A comparison of traumatic arrest cases intervened by Ankara Provincial Ambulance Service teams in the years 2017 and 2018

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ABSTRACT

This study aimed to evaluate traumatic cardiac arrest (TCA) cases in Turkey. This study was performed on 241 of the 10974 arrest cases (2.2%) intervened by Ankara Provincial Ambulance Service teams in 2017–2018, who developed after traumatic events. The cases recorded as R09 and I46 according to the ICD-10 classification were included in the study. The significance tests of the data were performed using SPSS for Windows version 13.0. For the statistical significance level, the P value was accepted as >0.05.

The arrival at scene time was 09:48 (min:s) in 2017 and 14:23 (min:s) in 2018. The intervention at the scene time was 18:04 (min:s) in 2017 (P = 0.043) and 28:48 (min:s) in 2018. The emergency department wait time was 21:10 (min:s) in 2017 and 27:29 (min:s) in 2018 (P = 0.000). The driving distance to the scene was 6.4 km in 2017 and 8.0 km in 2018. The business time of a unit for a case was 1:31:49 (h:min:s) in 2017 and 01:10:03 (h:min:s) in 2018. The average fare for a case was 738 YTL in 2017 and 622 YTL in 2018. In 2018, 24.5% of the cases (n = 25) were dead on arrival, while the number was 18% (n = 25) in 2017. In 2017, a demand arose for secondary transport of 29 patients after primary transport to a hospital, and 6 (20.7%) of them were secondarily transported to another hospital for specialist consultation. In 2018, 12 (54.5%) out of a total of 51 patients transported primarily to a hospital were secondarily transported to another hospital for specialist consultation.

In Turkey, as in other countries, patients with TCA constituted the group of patients with the lowest survival rate. It was determined that trauma teams should be formed to intervene the cases transported to the hospital.

Key words: Traumatic Cardiac Arrest, Ambulance Service, Prehospital Arrest

INTRODUCTION

Less than 6% of patients with out-of-hospital cardiac arrest (OHCA) and 24% of patients with in-hospital cardiac arrest (IHCA) are reported to have survived [1]. To improve survival in arrest cases, recommendations have been revealed especially for data collection, education, and public participation. The report stresses that it is necessary to centralize data collection and distribution, monitor and improve care services, increase the impact of research and treatments, and strengthen stakeholder communication. The study by Van Diepen et al. published in the Journal of American Heart Association discussed the first steps to fulfill most of the recommendations of The Institute of Medicine report.

The Heart Rescue Project, implemented by Van Diepen et al., created a population-based record bank that covered 90% of the US population. Of prehospital arrest cases, bystander CPR was performed in 42.8% and automated external defibrillators were used in 4.6%. In 21.9% of these cases, CPR was performed by police officers or first aiders before the ambulance team arrived. In this context, CPR and first-aid defibrillation rate increased from 14.1% to 23.1% and, with positive neurological outcomes, the survival rate increased from 7.1% to 9.7% [2].

According to a study published in 2015 on survival rates in arrest cases, special importance was attached to traumatic arrest cases [1]. A significant improvement was seen in the survival of medical arrest
cases, while no major progress occurred in the survival of traumatic arrest cases. The absence of trauma teams in emergency departments (EDs) and the time loss due to the presence of cascading in the patient referral system caused this to happen.

Also, it should be considered that the absence of multidisciplinary teams to respond to trauma cases in the EDs of hospitals in Turkey would cause problems. Therefore, survival and follow-up are difficult in traumatic arrest cases. In the present study, the studies investigating the effects of this issue were compiled.

In Turkey, few studies have been conducted on traumatic cardiac arrest (TCA). In this study, attempts were made to define the results of the traumatic arrest cases of emergency medical services (EMS), and the results obtained were shared.

