considerations; influence of commercial or vested interests; and freedom of civil society to accept or reject any health intervention. There are also natural barriers. For example, bike helmets that were heavy, hot and unattractive worked against increased usage rates till design issues were addressed by the manufacturers.

The advocacy network may consist of community members, medical professional bodies, parliamentary bodies, administrative bodies and nongovernmental organizations

The advocacy activities can be evaluated along the following lines:<sup>24</sup> evaluation of the process; short-term outcome in terms of change in knowledge and attitudes of the target population; change in policies; implementation/effectiveness of policy change; and injury reduction.

### **3.3.5 Suggested learning activities**

You can learn to communicate in an effective way through practice. The following techniques can be used to learn communication skills:

- (1) Listening to a didactic presentation of the material during lectures, or reading handouts and recommended resources.
- (2) Witnessing live interviews/role plays: for example, teacher–patient; teacher–student; student–student; or student–patient.
- (3) Witnessing videotaped interviews/role plays: for example, teacher–patient, teacher–student, student–student, student–patient; and/or non-clinical interviews; for example, a news interview or talk show.
- (4) Participating in role plays involving 2-3 students acting as doctor, patient and observer, on promoting prevention and control of injury through counseling.

- (5) Conducting a small group discussion to formulate a strategy for advocacy for seeking support from government authorities for an identified “injury prevention intervention” in your area.

## **3.4 Team and leadership skills**

As with other systems, the success of a health-care system is highly dependent on high levels of participation and cooperation of all the individuals involved in the health team. You must learn the characteristics and dynamics of a team and acquire the skills essential for team-building and providing leadership. Teamwork is essential in prevention and control of injury, as any effort in this direction needs the involvement of a large number of individuals belonging to a wide spectrum of professions.

### **3.4.1 The team**

A team may be defined as a number of individuals associated together in a work or activity, as a functional unit. It may be composed of individuals with varied and specialized training who coordinate their activities to provide the required service. A health team consists of a group of people who share a common health goal and common objectives, as determined by the needs of the community.<sup>2</sup> Members of the team contribute according to their competence and skills, in coordination with the others. A team as a whole performs better than individuals working on their own. The scope, intentions and the power of a team may be bigger than the sum of the capacities of the individuals of whom it is comprised.<sup>16</sup>

#### ***Characteristics of a team***

- A team consists of two or more individuals, and at least one of them must be a professional.
- Every team has an identifiable leader. Roles of the members are clearly defined in the team.
- The team is task-oriented. Team members collaborate to provide the solution(s) to the problem(s) being handled by the team.
- The team exists to serve the community and users of the team’s services. The team is, therefore, client-centred.

- The team has specific protocol for operations. The norms and procedures are to be followed by the members.
- There is effective communication between the members of the team. The members assume responsibility for sharing ideas and opinions.
- The team is stable over time.
- The team has a mechanism to obtain feedback on its performance and to review its functioning.

### ***Steps in team-building***

Three conditions must be met for the development of an effective team: group members must trust each other, a sense of group identity must be present, and there must be a sense of group efficacy.<sup>16</sup> The following activities are required for building a team:

- *Selection of the members:* The team members are to be selected depending on the nature of the task and resources available.
- *Clarity regarding goals and objectives of the team:* The goals and objectives of the team should be clearly defined. The leader and members should clearly understand their role and responsibilities.
- *Planning strategy:* Good teams discuss the various methods for achieving the goal and opt for the most appropriate one. Sound methods and decision-making lead to the attainment of the goal.
- *Creating support and trust:* The team members must trust each other. The team members should candidly discuss their points of view, and seek and provide help and feedback to each other. They should be ready to accept a marginal degree of role overlap.
- *Individual development:* Effective teams must pay attention to the development of individual competence, skills and abilities to ensure improved performance of the team and better relationships among the members.
- *Review of the functioning of the team:* The review of the functioning of the team should be undertaken at regular intervals by supervisory visits, exit interviews of clients, and medical audits, etc.

### 3.4.2 Roles in teams

Members assume roles that can facilitate or impede the functioning of the team. While the leader sets the direction for the team, other team members make valuable contributions by initiating discussions, clarifying issues, providing information and specialized expertise, keeping the group focused and assessing the performance of the group. They may also exert a positive influence by maintaining peace and minimizing conflicts in the team, and by solving problems. You must also be aware of some individual roles/behaviours that impede the progress of the team. Aggressive behaviour, lack of respect for the team, fault-finding, a recognition-seeking attitude, conformist or nonconformist approach, and a lack of interest or involvement are some such attributes.

### 3.4.3 Leadership skills

The leader of a team can be appointed, elected or chosen by the group. Different members of a group may take the leadership role with respect to different issues or tasks. The leader of a team is not expected to make all the decisions or to do all the work. The leader must encourage others in the team to perform and coordinate their efforts. The responsibility for the performance of the team ultimately rests with the leader. Leadership requires a set of skills that can be learned and developed over time<sup>2</sup> (see Box 3.2).

#### Box 3.2: Leadership skills

- Listening
- Observing
- Organizing
- Making decisions
- Communicating effectively and working well with others
- Encouraging and facilitating others
- Fostering enthusiasm and vision
- Goal-setting and evaluation
- Giving and receiving feedback
- Coordinating the efforts of others
- Chairing a meeting
- Accepting responsibility

The leader of the medical emergency services acts as the commander during a mass casualty situation. The commander should have strong leadership qualities; understand well the overall concerns and detailed plans for controlling the mass casualty situation; and be familiar with every member of the team participating in the rescue mission.

### 3.4.4 Teams in prevention and control of injury

The collaboration of persons from a large number of professions is required for injury prevention and control (IPC) including medical practitioners, nursing personnel, paramedics, police, teachers, factory managers, engineers, administrators, legislators, social workers, press and media and the public. The role of the medical practitioner in injury prevention and control is outlined in the box below.

