Situation analysis of trauma based on Arizona trauma center standards in university hospitals of Tehran, Iran

Mahdi Sharif-Alhoseini*, Aliashraf Eghbali, Vafa Rahimi-Movaghar and Soheil Saadat

Objective: Injuries are common and important problems in Tehran, capital of Iran. Although therapeutic centers are not essentially established following the constructional principles of developed countries, the present opportunities and equipments have to be used properly. We should recognize and reduce the deficits based on the global standards. This study deliberates the trauma resources and capacities in university hospitals of Tehran based on Arizona trauma center standards, which are suitable for the assessment of trauma centers.

Methods: Forty-one university hospitals in Tehran were evaluated for their conformity with “Arizona trauma center standards” in 2008. A structured interview was arranged with the “Educational Supervisor” of all hospitals regarding their institutional organization, departments, clinical capabilities, clinical qualifications, facilities and resources, rehabilitation services, performance improvement, continuing education, prevention, research and additional requirements for pediatric trauma patients. Relative frequencies and percentages were calculated and Student’s t test was used to compare the mean values.

Results: Forty-one hospitals had the average of 77.7 (50.7%) standards from 153 Arizona trauma center standards and these standards were present in 97.5 out of 153 (63.7%) in 17 general hospitals. Based on the subgroups of the standards, 64.8% items of hospital resources and capabiliites were considered as a subgroup with the maximum criteria, and 17.7% items of research section as another subgroup with the minimum standards.

Conclusions: On the basis of our findings, no hospital meet all the Arizona trauma center standards completely. The hospitals as trauma centers at different levels must be promoted to manage trauma patients desirably.

Key words: Trauma centers; Hospitals; Iran; Arizona; Reference standards
ter should have 42 special items in addition to levels 3 and 4 standards. And finally a level 1 trauma center should have a total of 153 standards that include 16 special items at this level.

A trauma center is a health care institution that has the resources and capabilities necessary to provide trauma services to injured patients at a particular level. Trauma center standards are proper gauges to evaluate hospitals and therapeutic centers in trauma management. The purpose of this study was to evaluate the conformity of capacities and resources of university hospitals in Tehran based on Arizona trauma center standards.

**METHODS**

Forty-one university hospitals in Tehran were evaluated for their conformity with “Arizona trauma center standards” in 2008. The study samples included all university hospitals of Tehran. A structured interview was arranged with the “Educational Supervisor” of the selected hospitals. They were asked to report institutional organization, departments, clinical capabilities, clinical qualifications, facilities and resources, rehabilitation services, performance improvement, continuing education, prevention, research and additional requirements for pediatric trauma patients in their hospitals according to the checklist of “Arizona trauma center standards”.

The pilot study which was carried out in Sina hospital revealed the need for a written and uniform explanation for every item in the checklist. A standard explanation for every item in the checklist was prepared, according to the preamble and subscripts of Arizona trauma center standards.

The study protocol and its ethical adequacy were approved in the Sina Trauma Research Center. Relative frequencies and percentages were calculated and Student’s t test was used to compare the means. SPSS software for windows version 13 was used for data handling and statistical analysis.

**RESULTS**

Forty-one hospitals had the average of 77.7 (50.7%) standards from 153 Arizona Trauma Center standards. Shariati General Hospital with 127 items had the maximum standards and Roozbeh Psychiatric Hospital with 25 items had the minimum standards. These standards were present in 97.5 out of 153 (63.7%) in 17 general hospitals, but 63.5 items (41.5%) were present in the other 26 specialized hospitals. Table 1 shows the average standards in Tehran university hospitals based on the university and hospital type. The difference between hospital types (general or specialized) was significant ($P=0.01$) but there was no statistical difference between the universities ($P=0.33$). Based on trauma center standards at different levels, the most and the least frequent items belonged to levels 4 (72.9%) and 1 (32.7%), respectively. There were 73% of the level 4 items in all hospitals, but 32.7% of the level 1 items. Fig. 1 demonstrates the percentage of each level items in Tehran university hospitals separately. The lack of 6 level 4 items was common in all hospitals.

