

Characteristics of Korean Trauma Patients: A Single-center Analysis Using the Korea Trauma Database

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Purpose: Two years have passed since a level I trauma center was officially opened in the Gacheon Gil Hospital, South Korea. We analyzed 2014 and 2015 registered patient data from the Korean Trauma Data Base (KTDB) to identify trends in trauma patient care and factors that influence the quality of trauma care at the Gacheon Gil trauma center.

Methods: Data was extracted from the KTDB included patient age, sex, systolic blood pressure at emergency room arrival, revised trauma score, injury severity score, trauma injury severity score, transfusion amount, and the cause of death was analyzed.

Results: A total of 3269 trauma patients were admitted to our trauma center in 2014 and 3225 in 2015. Demographics and mechanism of injury were not significantly different between years. The severity of trauma injury was decreased in 2015 although the mortality rate was slightly increased. This requires further analysis.

Conclusion: The aim of this study was to determine the general status and trends in trauma incidence and management outcomes for the Incheon area. We noted no significant changes in trauma status from 2014 to 2015. We need to collect and review trauma patient data over a long period in order to elucidate trauma incidence and management trends in the trauma field. Finally, studies using trauma patient data will indicate appropriate quality control factors for trauma care and help to improve the quality of trauma management. [J Trauma Inj 2016; 29: 155-160]

Key Words: Trauma center, Outcome, Quality control, Korean Trauma Data Base

I. Introduction

Trauma is a major cause of death in young people in South Korea. According to the 2011 Census Bureau report on causes of death, the number of deaths not due to disease, and including trauma, was 32,445 (12.5%).⁽¹⁾ Trauma increases the mortality rate in the young age group, and has an average socioeconomic cost of 35,000,000 South Korean Won per death according to a 2006 report.⁽²⁾ Though, the preventable

death rate in South Korea has been on the decline, from 50.4% in 1998, 39.6% in 2004, to 32.6% in 2007. To further reduce the preventable death rate in trauma patients to the level of developed countries, the Ministry of Health and Welfare established a severe trauma specialized medical center project in 2009 that established a level I trauma center for each regional area from 2012.^(3,4) Since the severe trauma care system is operational, basic data such as trauma patient medical care results and mortality

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rates have not been reported in Korea at that time. In 2014 a level I trauma center was officially opened in the Gacheon Gil Hospital in Incheon, South Korea. We reviewed and analyzed data for patients registered in the Korean Trauma Data Base (KTDB) who were admitted to the Gacheon Gil Hospital trauma center from 2014 to 2015 to identify trends in trauma patient care and factors that influence the quality of trauma care.

II. Materials and Methods

Level I trauma centers in Korea should collect data on trauma patients and input those data into the KTDB. The Gacheon Gil Hospital level I trauma center began officially treating trauma patients on January 1, 2014. Here, we analyzed trauma data from patients admitted to our trauma center from 2014 to 2015. Trauma patient data collected by our institution was uploaded to KTDB so that other researchers could also use it in their studies. Variables analyzed

from the KTDB included age, sex, systolic blood pressure at emergency room arrival, revised trauma score (RTS), injury severity score (ISS), trauma injury severity score (TRISS), transfusion amount, and the cause of death. Statistical analyses were performed using SPSS 18.0 (SPSS Inc., Chicago, USA) and a *p* value <0.05 was considered statistically significant. All data were analyzed for frequency. For nominal variables, chi squared test was used, and for continuous variables, independent sample T test and one way ANOVA were used.

III. Results

There were 3269 trauma patients admitted in 2014 and 3225 trauma patients in 2015. In both years, blunt injury was the cause of over 90% trauma admissions. The proportion of male patients was high (64.4% and 65.5% in each year), and the median age was 49 and 50 years in 2014 and 2015, respectively. Most patients with an ISS of >15 were blunt injury cases and older

Table 1. Overview of patients registered in the Korean Trauma Data Base in 2014 to 2015

	Total		ISS>15*	
	2014	2015	2014	2015
Admission (n)	3269	322	511	472
Blunt, n (%)	2973 (90.9)	2885 (89.5)	494 (96.7)	460 (97.5)
Penetrating, n (%)	246 (7.5)	305 (9.5)	11 (2.2)	9 (1.9)
Burn, n (%)	32 (1.0)	28 (0.9)	3 (0.6)	3 (0.6)
Others, n (%)	18 (0.6)	7 (0.2)	3 (0.6)	0
Male, n (%)	2105 (64.4)	2113 (65.5)	367 (71.8)	352 (74.6)
Age, median (IQR)	49 (31-63)	50 (31-64)	53 (40-65)	53 (38-64)

* Excluding DOA/CPR cases.