**METHODOLOGY**

In 2017, 415,874 cases were intervened by Ankara EMS ambulance teams; 5530 of these cases (13.3 per thousand) were arrest cases. Of these arrest cases, 139 were traumatic arrest cases (2.5% of all arrests). In 2018, 421,453 cases were intervened; 5444 (12.9 per thousand) of them were arrest cases. Of these arrest cases, 102 were traumatic cases (1.9% of all arrests).

Patients with R09 (Respiratory Arrest) and I46 (Cardiac arrest) ICD-10 diagnostic codes in the database of Ankara EMS administration were included in the study.

The data were analyzed using SPSS for Windows version 13.0. Median and interquartile range (IQR) values were used for descriptive statistical analysis of the data. The normal distribution of the variables was checked using the Kolmogorov–Smirnov test. Mann–Whitney U and Kruskal–Wallis H tests were used for analyzing numerical nonparametric data. The chi-square test was used for analyzing qualitative data, and Pearson Correlation was used for comparing numerical data. A value of $P < 0.05$ was considered statistically significant.

**RESULTS**

Patient records of the Ankara EMS were used for this study. The total number of cases was 5530 in 2017 and 5444 in 2018 (Table 1).

In 2017, 76.1% ($n = 105$) of patients with TCA were male. The male/female ratio was 3.2; 83.5% of patients were in urban areas ($n = 116$); 60.1% of the patients were in the 18–64 age group ($n = 83$), and 34.8% were in the 65 and older age group ($n = 48$); 97.8% of the patients were Turkish ($n = 136$); and 9.4% were not covered by any health insurance fund ($n = 13$). In 2018, 77.2% ($n = 78$) of the patients with TCA were male; The male/female ratio was 3.4; 97.1% of the patients were in urban areas ($n = 99$); 64.7% of the patients were in the 18–64 age group ($n = 66$), and 24.5% were in the 65 and older age group ($n = 25$); 97.1% of the patients were Turkish ($n = 99$); and 10.8% were not covered by any health insurance fund ($n = 11$). "Dead on arrival" rate was 18.0% ($n = 25$) in 2017 and 24.5% in 2018 ($n = 25$). The "transport to hospital from the scene" rate was 69.8% ($n = 97$) in 2017 and 61.8% ($n = 63$) in 2018 (Table 2).

In 2017, 33.1% of the cases were in autumn season ($n = 46$), 20.1% occurred on Sundays ($n = 28$), and 41.7% occurred between the 08:00–16:00 time interval ($n = 58$); 20.9% of the cases were accessed within 5 min ($n = 29$); 18.7% ($n = 26$) of the cases were in Keçiören district; and 57.6% ($n = 80$) were in the operating area of the ambulance units. Further, 44.6% ($n = 62$) of the cases were in the category of "other accidents," and 76.3% ($n = 106$) had a "red" triage code. For the 29 cases, secondary transport was requested by the primarily transported hospital. Moreover, 12.1% ($n = 6$) of these demands were due to the lack of specialist doctors in these hospitals. According to the reports from hospitals, none of the patients with arrest survived.

In 2018, 32.4% of the cases were in spring season ($n = 33$), 18.6% occurred on Sundays ($n = 19$), and 46.1% occurred between the 08:00–16:00 time interval ($n = 47$), and 9.8% of the cases were accessed within 5 min ($n = 10$). Also, 21.6% ($n = 22$) of the cases were in the Çankaya district, and 54.9% ($n = 56$) occurred within the exclusive operating area of each team. Further, 37.3% ($n = 38$) of the cases were in the category of "other accidents," and 61.8% ($n = 63$) had a "red" triage code. For the 51 cases, secondary transport was requested by the primarily transported hospital. Moreover, 54.5% ($n = 12$) of these demands were due to the lack of specialists at the hospitals. According to the reports from hospitals, none of the patients with arrest survived (Table 3).
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Comparison of traumatic arrest intervention cases (Ankara 112, 2017-2018)