#### Box 3.3: Role of medical practitioner in injury prevention and control

<b>Education and counseling</b>	<ul style="list-style-type: none"> <li>• Education for patients, families, the community, and health professionals about safety promotion and injury prevention information/programmes (Annex E).</li> <li>• Popularization of the latest scientific knowledge regarding first aid and immediate care methods.</li> </ul>
<b>Patient care and counseling</b>	<ul style="list-style-type: none"> <li>• Organization of efficient pre-hospital and hospital care for trauma victims.</li> <li>• Screening patients for drug-alcohol dependency/abuse; violent behaviour; domestic violence and child maltreatment; and intervention in the form of medical care, counseling to patient/families, and referral (if needed) to appropriated sources.</li> </ul>
<b>Registry, surveillance and research</b>	<ul style="list-style-type: none"> <li>• Adequate documentation of injuries in medical records, and assistance in trauma registry and injury surveillance.</li> <li>• Research on the extent of a problem and risk factors; identification of populations at high risk for injury; morbidity and mortality; and evaluation of the effectiveness of the injury prevention programme.</li> </ul>

<b>Advocacy</b>	<ul style="list-style-type: none"> <li>• Providing evidence and technical inputs to regulatory and governmental bodies in promoting legislative activity as well as enforcement for a safe environment, technology and behaviour.</li> <li>• Reporting of unsafe products and advocating improvement of product design and unsafe environment.</li> </ul>
<b>Community action</b>	<ul style="list-style-type: none"> <li>• Promotion of community involvement in pre-hospital care; reporting of injury events and violence; and injury prevention programmes.</li> <li>• Collaboration with other service providers/sectors such as the police, fire and rescue services, engineering departments, civil administration, the telecommunication sector, insurance companies, etc.</li> </ul>

The composition of the IPC team varies according to the task. The trauma rescue team may consist of trained paramedics and physicians at the base hospital. The trauma centre team consists of the trauma surgeon, anaesthesiologist, nursing personnel, paramedics, and laboratory, radiology, blood bank and operation theatre technicians. A team working on IPC in children should include the paediatrician, paediatric nurse, social worker, schoolteacher and parents.

Prevention of road crash injuries involves drivers, police, engineers, administrators and legislators in addition to medical personnel. The press and the media play a very important role in sensitizing the public to various injury prevention issues.

Professionals from different streams must work as an efficient and effective team to devise and implement various strategies, which can prevent injuries and reduce mortality and morbidity from injuries.

### 3.5 Suggested learning activities

- (1) Practice and sharpen your team skills while participating in various extracurricular activities such as sports, organizing college festivals, organizing blood donation camps, etc.
- (2) Form a team of student volunteers to organize an activity promoting injury prevention and control in your institution. The

team chooses a specific injury prevention objective, sets targets and assigns work to its members. The performance of the team must be reviewed on completion of the assignment.

- (3) Recall the working of a group of which you are currently a member. List the role played by the various members of the group. Share your observations with another member of the group.
- (4) Organize a committee for promoting “safe driving practices” among medical students. Outline the steps you will take to create an effective committee and write a proposal for creating this committee.

### 3.6 Summary

Injury victims require first aid at the scene of an accident to prevent death and disability. The safety of both the patient and the rescue team from traffic, fire, contamination from blood and body fluids, toxic substances, unstable surfaces and structures, and violence must be of prime concern. While extricating the injured, special care should be taken to stabilize the neck and allow minimal movement of spine.

On-site triage of the injured in mass casualty situations is an important strategy to ensure maximum benefit for the greatest number of the injured. Rapid assessment of the individual demographic features, circumstances leading to injury, and clinical condition of the injured allows their categorization into four triage categories. High priority is accorded to patients whose prognosis is critically affected by the available facilities. Triage also helps to decide the level of hospital for transfer of the injured depending on clinical condition.

You must practice important skills used in resuscitation of trauma patients. Measures to establish patent airway must be taken while protecting the cervical spine. The victim’s airway is cleared, and modified jaw-thrust without head tilt technique or the jaw-lift technique is used to open the airway. In case of absent or inadequate breathing, expired air ventilation or ventilation with a bag and mask system must be performed. Lesion-like tension pneumothorax, haemothorax, flail chest, fractured ribs and sucking chest wounds, all of which can seriously affect breathing, should be rapidly diagnosed and treated.

You must examine the carotid pulse. If not palpable, chest compressions should be started immediately. For effective compression, the sternum must be depressed 1.5 to 2 inches or to a depth sufficient to produce a palpable carotid or femoral pulse. The compression rate should be 80 to 100 per minute. If circulation is inadequate, external bleeding, if any, must be controlled. Two large-bore IV lines must be established and fluid must be administered, if possible. The blood loss should be minimized by firm pressure and packing, splintage of fractures and operative procedure.

The patient must be examined for any disability, and neurological status must be assessed. The patient should be undressed completely and the posterior surface of the body should be examined, by “log-rolling” the patient while protecting the spine, to ensure that other injuries have not been missed. Trauma patients can rapidly become cold; hence it is important to maintain optimum body temperature with the help of blankets.

It is necessary to learn how to organize safe transportation of patients. Attention must be paid to communication with the receiving centre, the mode of transport, personnel accompanying patient, stabilization and continuous monitoring of the patient, equipment and drugs required during transportation, and possible complications. While transporting, place the patient in recovery position and immobilize the joints on either side of a fracture.

It is important to learn and practice communication, counseling and advocacy skills. You must pay attention to various factors that affect communication to become an effective communicator, and also master important prevention strategies; the art of breaking bad news; and injury prevention counseling. You should familiarize yourself with the modus operandi for advocacy, which is very vital for the success of injury prevention initiatives.

