

Awareness of damage control surgery and resuscitation practice: Rational emergency surgical trends in mass trauma events in Syria

✉ Bahadır Karaca, M.D.,¹ ✉ Burak Çelik, M.D.²

¹Department of Emergency Service, Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital, İstanbul-Türkiye

²Department of Emergency Service, Kırşehir Training and Research Hospital, Kırşehir-Türkiye

ABSTRACT

BACKGROUND: Mass trauma is an event in which the number of patients temporarily exceeds the capacity of medical personnel to provide optimal care. Looking at the global terrorism index, Syria is one of the most terrorism-affected countries in the Middle East, and the threat of terrorist attacks that can cause mass trauma persists. When it comes to dealing with mass trauma, the damage control approach has come to the forefront in recent years. In our study, we aimed to assess the awareness and training effectiveness of emergency physicians and surgeons on damage control surgery and resuscitation in Northwest Syria, where mass trauma due to terrorist attacks and social events is common.

METHODS: A trauma team from Çobanbey Hospital in Northwest Syria conducted training on damage control and resuscitation. Syrian physicians who participated in this training were administered a damage control and resuscitation questionnaire before and after the training.

RESULTS: A total of 43 subjects were enrolled in the study, and their mean age was 44.04±9.01 years. The majority of the physicians who participated in the training were from Elbab (23.3%), Afrin (23.3%), and Çobanbey (20.9%). The average work experience of the physicians was 14 years and the average number of non-elective surgeries performed in the last year was 47.5. While the average total score (pre-test) before the training was 67, the average total score (post-test) after the training increased to 72, and this difference was statistically significant ($p=0.008$). While the pre-test and post-test scores of those who were trained and had practiced placing intrathoracic clamp-wound clamp and trauma laparotomy were significantly higher than those who were not trained and had not used them ($p<0.05$), the difference between the pre-test and post-test scores of those who were not trained and had not used them was statistically significant ($p<0.05$).

CONCLUSION: It is well known that there have been internal unrest and terrorist attacks in Northwest Syria for more than 10 years. It is important for physicians in this region to know the damage control strategies. In this regard, we have found that awareness among physicians has increased as a result of the training we have provided on damage control

Keywords: Damage control resuscitation; damage control surgery; emergency department; mass trauma; Syria.

INTRODUCTION

Mass trauma is an event in which the number of patients temporarily exceeds the capacity of onsite first responders or hospital medical staff to provide optimal care to all victims simultaneously. Even in countries where mass trauma is com-

monplace, a temporary state of incompetence occurs in both pre-hospital and inpatient care.^[1] Mass trauma is divided into natural and man-made trauma. Naturally caused examples include pandemics, earthquakes, and hurricanes. Examples of man-made mass trauma include mass shootings, terrorist attacks, riots, and traffic accidents.^[2] The frequency of mass

Cite this article as: Karaca B, Çelik B. Awareness of damage control surgery and resuscitation practice: Rational emergency surgical trends in mass trauma events in Syria. *Ulus Travma Acil Cerrahi Derg* 2022;28:1100-1108.

Address for correspondence: Bahadır Karaca, M.D.

Sancaktepe Şehit Prof. Dr. İlhan Varank Eğitim ve Araştırma Hastanesi, Acil Servis Bölümü, İstanbul, Türkiye

Tel: +90 216 - 606 33 00 E-mail: dr.bk40@hotmail.com

Ulus Travma Acil Cerrahi Derg 2022;28(8):1100-1108 DOI: 10.14744/tjtes.2022.70887 Submitted: 04.03.2022 Accepted: 12.05.2022

Copyright 2022 Turkish Association of Trauma and Emergency Surgery



trauma events is gradually increasing,^[3,4] and their causes may vary by region.

