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Application of Injury Scaling in Assessing Variation of Injury Cost in MVA Insurance Claim

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ABSTRACT

Background: There is no standard and clear guideline on how to determine the amount of injury claimed by road crash victims leading to very big variation in injury cost paid by insurance companies. The amount varies from case to case even though it is involved same body part. **Objective:** The objective of the study is to profile the cost third party bodily injury claim according to the science of injury scaling assessment. **Results:** Male encountered the highest study population for both first and third party category with 71.7% and 73.4% respectively. The injured victims mainly motorcyclist (82.3%) where lower limb is the most injured region (57%) with the highest injury cost (RM1,197,329). AIS 1 was the most injury severity level suffered by the victims followed by AIS 2. The median cost of AIS 2 for spine injury was the highest with RM28,750 (interquartile range RM18,125 – RM39,375) compared to other body region. In term of thorax region, median cost of AIS 2 for thorax region was RM8500 (interquartile range RM8250 – RM8750) which was found higher than median cost of AIS 3 (RM2700 (IQR RM2675 – RM6025)) in the same body region. There was variation of injury cost within the same injury severity. Extreme values of injury cost ware identified at the same injury severity as reflected by ISS 0, ISS 1, ISS 5, ISS 9 and ISS 10. **Conclusion:** By assessing the injury claim using AIS, found that the cost was varies within the same injury level where some data could have extreme value. This finding could help insurance company to investigate and identified their over or underestimation of their compensation claim.

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INTRODUCTION

There is no standard and clear guideline on how to determine the amount of injury claimed by road crash victims leading to very big variation in injury cost paid by insurance companies. The amount varies from case to case even though it is involved same body part.

Issues of fraud claims cannot be certainly rule out and it is a great concern in insurance industry. According to Abrahamse and Stephen (1999) when insurance companies pay compensation from nonexistent injuries, the costs are inevitably reflected in higher insurance bills for everyone. In Malaysia, in year of 1999 alone, general insurers paid RM1.67 billion or an average of RM4.6 million a day on motor claims (Abdul Kareem , 2003). Parts from false claim, the big variation in amount of genuine claims are also contributed to the large amount paid by the industries. As the current process is very complex and flexible, it is depend on lawyer to justify and defend the amount claimed. The level of injury severity is poorly understood in any insurance claim case. There is a need to understand how injury cost paid vary by injury severity and body part injury before any guideline can be introduced to minimize such variation.

The Abbreviated Injury Scale (AIS) is an anatomically-based, consensus-derived global severity scoring system that classifies each injury by body region according to its relative importance on a 6-point ordinal scale with a post decimal place representing score of severity. The description for each AIS code is contained in the AIS dictionary where the injury severity ranges from 1 (minimal) to 6 (maximal) (Lesko *et al*., 2010). As known, AIS was widely used in automotive and biomechanical research to map a series of anatomically-defined injury descriptions by several parameters such as energy dissipation, threat to life, permanent impairment, treatment period, and incidence.

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Study on the injury compensation claim using insurance database has been widely done such as pattern of excessing injury claim (Abrahamse and Stephen, 1999), fraud and bias claim (Doerpinghaus *et al*., 2003) and forecasting injury compensation (Ayuso *et al*., 2008). However, little research found on the application of AIS in motor vehicle accident insurance claim especially in Malaysia as none of them using AIS for evaluating injury for injury compensation. Nonetheless, the validation of the application and benefit of AIS usage in insurance claim specifically in bodily injury was still under review. Our study's aim is to profile the injury cost paid by insurance industry according to injury severity and body part injured.

Methodology:

The source of study data was from the Third Party Bodily Injury (TPBI) insurance claims database of one of insurance company in Malaysia that involved third party bodily injured. The dataset use for the study was for the year 2012.. The inclusion criteria for the study were closed cases, involving private car, and non-fatal cases. Out of 803cases in 2012, 565 met our criteria and eligible for the study. Then, we applied random sampling technique to select 192 cases of 565 eligible samples. The injury details were retrieved from all selected records and the injury severity was assessed using AIS (AIS; 2005 revision, updated 2008). The Injury Severity Score (ISS) was then calculated for each victim.

The data obtained were analysed using SPSS, version 17. Data were presented in term of demographics, pre-crash factors, injury severity and the cost of the injury. In addition, analysis of variance was conducted to identify the difference in cost at different body region with the same AIS level. To investigate the variation of cost within same injury level, the individual cost of each injury type in each case were identified. A total of 300 injuries were identified to have individual cost in the study data and were used in the analyses phase.

