

Musculoskeletal Trauma Service in Thailand

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Abstract Trauma is becoming a leading cause of death in most of the low-income and middle-income countries worldwide. The growing number of motor vehicles far surpasses the development and upkeep of the road and highway networks, traffic laws, and driver training and licensing. In Thailand, road traffic injuries have become the second leading cause of death and morbidity overall since 1990. The lack of improvement to existing roadways, implementation of traffic safety and ridership laws including seatbelt regulations, and poor emergency medical assistance support systems all contribute to these statistics. An insufficient number and inequitable distribution of healthcare professionals is also a national problem, especially at the district level. Prehospital care of trauma patients remains insufficient and improvements at the national level are suggested.

Introduction

Trauma has become a leading cause of death and disability globally. In 2002, an estimated 1.2 million people were killed and 50 million injured in road traffic crashes worldwide, costing the global community about US\$ 518 billion [1]. Road traffic injuries are predicted to escalate from the

ninth leading cause of disability-adjusted life years lost (1990) to the third by the year 2020 [6]. Ninety percent of the worldwide disability-adjusted life years (DALY) due to road traffic accidents are in developing countries, especially in low-income and middle-income countries [2]. Moreover, whereas rates of injury-related death are falling in most developed countries, they are on the rise in most underdeveloped countries [1]. It has been observed that rapidly increasing motorization is outpacing the development of transportation infrastructure. This is believed to be the primary reason for the increasing numbers and rates of motor vehicle injuries in developing countries. Existing roadways require improvement, traffic safety and ridership laws including seatbelt regulations must be implemented, and the current inadequate emergency medical assistance system needs to be upgraded. The majority of trauma deaths in developing countries occur in the prehospital setting [5].

This article outlines the current situation of musculoskeletal trauma service in Thailand, and what measures have been taken to address the burden of injuries. The problem needs to be solved not only through changes in national policy, but also at a global level.