When it comes to man-made mass trauma, terrorist attacks are significant on a global scale. To draw more attention to terrorist incidents, it is observed that explosions or suicides are mainly among the methods of attack.^[5,6] Looking at the global terrorism index, Syria is one of the most affected countries by terrorism in the Middle East. Syria, which is ranked 4th in 2020 according to the terrorism impact index, has experienced many terrorist attacks over the past decade, especially in the north. Although the number of terrorist attacks has decreased to some extent in the past 2–3 years, the risk still exists.^[7]

In mass trauma events, security concerns continue in the chaos phase immediately after the event, and the chaos phase continues until the last injured person is transported to the hospital. The effective actions that can be taken during this phase not only involve pre-hospital health workers but also require awareness studies that can be conducted with all community service organizations.^[1] Even the most developed countries have difficulty responding to the pre-hospital chaos phase. In regions where there is internal unrest, such as northern Syria, it is even more difficult to intervene during this period. For this reason, it is believed that in-hospital investigations may be of greater benefit in mass trauma in this region.

The damage control approach to mass trauma has come to the forefront in recent years. Severely injured patients often do not have the physiologic reserves to tolerate the full course of definitive therapy. The strategy of damage control can be used to help the maximum number of patients with the least amount of resources while saving time for the patient's physiologic recovery. The term "damage control" is used in the U.S. Navy to refer to the special teams responsible for keeping a badly damaged ship afloat until it is fully repaired. Similarly, the term damage control surgery aims to intervene immediately in life-threatening conditions and delay final treatment as much as possible. Although this principle was initially defined only for abdominal injuries, the concept of damage limitation began to be used as a strategy in the concept of resuscitation and later in treatment as an extended concept from the first encounter with the patient in the pre-hospital period to the final treatment process of the patient.^[8–10]

In our study, we aimed to assess emergency physicians' and surgeons' awareness of damage control and resuscitation and the effectiveness of training in Northwest Syria, where mass trauma due to terrorist attacks and social events is common.

MATERIALS AND METHODS

Study Design

This study was conducted with 43 Syrian physicians, most of whom were surgeons, who participated in the workshop on

Damage Control Surgery and Resuscitation in mass trauma at Çobanbey Hospital in Northwest Syria on the dates of "May 21, 2021." The workshop consisted of two phases. On the 1st day, academicians with war surgery experience provided theoretical training as part of the seminar. On the 2nd day, interactive training was given with indications compiled from the literature in groups formed by participants led by these instructors. The academics who conducted the training were physicians who had worked in mass trauma events (such as terrorist attacks, earthquake zones, and conflict zones) and field hospitals for more than 10 years and had performed more than 50 non-elective surgeries per year.

We obtained permission from the ethics committee of Hatay Mustafa Kemal University for non-interventional research (Date: May 6, 2021, Decisions Number: 21) and the relevant hospital administrations. In addition, we conducted this study in accordance with the "World Medical Association Declaration of Helsinki Ethical Principles."

Selection of Participants

Physicians working in the emergency and surgery departments throughout the North Syria region were invited to participate in the workshop. The physicians included in the study were emergency medicine specialists, surgical surgeons working at ED, and other physicians working at ED. Physicians who did not work in the emergency department or did not perform emergency surgeries were excluded from the study. Fifty Syrian physicians attended the workshop, and 43 physicians who volunteered to participate in the study and met the study criteria were included in the study.

Obtaining the Data

We surveyed Syrian physicians on damage control in surgery and resuscitation before and after the training. The survey asked for information such as name/surname, age, specialty, length of professional experience, the hospital where the physician works, and the number of non-elective surgeries performed in the last year. Before the training, the literature (Source: Update) describing and explaining damage control surgery and resuscitation was given in written form. To assess awareness of damage control surgery and resuscitation, the questionnaire asked for 17 pre-operative and intraoperative indications for damage control in adult patients. For each indication, participants were asked to rate the benefit-harm ratio of damage control practices (1 = Absolutely harmful, 2 = Harmful, 3 = Uncertain, 4 = Beneficial, and 5 = Definitely beneficial) using a 5-point Likert scale. Questions about indication were based on studies of damage control during surgery and resuscitation in the literature.^[11] In addition, the survey asked participants whether they had previously received training on cricothyrotomy, needle thoracentesis, tube thoracostomy, tourniquet, intrathoracic applications, and trauma laparotomy procedures and whether they had performed each of these applications.