The characteristics and dynamics of a team, and the skills essential for team-building and providing leadership must be learned. Teamwork is essential in injury prevention and control, as any effort in this direction needs the involvement of a large number of individuals belonging to a wide spectrum of professions.

### 3.7 Check your progress

This section includes five case scenarios related to trauma patients who sustained injuries in different circumstances. The case scenarios are opportunities to review the management of injuries; the injury prevention issues involved; strategies for injury prevention; and the role of the physician in injury prevention. The student must find answers to the following questions:

- What is the mechanism of the injury?
- How would I approach this patient?
- What type of assessment would I perform?
- What would I do first?
- What injury prevention issues are involved in the injury?
- What strategies could be adopted to prevent such injuries?
- What may be my role in the prevention of these injuries?
- What would I plan to communicate/advocate to the patient, family, community, community leaders, government authorities, etc.?

The students must identify what they need to learn about the injuries, and also identify the resources that they are going to use to accomplish that learning. They may take the help of faculty and use books, journals, online resources and other experts for this purpose. This will help them to develop problem-solving skills as well as self-directed learning skills.

#### Case 1

This patient (name: RKS) is a 23-year-old woman who was cooking in her kitchen in the afternoon. She has to cook food sitting on the floor of the kitchen using a kerosene pressure stove. On the day of the incident, she pumped more air into the stove since the flame was feeble. Suddenly, the stove's tank burst, spilling kerosene all over her body. Her synthetic polyester *saree* caught fire immediately. She ran out of the house crying for help. The neighbors doused the fire and applied turmeric and coconut oil on her body. In the process of extinguishing the fire, one of the neighbors (name: PKG) sustained burns to his hands. The patient's husband was called from his workplace; he reached home 90 minutes after the incident. It was then decided to take the patient to hospital.

On arrival at the hospital two-and-a-half hours after sustaining the burns, the patient was found to be in severe pain. Her pulse was 112 per minute and blood pressure 90/50 mmHg. She had sustained second- to third-degree burns over the face, chest, abdomen, upper limbs and legs, involving 45% of her body surface. RKS was admitted to the intensive care unit (ICU) of the burns department. PKG was attended to for first-degree hand burns and was discharged after dressing and prescription for analgesics.

RKS remained in ICU for four days and was then transferred to the burns ward. She remained in hospital for 10 weeks and required skin grafting of burn wounds over two operative sessions. She continued to have areas of post-burn scarring on her face and chest and some degree of restriction of movement of the neck and right elbow.

## Case 2

Two college students (names: SKM and GKG) were returning to their hostel around midnight on a motorbike after attending a birthday party of their friend. They had consumed alcohol at the party. SKM was driving the bike while GKG was the pillion rider. Neither of them wore a helmet. They were traveling at high speed on a straight road and were talking to each other. A truck traveling ahead of the motorbike stopped abruptly. The truck had no backlights. SKM could not stop or control the bike in time. The bike struck the truck and overturned, and both the riders were thrown off it.

Both were rescued by centralized accident and trauma ambulances and rushed to a tertiary care hospital. On arrival at the hospital, SKM was found to be unresponsive; no pulse was palpable; both pupils were dilated and fixed; and respiration was gasping. Despite continued resuscitation for over 30 minutes, he could not be revived. His injuries included multiple fractures of bilateral ribs with left-sided haemothorax, ruptured spleen, fracture of the pelvis and shaft of left femur, and compound fracture of the left tibia.

GKG was disoriented on arrival in the hospital. The pulse was 108 per minute; blood pressure was 98/44 mmHg. His injuries included scalp contusion, left-sided haemothorax, and fracture of the left femur. GKG required emergency chest drainage, blood transfusion, and internal fixation of femur. He was discharged 12 days after the incident. He could resume his college studies after a recuperation period of another six weeks.

### Case 3

A two-year-old boy (SG) presented in cardiopulmonary arrest after being pulled out of a pond surrounding a fountain in a public park. The family, including the mother, father and three children, had gone to the park for a picnic along with family friends. SG gave his parents the slip and wandered away. A search began as soon as his absence was noticed. The boy was found drowned in a pond of half meter deep. He showed no signs of life when pulled out of the water. Attempts were made to drain water from the chest and give mouth-to-mouth respiration. He was then rushed to a nearby hospital in an ambulance.

On arrival at the hospital's accident and emergency ward, the child was comatose; no pulse was palpable; no respiratory effort was noted. Both the pupils were dilated; there was no cardiac activity. The core temperature was 92 degrees Fahrenheit. SG went under cardiopulmonary resuscitation and re-warming, but could not be revived.

### Case 4

A 55-year-old factory worker (MN) was brought to the accident and emergency ward 40 minutes after sustaining a crush injury. MN was working in a cardboard manufacturing facility when his right hand was caught in the heavy-duty press. The hand was disengaged from the press by co-workers. The injured hand was covered with a towel and the patient was rushed to hospital.

MN's right hand had sustained severe crush injury. There were lacerated wounds on both the dorsal and palmar aspect of the hand and fingers, exposing the tendons. There were multiple fractures of the metacarpals and phalanges. Emergency excision of the wound and repair was undertaken. The fractures were stabilized by internal fixation. The little finger required amputation. During convalescence the patient mentioned his poor vision, which was confirmed by refraction and corrected with appropriate glasses. MN required a series of operations over a period of eight weeks. Even after completion of treatment he had moderate restriction of movement in the right hand.

### Case 5

An eight-year-old boy (PCJ) was brought to the accident and emergency ward following a fall from the roof of his home. The boy was flying a kite

alone on the roof. While focused on the kite and moving backwards he fell from the edge of the roof, which had no parapet. He fell from a height of about 12 feet. He was immediately rescued and transported to hospital. He vomited twice on the way to hospital.