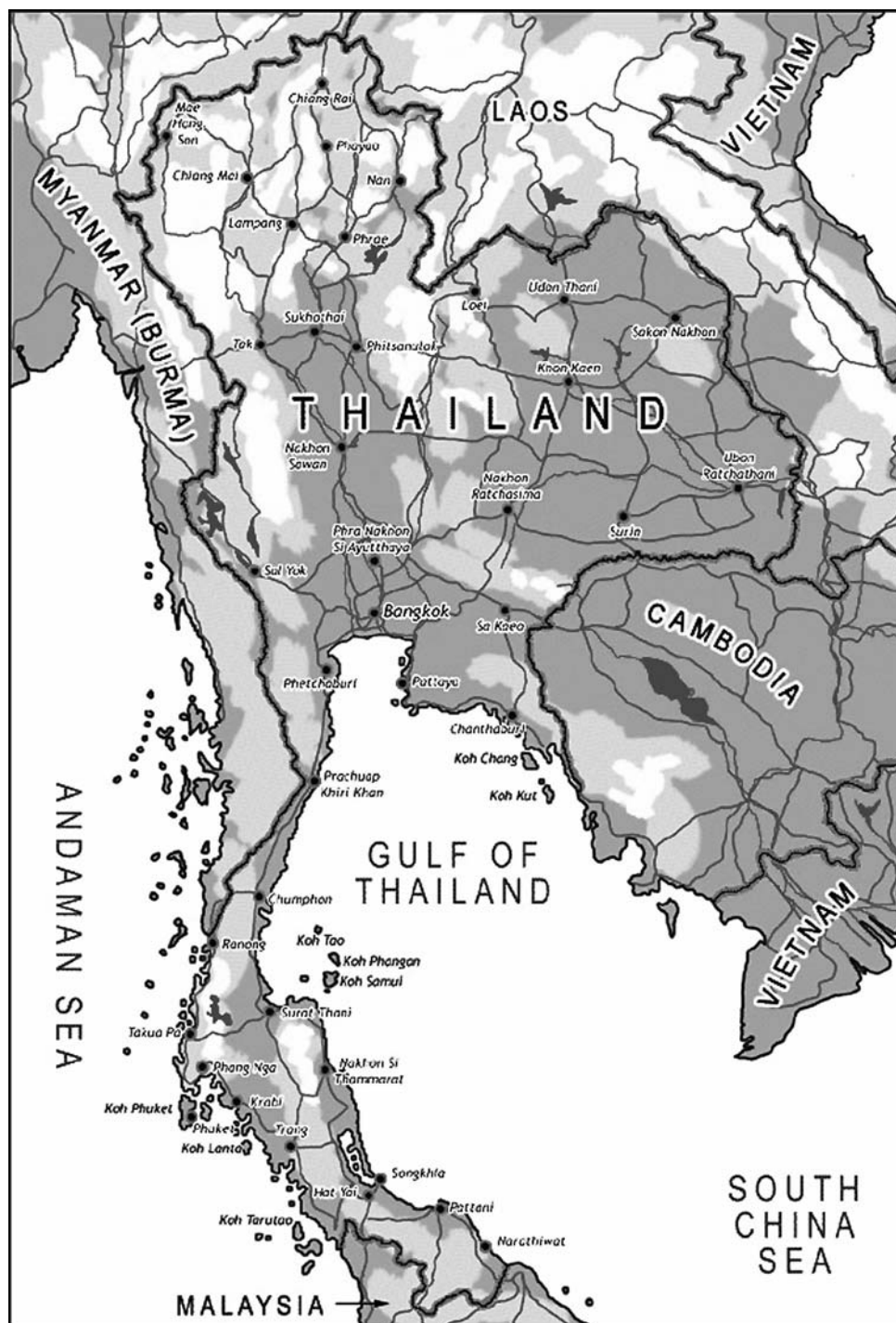
Geographic Overview

Thailand is located in the southern part of Indochina and is bordered by Cambodia, Lao PDR, Malaysia, and Myanmar. The country spreads out over 513,000 km² of land and stretches 1620 km from north to south and 775 km from east to west with a coastline of 861 km along the Indian Ocean and 1840 km on the Gulf of Thailand (Fig. 1) [7]. Thailand is administratively divided into 76 provinces, which are further divided into district, subdistrict, and

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Fig. 1 Thailand is administratively divided into 76 provinces, which are further divided into district, subdistrict, and village. There are various sizes of government hospitals at the different levels administered by the Ministry of Public Health, including urban provincial hospitals, rural community hospitals, and rural health centers. In 2002, there were 94 provincial-level hospitals and there were 728 district hospitals.



village. The population is approximately 64 million, of which approximately 6 million are registered in the capital city of Bangkok.

The living standard in Thailand has improved over the past four decades. In 2002, 9.8% of the population (6.2 million people) was living in poverty, defined as an income of 20,000 bahts (US\$ 500) per household per year, compared to 57% in 1962. Eighty-six percent of the

impoverished live in rural areas, $\frac{2}{3}$ of whom reside in the Northeastern region of the country. In 2002, there were 34,969,600 working people, and 616,000 were unemployed (1.7%). The GDP of Thailand has increased from US\$ 85,345 million in 1990 to US\$ 142,953 million in 2003, with an average annual economic growth of 7% [10].

Thailand is occasionally affected by natural disasters (floods, droughts), most recently the tsunami in December

Table 1. Statistical data of disaster and damage in Thailand, 2001–2004

| Year | Type of disaster | Number of occurrences | Injuries (people) | Fatalities (people) |
|------|------------------|-----------------------|-------------------|---------------------|
| 2001 | Flood | 14 | — | 244 |
| | Storm | 1061 | — | 6 |
| | Earthquake | — | — | — |
| | Fire | 1498 | — | — |
| | Road accident | 17,616 | 53,960 | 11,652 |
| 2002 | Flood | — | — | 216 |
| | Storm | 594 | 11 | 18 |
| | Earthquake | 12 | — | — |
| | Fire | 1135 | 150 | 24 |
| | Road accident | 88,390 | 62,054 | 13,398 |
| 2003 | Flood | 17 | 10 | 53 |
| | Storm | 3213 | 434 | 74 |
| | Earthquake | 1 | — | — |
| | Fire | 2267 | 167 | 56 |
| | Road accident | n/a | 952,238 | 13,290 |
| 2004 | Flood | 6 | 8 | 27 |
| | Storm | 3843 | 63 | 73 |
| | Earthquake | 6 | — | — |
| | Fire | 1712 | 69 | 31 |
| | Road accident | 124,530 | 94,164 | 13,406 |

of 2004. The country has also encountered numerous man-made disasters during the past two decades such as industrial accidents, urban fires, and especially road traffic accidents (Table 1) [7]. These are the undesirable consequences of rapid progress in economic and social development.