In the post-test after training, the same participants were asked again about the damage control indications queried in the pre-test. The training topics given by the academics were as follows: Pre-hospital damage control resuscitation (REMOTE Damage Control Resuscitation) for mass trauma; delayed surgical applications for cranial, thoracic, abdominal, and extremity injuries; indications for damage control surgery, damage control resuscitation in the process between delayed surgery and final repair; damage control surgery and resuscitation for burn patients, and damage control practices for cardiovascular injuries.

Participant data and pre- and post-training responses were entered into the statistical program and analyzed.

Statistical Analysis

Statistical analyses of the study were performed using the Statistical Package for the Social Sciences for Windows software (IBM SPSS version 25.0, Armonk, NY, USA). The normality assumption of the continuous variables was tested using Kolmogorov–Smirnov and Shapiro–Wilk tests. In addition to these tests, the coefficients kurtosis and skewness were also examined since this was a survey study. The assumption

of homogeneity of variances was tested using Levene's test. Descriptive statistics of the variables are reported as mean±standard deviation, median (min-max), and median (25th–75th percentiles), provided the normality assumption is met. Two-group comparisons of variables included in the study were performed using the independent t-test. For the comparison of pre-test and post-test results obtained by the same participants at two different time points, the paired t-test was used when the normality assumption was met and the Wilcoxon test was used when it was not met. During the coding phase of the survey questions, the recoding process was conducted so that positive responses received the highest score and negative responses received the lowest score.

RESULTS

A total of 43 subjects were included in the study. The mean age of the participants was 44.04±9.01 years. When the specialties of the physicians who participated in the training were examined, it was found that physicians from general surgery participated most frequently in the training. The majority of the physicians who participated in the advanced training were from Elbab (23.3%), Afrin (23.3%), and Çobanbey (20.9%).

Table 1. Comparison of pre-test and post-test overall results of physicians participating in the study with their specialties and hospitals

Specialties	n (%)	Pre-test Total	Post-test Total	p ¹
		Mean Score (±SD)	Mean Score (±SD)	
Emergency	2 (4.7)	65.50±4.94	68.00±5.65	0.126
Anesthesia	3 (7.0)	67.33±1.52	73.00±7.93	0.278
Orthopedics	7 (16.3)	64.28±11.96	67.42±11.19	0.667
Maxillofacial surgery	6 (14.0)	55.40±14.94	58.33±17.78	0.325
Neurosurgery	4 (9.3)	77.00±5.29	80.50±3.69	0.035
General surgery	10 (23.3)	69.80±11.20	71.00±12.14	0.719
Ear nose and throat	3 (7.0)	58.66±7.02	63.33±14.01	0.582
Urology	4 (9.3)	73.75±13.30	72.75±10.87	0.759
Pediatric surgery	1 (2.3)	17	17	
Forensic medicine	1 (2.3)	43	33	
Radiology	1 (2.3)	23	18	
General practitioner	1 (2.3)	49	30	
Hospital				
Çobanbey	9 (20.9)	73.25±11.74	77.00±8.26	0.087
Azez Vatan	3 (7.0)	61.66±8.08	73.66±2.88	0.126
Marae	3 (7.0)	74.66±8.96	77.00±7.00	0.192
Elbab	10 (23.3)	63.88±16.90	70.11±13.87	0.189
Cerablus	2 (4.7)	82.50±2.12	54.80±10.60	0.198
Afrin	10 (23.3)	66.22±6.57	72.55±5.31	0.031
Rasulayn	3 (7.0)	58.33±5.50	59.66±16.77	0.892
Telabyad	3 (7.0)	57.00±8.18	59.33±5.68	0.423

¹Paired t-test; SD: Standard deviation.