PCJ was drowsy when he arrived at the hospital. His oropharynx contained some residual vomitus. His pulse was 100 per minute; blood pressure was 102/66 mmHg. There was a haematoma in the left parietal region of the scalp. The chest on the left side was tender. The air entry was restricted on the left side of the chest. There was deformity in the region of the left ankle. CT scan of the head showed no intracranial lesion. The X-ray of the chest revealed a moderately sized haemothorax. The patient also had fracture dislocation in the region of the left ankle. PCJ went under tube thoracostomy and reduction and stabilization of the ankle injury. He also received antibiotics, analgesics and two units of blood. He was discharged after six days.

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# Annexes

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# Glossary

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**accident:** an undesirable event resulting from carelessness, unawareness, ignorance, or a combination of causes.

**air bags:** safety devices installed in vehicles that inflate to protect the occupants in case of a collision.

**alcohol interlock device:** an electronic breath-testing device connected to the ignition of a vehicle. The driver has to breathe into the device. If the driver's breath alcohol level is above a set limit, the vehicle will not start.

**blood alcohol concentration (BAC):** the amount of alcohol present in the bloodstream, usually denoted in gram per deciliter. A legal BAC limit refers to the maximum legally acceptable amount of alcohol allowed in the bloodstream for a driver on the road.

**central refuges:** areas in the middle of a carriageway where pedestrians can stop and wait until the road is clear before crossing.

**child restraints:** special seat restraint for children, designed according to age and weight, and offering protection in the event of a car crash.

**crash cushions:** energy-absorbing cushions that can be attached to barrier terminals and other sharp-ended roadside objects to provide crash protection on impact.

**crash-protective roadsides:** collapsible or breakaway roadside objects or energy-absorbing "cushions" on barriers and rails that reduce the severity of injury on contact.

**crash-protective vehicles:** vehicles designed and equipped to afford interior and exterior protection to occupants, as well as to road-users who may be hit in the event of a crash.

**disability:** any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being.

**disability-adjusted life year (DALY):** a measure of the burden of disease which reflects the total amount of healthy life lost, to all causes, whether from premature mortality or from some degree of disability during a period of time. These disabilities can be physical or mental.

**disaster:** any occurrence that causes damage, ecological destruction, loss of human lives, or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community area.

**emergency medical services system (EMS):** a system that provides for the arrangement of personnel, facilities and equipment for the effective and coordinated delivery of health-care services in appropriate geographical areas under emergency conditions.

**grade-separated junctions:** junctions or intersections that separate non-motorized road-users from motorized road-users so as to avoid conflicts; for example, footbridges over motorways.

**guard fences and rails:** rigid, semi-rigid or flexible barriers which are situated at the edge of a carriageway to deflect or contain vehicles, or in the central reserve to prevent a vehicle crossing over and crashing into oncoming traffic.

**handicap:** a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfillment of a role that is normal (depending on age, sex and sociocultural factors) for that individual.

**homicide, fatal:** death caused by injuries inflicted by one person with intent to injure/kill another by any means. Homicide is usually considered to be with intent; manslaughter and accidental death refer to less conscious acts.

**ignition interlock function:** a device that prevents the ignition from starting until certain conditions have been met, such as putting on a seatbelt.

**impairment:** any loss or abnormality of psychological, physiological or anatomical structure or function.

**injury:** acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals and ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance. In some cases, injuries result from the sudden lack of essential agents such as oxygen or heat.

**injury control:** the scientific approach to injury that includes analysis, data acquisition, identification of problem injuries in high-risk groups, option analysis and implementing and evaluating countermeasures.

**injury prevention:** efforts to forestall or prevent events that might result in injuries.

**injury rate:** a statistical measure describing the number of injuries expected to occur in a defined number of people (usually 100 000) within a defined period (usually one year), which is used as an expression of the relative risk of different injuries or groups.

**median barrier:** safety barrier positioned in the centre of the road that divides the carriageway, deflects traffic and often has energy-absorbing crash-protective qualities.

**personal flotation device (PFD):** a lifesaving device to help a person float if he/she falls into the water by mistake. PFDs add buoyancy to the body, hold the head and body higher in the water so the victim can see better, and help keep the body warm. Air-filled swimming aids such as inner tubes, water-wings and inflatable rafts are not substitutes for approved PFDs.

**reflectors:** materials that reflect light as an aid to visibility. They may be fitted to non-motorized transport and roadside objects.

**rehabilitation:** services that seek to return a trauma patient to the fullest physical, psychological, social, vocational and educational level of functioning of which he or she is capable, consistent with physiological or anatomical impairments and environmental limitations.

**response time:** the time lapse between when an emergency response is dispatched and when it arrives at the scene of the emergency.

**risk factor:** a characteristic that has been epidemiologically demonstrated to be associated with—although not necessarily the direct cause of—a particular injury. Risk factors can be used for targeting preventive efforts at groups who may be particularly vulnerable to injury.

**road traffic accident:** a collision involving at least one vehicle in motion on a public or private road that results in at least one person being injured or killed.

**road traffic crash:** a collision or incident that may or may not lead to injury, occurring on a public road, and involving at least one moving vehicle.

**road traffic fatality:** a death occurring within 30 days of a road traffic crash.

**rumble strips:** a longitudinal design feature installed on a roadway shoulder near the travel lane. Rumble strips are made of a series of indented or raised elements that alert inattentive drivers through their vibration or sound. They may also be used for speed reduction.

**seatbelt:** vehicle occupant restraint; worn to protect an occupant from injury, ejection or forward movement in the event of a crash or sudden deceleration.