Based on the subgroups of the standards, there were 64.8% items of hospital resources and capabilities as a subgroup with the maximum criteria and 17.7% items of the research section as a subgroup with the minimum standards. There were 32.1 items of institutional organization subgroup. Figs. 2 and 3 show Arizona trauma center standards in Tehran university hospitals based on the subgroups and for 17 general hospitals, respectively.

**DISCUSSION**

The creation of trauma centers has proven to have a positive effect on the outcomes of severely injured patients and the decrease of trauma mortality. Previous researches show that if hospitals and therapeutic centers indexes are consistent with trauma centers indexes, the mortalities of the injured will be remark-
ably decreased.  

On the other hand, some studies demonstrate that trauma care in Tehran hospitals is not satisfactory, thus the advanced trauma centers should be established. Therefore, the present opportunities and equipments have to be investigated until the recognized deficits can be reduced based on the valid standards. Thus, the current study deliberated trauma resources and capacities of university hospitals in Tehran based on Arizona trauma center standards.

As a standard, trauma centers in each level should have the specific items. While there are 231 level 1 trauma centers in the United States, there are no Tehran university hospital specific standards of at least one level completely. In Tehran university hospitals, although some expensive items of level 1 are present as the topmost level, it does not have some common and ordinary criteria of level 4 as the undermost level. Therefore, we could not grade the hospitals exactly so data analysis was performed based on the existents versus the deficits.

These hospitals had half of Arizona Trauma Center standards (50.7%) and general hospitals had only 63.7% of items. Shahid Beheshti University hospitals had an average of 86.2 standards (Table 1).

Table 1. Mean of Arizona Trauma Centers Standards in Tehran university hospitals based on hospital types and universities

<table>
<thead>
<tr>
<th>Medical University</th>
<th>Specialized (%)</th>
<th>General (%)</th>
<th>Total* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>64.4 (42.1)</td>
<td>89.7 (58.6)</td>
<td>75.2 (49.1)</td>
</tr>
<tr>
<td>Tehran</td>
<td>50.7 (33.2)</td>
<td>99.5 (65)</td>
<td>71.6 (46.8)</td>
</tr>
<tr>
<td>Shahid-Beheshti</td>
<td>75.4 (49.3)</td>
<td>103.4 (67.6)</td>
<td>86.2 (56.3)</td>
</tr>
<tr>
<td>Mean</td>
<td>63.5 (41.5)</td>
<td>97.5 (63.7)</td>
<td>77.7 (50.7)</td>
</tr>
</tbody>
</table>

* P=0.01; △ P=0.33

Among the 43 special items of level 4 standards, six items were not observed in any hospitals (Advance Trauma Life Support Certification for general surgeons and emergency medicine specialists, Broselow tape and qualitative end-tidal CO\textsubscript{2} determination in the emergency department, thermal control equipment for fluids and blood in the emergency department and operating rooms) and there were 2 items for this level in only 2 hospitals (trauma program manager, performance improvement programs). According to researches, a significant reduction in mortality of trauma patients with severe or specific injuries happened after the promotion of trauma centers to a higher trauma level designation.

Figs. 2 and 3 show the existence rate of the subgroups of Arizona trauma center standards in hospitals. While the subgroup of trauma facilities and resources had a desirable rate, especially in general hospitals, subgroups of research, clinical qualifications, institutional organizations, preventions, additional requirements for pediatric trauma patients and clinical capabilities had less than half of the items (Table 2).

While nowadays the participation in trauma research has increased subsequent to health care utilization, in Tehran university hospitals, research section has 17.7% items as a subgroup with the minimum standards.