The average professional experience of the physicians was 14 years, the least experience was 2 years, and the most experience was 37 years. The median number of non-elective surgeries in the last year was 47.5. Hospitals with an annual number of surgeries per surgeon above this median were Jarablus, Marea, Afrin, and Elbab, while hospitals below this median were Rasulayn, Telabyad, and Azez. Participants were asked for 17 pre-operative and intraoperative indications for damage control in adult patients in pre- and post-test. For each indication, participants were asked to rate the benefit-harm ratio of damage control practices (1 = Absolutely harmful, 2 = Harmful, 3 = Uncertain, 4 = Beneficial, and 5 = Definitely beneficial) using a 5-point Likert scale.

When the physicians' specialties were considered separately in

relation to the pre-test-post-test totals, the post-test total increased in all specialties except urology. With the exception of urology, awareness of the specialties participating in the training increased. This increase was statistically significant only in neurosurgery ($p=0.035$). Other participants based on specialty were forensic medicine, radiology, general practitioner, and pediatric surgery and were not included in the comparison based on specialty. The pediatric surgery physician participating in the study reported the lowest Likert score for all indications in the questionnaire. Regarding the hospitals attended by the physicians participating in the training, it was found that the level of awareness decreased only in the physicians from Cerablus Hospital. Among the physicians who came from hospitals other than Cerablus Hospital, the level of awareness had increased. Only the increase in awareness among the physi-

Table 2. Pre-test and Post-test values of the questionnaire

Indication categories	Pre-test Score	Post-test Score	p
	Mean(\pm SD)	Mean(\pm SD)	
1 Injury to multiple anatomic sites or organs associated with high energy blunt thoracoabdominal trauma (e.g., resulting from a high-speed motorcycle accident)	4.51 \pm 0.96	4.32 \pm 0.99	0.221 ¹
2 Preoperative fatal triad associated with multiple high-energy gunshot wounds in a single body cavity (e.g., abdomen)	4.41 \pm 1.05	4.55 \pm 0.73	0.278 ¹
3 Persistent hypotension (systolic blood pressure consistently below 90 mmHg) during a post-traumatic hospital transfer	3.92 \pm 1.17	4.23 \pm 0.95	0.108 ¹
4 Cardiac arrest successfully resuscitated during a post-traumatic hospital transfer with an Injury Severity Score (ISS) greater than 17	3.65 \pm 1.51	3.60 \pm 1.44	0.828 ¹
5 Severe traumatic brain injury following a mass casualty event (multiple injuries and concurrent hospitalization)	3.76 \pm 1.37	3.86 \pm 1.35	0.685 ¹
6 Persistent preoperative hypotension in a patient with severe trauma and concomitant medical conditions (history of severe cardiac and/or pulmonary disease)	3.60 \pm 1.09	3.97 \pm 1.10	0.037 ¹
7 Severe trauma with preoperative administration of more than 10 units of red blood cell suspension	3.72 \pm 1.35	4.06 \pm 0.96	0.096 ¹
8 Severe trauma with preoperative resuscitative thoracotomy in the emergency department	3.69 \pm 1.26	4.23 \pm 0.89	0.001 ¹
9 Severe trauma with preoperative body temperature below 34°C	3.60 \pm 1.34	4.06 \pm 1.22	0.058 ¹
10 Trauma with preoperative arterial pH <7.2	3.52 \pm 1.36	3.90 \pm 1.20	0.044 ¹
11 Trauma with a preoperative INR or PT >1.5 times the normal value	3.92 \pm 1.04	4.09 \pm 0.95	0.399 ¹
12 Trauma with an enlarged and difficult-to-operate pelvic hematoma	4.06 \pm 1.27	3.79 \pm 1.33	0.177 ¹
13 Trauma with two or more major injuries of solid or hollow abdominal organs associated with abdominal vascular injury	4.30 \pm 0.93	4.48 \pm 0.82	0.198 ¹
14 Trauma with devascularization or injury of the duodenum, pancreas, and/or pancreaticoduodenal complex	3.65 \pm 1.27	4.02 \pm 1.14	0.073 ¹
15 Longer than expected time for final repair in posttraumatic surgery	3.95 \pm 0.99	4.04 \pm 1.17	0.660 ¹
16 Predicted to exceed 90 minutes for final repair after trauma	3.81 \pm 1.18	4.25 \pm 1.04	0.013 ¹
17 Estimated posttraumatic blood loss of more than 4 liters	3.97 \pm 1.29	4.25 \pm 1.15	0.135 ¹
Total Score, Median (min-max)	67 (58.50~74.75)	72 (62.5~78.75)	0.008 ²