**sexual assault:** includes any manual, genital or oral contact with the victim's genitalia without consent and obtained by force, threat or fraud.

**speed bump:** a device for controlling vehicle speed, usually a raised form placed across a road. It can be permanent or temporary.

**suicide:** death arising from an act inflicted upon oneself with the intent to kill oneself.

**surveillance:** The ongoing systematic collection and analysis of data and the dissemination of information that leads to preventive and control action upon undesirable health-related event.

**transition zones:** road-markings or features forming a gateway that mark the transition from higher-speed to lower-speed roads or parts of roads; for example, rumble strips, speed bumps, visual warnings in the pavement and roundabouts.

**trauma:** an injury (as for example a wound) to living tissue caused by an extrinsic agent.

**trauma-care system:** an organized approach to treating patients with acute injuries; it provides dedicated (available 24 hours a day) personnel, facilities and equipment for effective and coordinated trauma care in specific geographical region.

**trauma centre:** a specialized hospital facility distinguished by the immediate availability of specialized surgeons, physician specialists, anaesthesiologists, nurses, and resuscitation and life support equipment on a 24-hour basis to care for severely injured patients or those at risk for severe injury.

**trauma registry:** a collection of data on patients who receive hospital care for certain types of injuries. Such data are primarily designed to ensure quality trauma care and outcomes in individual institutions and trauma systems, but have the secondary purpose of providing useful data for the surveillance of injury morbidity and mortality.

**trauma team:** a multidisciplinary group of professionals who have been designated to collectively render care for trauma patients in a particular trauma-care system.

**trauma, major:** that subset of injuries affecting the patient with or at risk for the most severe or critical types of injury and therefore requiring a systems approach in order to save life and limb.

**triage:** the process of sorting injured patients on the basis of the actual or perceived degree of injury and assigning them to the most effective and efficient care resources in order to insure optimal care and the best chance of survival.

**violence:** the intentional use of physical force or power, threatened or actual, against oneself, another person, a group or a community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation.

**violence, collective:** violence committed by larger groups of individuals. It can be subdivided into social, political and economic violence. Cross-cutting each of these categories are the four modes in which violence may be inflicted, namely: physical, sexual, psychological and deprivation.

**violence, interpersonal:** violence between individuals; subdivided into "family and intimate partner violence" and "community violence". The former category includes child maltreatment, intimate partner violence,

and elder abuse; community violence is broken down into acquaintance and stranger violence, and includes youth violence, assault by strangers, violence related to property crimes, and violence in workplaces and other institutions.

**violence, self-directed:** violence in which the perpetrator and the victim are the same individual; subdivided into self-abuse and suicide.

**violence, simple:** an attack or attempted attack without a weapon, resulting in minor injury.

**vulnerable road-users:** road-users most at risk in traffic, such as pedestrians, cyclists and public transport passengers. Children, older people and people with disabilities may also be included in this category.

# Annex A

## Burden of injury

**Table 1: Burden of specific injuries in the WHO South-East Asia Region, and their global share (in 2000)**

	Number of deaths in thousands (SEA Region)	Share in global burden	Number of DALYs lost in thousands (SEA Region)	Share in global burden
Road traffic injury	435	35%	14 033	34%
Falls	39	13.8%	5 085	26.0%
Drowning	97	21.6%	2 752	20.7%
Fire-related burns	128	53.8%	5 630	56.4%
Poisoning	82	26.0%	2 399	29.1%
Interpersonal violence	77	14.8%	2 241	13.9%
Self directed injuries	169	20.7%	4 905	25.5%
Collective injuries	63	20.3%	2 210	-

\*In 2000, the total population of countries of the WHO SEA Region was 1536 million, or 25.4% of the global population of 6045 million.

Computed from: *The injury chart book: A graphical overview of the global burden of injuries*. Department of Injuries and Violence Prevention: Noncommunicable Diseases and Mental Health Cluster, Geneva, World Health Organization, 2002.

**Table 2: Prioritization of injury problems among the Member States of the WHO South-East Asia Region (1=highest, 7=lowest)**

	RTI	Burns	Occupational Injury	Poisoning	Drowning	Disaster	Violence & suicides	Falls
Bangladesh	1		2		3	5	4	
Bhutan	1		4		3		5	2
DPR Korea			3		2	1	4	
India	1	3	2	5	6		4	
Indonesia	1			2	3		4	
Maldives	3	4	2		1		5	
Myanmar	1	3	2	5	6		4	
Nepal	1	3	2	5	7		4	6
Sri Lanka	1	5	4	2	2		3	
Thailand	1	5	4		2		3	

Source: *Strategic plan for injury prevention and control in South-East Asia*. New Delhi, WHO, SEARO, 2002.

# Annex B

## ICD-10 (2<sup>nd</sup> Ed, 2004): Classification of injury

### Chapter XIX

Injury, poisoning and certain other consequences of external causes (S00-T98)

*Excludes:* birth trauma (P10-P15), obstetric trauma (O70-O71).

