

MISSED INJURIES IN TRAUMA FROM HOSPITAL UNIVERSITI SAINS MALAYSIA EXPERIENCE

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INTRODUCTION

- This study is conducted to determine the incidence rate, evaluate the risk factors and missed injuries description after initial assessment in red zone ED Hospital Universiti Sains Malaysia (Hospital USM).

MATERIALS & METHODS

- Hospital records of 485 patients presented to red zone over June 2016 to May 2017 were retrospectively reviewed
- Missed injuries were defined as any new injury identified after disposition from ED to a period before hospital discharge; injuries reported from formal radiological reports; injuries found after surgical exploration
- Clinically significant missed injury is an injury that require operative treatment and injury with Abbreviated Injury Scale (AIS) ≥ 3 .

RESULTS

- 135 missed injuries were discovered in 94 patients with a prevalence of 19.4% and incidence rate of 2.75/100 person-hours
- Common involved body regions were the face (35%), upper & lower extremities (20%), head (11%), thorax & abdomen (10% each), spine (9%)
- 46 injuries were clinically significant, but majority missed injuries (81%) were treated conservatively
- Multiple logistic regression showed ISS, blood transfusion within 24 hours and length of stay in ED were significantly associated with missed injuries.

DISCUSSION

- Prevalence and incidence rate of missed injury in Hospital USM is relatively high for a retrospective study.
- Strategies to reduce missed injury include implementation of tertiary trauma survey in a high risk patients after ED disposition, have sufficient training to the latest ATLS protocol and to get early radiological input in imaging interpretation.

Table 1: Distribution of demographics and injury-related characteristics among patient without & with missed injuries

	Without Missed Injuries N = 391		With Missed Injuries N = 94		P value
	Mean (SD)	n (%)	Mean (SD)	n (%)	
(A) Patient-related factors					
Age (year)	32.55 (18.89)		29.12 (16.85)		0.085 ^a
Gender					
Male		327 (83.6)		76 (80.9)	0.518 ^b
Female		64 (16.4)		18 (19.1)	
Intubation status					
Yes		129 (33.0)		45 (47.9)	0.007 ^b
No		262 (67.0)		49 (52.1)	
Glasgow Coma Scale (GCS)	11.79 (3.69)		10.79 (4.13)		0.033 ^a
Mechanism of Injury					
Motor vehicle accident		323 (82.6)		85 (90.4)	0.302 ^c
Fall		23 (5.9)		2 (2.1)	
Pedestrians		14 (3.6)		4 (4.3)	
Assaulted		15 (3.8)		2 (2.1)	
Others		16 (4.1)		1 (1.1)	
Injury Severity Score (ISS)	15.51 (8.60)		20.21 (9.05)		<0.001 ^a
Blood transfusion within first 24 hours					
Yes		104 (26.6)		42 (44.7)	0.001 ^b
No		287 (73.4)		52 (55.3)	
Systolic blood pressure on arrival (mmHg)					
≤ 90		20 (5.1)		4 (4.3)	>0.999 ^c
> 90		371 (94.9)		90 (95.7)	
Surgical Intervention from ED within 6 hours					
Yes		63 (16.1)		14 (14.9)	0.772 ^b
No		328 (83.9)		80 (85.1)	
(B) Circumstantial factors					
Length of stay in ED (hours)	6.80 (4.03)		8.14 (4.79)		0.013 ^a
Day of arrival					
Weekdays		260 (66.5)		59 (62.8)	0.494 ^b
Weekend/ Public holidays		131 (33.5)		35 (37.2)	
Time of arrival					
Morning		74 (18.9)		16 (17.0)	0.137 ^b
Evening		144 (36.8)		26 (27.7)	
Night		173 (44.2)		52 (55.3)	
Primary disposition					
Intensive care unit		69 (17.6)		32 (34.0)	0.002 ^b
General ward		316 (80.8)		60 (63.8)	
Mortuary		6 (1.5)		2 (2.1)	
(C) Medical outcomes					
In-hospital mortality		32 (8.2)		5 (5.3)	0.347 ^b
Yes		359 (91.8)		89 (94.7)	
No					
Length of hospital stay (day)	10.30 (17.76)		12.85 (11.82)		0.187 ^a

a Student's t test, b Pearson's Chi-Square test, c Fischer's Exact test

Table 3
Location and severity of missed injuries based on AIS

AIS Body Region	AIS 1	AIS 2	AIS 3	AIS 4	AIS 5	Total
Head	0	7	6	1	1	15
Face	17	31	0	0	0	48
Neck	1	0	0	0	0	1
Thorax	2	6	6	0	0	14
Abdomen	0	13	1	0	0	14
Spine	4	4	4	1	0	13
Upper extremity	6	8	0	0	0	14
Lower extremity	0	13	0	0	0	13
External	3	0	0	0	0	3
Total	33	82	17	2	1	135

