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## The burden of injuries at the Jigme Dorji Wangchuck National Referral Hospital in Thimphu, Bhutan

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## ABSTRACT

A review of the surgical admission, operating room records, and emergency room consultations for the 2006 was undertaken with the objective of assessing the injury burden at the Jigme Dorji Wangchuck National Referral Hospital in Thimphu. The study revealed that trauma accounted for 20% of all surgical admissions in 2006, out of which the Orthopedic department bore the major chunk of trauma admissions at 61%. Trauma was responsible for more than 5000 disability-adjusted life years lost (DALYs) in 2006. On an average, 2 out of 3 orthopedic procedures were performed for trauma-related conditions. It is hoped that this study will stimulate the local practitioners and policy makers to initiate further studies to build up standardized database on injury burden in Bhutan to facilitate evidence-based decisions by the stakeholders.

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### 1. Introduction

Injuries are increasingly recognized as a major cause of death and disability in developing countries.<sup>1–5</sup> Road traffic crashes account for nearly one quarter of those,<sup>5,6</sup> yet there has been little research done on prevention in such environments.<sup>7–9</sup> Economic development is associated with improvements in infrastructure and an increase in the number of motorized vehicles that often outpaces the capacity to manage trauma victims. In some poorer countries there is a justified concern that this situation may overwhelm otherwise scarce health care resources. The purpose of this paper is to review the impact and some of the epidemiology of injuries at the Jigme Dorji Wangchuck National Referral Hospital (JDWRH) in the capital of Bhutan, Thimphu. Such information has been used elsewhere in developing countries to assist in planning how to address this injury epidemic.<sup>8,10,11</sup>

The kingdom of Bhutan is a small landlocked country in the heart of the Himalayas. The 2005 census estimated the population at around 673,000, up from 600,000 in 1990 and 657,000 in 2000.<sup>12</sup> A third of the population is younger than 15 years. Approximately 100,000 people live in the capital, Thimphu, while most of the rest live scattered among the 19 other dzongkhags (districts), in mostly

rural settlements that are difficult of access because of the mountainous terrain. Life expectancy at birth is 66 years, literacy rate is 60% and gross national income per capita is around \$1235. Every aspect of personal and societal life is highly influenced by lamaistic Buddhism, and Bhutanese are proud of their national state of happiness: 96.7% of them consider themselves happy or very happy, the highest in the world. Access to health care is free, and most but not all dzongkhags have the equivalent of a district hospital. There is no School of Medicine, so all physicians are trained outside the country, leading to a chronic shortage of generalists and specialists alike.<sup>13</sup> When resources to manage certain medical conditions are not available in-country, the government will pay for care in neighboring countries such as India or Thailand.

The JDWRH in Thimphu was built in 1972 as a general hospital and upgraded in 1994 as a national referral hospital. Until recently, it was the only site providing orthopedic surgical care, thus draining cases from the entire country. CT-imaging and MRI facilities were inaugurated in 2006. A newer, more modern hospital is now completed and operational on the same grounds. In 2009, bed capacity was at 213: medical 32, pediatrics 33, ob-gyn 41, general surgery 32, orthopedics 31, ENT and ophthalmology 19, intensive care unit (ICU) and cabin (private) 13 and psychiatry 12. The hospital is also where the nascent injury surveillance system is located, which collects, classifies and analyses data from the ministry of health (MoH), the ministry of transport, all other regional hospitals, and the police.

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**Table 1**  
2006 JDWNRH surgical admissions.

	Trauma (% trauma adm)	Non-trauma	Total (% total adm)	Deaths
ICU	30 (4%)	109	139 (3.7%)	11
Cabin	24 (3.2%)	238	262 (7%)	0
ENT	34 (4.7%)	653	687 (18.2%)	0
EYE	32 (4.6%)	330	362 (9.6%)	0
General	167 (23.5%)	1393	1560 (41.4%)	4
Ortho	446 (61%)	317	763 (20.1%)	3
Total	733 (100%)	3040	3773	18 (0.48%)

**Table 2**  
2006 caseload, JDWNRH emergency dept.

	Trauma	Non-trauma	Total
Observation	344 (3.8%)	8538	8882
Discharged	4243 (11.8%)	31,976	36,219
Total	4587	40,514	45,101

**2. Methods**

The admission records and log books of all surgical wards, the ICU and the private section (cabins) were reviewed for year 2006, as were the records and log books of the emergency room (casualty, ER). All patients were divided according to whether their condition was trauma-related or not. For those whose condition was trauma-related, data was collected on age, sex and mechanism of injury. The orthopedic ward logbook provided accurate data for age, sex, diagnosis, treatment, length of hospital stay and condition at discharge for every admitted patient. The orthopedic operating room (OR) records were also reviewed from year 1999 through year 2008 and data collected on the number of orthopedic cases and the number of trauma-related cases. These records reflect accurately the patient's name, age, sex, diagnosis, procedure and type of anesthesia for any and all cases done in the OR. Data from the wards were cross-referenced with the OR data.