¹Paired t-test; ²Wilcoxon test. SD: Standard deviation; INR: International normalized ratio; PT: Protrombin time.

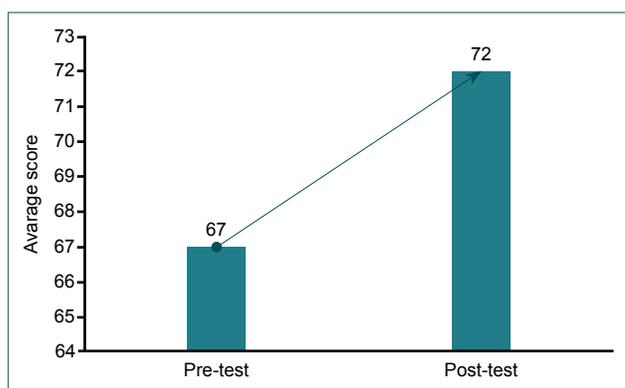


Figure 1. Pre-test and post-test total score average (p=0.008).

cians who had participated in the training from Afrin Hospital was statistically significant (p=0.031) (Table I).

The mean scores of the pre-test and post-test results and the pre-test-post-test total scores of the 17 items of the educational awareness questionnaire are shown in Table 2. Accord-

ing to these results, the training increased participants' awareness. While the pre-test total score average of the participants before the training was 67, the average of the post-test total scores obtained after the training increased to 72 (Fig. 1). This difference between the pre-test-post-test scores in relation to the total score was statistically significant (p=0.008). When the items of the scale were examined individually, it was found that the post-test scores had generally increased (Fig. 2). The difference between pre-test-post-test scores in scenarios 6, 8, 10, and 16 was statistically significant (p<0.05).

Participants' training on invasive emergency procedures and their application status are shown in Table 3. They were most frequently trained in the use of a tourniquet (85.7%), needle thoracentesis (71.4%), and tube thoracostomy (64.3%), and least frequently in the placement of an intrathoracic clamp-wound clamp (16.3%).

The mean post-test score was significantly higher in participants who received cricothyroidemia training than in those

Table 3. Training in invasive emergency procedures and application status of participants

Status of training and application of procedures	Yes, n (%)	No, n (%)
Are you trained to perform a cricothyroidotomy?	27 (62.8)	16 (37.2)
Have you ever performed a cricothyroidotomy?	18 (42.9)	24 (57.1)
Are you trained to perform a needle thoracentesis?	30 (71.4)	12 (28.6)
Have you ever performed a needle thoracentesis?	29 (69.0)	13 (31.0)
Are you trained to perform a tube thoracostomy?	30 (69.8)	13 (30.2)
Have you ever performed a tube thoracostomy?	27 (64.3)	15 (35.7)
Are you trained to place a tourniquet?	36 (85.7)	6 (14.3)
Have you ever applied a tourniquet?	32 (78.0)	9 (22.0)
Are you trained to place an intrathoracic clamp-wound clamp?	12 (29.3)	29 (70.7)
Have you ever placed an Intrathoracic clamp-wound clamp?	7 (16.3)	34 (82.9)
Are you trained to perform a trauma laparotomy?	22 (52.4)	20 (47.6)
Have you ever performed a trauma laparotomy?	18 (42.9)	24 (57.1)