RESULT AND DISCUSSION

Demographic profile:

Study group comprised 192 data of TPBI cases from the TPBI insurance claim database which contained information of the insured person (173 personal) and victims (the claimant, 192 personal). Victim in this study is referring to the injured person known as third party (the claimant) while the insured person is the first party. Table 1 shows the demographic characteristic for first party and third party. Of 173 first party, 112 (71.7%) were male where most of the first party involved age range from 21-30 years (32.3%) as the driver.

Similarly for third party, male was predominant with 73.4% out of 194. However, the dominant age group for this category was among younger age group between 11 to 20 years old (31.8%) followed by age range 21-30 (29.2%).

Table 1: Demographic characteristic for first party and third party.

Victims variables	Frequency	%	Frequency	%
	(first party, N=173)		(third party, N=192)	
Gender	(N=170)*		(N=191)*	
Male	112	71.7	141	73.4
Female	58	33.5	50	26.0
Age group (years)	(N=168)*		(N=192)	
0-10	-	-	10	5.2
11 - 20	12	6.9	61	31.8
21-30	62	35.8	56	29.2
31-40	51	29.5	23	12.0
41-50	18	10.4	19	9.9
>50	25	14.5	23	12.0
*Frequency do not add to total due to missing data				

Road user profile:

Motorcycles users made up 82.3% of the cases with the breakdown of rider and pillion riders were 67.2% and 15.6% respectively as shown in table 2. Most of the motorcyclist, involved age range from 11 – 30 years old. This finding is consistent with motorcyclist study done by Zarir *et al*. (2012), stated that most of his subjects were aged 16-25 which reflected the fact that a large portion of the motorcyclist population in Malaysia is in this group. A similar relationship between road crash and casualty age of motorcyclists has been reported by the annual statistics report from the Royal Malaysian Police 2009 and by a previous study on motorcycle road crashes in Malaysia (Phang *et al*., 2000).

Injury severity and injury cost distribution:

In term of injury cost assessment analysis among the injured victims, 51% of victim sustained injury only at single body region while 46% had injury at multiple body regions. Among the single body region, most of the victims had lower extremity injury (57%) with total injury cost was RM1, 197, 329. Figure 2 shows the claim cost for injured body regions regardless the injury severity level. In multiple body regions, victim sustained

injury on two body regions was the highest (68%) with total injury cost was RM1, 247, 210. In two body regions category, combination of head and lower extremity injury shows the highest mean cost spend with RM 14,757.39.

Table 2: Tabulation of victims' road user profile.

Victims variables	Frequency	%
Vehicle type	(N= 192)	
Passenger car	20	10.4
Motorcycle	158	82.3
Bicycle	2	1.0
Pedestrian	12	6.2
Road user profile	(N= 192)	
Rider	129	67.2
Pillion	30	15.6
Driver	12	6.3
Passenger car occupant	7	3.6
Pedestrian	12	6.3
Cyclist	2	1.0

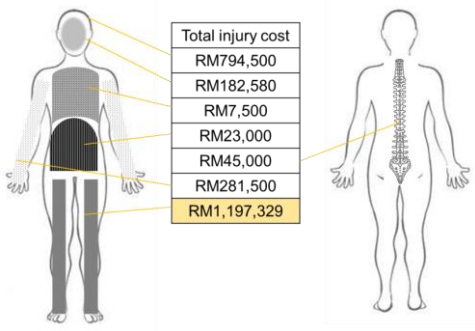

Fig. 1: Claim cost compensated by insurance company for bodily injury victims in single region.

The number of injured body regions for each AIS level is shown in table 3. The study shows that lower and upper region accounting for more than half (68.2%) of the injured body regions for overall injuries. Most of the injury severity level was at AIS 1, followed by AIS 2. It shows that the injuries sustained by the victims in insurance claims database were fall below serious injury level where mainly the injuries incurred by the victims were abrasion, laceration and fracture. Lower region sustained the most injured body region (42.3%) in the study reflected that most of the motorcyclist's victims nature of the injury is lower extremity [Odera, 2009, Begg *et al*., 1994, Andrew, 1979).

Table 3: Tabulation of injured body regions for each AIS level among inured victims.

Body region	AIS 1		AIS 2		AIS 3		AIS 4		AIS 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Head	36	47.4	17	22.4	21	27.6	2	2.6	-		76	13.9
Face	53	86.9	8	13.1	-		-		-		61	11.1
Neck	1	100	-		-		-		-		1	0.2
Thorax	6	42.9	3	21.4	5	35.7	-		-		14	2.6
Abdomen	2	20.0	7	70.0	1	10.0	-		-		10	1.8
Spine	-		10	83.3	-		1	8.3	1	8.3	12	2.2
Upper region	77	54.2	66	46.5	-		-		-		142	25.9
Lower region	90	38.8	107	46.1	38	16.4	-		-		232	42.3
Total											552	