The “dispatcher response time” was 3:16 (min:s) in 2017 and 04:18 (min:s) in 2018. The “response time of the ambulance team” was 39 s in 2017 and 38.1 s in 2018. The “arrival at scene time” was 9:48 (min:s) in 2017 and 14:23 (min:s) in 2018; The “intervention at the scene time” was 18:04 (min:s) in 2017 ($P = 0.043$) and 28:48 (min:s) in 2017. The “emergency department wait time” was 21.10 (min:s) in 2017 and 17:29 (min:s) in 2018 ($P = 0.000$). The “driving distance to the scene” was 6.4 km in 2017 and 8 km in 2018. The “business time of a team for a case” was 1:31:49 (h:min:s) in 2017 and 01:10:03 (h:min:s) in 2018; The “average wage for a case” was 738 YTL in 2017 and 622 YTL in 2018.

DISCUSSION

According to a study by Foucher et al. (2), 129 of the 1542 arrest cases were diagnosed with traumatic arrest (8.3%) by EMS teams. The mean age of the patients was 47.1 years. The proportion of male patients was 74.4%, and the rate of nonpenetrating trauma was 94.6%. The return of spontaneous circulation (ROSC) ratio was 24.8%. The 24-h survival rate was 3.9%, and the annual survival rate was 0.8%. The male/female ratio was similar in this study.

According to a study by Chester et al. (3) investigating 429 arrest cases, 193 patients were delivered to ED with their heartbeats present. Complete follow-up was achieved in 140 patients, and the overall survival rate was 50.7 %. The overall survival/discharge rate was 11.7% in all patients. In the present study, hospital discharge rates could not be determined due to the lack of data.

Kim et al. [4] investigated the “intervention at scene time” of the patients with good post-discharge neurological outcomes in 2017 and reported that the patients intervened for 4–7 min at the scene had the best results. In the present study, the “intervention at scene time” was 18–28 min.

According to the study performed by Chein et al. [5] including 396 arrest cases, most of the cases were due to traffic accidents (66.5%), followed by fall cases (31.5%). Also, 34 patients underwent CPR at the scene (8.6%). In the present study, 24.5% of the arrest cases were caused by traffic accidents. Further, 18.4% of the patients were sent to intermediate- and advanced-level traumatic care hospitals. Also, 4.8% ($n = 24$) of these patients who were transported to the hospital survived; 2.3% of them were discharged from...

| Characteristic | 2017 | 2018 | Total |
|----------------|------|------|-------|
| **Number of cases** | **Percentag e** | **Number of cases** | **Percentag e** | **Number Of cases** | **Percentag e** |
| **Time** | | | | | |
| **Dispatcher response time** | 3:16 | | | | |
| **Response time of the ambulance team** | 39 s | | | | |
| **Arrival at scene time** | 9:48 | | | | |
| **Intervention at the scene time** | 18:04 | | | | |
| **Emergency department wait time** | 21.10 | | | | |
| **Driving distance to the scene** | 6.4 km | | | | |
| **Business time of a team for a case** | 1:31:49 | | | | |
| **Average wage for a case** | 738 YTL | | | | |

Table 1 Characteristics of traumatic arrest cases
### Table 2 Time and location characteristics of traumatic arrest cases