![Fig. 2. Percentage of Arizona trauma centers standards in Tehran university hospitals based on subgroups.](image)

![Fig. 3. Percentage of Arizona trauma centers standards in general hospitals of Tehran universities based on subgroup and university.](image)
Table 2. Percentage of Arizona trauma centers standards in general hospitals of Tehran universities based on subgroups

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Research</th>
<th>Clinic qualification</th>
<th>Continuing education</th>
<th>Institutional organization</th>
<th>Prevention</th>
<th>Pediatric trauma care</th>
<th>Clinical capabilities</th>
<th>Hospital departments</th>
<th>Performance improvement</th>
<th>Rehabilitation services</th>
<th>Facilities and resources</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazrat-e-Rasool</td>
<td>50</td>
<td>57.1</td>
<td>66.7</td>
<td>33.3</td>
<td>50</td>
<td>83.3</td>
<td>82.4</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>90.3</td>
<td>81.7</td>
</tr>
<tr>
<td>Firuzabadi</td>
<td>0</td>
<td>28.6</td>
<td>33.3</td>
<td>33.3</td>
<td>50</td>
<td>33.3</td>
<td>47.1</td>
<td>71.4</td>
<td>40</td>
<td>60</td>
<td>72.2</td>
<td>55.6</td>
</tr>
<tr>
<td>Firoozgar</td>
<td>0</td>
<td>57.1</td>
<td>33.3</td>
<td>33.3</td>
<td>16.7</td>
<td>16.7</td>
<td>64.7</td>
<td>100</td>
<td>40</td>
<td>60</td>
<td>76.4</td>
<td>61.4</td>
</tr>
<tr>
<td>Lolagar</td>
<td>0</td>
<td>0</td>
<td>33.3</td>
<td>33.3</td>
<td>50</td>
<td>50</td>
<td>35.3</td>
<td>28.6</td>
<td>40</td>
<td>40</td>
<td>55.6</td>
<td>40.5</td>
</tr>
<tr>
<td>Haft-e-tir</td>
<td>0</td>
<td>28.6</td>
<td>33.3</td>
<td>33.3</td>
<td>16.7</td>
<td>16.7</td>
<td>52.9</td>
<td>100</td>
<td>90</td>
<td>60</td>
<td>76.4</td>
<td>61.4</td>
</tr>
<tr>
<td>Yaftabad</td>
<td>25</td>
<td>0</td>
<td>16.7</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>29.4</td>
<td>57.1</td>
<td>60</td>
<td>60</td>
<td>72.2</td>
<td>51</td>
</tr>
<tr>
<td>Emam-Khomeini</td>
<td>25</td>
<td>57.1</td>
<td>50</td>
<td>33.3</td>
<td>16.7</td>
<td>16.7</td>
<td>88.2</td>
<td>100</td>
<td>40</td>
<td>80</td>
<td>88.9</td>
<td>71.9</td>
</tr>
<tr>
<td>Amiralam</td>
<td>25</td>
<td>14.3</td>
<td>50</td>
<td>33.3</td>
<td>16.7</td>
<td>0</td>
<td>35.3</td>
<td>28.6</td>
<td>40</td>
<td>60</td>
<td>62.5</td>
<td>45.1</td>
</tr>
<tr>
<td>Baharloo</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>33.3</td>
<td>16.7</td>
<td>50</td>
<td>52.9</td>
<td>71.4</td>
<td>90</td>
<td>80</td>
<td>69.4</td>
<td>54.2</td>
</tr>
<tr>
<td>Sina</td>
<td>100</td>
<td>64.3</td>
<td>66.7</td>
<td>100</td>
<td>100</td>
<td>33.3</td>
<td>58.8</td>
<td>85.7</td>
<td>100</td>
<td>60</td>
<td>88.9</td>
<td>81</td>
</tr>
<tr>
<td>Shariati</td>
<td>100</td>
<td>64.3</td>
<td>66.7</td>
<td>100</td>
<td>50</td>
<td>50</td>
<td>82.3</td>
<td>85.7</td>
<td>80</td>
<td>60</td>
<td>93</td>
<td>83</td>
</tr>
<tr>
<td>Ziaeian</td>
<td>0</td>
<td>0</td>
<td>50</td>
<td>33.3</td>
<td>100</td>
<td>16.7</td>
<td>47.1</td>
<td>57.1</td>
<td>70</td>
<td>80</td>
<td>68</td>
<td>54.9</td>
</tr>
<tr>
<td>Taleghani</td>
<td>0</td>
<td>28.6</td>
<td>66.7</td>
<td>33.3</td>
<td>16.7</td>
<td>33.3</td>
<td>52.9</td>
<td>57.1</td>
<td>70</td>
<td>100</td>
<td>73.6</td>
<td>59.5</td>
</tr>
<tr>
<td>Emam Hosein</td>
<td>25</td>
<td>57.1</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>50</td>
<td>76.5</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>88.9</td>
<td>73.9</td>
</tr>
<tr>
<td>Shohada-Tajrish</td>
<td>25</td>
<td>57.1</td>
<td>50</td>
<td>33.3</td>
<td>50</td>
<td>50</td>
<td>70.6</td>
<td>100</td>
<td>70</td>
<td>100</td>
<td>88.9</td>
<td>75.2</td>
</tr>
<tr>
<td>Torfeh</td>
<td>25</td>
<td>28.6</td>
<td>33.3</td>
<td>33.3</td>
<td>66.7</td>
<td>33.3</td>
<td>70.6</td>
<td>71.4</td>
<td>70</td>
<td>60</td>
<td>68</td>
<td>59.9</td>
</tr>
<tr>
<td>Loghman</td>
<td>100</td>
<td>42.9</td>
<td>50</td>
<td>33.3</td>
<td>33.3</td>
<td>66.7</td>
<td>52.9</td>
<td>85.7</td>
<td>80</td>
<td>80</td>
<td>81.9</td>
<td>69.9</td>
</tr>
<tr>
<td>Mean</td>
<td>29.7</td>
<td>34.8</td>
<td>43.3</td>
<td>40.9</td>
<td>41.1</td>
<td>37.8</td>
<td>59.2</td>
<td>53.1</td>
<td>68.6</td>
<td>71.1</td>
<td>77.5</td>
<td>63.7</td>
</tr>
</tbody>
</table>
The clinical qualification subgroup emphasizes scientific promotion and updating in surgery, neurosurgery, emergency medicine and orthopedic surgery. The 14 standards of this section were not present in 16 hospitals and the hospital with the highest rate had only 9 items. The past studies emphasized dynamism in medical sciences, especially in the field of trauma.\textsuperscript{14,15}