Distribution of cost spread per injury severity by body region was presented in table 4. To investigate the variation of cost of the said variable, out of 548 number of injuries, total of 300 injuries with individual cost were identified for the analyses. By comparing AIS 2 with other body region, the median cost in spine injury was the highest with RM28,750 (interquartile range RM18,125 – RM39,375). However the number of spine injuries for AIS 2 was the least compared to other body region. From this result shows that the compensation claim cost for victim who has spine injury will be higher compared to other region. According to Zarir *et al*. (2009) spine injury is among the highest medical treatment cost due to longer hospitalization and rehabilitation period. Zaloshnja *et al*. (2004) also stated that the highest medical cost among other types of injury is neck–spinal cord injury; followed by injury to trunk–spinal cord, brain, hips/thigh and skull fracture. It is also reported that spinal injuries incur societal costs of up to 5 to 10 billion euros and are on the increase in Europe (Morris *et al*. 1996).

The median cost of AIS 2 for thorax region was RM8500 (interquartile range RM8250 – RM8750) which was found higher than median cost of AIS 3 with median was RM2700 (interquartile range RM2675 – RM6025) in the same body region. In injury severity rank, AIS 3 is more severe than AIS 2. Type of injury sustained by the victim with thorax injury, AIS 3 has internal organ injury while victim with thorax injury, AIS 2 has fracture injury. Although the severity level for victim who is sustained non-fracture injury was higher in thorax region, nevertheless the compensation claim cost was lower than victim who has fracture injury within the same body region. This finding supported Zaloshnja *et al*. (2004) study where the study mentioned that an injury of low AIS does not necessarily have lower total costs than one of high AIS even when controlling for body part. This proved that AIS is more significant as threat-to-life scale and not a scale to measure cost.

Table 4: Distribution of cost spread according to injury severity by body region.

Body region	AIS 0	AIS 1	AIS 2	AIS 3
	Median (Q1 – Q3)	Median (Q1 – Q3)	Median (Q1 – Q3)	Median (Q1 – Q3)
Head	-	RM5000 (RM5000 – RM5000)	RM6250 (RM4240 – RM10000)	RM10000 (RM6250 – RM12000)
Face	RM11000	RM2000 (RM1250 – RM3000)	RM16500 (RM12750 – RM27000)	-
Thorax	-	-	RM8500 (RM8250 – RM8750)	RM2700 (RM2675 – RM6025)
Spine	RM7500	-	RM28750 (RM18125 – RM39375)	-
Abdomen	-	RM2500 (RM2500 – RM2750)	RM13500 (RM7750 – RM19250)	-
Upper region	RM1500 (1287.50 – RM1750)	RM2000 (RM1650 – RM4000)	RM13250 (RM10937.50 – RM1500)	-
Lower region	RM2500 (RM2500 – RM3000)	RM2500 (RM1750 – RM4000)	RM15000 (RM11437.50 – RM22250)	RM25750 (RM22750 – RM33750)

In addition, box plot graph analysis was used in the study for comparing distribution and identifying outliers among Injury Severity Score (ISS) and injury claim cost. Figure 2 show the extracted distribution of injury claims cost according to ISS. Looking at figure 2 below, extreme values of injury cost were identified at ISS 0, ISS 1, ISS 5, ISS 9 and ISS 10, which warrant the related insurance company to further investigate the root cause. The result shows that there was variation of injury cost within the same injury severity.

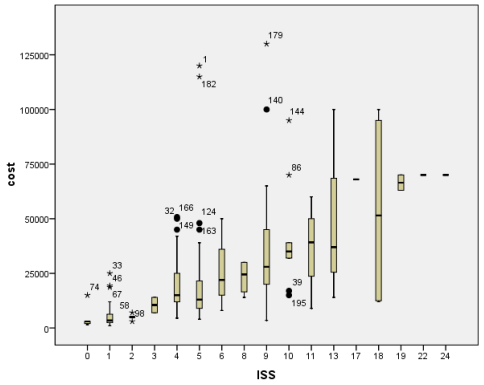

Fig. 2: Extracted distribution of injury claims cost according to ISS.

Limitation:

Rather the results are not likely representing the overall scenario of TPBI claim in Malaysia as the study data was limited due to time constraint and involved one insurance company only. This study need to be extended to other insurance company in order to gather more data and to profile the variation pattern of the injury cost according to injury scale.

Conclusion:

By assessing the injury claim using AIS, found that the cost was varies within the same injury level where some data could have extreme value. This finding could help insurance company to investigate and identified their over or underestimation of their compensation claim. Furthermore, AIS could be a potential tool for insurance industry to use as a scientific reference to estimate injury cost especially for injury in a same body region with same type of injury. The study was a preliminary study of AIS application in assessing injury claim.

The finding might be very fundamental and superficial due to some limitation of the study. A thorough study is needed in order to give more intensive finding on the AIS application among injury claim.

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