| Characteristic          | Status                  | 2017       | 2018       | Total       | 2017 | 2018 | Total | P value |
|-------------------------|-------------------------|------------|------------|-------------|------|------|-------|---------|
| **Time characteristics**|                         |            |            |             |      |      |       |         |
| **Seasons**             |                         |            |            |             |      |      |       |         |
| Winter                  |                         | 28         | 202        | 16          | 156  | 44   | 183   |         |
| Spring                  |                         | 32         | 230        | 33          | 324  | 65   | 270   |         |
| Summer                  |                         | 33         | 238        | 25          | 246  | 58   | 240   |         |
| Fall                    |                         | 46         | 330        | 28          | 275  | 74   | 307   |         |
| **Days Of week**        |                         |            |            |             |      |      |       |         |
| Sunday                  |                         | 28         | 20.1       | 19          | 18.6 | 47   | 19.5  | 0.592   |
| Monday                  |                         | 24         | 17.3       | 12          | 11.8 | 36   | 14.9  |         |
| Tuesday                 |                         | 19         | 13.7       | 13          | 127  | 32   | 13.3  |         |
| Wednesday               |                         | 21         | 15.1       | 12          | 11.8 | 33   | 13.7  |         |
| Thursday                |                         | 18         | 12.9       | 15          | 147  | 33   | 13.7  |         |
| Friday                  |                         | 15         | 10.8       | 19          | 18.6 | 34   | 147   |         |
| Saturday                |                         | 14         | 147        | 12          | 11.8 | 26   | 10.8  |         |
| **Hours**               |                         |            |            |             |      |      |       |         |
| 00:00–07:59             |                         | 25         | 18.0       | 16          | 157  | 41   | 17.0  |         |
| 08:00–15:59             |                         | 58         | 41.7       | 47          | 46.1 | 105  | 43.6  |         |
| 16:00–23:59             |                         | 56         | 403        | 39          | 382  | 95   | 39.4  |         |
| **Arrival at scene time**|                         |            |            |             |      |      |       |         |
| In 5 min or earlier     |                         | 29         | 20.9       | 10          | 9.8  | 39   | 16.2  |         |
| in 6–10 min             |                         | 65         | 46.8       | 47          | 46.1 | 112  | 46.5  |         |
| in 11–15 min            |                         | 24         | 17.3       | 22          | 21.6 | 46   | 19.1  |         |
| in 16–30 min            |                         | 17         | 12.2       | 14          | 13.7 | 31   | 12.9  |         |
| in 31–60 min            |                         | 3          | 2.2        | 5           | 4.9  | 8    | 3.3   |         |
| in 61 min or later      |                         | 1          | 0.7        | 4           | 3.9  | 5    | 2.1   |         |
| **Operating area**      |                         |            |            |             |      |      |       | 0.039   |
| Out of operating area   |                         | 59         | 424        | 46          | 451  | 105  | 43.6  |         |
| in operating area       |                         | 80         | 576        | 56          | 549  | 136  | 564   |         |
| **Cause of arrest**     |                         |            |            |             |      |      |       | 0.034   |
| Others                  |                         | 62         | 44.6       | 38          | 37.3 | 100  | 41.5  |         |
| Suicide                 |                         | 15         | 10.8       | 27          | 26.5 | 42   | 17.4  |         |
| Work accident           |                         | 6          | 43         | 6           | 5.9  | 12   | 5.0   |         |
| Traffic accident        |                         | 37         | 26.6       | 22          | 21.6 | 59   | 24.5  |         |
| Fire                    |                         | 2          | 14         | 0           | 0.0  | 2    | 0.8   |         |
| Injury                  |                         | 17         | 12.2       | 9           | 8.8  | 26   | 10.8  |         |
| **Triage category**     |                         |            |            |             |      |      |       |         |
| Red                     |                         | 106        | 76.3       | 63          | 61.8 | 169  | 70.1  |         |
| Yellow                  |                         | 1          | 0.7        | 2           | 20   | 3    | 12    |         |
| Black                   |                         | 31         | 22.3       | 35          | 34.3 | 66   | 27.4  |         |
| Green                   |                         | 1          | 0.7        | 2           | 20   | 3    | 12    |         |
| **Reported reason for inter-hospital transfer need** | | | | | | | | 0.059 |
| Need for specialist physician care | | 6 | 20.7 | 12 | 54.5 | 18 | 35.3 | | |
| Others                  |                         | 23         | 792        | 10          | 45.5 | 31   | 60.8  |         |
the hospital; and 0.8% of these discharged patients had cerebral performance category 1 or 2. The ROSC ratio was found to be 14.3% at the 15th min of CPR. Although CPR was performed in cases accessed later than 15 min, survival did not occur. The survival rates were high in arrest cases that arrived in 5 min or earlier. However, available data are insufficient to confirm these rates in Turkey and Ankara EMS. In contrast, "arrival at scene" times were too long to be compared.