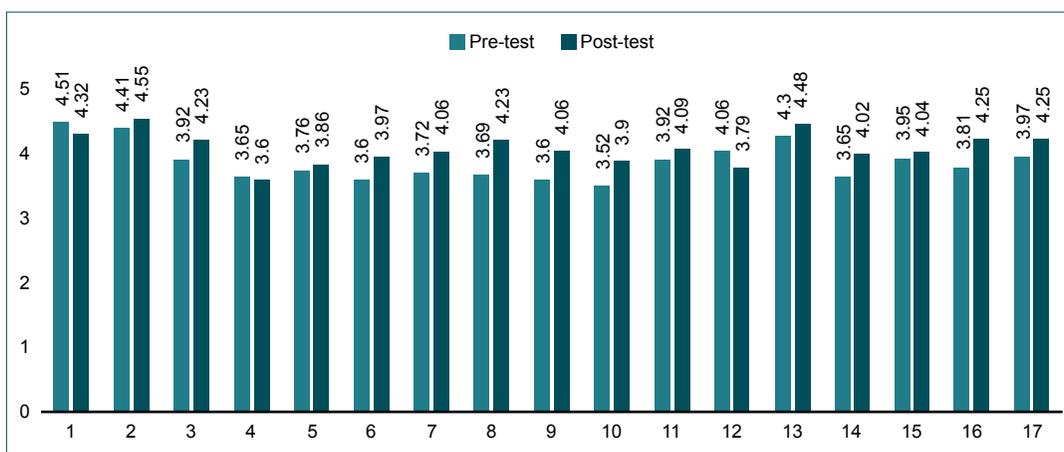


Figure 2. Pre-test and post-test values of the indications.

Table 4. Comparison of invasive intervention training and practice conditions according to pre-test and post-test

Status of training and application of procedures	Pre-test Total Score	Post-test Total Score	p ¹
	Mean(±SD)	Mean(±SD)	
Are you trained to perform a cricothyroidotomy?			
Yes	69.44±10.46	73.25±9.97	0.030
No	61.69±14.09	63.87±14.31	0.530
p ²	0.058	0.015	
Have you ever performed a cricothyroidotomy?			
Yes	69.00±9.32	72.44±9.21	0.137
No	64.57±14.03	67.16±14.14	0.245
p ²	0.262	0.176	
Are you trained to perform a needle thoracentesis?			
Yes	68.96±11.43	71.23±11.15	0.360
No	60.63±12.36	64.91±14.71	0.076
p ²	0.053	0.139	
Have you ever performed a needle thoracentesis?			
Yes	69.77±10.60	72.17±10.78	0.341
No	60.33±13.77	64.23±15.04	0.075
p ²	0.025	0.059	
Are you trained to perform a tube thoracostomy?			
Yes	70.00±10.84	71.86±11.43	0.441
No	58.81±12.12	64.92±13.88	0.046
p ²	0.008	0.094	
Have you ever performed a tube thoracostomy?			
Yes	70.26±10.61	70.85±11.80	0.944
No	59.30±12.08	66.86±13.52	0.003
p ²	0.006	0.326	
Are you trained to place a tourniquet?			
Yes	68.21±10.58	70.66±12.49	0.083
No	62.33±18.82	67.83±10.94	0.446
p ²	0.278	0.605	
Have you ever applied a tourniquet?			
Yes	67.37±12.79	69.84±13.16	0.134
No	68.11±10.33	71.00±9.19	0.431
p ²	0.877	0.807	
Are you trained to place an intrathoracic clamp-wound clamp?			
Yes	76.16±8.06	78.58±7.11	0.054
No	63.19±11.91	67.06±12.55	0.027
p ²	0.002	0.005	
Have you ever placed an Intrathoracic clamp- wound clamp?			
Yes	75.85±8.57	79.14±6.30	0.079
No	65.35±12.35	68.64±12.57	0.015
p ²	0.040	0.039	
Are you trained to perform a trauma laparotomy?			
Yes	73.57±10.52	73.72±11.76	0.925
No	59.05±9.37	67.00±9.84	0.005
p ²	0.000	0.029	
Have you ever performed a trauma laparotomy?			
Yes	73.52±10.22	74.22±10.98	0.896
No	61.27±10.89	65.83±12.44	0.008
p ²	0.001	0.029	

¹Paired t-test; ²Independent t-test. SD: Standard deviation.