Table 2. Injury severity of trauma patients in 2014 to 2015

	Total		ISS>15*	
	2014	2015	2014	2015
ISS, median (IQR)	5 (4-10)	5 (4-10)	21 (17-25)	22 (17-27)
ISS, n (%)				
1-8	1943 (59.4)	2326 (72.1)	0	0
9-15	775 (40.6)	342 (10.6)	0	0
16-24	326 (16.9)	336 (10.4)	311 (60.8)	313 (66.3)
≥25	225 (6.9)	174 (5.4)	200 (39.2)	159 (33.7)
mean RTS	7.65	7.46	6.93	6.32
mean GCS	14.4	14.1	12.1	11.2
mean TRISS	0.97	0.91	0.85	0.77

* Excluding DOA/CPR cases.

Table 3. Mortality of trauma patients in 2014 to 2015

	Total		ISS>15*	
	2014	2015	2014	2015
Mortality, n (%)	138 (4.2)	160 (4.9)	75 (14.7)	70 (14.8)
Death on arrival (DOA)	6 (0.2)	16 (0.5)		
Death after CPR (DOA)	33 (1)	45 (1.4)		
Death after CPR (nonDOA)	12 (0.4)	13 (0.4)		
Death after admission	87 (2.7)	86 (2.7)		

* Excluding DOA/CPR cases.

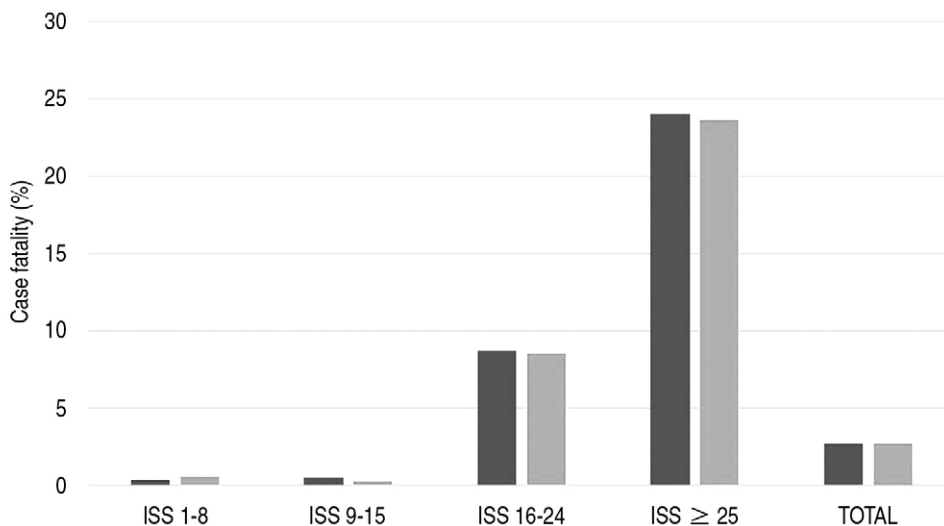


Fig. 1. Case fatality according to ISS severity.

Table 4. Case fatality according to ISS severity

ISS	Case fatality n (%)	
	2014	2015
1-8	7 (0.4)	14 (0.6)
9-15	4 (0.5)	1 (0.3)
16-24	27 (8.7)	29 (8.6)
≥25	48 (24)	41 (23.6)
Total*	86 (2.7)	85 (2.7)

* Excluding DOA/CPR cases.

males (Table 1).

Trauma severity was measured by ISS, RTS, and TRISS. The median ISS was 5 in both years. Mean RTS were 7.65 and 7.46 for each year. TRISS were 0.97 and 0.91 for each year. In ISS > 15 patients group, RTS and TRISS tended to decrease indicating lower survival rate. In 2015, the number of patients with an ISS 9–15 and with an ISS 16–24 decreased (Table 2).

The mortality rate of trauma patients was 4.2% and 4.9% in 2014 and 2015, respectively. Patients with

an ISS > 15 had mortality rates of 14.7% and 14.8% in 2014 and 2015, respectively (Table 3). Patients with an ISS > 15 had a much higher mortality rate, thus, ISS is a good indicator for the prognosis of trauma patients (Table 4, Fig. 1). And the case fatality by ISS severity in South Korea was shown similar outcome compare to the US National Trauma Databank Annual Report.(8)

The incidence of trauma tended to increase with age and the 45–54 year cohort had the highest incidence. Fatalities also tended to increase with age (Fig. 2, 3). The most common cause of injury were slips in 2014 and falls in 2015 and the second most common cause of injury was motor vehicle collision in both years (Table 5).