According to the study of Avest et al. published in 2019 [6], 263 patients with TCA used the helicopter emergency medical services (HEMS). Also, 51 patients (20%) developed ROSC at the scene (28 patients before HEMS arrival and 23 after the HEMS arrival). Specific interventions for blood product administration (OR 8.54 [2.84 [25.72]) and RSI (2.95 [1.32 [6.58]) in HEMS were positively associated with ROSC. In the present study, no TCA cases were reported to be transported by HEMS.

According to the study by Beck et al., among 2334 traumatic OHCA cases, resuscitation was performed in 28% of the cases, and this rate remained constant over

### Table 3 Response times and distances and costs of traumatic arrest cases

| Table 3 Response times and distances and costs of traumatic arrest cases | Year | N   | Mean (s) | Mean (min) | Standard deviation | standard error | Total | Significance |
|------------------------------------------------------------------------|------|------|----------|------------|-------------------|---------------|-------|--------------|
| Dispatcher response time                                               | 2017 | 139  | 196.0    | 03:16      | 271.8             | 23.1          |       | 0.14992      |
| Dispatcher response time                                               | 2018 | 102  | 257.9    | 04:18      | 492.3             | 48.7          |       |              |
| Dispatcher response time                                               | Total | 241  | 222.2    | 03:42      | 381.3             | 24.6          |       |              |
| Ambulance unit response time for startup                                | 2017 | 139  | 39.0     | 00:39      | 36.3              | 3.1           |       | 0.69077      |
| Ambulance unit response time for startup                                | 2018 | 102  | 381      | 00:38      | 40.4              | 4.0           |       |              |
| Ambulance unit response time for startup                                | Total | 241  | 38.6     | 00:39      | 38.0              | 2.4           |       |              |
| Ambulance arrival at scene time                                         | 2017 | 139  | 3534     | 05:53      | 358.0             | 30.4          |       | 0.51751      |
| Ambulance arrival at scene time                                         | 2018 | 102  | 566.9    | 09:27      | 592.0             | 58.6          |       |              |
| Ambulance arrival at scene time                                         | Total | 241  | 443.8    | 07:24      | 482.0             | 31.1          |       |              |
| Paramedic arrival to patient contact                                    | 2017 | 139  | 588.5    | 09:48      | 504.1             | 42.8          |       | 0.34220      |
| Paramedic arrival to patient contact                                    | 2018 | 102  | 862.8    | 14:23      | 1067.8            | 105.7         |       |              |
| Paramedic arrival to patient contact                                    | Total | 241  | 704.6    | 11:45      | 802.7             | 51.7          |       |              |
| Intervention time                                                       | 2017 | 121  | 1084.0   | 18:04      | 909.8             | 82.7          |       | 0.04349      |
| Intervention time                                                       | 2018 | 102  | 1728.1   | 28:48      | 2131.5            | 211.0         |       |              |
| Intervention time                                                       | Total | 223  | 1378.6   | 22:10      | 1617.9            | 108.3         |       |              |
| Emergency department wait time                                          | 2017 | 89   | 1269.8   | 21:10      | 737.6             | 78.2          |       | 0.00006      |
| Emergency department wait time                                          | 2018 | 102  | 1049.4   | 17:29      | 1337.3            | 132.4         |       |              |
| Emergency department wait time                                          | Total | 191  | 1152.1   | 19:12      | 1102.2            | 79.8          |       |              |
| Total business time of the unit                                         | 2017 | 93   | 5509.0   | 01:31:49   | 9688.0            | 1004.6        |       | 0.80684      |
| Total business time of the unit                                         | 2018 | 102  | 4203.3   | 01:10:03   | 2589.8            | 256.4         |       |              |
| Total business time of the unit                                         | Total | 195  | 4826.0   | 01:20:26   | 6959.1            | 498.3         |       |              |
| Driving distance to the scene (km)                                       | 2017 | 131  | 6.4      | 8.6        | 08                |               |       | 0.43371      |
| Driving distance to the scene (km)                                       | 2018 | 72   | 8.0      | 7.8        | 0.9               |               |       |              |
| Driving distance to the scene (km)                                       | Total | 203  | 7.0      | 8.4        | 0.6               |               |       |              |
| Average wage per case (YTL)                                             | 2017 | 136  | 738      | 326        | 28                | 100,374       |       | 0.95471      |
| Average wage per case (YTL)                                             | 2018 | 102  | 622      | 352        | 35                | 63,442        |       |              |
| Average wage per case (YTL)                                             | Total | 238  | 688      | 341        | 22                | 163,815       |       |              |
According to the study by Deasy et al., 2187 (6.6%) of 33,178 prehospital arrest cases had traumatic etiology. The median age (IQR) of patients with traumatic OHCA was 36 (25–55) years, and 1612 of these cases were male (77.5%). Bystander CPR was applied to 201 patients (10.2%) whose median (IQR) EMS response time was 8 (6–11) min. Among EMS cases, the first recorded rhythm was asystole in 1650 cases (75.4%), PEA in 294 cases (13.4%), and VF in 35 cases (1.6%). A high cardiac output was reported in 208 (9.5%) of 545 cases transported to the hospital (24.9% of the cases). Of these, 84 (15.4%) had developed ROSC, and 27 (5.1%) were discharged from the hospital. Further, 107 patients underwent CPR during transport, and 8 patients (7.4%) were discharged from the hospital. The survival rate was 11.8% (n= 4) for VF, 5.1% (n= 10) for PEA, and 2.4% for asystole (n = 3) in traumatic OHCA cases. Resuscitation was performed in 175 cases (84.1%) diagnosed with traumatic OHCA; Of these, 35 (16.8%) were transferred to the emergency department, and 5 (14%) were discharged from the hospital. Although 60 cases (28.8%) developed ROSC before being transferred to the hospital, 6 of them (10%) were discharged from the hospital. Patients with traumatic OHCA were younger [median year (IQR): 25 (48) vs 1.6 (17,1)]. The resuscitation attempt was less (62.8% and 38.1%). The probability of having a shockable rhythm (10.2%–25.5%) was low. They were mostly witnessed-arrest cases (0.001%–61.5%). The likelihood of undergoing CPR was low (0.001%–25.5%) (P < 0.001, respectively).