**This chapter contains following blocks:**

S00	-	S09	Injuries to the head		
S10	-	S19	Injuries to the neck		
S20	-	S29	Injuries to the thorax		
S30	-	S39	Injuries to the abdomen, lower back, lumbar spine and pelvis		
S40	-	S49	Injuries to the shoulder and upper arm		
S50	-	S59	Injuries to the elbow and forearm		
S60	-	S69	Injuries to the wrist and hand		
S70	-	S79	Injuries to the hip and thigh		
S80	-	S89	Injuries to the knee and lower leg		
S90	-	S99	Injuries to the ankle and foot		
T00	-	T07	Injuries involving multiple body regions		
T08	-	T14	Injuries to unspecified parts of trunk, limb or body region		
T15	-	T19	Effects of foreign body entering through natural orifice		
T20	-	T32	Burns and corrosions		
		T20	-	T25	Burns and corrosions of external body surface, specified by site
		T26	-	T28	Burns and corrosions confined to eye and internal organs
		T29	-	T32	Burns and corrosions of multiple and unspecified body regions
T33	-	T35	Frostbite		
T36	-	T50	Poisoning by drugs, medicaments and biological substances		
T51	-	T65	Toxic effects of substances chiefly non-medical as to source		
T66	-	T78	Other and unspecified effects of external causes		
T79			Certain early complications of trauma		
T80	-	T88	Complications of surgical and medical care, not elsewhere classified		
T90	-	T98	Sequelae of injuries, of poisoning and of other consequences of external causes		

The chapter uses the S-section for coding different types of injuries related to single-body regions and the T-section to cover injuries to multiple or unspecified body regions as well as poisoning and certain other consequences of external causes.

## Chapter XX

External causes of morbidity and mortality

(V01-Y98)

**This chapter contains following blocks:**

<b>V01-X59</b>	<b>Accidents</b>			
	<b>V01-V99</b>	<b>Transport accidents</b>		
	V01	-	V09	Pedestrian injured in transport accident
	V10	-	V19	Pedal cyclist injured in transport accident
	V20	-	V29	Motorcycle rider injured in transport accident
	V30	-	V39	Occupant of three-wheeled motor vehicle injured in transport accident
	V40	-	V49	Car occupant injured in transport accident
	V50	-	V59	Occupant of pick-up truck or van injured in transport accident
	V60	-	V69	Occupant of heavy transport vehicle injured in transport accident
	V70	-	V79	Bus occupant injured in transport accident
	V80	-	V89	Other land transport accidents
	V90	-	V94	Water transport accidents
	V95	-	V97	Air and space transport accidents
	V98	-	V99	Other and unspecified transport accidents
	<b>W00-X59</b>	<b>Other external causes of accidental injury</b>		
	W00	-	W19	Falls
	W20	-	W49	Exposure to inanimate mechanical forces
	W50	-	W64	Exposure to animate mechanical forces
	W65	-	W74	Accidental drowning and submersion
	W75	-	W84	Other accidental threats to breathing
	W85	-	W99	Exposure to electric current, radiation and extreme ambient air temperature and pressure
	X00	-	X09	Exposure to smoke, fire and flames
	X10	-	X19	Contact with heat and hot substance

	X20	-	X29	Contact with venomous animals and plants
	X30	-	X39	Exposure to forces of nature
	X40	-	X49	Accidental poisoning by and exposure to noxious substance
	X50	-	X57	Overexertion, travel and privation
	X58	-	X59	Accidental exposure to other and unspecified factors
<b>X60-X84</b>	<b>Intentional self-harm</b>			
<b>X85-Y09</b>	<b>Assault</b>			
<b>Y10-Y34</b>	<b>Event of undetermined intent</b>			
<b>Y35-Y36</b>	<b>Legal intervention and operations of war</b>			
<b>Y40-Y84</b>	<b>Complications of medical and surgical care</b>			
	Y40-Y59	Drugs, medicaments and biological substances causing adverse effects in therapeutic use		
	Y60-Y69	Misadventures to patients during surgical and medical care		
	Y70-Y82	Medical devices associated with adverse incidents in diagnostic and therapeutic use		
	Y83-Y84	Surgical and other medical procedures as a cause of abnormal reaction of the patient, or of later complication, without mention of misadventure at the time of procedure		
<b>Y85-Y89</b>	<b>Sequelae of external causes of morbidity and mortality</b>			
<b>Y90-Y98</b>	<b>Supplementary factors related to causes of morbidity and mortality classified elsewhere</b>			

## Place of occurrence code

The following 4<sup>th</sup> character codes are for use with categories W00-Y34 except Y06 (neglect and abandonment) and Y07 (maltreatment syndromes)-to identify place of occurrence of the external cause where relevant.

<b>4<sup>th</sup> Character Code</b>	<b>Place of occurrence</b>
<b>***.0</b>	Home
<b>***.1</b>	Residential institution
<b>***.2</b>	School, other institution and public administrative area
<b>***.3</b>	Sports and athletics area
<b>***.4</b>	Street and highway
<b>***.5</b>	Trade and service area
<b>***.6</b>	Industrial and construction area
<b>***.7</b>	Farm
<b>***.8</b>	Other specified places
<b>***.9</b>	Unspecified place

## Activity code

The following sub-classification is provided for optional use in a supplementary character position with categories V01-Y34 to indicate the activity of the injured person at the time the event occurred. This should not be used instead of the 4<sup>th</sup> character subdivisions but to be added as 5<sup>th</sup> character.

<b>5<sup>th</sup> Character Code (Optional)</b>	<b>Activity of victim at the time of event</b>
<b>***.*0</b>	While engaged in sports activity
<b>***.*1</b>	While engaged in leisure activity
<b>***.*2</b>	While working for income
<b>***.*3</b>	While engaged in other types of work
<b>***.*4</b>	While resting, sleeping, eating or engaging in other vital activities
<b>***.*8</b>	While engaged in other specified activities
<b>***.*9</b>	During unspecified activity

## **Safety promotion audit items**

### **Home safety**

#### ***Structural***

- Double exit
- Safe access to road/street
- Safe interiors (fixtures, wall plaster, paint)
- Safety of doors, windowpanes and cupboards
- Pest safety
- Earthquake-proof construction
- Invulnerability to floods

#### ***Electrical***

- Load-compatible voltage supply and connection
- Safe cables and fixtures

#### ***Household items***

- Safe domestic gadgets and connections
- Safe furniture
- Sharps not within reach of children
- Medicines/pesticides not within reach of children
- Hazardous chemicals and inflammables not stored in house
- Safe toys