Fig. 1 Treatment of missed injuries

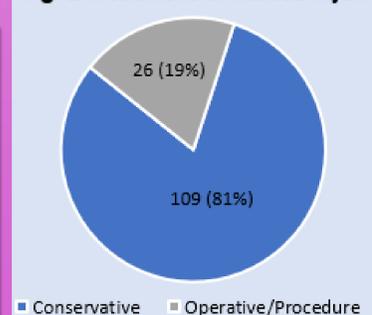


Fig.2 Method of detection of missed injuries

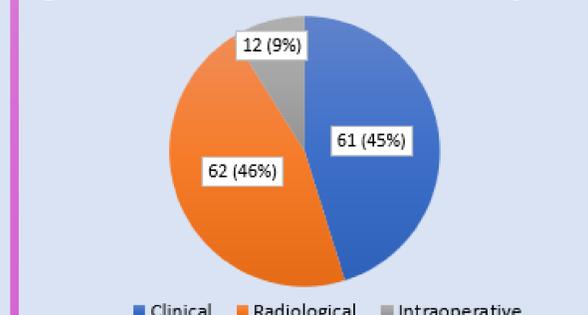


Table 4 Location, numbers & descriptions of missed injuries

AIS Location	Injuries	n	Median AIS score	Median day of detection	Suspicion lead to detection	Treatment
Head	Skull fracture	6	2	1	5 by radiological	Conservative
	Intracerebral hematoma (SAH, SDH, EDH, contusion)	7	3	1	1 by intraoperative	Conservative
	Brainstem bleed	1	5	1	All by radiological	Conservative
	Intraventricular haemorrhage	1	2	1	Radiological	Conservative
Face	Maxillofacial fractures	24	2	2	16 by radiological	22 conservatives
	Eye injury	5	1	2	8 by clinical	2 operatives
Neck	Cranial nerves injury	19	2	3	All by clinical	4 conservatives
	Hyoid & thyroid cartilage fracture	1	1	11	Radiological	1 operative
	Lung contusions	6	2	1	All by radiological	All conservatives
	Pneumothorax and or hemothorax	5	2	1	All by radiological	All conservatives
Abdomen	Rib fracture	3	1	1	All by radiological	All conservatives
	Liver injury	3	2	1	2 by radiological	All conservatives
Spine	Spleen injury	3	2	1	1 by clinical	All conservatives
	Pancreatic injury	1	2	1	All by radiological	Conservative
	Kidney injury	2	3	1.5	Radiological	Conservative
	Mesenteric injury	2	2	1.5	All by radiological	All operatives
	Small bowel injury	3	2	1	All by intraoperative	All operatives
	Cervical fracture	5	1	1	All by radiological	All conservatives
	Thoracolumbar fracture	1	1	1	Radiological	Conservative
Upper Extremity	Spinal cord injury	2	4	9.5	All by clinical	All conservatives
	Brachial plexus injury	5	3	16	All by clinical	All conservatives
	Clavicle fracture	1	2	3	All by clinical	Conservative
	Scapula fracture	2	2	1.5	1 by radiological	All conservatives
	Humerus fracture	1	2	4	1 by clinical	Operative
	Elbow dislocation	1	1	11	Clinical	Procedure
	Radius fracture	3	2	4	All by clinical	2 operatives
Lower Extremity	Metacarpal and phalangeal bone fracture	4	1	3	All by clinical	1 conservative
	Tendon cut	2	1	1	2 conservatives	2 operatives
	Pelvic fracture	3	2	1	All by clinical	All operatives
	Patella fracture	2	2	2	1 by clinical	All operatives
External	Tibia fracture	2	2	2	1 by intraoperative	1 operative
	Cruciate ligament and meniscus injury	5	2	4	All by clinical	1 conservative
	Malleolus fracture	1	2	1	3 by intraoperative	4 operatives
External	Scrotal hematoma	3	1	4	2 by clinical	1 conservative
Total		135				

AIS, Abbreviated injury scale; SAH, subarachnoid hemorrhage; SDH, subdural hemorrhage; EDH, extradural hemorrhage; n, number of missed injuries

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