IV. Discussion

In order to reduce the preventable death rate of severe trauma patients and to provide trauma care at

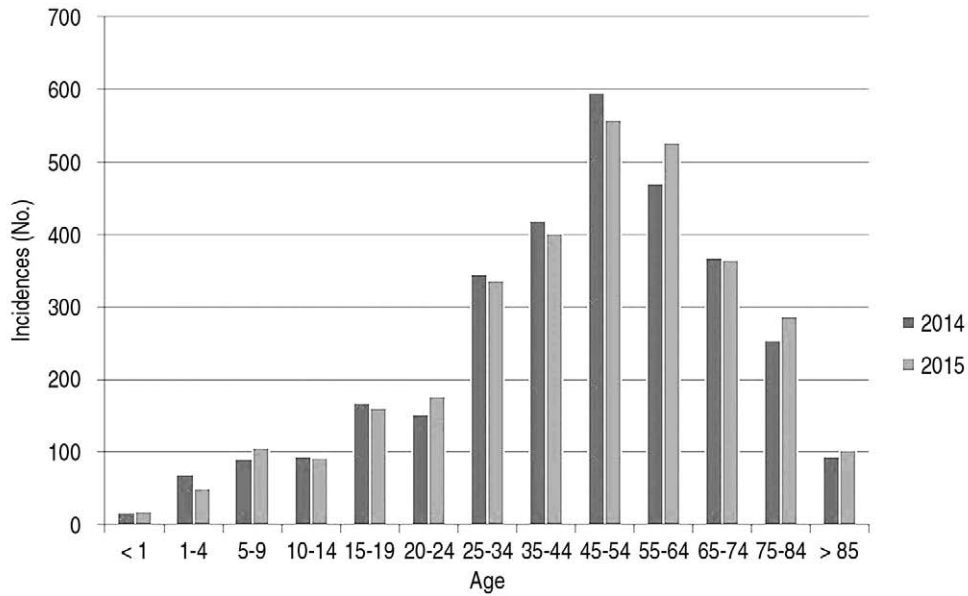


Fig. 2. Incidence of trauma by age.

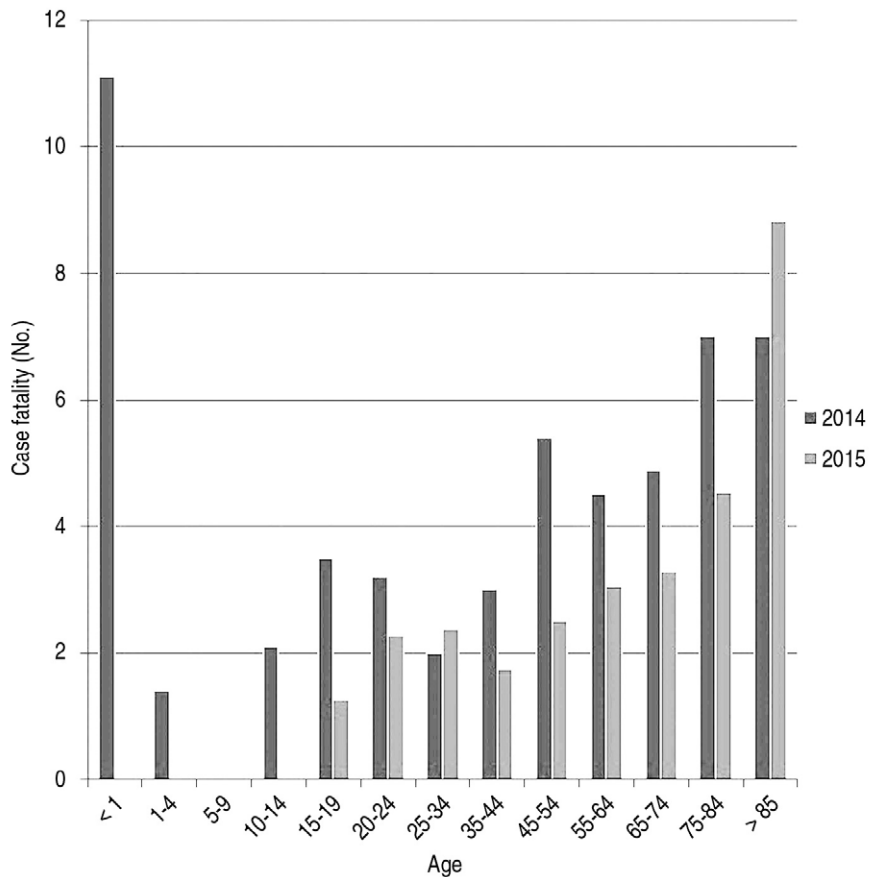


Fig. 3. Case fatality of trauma patients by age.