A total of 410 patients with OHCA were included in the 6-year study by Furgan et al. (13). The annual average incidence rate of OHCA in Qatar was 4.0 in a population of 100,000 people. OHCA was mostly seen in men, and the median age of these patients was 33 years. Blunt injuries (94.3%) and head injuries (66.3%) were found. The overall survival rate was 2.4%. Shockable rhythm and external bleeding control in EMS were associated with blood transfusion and high surgical survival rates in the hospital. Adrenaline (epinephrine) reduced the survival rate.

According to the studies by Escutnaire et al., compared with patients with medical OHCA (n = 40,878), trauma victims (n = 3209) were younger and less likely to resuscitate. The survival rate was low at the time of hospitalization and 30 days after hospitalization. The survival rates for traumatic OHCA were 2.4 times lower.
Comparison of traumatic arrest intervention cases (Ankara 112, 2017-2018)

A total of 227,944 patients were included in the study by Barnard et al. [15]. According to this study, 705 (0.3%) patients with TCA survived; 74.3% of the patients were male, and 601 (85.2%) of the patients had blunt injuries. Further, 612 patients (86.8%) had a severe traumatic brain injury and/or severe bleeding. The 30-day survival rate was 7.5%; this rate was 11.5% for TCA cases in the EMS stage and 3.9% for TCS cases in the ED stage ($P < 0.02$). No patient survived in both the prehospital stage and the ED stage. The short-term survival from TCA was 7.5%.