Healthcare Resources

As of 2002, there were 18,978 medical doctors (1 per every 3372 people) in Thailand [10]. Of this group, approximately 40% (7504) practiced in Bangkok, with one doctor for 767 persons. The remaining 60% of medical doctors are distributed throughout four regions (Table 2) [10]. The ratio of medical doctors in government hospitals to private hospitals is 4:1.

To cover the healthcare services for 76 provinces, which include 774 districts, 81 subdistricts, and 6397 communities called “tambons,” there are various sizes of government hospitals at different levels. These are administered by the Ministry of Public Health (MoPH) and include urban provincial hospitals, rural community hospitals, and rural health centers. In 2002, there were 728 district hospitals. The district hospital is a 10- to 120-bed facility; most of

Table 2. Number and distribution of medical doctors in Thailand 2002

| Region | Number | Doctor:population |
|--------------|--------|-------------------|
| Bangkok | 7504 | 1:767 |
| Central | 4135 | 1:3566 |
| Northeastern | 2972 | 1:7251 |
| Northern | 2698 | 1:4498 |
| Southern | 1678 | 1:4984 |
| Total | 18,987 | 1:3295 |

them have 30 beds. These cover more than 95% of the total rural districts. There are about 2800 medical doctors working at district hospitals. At the provincial level there are 94 hospitals. Twenty-five of them are designed as regional hospitals, with 500 to 1000 beds. The rest are general hospitals, with 150 to 450 beds. There are 5700 doctors working in the urban provincial and regional hospitals [9, 10]. Apart from the government hospitals of the MoPH, 5.5% of the hospitals belong to other ministries. This includes one large army medical center and 36 military hospitals. There are 977 government hospitals with inpatient facilities. Only 319 private clinics have similar facilities.

Thailand has 12 public medical schools and one private medical school, producing 1400 graduates annually. After graduation from public medical school each medical graduate must work for the public for 3 years. Maldistribution of human resources for health is still a problem. Most health workers are found in the big cities, similar to the situation in developing countries. Several strategies have been implemented to improve the distribution of doctors. These include: compulsory service at a district hospital for 3 years, the recruiting of medical students from villages to return and serve in the village after graduation, financial incentives for doctors working in district hospitals without private practice, and the improvement of available resources including paramedics, drugs and equipment, supplies, housing, transportation and communications. Most of the rural district hospitals are now very well-equipped and supported by adequately trained staff [9].

Those seeking specialization after the 3 years of public work must enter a residency training program. The Thai Medical Council started its specialty or residency training program in 1971. The training period varies from 3 to 5 years, depending upon the specialty chosen [9]. There are now 42 specialty boards approved by the Medical Council of Thailand, and approximately 1160 specialists are trained per year. Resident trainees are required to participate in rural public service for at least 1 year, except for selected specialties such as general practice, pathology, forensic medicine, and psychiatry [9].

Orthopaedic Training

Orthopaedic residency training in Thailand begins with 1 year of general surgery, which is followed by 3 years of orthopaedics. Residents are exposed to various orthopaedic specialties: trauma (40%), hand (15%), pediatric (15%), spine (10%), sports medicine (5%), hip and knee reconstruction (5%), tumors (5%), and metabolic disease (5%). Residents must conduct at least one research project with faculty supervision, and a completed manuscript is required for the student to be eligible for board examination. These activities are supervised by the Royal College of Orthopaedic Surgeons, as designated by the Medical Council of Thailand.

There are currently 12 institutions certified for orthopaedic training, and 75 orthopaedic trainees passed the board examination in 2007. The total number of orthopaedic surgeons who still actively work in the field is approximately 1350, a ratio of one orthopaedist per 47,400 inhabitants.