#### ***Others***

- Social environment (with reference to domestic violence)
- At least one individual possessing first-aid skills

## **School safety**

### **Structural** (*check all classrooms, laboratories and common facilities*)

- Multiple exits
- Safe access to road
- Safety of stairs, ramps and railings
- “No free access” to roof or hazardous/unprotected areas
- Safe interiors (fixtures, wall plaster, paint)
- Safety of doors, windowpanes and cupboards
- Safe toilets
- Pest safety
- Earthquake-proof construction
- Invulnerability to floods

### **Electrical** (*check all classrooms, laboratories and common facilities*)

- Load-compatible voltage supply and connection
- Safe cables and fixtures

### **Fire protection** (*check all classrooms, laboratories and common facilities*)

- At least one fire extinguisher on every floor
- Fire hose with uninterrupted water supply

### **Transport**

- Safe and supervised embarkation/disembarkation for students
- Safe vehicles in adequate numbers
- Trained drivers and attendants
- Orientation, advice and regulation to avoid risky transportation to school

### **Others**

- Safe furniture (*check all classrooms, laboratories and common facilities*)

- Safe laboratories (including chemicals, inflammables, instruments, sharps, models and furniture)
- Safe play area (including playing surface/fixtures/appliances/toys)
- Safe swimming pool
- Safe kitchen/canteen/passage ways/vending areas (including LPG cylinders, stoves/hazardous cooking areas, sharps and heavy utensils)
- Safe library (including shelves and ladders)
- Optimally facilitated and staffed sick/first-aid room
- Training of teachers in first-aid skills
- Training of senior students in first-aid skills
- Trained, "in-house" disaster management team
- Internal and external communication for emergencies (landline phones, cell phones, public address system)
- "In-house" counseling/conflict resolution/disciplinary body for prevention and control of bullying/harassment/violence among students
- No simultaneous construction activity on inside the premises

## **Workplace safety**

**Structural** (*check all workshops, offices, storage areas and common facilities*)

- Multiple exits
- Safe access to road
- Safety of stairs, ramps and railings
- "No free access" to hazardous/unprotected areas
- Safe interiors (fixtures, wall plaster, paint)
- Safety of doors, windowpanes and cupboards
- Safe toilets
- Pest safety
- Earthquake-safe construction
- Invulnerability to floods

**Electrical** (*check all workshops, offices, storage areas and common facilities*)

- Load-compatible voltage supply and connection
- Safe cables and fixtures
- At least one fire extinguisher in every workshop/office section
- Fire hose with uninterrupted water supply
- Prescribed safety measures for heavy machines and mechanical injuries
- Prescribed safety measures against falls/drowning/burns
- Prescribed safety measures against hazardous chemicals
- Prescribed safety measures against hazardous dusts
- Prescribed safety measures against hazardous lights and radiation
- Prescribed safety measures against hazardous noises
- Pre-placement risk assessment and medical examination
- Observation of “no child labour” norm
- Observation of “gender-sensitive work” norms for female workers

**Transport** (*inside and outside workplace*)

- Safe and supervised embarkation/disembarkation for workers
- Safe vehicles in adequate numbers
- Trained drivers and attendants
- Orientation, advice and regulation to avoid risky transportation to workplace

**Others**

- Safe furniture (*check all workshops, offices, storage areas and common facilities*)
- Safe kitchen/canteen/passage ways (including LPG cylinders, stoves/hazardous cooking areas, sharps and heavy utensils)
- Optimally facilitated and staffed sick/first-aid room
- Training of management staff in first-aid skills

- Training of workers in first-aid skills
- Trained, “in-house” disaster management team
- Internal and external communication for emergencies (landline phones, cell phones, public address system)
- “In-house” counseling/conflict resolution/disciplinary body for prevention and control of harassment/violence among workers
- No simultaneous construction activity inside the premises

# Annex D

## Trauma score

Points	Respiratory rate A	Respiratory effort B	Systolic blood pressure C	Capillary refill D	Glasgow Coma Scale E
5	-	-	-	-	14-15
4	10-24	-	> 90	-	11-13
3	25-35	-	70-90	-	8-10
2	>35	-	50-69	Normal	5-7
1	1-9	Normal	1-49	Delayed	3-4
0	0	Shallow or retractive	-	None	-

**Trauma score = A+B+C+D+E; maximum=16; minimum=01.**

Survival is about: 99% for a score of 16

90% for a score of 12

50% for a score of 8

10% for a score of 4

## Cramps scale

The Circulation, Respiration, Abdomen, Motor, Speech (CRAMS) Scale resulted from an attempt to simplify the trauma score (TS) for field triage use. The CRAMS Scale eliminated eye opening and respiratory effort and added an assessment of thoraco-abdominal trauma. Reliability for the abdominal and thoracic field assessments has not been documented. The scale is, however, successfully applied in many areas.

### The CRAMS Scale

#### *Circulation*

- Normal capillary refill and blood pressure (BP) > 100 2
- Delayed capillary refill or  $85 < BP < 100$  1
- No capillary refill or  $BP < 85$  0

### **Respiration**

- Normal 2
- Abnormal [labored or shallow] 1
- Absent 0

### **Abdomen**

- Abdomen and thorax non-tender 2
- Abdomen or thorax tender 1
- Abdomen rigid or flail chest 0

### **Motor**

- Normal 2
- Responds only to pain [other than decerebrate] 1
- No response [or decerebrate] 0

### **Speech**

- Normal 2
- Confused 1
- No intelligible words 0

---

Score  $\leq 8$  indicates major trauma; score  $\geq 9$  minor trauma.

