Change of inter-facility transfer pattern in a regional trauma system after designation of trauma centers

Suckju Cho, Kyungwon Jung, Seokran Yeom, Sungwook Park, Hyunghoi Kim, Seongyoun Hwang

Department of Emergency Medicine, Medical Research Institute, Pusan National University Hospital, Busan, Division of Trauma Surgery, Department of Surgery, Ajou University Hospital, Ajou University School of Medicine, Suwon, Department of Laboratory Medicine and Biomedical Informatics Unit, Pusan National University School of Medicine, Busan, Department of Emergency Medicine, Samsung Changwon Hospital, Sungkyunkwan University School of Medicine, Changwon, Korea

Purpose: The Ministry of Health and Welfare recently designated 35 major trauma-specified centers (MTSC). The purpose of this study is to determine changes in patient flow and designated hospitals, and to describe the role of the emergency medical information center (EMIC) in a regional trauma care system. Methods: Data of trauma patient inter-facility transfer arrangement by one EMIC were reviewed for 2 months before and after the designation of MTSC. The data included success or failure rates of the arrangement, time used for arrangement, and inquiring and accepting facility. Results: At pre- and post-designation study period, there were 540 and 433 trauma patient inter-facility transfers arranged by EMIC, respectively. The median time used for arrangement decreased from 9.3 to 7.7 minutes (P = 0.007). Arrangement failure rate was 3.5% and 2.5%, respectively, with no significant interval change (P = 0.377). The percentage of inquiring MTSC decreased from 49.1 to 36.9% (P < 0.001). The percentage of accepting MTSC increased from 20.2 to 37.4% (P < 0.001). Conclusion: With the designation of MTSC, EMIC could arrange inter-facility transfers more quickly. The hospitals wanted more trauma patients after the designation. There would be a concentration of trauma patients to MTSCs in our region. Further studies are needed for scientific evidence on patient outcome.

Key Words: Trauma centers, Information services, Hospital emergency service, Referral and consultation

INTRODUCTION

The Ministry of Health and Welfare designated 35 major trauma-specified centers (MTSC) in April 2010 via preliminary designation in Many 2009, and those are high-level trauma centers in the existing system. With designation of a facility as a trauma center, the government introduces the necessary resources and administrative changes to establish a trauma care service within that facility [1]. High-level trauma centers are equipped with workforce, facilities, and instruments to diagnose and treat severely injured patients. But, there was recent social concern on incidences where emergency patients were left to wander large medical facilities with large resources in Daegu.
There was delay in finding available facilities due to weak coordination systems for inter-facility transfer. Construction of regional trauma systems improves outcome of trauma patients [2-4]. To achieve the purpose of a trauma system to get the right patient to the right hospital at the right time, organized and coordinated means of systemic approach is needed [5]. Major injury patients transported to small facilities need to be transferred to high-level trauma centers. But, exhaustion of medical resources in high-level trauma centers due to overcrowding is related to long waits, undesired outcomes of patients, and high social expenses [6,7]. Optimal matching of patient needs with hospital capabilities relies on appropriate transfers into the high-level trauma centers as well as “back-transfer” of patients from high-level trauma centers to low-level facilities.

Our emergency medical information center (EMIC) has performed structured inter-facility transfer arrangements since 2001. The first purpose of this study is to determine necessary changes of designated hospitals and trauma patient flow in a regional trauma care system. The second purpose is to describe the role of EMIC.

**METHODS**

**Study design**

This was a pre-post observational study designed to assess the effect of designation of MTSC on performance of inter-facility transfer arrangements by one EMIC.

The study was deemed exempt from review and informed consent by the institutional review board because of the observational nature of the study.

**Study setting and population**

Our EMIC has been entrusted to a wide regional emergency center by the Ministry of Health and Welfare in 2001. This EMIC is in charge of urban areas of two cities with populations of 4.7 million. The area has about 5,600 medical facilities with 43 designated emergency medical centers including 4 MTSCs.

The EMIC has performed arrangements for available medical facilities to diverse inquirers of laypersons, ambulance crews and medical providers on a 24 hours/7 days basis. Most are performed by emergency medical technicians under supervision of board-certificated physicians. On performance of the arrangement, basic data of availability of emergency department bed, intensive care unit bed, inward bed, computed tomography, ventilator, etc., are available via internet. The authors’ EMIC has secured cellular phone numbers of cooperative physicians on a volunteer basis. They are comprised of diverse specialties in diverse medical facilities.

Emergency medical providers of a transferring facility request inter-facility transfer to the telephone number 1339. Acceptance of transfer is decided by the physicians of each specialty or emergency department of the receiving hospital under mediation of the EMIC workforce. Sometimes, EMIC attempts several calls to find a receiving hospital. Telephone number, call time, and content of calls were recorded automatically. Data of each arrangement case were recorded on the electrical database of EMIC.

**Measurements**

Data of trauma patient inter-facility transfer arrangement by our EMIC were reviewed for 2 months before (September and December, 2008) and after (September and December, 2010) the designation of MTSC. The data included success or failure of arrangement, time used for the arrangement, and name of inquiring and accepting facility. We measured the percentage of MTSC hospitals that requested inter-facility transfer in the pre- and post-designation period. We measured the percentage of MTSC hospitals that accepted inter-facility transfer, as well. These processes would describe the trend of patient flow between MTSC hospitals and non-MTSC hospitals in our region. Missing rates of each data component was no more than 3%. Burn patient data were excluded as there is an additional burn transfer system in the region. Asphyxia and drowning patient data were excluded also.

**Data analysis**

Data were analyzed using PASW 18.0 (SPSS Inc., Chicago, IL, USA). Analyses for continuous and categorical variables were performed using the Student’s t-test or Mann-Whitney U test and $X^2$ test, respectively. All tests for