Road Traffic Accidents in Thailand

Since 1990, trauma has become the second leading cause of death (heart disease is first) in Thailand, and road traffic crashes have resulted in the most frequent injuries [3]. Approximately 66,300 people died in road traffic crashes from 2002 to 2006, an average of 13,260 deaths per year (equivalent to 24/100,000 population) (Fig. 2). Some 5 million people were injured, and several hundreds of thousands of those injured have become permanently disabled. The economic

loss resulting from traffic accidents was estimated at 200,000 million Bahts (approximately US\$ 5 billion), roughly 3.1% of the country's gross national product [8].

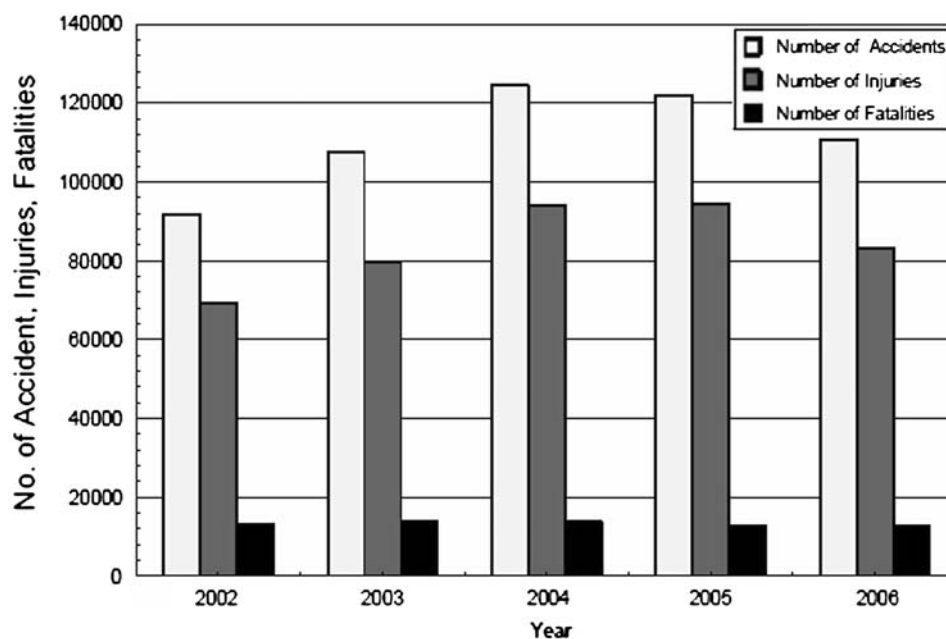
The rate of accidental deaths peaks between the ages of 15 and 34, with a male to female ratio of 4:1 [4]. Many factors contribute to the rising traffic fatality rates in Thailand. Urbanization and economic growth have been accompanied by rapid motorization, however road infrastructure and traffic safety have not developed as quickly. Those most likely to be injured include pedestrians, and bicyclists or motorcyclists. Motorcycle crashes account for a large majority (72%) of hospital admissions due to traffic injuries [4].

Prehospital Care

Emergency medical services (EMS) are available 24 hours a day even in most regional or provincial hospitals. Pre-hospital transport is usually by ambulance, although a select few university hospitals and some military hospitals can accept helicopter transport. Decisions regarding triage for life-threatening (neurological, vascular, orthopaedic) injuries are made at an EMS radio control room located at the provincial health office, police station, or provincial hospital depending upon the requirements of each province.

There are also emergency transport services provided by several nongovernmental organizations and private hospitals, each maintaining its own workforce and emergency vehicles. The foundations' emergency vehicles are normally operated by teams of two or three men. These transport vehicles are modified pickup trucks; a covered cabin is

Fig. 2 This graph shows the increase in incidence and injuries, but not mortality, of road traffic accidents in Thailand from 2002 to 2006.



placed over the bed in the rear of the truck. Space is constrained, and standard equipment includes a stretcher, homemade spinal board, and splints for arms and legs. Cervical collars, first-aid kits, gloves, and bag-mouth apparatus are not uniformly provided. When an emergency message is received, these volunteers will hasten to traffic crash sites and transport injured persons to public or private hospitals.