An attempt was made to calculate the burden of injuries measured in Disability-Adjusted Life Years (DALY) using the methods described in the Global Burden of Disease study.<sup>6</sup> Age, sex and diagnosis were available for all patients. DALYs were calculated by adding the years of life lost (YLLs) for all 18 deaths and the years lived with disability (YLDs) for all 733 patients admitted for trauma, using the age-weighted life tables at 3% discounting, and the disability weights provided in the GBD study. This was possible only for admitted patients, as the ER records were not precise enough in their diagnoses. Finally, data were collected again for the first 6 months of 2009 for all orthopedic admissions.

**3. Results**

There were a total of 3773 surgical admissions and 45,101 ER visits in 2006. Of the admissions, 733 (20%) were for trauma-related conditions as shown in Table 1, which is stratified by ward. The orthopedic ward accounted for 20% of all admissions, but 61% of all trauma admission. Of all orthopedic admissions, 59% were for

**Table 3**  
2006 mechanism of injury.

	% Recorded cases	RTA	Fall	Hit by object	Assault	Burn	Other (bites, blasts)	% Un-recorded cases
ICU	10/30 33%	5	2	0	1	0	2	66%
Cabin	9/24 39%	4	3	0	0	2	0	61%
ENT	25/34 74%	16	2	2	5	0	0	26%
EYE	8/32 25%	3	0	4	1	0	0	75%
General	156/167 94%	66	31	4	19	28	8	6%
Ortho	263/446 59%	54	160	35	0	5	9	41%
Sub-total	471/733 65%	148	198	45	26	35	19	35%
		32%	43%	10%	5%	7%	3%	
Casualty	299/344 87%	136	118	12	9	2	22	13%
Total	770/1077 72%	284	316	57	35	37	41	28%
		37%	41%	8%	4%	5%	5%	

**Table 4**  
Burden of injuries by ward – 2006.

	Patients	DALYs
ICU	30	357
Cabins	24	79
ENT	34	144
EYE	32	316
General surgery	167	1557
Orthopedics	446	2708
Total	733	5161

trauma. There were a total of 18 deaths for an overall hospital mortality rate of 0.48%. Mortality from the ER was not included. All patients died from severe trauma, but no autopsy was performed and the exact causes of death are unknown. Of the 18 deaths, 11 occurred in the ICU, most of them from head injuries. In the ER, 8882 (20%) patients were kept for observation and 36,219 (80%) released after treatment. Approximately one in five patients kept for observation had been referred from another health care facility. Only 3.8% of those kept for observation had a trauma-related condition, whereas this was 11.8% for those released after treatment, as shown in Table 2. The mechanism of injury was unevenly recorded by different ward, as high as 94% of cases in the general surgery ward and as low as 25% of cases in the EYE ward, with an average of 72% for the entire hospital, as seen in Table 3. For those patients whose mechanism of injury was recorded, falls were the highest contributor followed closely by road traffic injuries, not unexpected in this mountainous country where there are so few cars in the capital that there are no traffic lights. Together they combine for nearly 80% of all injuries.

DALY calculations were made for every admitted trauma patient on each ward, and results are shown in Table 4. The average DALY per patient is higher for general surgery (9.4) than on orthopedics (6.1), as would be expected. Since there are no data on outcomes, it was not possible to calculate DALYs averted by treatment.

The review of the orthopedic OR records from 1999 to 2008 showed a steady increase in the number of total surgeries, from 597 to 926 (+55%), and of total trauma surgeries, from 395 to 729 (+85%). On average, 2 out of 3 orthopedic procedures were performed for trauma-related conditions, as shown in Table 5.

Table 6 shows that for the first 6 months of 2009, there were 413 orthopedic admissions, of which 301 (73%) were for trauma. On an annualized basis this represents a 2.8% increase in total admissions, but a 11.6% increase in trauma-related admissions compared to 2006. Table 7 shows the distribution of orthopedic injuries by site, with an attempt at DALY calculation, using the same methods as in 2006. If the 2009 trend holds true for the last 6 months, the annualized increase in trauma-related DALYs will be 11.4%.

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