Re-education for physicians, residents, nurses, pre-hospital and the other personnel had 30.9% of criteria. Researches show that continuous education/training of the staff improves the outcomes of injured patients.\textsuperscript{14}

While other studies demonstrate the organization importance for performance improvement,\textsuperscript{11, 15, 16} Tehran university hospitals had 32.1% related items. Two hospitals had all the 6 standards of institutional organization, 28 hospitals had 2 items and 11 hospitals had only one item. There was no trauma program as the main index of organization in 39 hospitals. The organization reduces preventable death and severe complications of trauma patients.\textsuperscript{15-17} However, despite the increasing incidence of trauma in Iran, many hospitals do not have a trauma program, trauma team, trauma program medical director, trauma multidisciplinary committee and trauma program manager.

An effective and beneficial trauma system should design a coordination network between different hospitals\textsuperscript{18, 19} but lack of a definite and easy intra-hospital liaison in Tehran resulted in some difficulties.

In the current study, 41 Tehran university hospitals were surveyed, while there are more hospitals including private, governmental and military hospitals. Therefore we suggest surveying all types of hospitals and even other cities based on trauma management standards in a more comprehensive study.

We also suggest that Iranian trauma experts revise Arizona Trauma Center standards and conduct national trauma centers criteria which are proportionate to Iranian conditions and present recourses.

In this study, no Tehran university hospital has the whole of special standards of at least one level completely, whereas every hospital as a trauma center should be able to provide primary trauma management.

The qualitative promotion of Tehran university hospitals in trauma management needs the preparation of trauma centers criteria (from low to top levels). We should pay more attention to research, clinical qualifications, education, organization sections and intra-hospital coordination.

Acknowledgement

This project was supported by a grant number 76 from Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran. The authors thank Mrs. Bita Pourmand for her editing of the manuscript.

REFERENCES

11. Shafer TJ, Davis KD, Holtzman SM, et al. Location of in-
house organ procurement organization staff in level I trauma centers increases conversion of potential donors to actual donors. Transplantation 2003; 75(8): 1330-1335.


(Received May 4, 2009)
Edited by LIU Jun-lan