## **Glasgow Coma Scale (GCS)**

The Glasgow Coma Scale is a widely used index that reliably assesses the degree of coma in patients with cranio-cerebral injuries. The scale can assess brain function, brain damage, and patient progress and is based on three behavioural responses: eye opening, best verbal response, and best motor response. Scores range from 3 to 15, with higher scores indicating increased consciousness. This scale is simple to use and has been correlated with mortality and with the Glasgow Outcome Scale, which measures the level of ultimate brain function. The scale is widely used for pre-hospital triage and for determining the level of consciousness after hospital admission. The scale has been incorporated into the Trauma Score and Revised Trauma Score.

---

## Glasgow Coma Scale

---

### **Eye opening**

- Spontaneous ----- 4
- To voice ----- 3
- To pain ----- 2
- None ----- 1

### **Verbal response**

- Oriented ----- 5
- Confused ----- 4
- Inappropriate words ----- 3
- Incomprehensible sounds ----- 2
- None ----- 1

### **Motor response**

- Obeys commands ----- 6
- Localizes pain ----- 5
- Withdrawal [pain] ----- 4
- Flexion [pain] ----- 3
- Extension [pain] ----- 2
- None ----- 1

---

**Total GCS points [1 + 2 + 3] \_\_\_\_\_**

On the basis of the Glasgow Coma Scale, the head injuries are classified into mild, moderate and severe injuries:

- Mild 13-15
- Moderate 9-12
- Severe 8 or less

## Revised trauma score (RTS)

Glasgow Coma Scale	Systolic blood pressure (mmHg)	Respiratory rate	Coded value
13-15	> 89	10-29	4
09-12	76-89	> 29	3
06-08	50-75	06-09	2
04-05	01-49	01-05	1
03	0	0	0

$RTS = 0.9368 GCS_c + 0.7326 SBP_c + 0.2908 RR_c +$  where the subscript c refers to coded value.

RTS values range from 0 to 7.84. Higher values are associated with better prognoses.

## Injury prevention areas and strategies

Injury prevention areas	Preventive strategies
Alcohol and drug abuse	"Just say no"/educational campaigns, rehabilitation programmes.
Bicycle safety	Use bicycle helmets, proper lighting and reflectors, build more bicycle trails.
Burn prevention	Stove safety, reducing temperature in water-heaters (130 degrees Fahrenheit/55 degrees Celsius or lower), use liquid-crystal thermometer for checking tap water temperature, avoid smoking near bed or upholstery, nonflammable sleepwear, safe storage of matches and lighter, smoke detector, automatic sprinkler systems, fire-escape plan.
Drowning prevention	Learn to swim, never swim alone, supervise young children in bathtubs and all children when swimming; install isolation fences around swimming pools and proper floatation devices for boating.
Fall prevention	Install window and staircase guards in high-rise apartments; correct home hazards related to fall; discourage use of infant walkers; promote physical exercise for elderly.
Gun safety	Avoid keeping guns or keep guns unloaded; store gun in locked cabinets separate from ammunition.
Motor vehicle safety	Avoid alcohol/drug use; observe safe driving speed, no hand-held mobile telephones, car safety-belts, backseat placement of children, child-safety/bucket seats, pedestrians' visibility.
Playground injuries	Use proper height and landing material.
Poison prevention	Display telephone number of poison control centre, child-resistant packing, safely store medicines, cabinet locks.
Suicide prevention	Suicide hotline, counseling.
Violence prevention	Learning non-violent approaches to conflict resolution, empathy training, impulse control, anger management.
Miscellaneous	Learn CPR, use electrical outlet covers.

# Annex F

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## Developing a teaching manual on prevention and control of injury for undergraduate medical education curriculum

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## Intercountry Consultation on "Developing a teaching manual on prevention and control of injury for undergraduate medical education curriculum", Manesar, Haryana, India, 16-18 November 2005

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# Annex H

## Schedule for teaching-learning activities for implementation of teaching module on injury prevention and control (IPC) for 8<sup>th</sup> semester MBBS students. "A pilot project in Medical Schools in India"

Day	2:00 – 3:00 PM	3:00 – 5:00 PM
Day 1	Program introduction Pretest	Definitions Concepts Burden of Injuries Classification
Day 2	Haddon's Matrix 10 basic strategies	Group work: 4 Groups 4 simultaneous sessions on 4 days: <ul style="list-style-type: none"> <li>• CPR-hands on</li> <li>• Extrication, triage, transport</li> <li>• Haddon's Matrix</li> <li>• Classification of injuries</li> </ul>
Day 3	Informatics Safety promotion audit Population-based program Legislation Ethical issues	
Day 4	Road traffic injuries Burn injury	
Day 5	Violence	
Day 6	Drowning Poisoning Animal-related Fall-related injuries Mass trauma and disaster Occupational injury Work safety	Student seminar on earthquake preparedness
Day 7	Communication Counseling Advocacy skills	Student seminar on prevention of injuries during Indian festivals
Day 8	Communication Skill: Role Play	Feedback Post Test

The South-East Asia Region accounts for approximately one third of the global total number of injury-related deaths as well as the total disability-adjusted life years (DALYs) lost to injury. However, injury has long been a neglected public health problem in the Region.

Even though medical professionals have a critical role in treating trauma victims as well as promoting injury-prevention activities, it has been observed that the present medical and nursing curriculum in the Member States does not adequately cover violence and injury prevention. Consequently, several intercountry consultations were held to identify the gap regarding violence and injury prevention education, and the core areas for strengthening injury prevention and control (IPC) in medical and nursing education. Based on these findings, a group of experts prepared this handbook on injury prevention and control for use in undergraduate medical curricula, considering the core competencies required and the learning process needed to achieve the competencies. This handbook also describes the approaches for strengthening communication, counseling, and advocacy skills, which are especially critical for violence and injury prevention.



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SEA-Injuries-15