According to the study by Chen et al., 73 (16%) of 463 patients with TCA had ROSC during ED resuscitation, and 10 (14%) patients with continuous ROSC survived for at least 30 days. Cases with an injury severity score of $\geq 16$ and a total resuscitation time of $>20$ min were associated with ROSC.

In Turkey, as in other countries, the prehospital survival rate of TCA was found to be low, adequate, and effective interventions were missing, case performance times expanded, and distance to the scene was long. When the on-site intervention time for TCA was likely to increase, the team’s tendency to transfer the patient to ED also increased. This might be due to cost increases or because teams that preferred on-site intervention rather than transport were more efficient and skilled. However, it is important to train staff in this area.

Turkey has no legislation governing "declaration of death" by paramedics. In this study, 66.4% of TCA cases ($n = 160$) were transported to the hospital, 20.7% ($n = 50$) were considered dead on arrival, and others were not accessed. Türkdemir et al. showed in 2003 that effective CPR application was 2.5 times higher in traumatic arrest cases. Türkdemir et al., in another study carried out 1 year later, found that CPR application rate increased to 12.5% in traumatic cases (18). The most important factor accounting for this increase might be that within this 1 year, the training of EMS professionals with trauma resuscitation courses started. Of the arrest cases, 84.8% were nontraumatic, 9.5% were traffic accidents, 1.9% were home accidents, and 1.8% were injuries; 90.3% of these nontraumatic arrest cases were due to cardiovascular, 4.5% respiratory, 1.2% psychiatric (suicidal), 1.0% gastrointestinal, and 1.0% neurological causes. Türkdemir et al. reported in 2005 that 6 out of 181 women exposed to trauma developed arrest (3.3%) [20]. Türkdemir et al. (2005) reported that the rate of arrest among trauma patients, aged 0–14 years, in EMS ($n = 1043$) was 2.2% [21]. The same author group, in their study in 2006, reported that the rate of arrest ($n = 1549$) was 2.4%.

According to Berger’s study, less than 6% of OHCA cases and 24% of IHCA cases survived. To improve survival in arrest cases, recommendations were revealed especially for data collection, education, and public participation. The report stressed that it was necessary to centralize data collection and distribution, monitor and improve care services, increase the impact of research and treatments, and strengthen stakeholder communication. This study found that the rate of traumatic arrest was 2.2% ($n = 241$) in all arrests ($n = 10,974$). The "dead on arrival" rate of these cases was 20.7% ($n = 50$).

Transport of the patients with TCA directly to specialized hospitals can improve the survival of these patients.

Some of the urgent requirements are as follows. "Declaration of death" criteria must be determined. On the other hand, EMS teams should be trained on TCA, the distribution of station locations should be reassessed, new dispatch algorithms should be developed, and case prioritization should be implemented, so as to enable better access to the case.

The creation of multidisciplinary (neurosurgery, orthopedics, cardiovascular surgery, anesthesia, and reanimation) emergency response teams and trauma centers in hospitals, especially for multiple trauma care, can help in this area.

In EDs, trauma intervention teams should be formed where professionals from multiple disciplines work together.

CONCLUSIONS

Although one fifth of the traumatic arrest cases were "dead on arrival," the survival rate of the patients transferred to the hospital also decreased considerably. Survival rates can be increased if TCA cases that require rapid intervention by multiple disciplines are...
transferred directly to the centers where they can be treated and when prehospital and hospital teams work more effectively and in communication with each other. It is believed that researches on this subject need to be expanded, and similar studies should be carried out more comprehensively.

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