the level of developed countries, the Ministry of Health and Welfare began a severe trauma specialized medical center project in 2009. According to the project,

35 hospitals nationwide have been operating trauma centers as a preparatory course.(5) In 2014, state supported level I trauma centers began operation includ-

Table 5. Patient injury mechanisms (2014 n=3269, 2015 n=3225)

Injury Mechanism	No. of Patients, N (%)		Case fatality, N (%)	
	2014	2015	2014	2015
Motor vehicle collision	631 (19.3)	598 (18.8)	37 (5.9)	26 (4.3)
Traffic accident, pedal cyclist	130 (4.0)	169 (5.3)	5 (3.8)	1 (0.6)
Traffic accident, motorbike	203 (6.2)	222 (7)	12 (5.9)	7 (3.2)
Traffic accident, trains	28 (0.9)	36 (1.1)	3 (10.7)	4 (11.1)
Traffic accident, unknown	12 (0.4)	1 (0)	2 (16.7)	0
Fall	501 (15.3)	679 (21.4)	25 (5)	16 (2.4)
Slip down	878 (26.9)	582 (18.3)	21 (2.4)	9 (1.5)
Struck by, against	324 (9.9)	312 (9.8)	3 (0.9)	4 (1.3)
Gunshot	1 (0)	0	0	0
Stab	242 (7.4)	269 (8.5)	7 (2.9)	3 (1.1)
Machinery	78 (2.4)	76 (2.4)	0	0
Drowning	4 (0.1)	4 (0.1)	1 (25)	1 (25)
Suffocation	20 (0.6)	26 (0.8)	10 (50)	5 (19.2)
Other specified	107 (3.3)	117 (3.7)	2 (1.9)	0
Not elsewhere classifiable	110 (3.4)	87 (2.7)	9 (8.2)	9 (10.3)

ing our trauma center and comprehensive information on trauma patients was collected and entered into the KTDB. Data from the KTDB are used as the basis for conducting studies on injuries and are also helping to establish trauma prevention programs and guidelines for treating trauma patients.(6) Trauma data from the KTDB can also be used to evaluate and compare trauma care quality from different regional trauma centers. Due to the importance of this systematic data collection, trauma registration systems operate not only in South Korea but also around the world. Excluding KTDB, there are 17 trauma registration systems currently operating in different countries.(7,8)

In this study, most trauma patients were aged 45–54 years and the incidence and mortality rate tended to increase with age. Data analyses of the US and Japanese trauma registration systems also show similar trends. Since the number of elderly patients is increasing in general and their mortality rate is also high, continuous research and management guidelines for elderly trauma patients are needed. (9,10)

The ISS is currently widely used as an index to evaluate the severity of trauma patients in Korea. In general, an ISS of 1–8 is considered to represent mild trauma, 9–15 represents moderate trauma, 16–24 represents severe trauma, and over 25 represents very severe trauma.(11–13) The ISS index can be useful for

predicting the mortality of trauma patients, estimating the length of hospital stay and recovery period, and for predicting resource demands for patient management in a trauma center.(14) In this study, 23.8% of patients in 2014 and 15.8% in 2015 had an ISS >15 (Table 2). Although the purpose of establishing level I trauma centers was to treat severe trauma patients, it is clear that many patients were treated for minor trauma injuries in level I trauma centers. In the pre-hospital stage, improving patient classifications and transfer processes seems to be necessary, and it is important to attempt to increase the admission rate of severe trauma patients.

Trauma injuries were primarily due to falls and motor vehicle accidents, and we can use this information to refine traffic and safety policy. However, this information is the result of two years data, a long-term data analysis is required for policy determination. This is just the beginning, and a long-term, systematic collection of trauma patient data is essential to reduce mortality and improve the quality of treatment in trauma centers.

V. Conclusion

It is known that when a trauma center is properly designated and operated, the prognosis of trauma patients can be greatly improved.(15–18) Trauma

data collection and analysis are important for improving the quality of care and developing appropriate health policies.

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