To enhance the quality of treatment in the field, the Ministry of Public Health has mandated that professionals working with the rescue foundations must be trained in Basic Life Support (BLS), while hospital-based EMS units are required to be certified in Advanced Life Support (ALS). From a practical standpoint, most rural district hospital ambulances rarely give ALS to road traffic accident victims. They are most often utilized for interhospital patient transportation.

Hospital Care

In higher-level health facilities, such as regional hospitals or teaching institutions, the initial management of traumatic injuries is provided by general surgeons or by the emergency room staff. Trauma staff must be available onsite during normal working hours (8:30 a.m. to 4:30 p.m.), after which in-house coverage is available only in some provincial hospitals.

In the 12 teaching institutions, residents remain in-house 24 hours a day and have initial responsibility for the care of the injured patients at all times. Injured patients are initially assessed, and resuscitated if necessary, by a junior resident in the accident/emergency room. The accident or emergency room is equipped for a variety of interventions including CPR, intubation, chest tube insertion, etc. Basic investigations (complete blood count, serum electrolytes, blood gas analysis) and plain radiographs are available at all times. More advanced imaging techniques (CT, MRI) are available in selected medical centers. The operating room is available for emergency cases 24 hours a day, but is mostly utilized for elective cases during official hours. The trauma team includes general surgeons, neurosurgeons, orthopaedic surgeons, and anesthesiologists, along with their residents.

For the provincial hospitals, which have no residents in training, trauma treatment is first provided by a general surgeon. Specialty consultation is then the responsibility of staff from each specialty. For patients with multiple injuries, treatment follows the priorities of the condition, decided mainly by the trauma surgeon with discussion among other specialties as required.

At the district hospitals, trauma patients are treated for less severe conditions, such as common fractures and dislocations, which can be adequately treated by general physicians. For severely injured or polytrauma patients at

small district hospitals, primary care or basic life support is provided prior to the transfer to the provincial hospital. In some larger district hospitals, in which there is a trained general surgeon, noncomplex emergency surgery is performed for life-threatening conditions, as well as other procedures including débridement of simple open fractures. Referral to the specialist at provincial or regional medical center is usually needed for further definitive treatment. This is accomplished after the patient's condition is stabilized.

Discussion

Despite substantial improvements in the economy and in the delivery of health services over the past decades, the burden of injuries is increasing in Thailand, and our country still faces a major shortage (and maldistribution) of healthcare workers such as doctors and paramedics. Although the government has implemented many strategies to address these challenges, much work remains if we are to adequately staff our health facilities, especially in the more rural communities. Road traffic crashes have been a major contributor to the burden of trauma, alongside an exponential increase in the number of drivers from all sectors, including agricultural, industrial, and academic. Travel has become a very common activity nationwide. These factors and others have been associated with an increase in the incidence of road traffic injuries, especially where road infrastructure is poorly developed. Injuries may occur anywhere, and care for the injured is often compromised due to deficiencies of healthcare resources (human), especially in district areas. For musculoskeletal trauma, appropriate treatment requires a knowledge base and set of skills that are typically beyond the capacity of the district hospitals, which are staffed by young, inexperienced doctors. Many serious conditions require timely treatments to save lives and minimize morbidity; rapid evacuation and transportation of the victims from the scene to an appropriate facility is crucial. This requires effective communication and rapid and safe transportation by well-trained staff with adequately equipped vehicles.

A host of issues must be addressed if we are to decrease the burden of musculoskeletal trauma including road traffic accidents in Thailand. First, advocates must raise the profile of this problem at the national level. Laws that modify or regulate driver behavior will help. Laws creating and governing road infrastructure must be improved nationwide. Second, the Ministry of Public Health must increase allocation of healthcare resources to address deficiencies in the number and distribution of trained health providers, and to enhance the number and quality of health facilities where they work. Improving the prehospital care will also be essential, including the function of the Emergency

Medical Services, the referral mechanism to higher-level facilities, and the avenues for effective communication between healthcare facilities. Third, at the hospital level, the knowledge and skills required to evaluate and treat the trauma patient should be improved by continuing medical education. Improvements in infrastructure and equipment/supplies must also be considered at the facility level. Fourth, medical school curricula should adequately address the management of the trauma patient at the level of the district hospital, as the new graduates will be charged with staffing such facilities for 3 years following graduation.

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