Table 5. Pre-test and post-test values in relation to professional experience

Experience	Pre-test Total Score	Post-test Total Score	p ¹
	Mean(±SD)	Mean(±SD)	
<10 years	70.07±10.58	74.80±9.75	0.191
≥10 years	65.23±12.78	67.07±13.09	0.181
p ²	0.234	0.052	

¹Paired t-test; ²Independent t-test. SD: Standard deviation.

who had not ($p=0.015$). Again, the difference in scores between the pre-test and post-test also increased significantly ($p=0.030$).

The scores of those who had needle thoracocentesis performed were significantly higher than those who had not ($p=0.025$). The pre-test scores of those who had received training for tube thoracostomy and those who performed thoracostomy were significantly higher than those who had not ($p<0.05$), while the difference between the pre-test and post-test scores of those who had not received this training and those who did not perform thoracostomy was significantly higher ($p<0.05$).

The pre-test and post-test scores of those who were trained and had practiced intrathoracic clamp-wound clamp placement and trauma laparotomy were significantly higher than those who were not trained and had not performed the training ($p<0.05$), while the difference between the pre-test and post-test scores of those who were not trained and had not performed the training was statistically significant ($p<0.05$) (Table 4).

Although the pre-test and post-test scores of physicians with <10 years of professional experience were higher, no statistically significant difference was found ($p>0.05$) (Table 5).

DISCUSSION

The average age of the physicians involved in our study was 44 years and the average work experience was 14 years. Nowadays, many medical schools accept students 18 years of age and older^[12] and a physician graduates from medical school at an estimated age of 24–26 years. Moreover, the earliest one starts working as a specialist is at the age of 28–30 years with the completion of specialization training.^[13] In Syria, where there has been internal unrest since 2010, new physicians and surgeons cannot be trained. For this reason, the average age of currently working specialists is over 40 years old. The Çobanbey Faculty of Medicine was established in 2021 by the University of Health Sciences in Northwest Syria.^[14,15] Its purpose is to train physicians and other health personnel to meet the region's needs in the future. Access and quality of health services are expected to increase as security risks decrease and educational opportunities increase.

The median number of non-elective surgeries performed by participating surgeons last year was 47.5. In a study of international damage control surgery by Roberts et al.,^[11] the number of non-elective surgeries performed by surgeons in the United States was close to our study, with a median value of 45 for a year, whereas these values were 20 in Canada and 12.5 in Australia. This can be explained by the fact that terrorism-related injuries occur frequently in the Syrian region and the number of surgeons per populous region is low. In our study, the annual number of operations per surgeon was above the median (47.5) in four of the hospitals and below in 3. The existing hospitals in North Syria serve populations with different characteristics due to their location. The ethnic and sociocultural structure, the different working conditions (industrial, commercial, agricultural, etc.), and security risks in the regions where the hospitals operate, as well as the applications of injured military and civilian personnel, also affect emergency trauma applications. It is likely that all of these factors may influence the number and characteristics of patients that physicians encounter.

In our study, theoretical and indication-based training were performed together. When pre-test and post-test results were compared, it was found that training resulted in increased awareness. Similarly, increased awareness among emergency department and surgical department physicians has been found in the literature after pre- and post-training with many trauma and resuscitation training models.^[16] Hansen et al.^[17] conducted theoretical and practical training together and showed that this training model was perceived as more beneficial by participants. It is anticipated that the use of applied models in training for emergency physicians and surgeons working in Syria and similar conflict areas will be beneficial in terms of rational modification practices in damage control surgery and resuscitation training.

Our study found that awareness has generally increased across all branches. Although the damage control application is introduced in general surgery, these strategies are also on the agenda in other specialties.^[18] Studies of damage control in trauma are being conducted from the pre-hospital phase to the emergency department,^[19,20] from the radiology department to the operating room,^[21,22] and from the intensive care unit to definitive treatment.^[23] In the future, this approach will be encountered in the literature and in clinical applications with broader models.

In our study, we did observe that awareness of damage control surgery and resuscitation increased in all scenarios. However, the increases in the scenarios of pre-operative resuscitative thoracotomy, pH <7.2, and prediction of definitive surgery that would take longer than 90 min were found to be statistically significant, and the Likert value was 4 and above. In parallel with our study, it was observed in the study by Roberts et al.^[11] that surgeons tended to use damage control with similar Likert scores in similar scenarios. In this and

similar scenarios where patient management is difficult, it is reasonable to assume that experienced surgeons are more likely to use damage control.

Hansen et al.^[17] study trained interventional applications that can be used in damage control strategies, and in rural areas, these practices can be life-saving. In addition, the team-based approach to damage control has been shown to be beneficial. In the study by Manzano-Nunez et al.,^[24] the use of intrathoracic clamps was found to be effective in damage control approaches in trauma patients. In our study, emergency physicians and surgeons were trained in resuscitation and surgical procedures, and awareness was found to increase among physicians who had previously been trained in or practiced cricothyrotomy, thoracostomy, and intrathoracic clamping. In general, it can be assumed that training and practice in invasive procedures promotes learning of damage control measures.

A study by Ugur et al.^[25] examined 25 patients who underwent damage control surgery in Syria between 2010 and 2015. This study reported that there should be sufficient equipment and staff for damage control surgery in hospitals in Syria, but intensive care unit is inadequate. Since 2016, there are hospitals in the north of Syria opened by Turkey as part of humanitarian aid, and these hospitals have the necessary intensive care units and operating rooms.^[26–30] Considering the whole Northwest Syria, our study assessed the current situation of doctors in hospitals regarding damage control surgery and resuscitation and showed that awareness of this issue has increased with the training provided.

While no difference was found between years of professional experience and damage control perspective in the study by Roberts et al.,^[11] similar results were obtained in our study. The fact that the damage control strategy is less complex than many complex operations and resuscitation strategies may have facilitated learning regardless of years of professional experience and increased awareness of this strategy.

Conclusion

It is known that there have been internal unrest and terrorist attacks in Northwest Syria for more than 10 years. It is important to know the damage control strategies for physicians who face many war injuries and mass trauma in this region. In this regard, we have found that awareness among physicians has increased as a result of the training we have provided on damage control in surgery and resuscitation. We believe that such and similar training will be useful and life-saving in hospitals that are opened for humanitarian aid.

Limitations

Forty-three physicians were included in our study. The low number of participants is due to the lack of emergency and surgical physicians in the Syrian region due to war and migration.

Acknowledgment

The authors would like to thank Prof. Dr. Ozkan GORGULU (Kırşehir Ahi Evran University, Faculty of Medicine, Biostatistics and Medical Informatics Department) for his assistance in the statistical analysis of the study.

Ethics Committee Approval: This study was approved by the Hatay Mustafa Kemal University Faculty of Medicine Non-interventional Clinical Research Ethics Committee (Date: 06.05.2021, Decision No: 21).

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: B.K., B.Ç.; Design: B.K., B.Ç.; Supervision: B.K., B.Ç.; Resource: B.K., B.Ç.; Materials: B.K., B.Ç.; Data: B.K., B.Ç.; Analysis: B.K., B.Ç.; Literature search: B.K., B.Ç.; Writing: B.K., B.Ç.; Critical revision: B.K., B.Ç.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

- Lynn M, Lieberman H, Lynn L, Pust GD, Stahl K, Yeh DD, editors. *Disasters and Mass Casualty Incidents: The Nuts and Bolts of Preparedness and Response to Prolonged and Sudden Onset Emergencies*. Berlin, Heidelberg: Springer; 2018. [CrossRef]
- Nasir MU, Chandy PE, Roberts J, O'Neill SB. A guide to mass casualty incidents for radiology residents: Strategies, ethics, directions. *Curr Probl Diagn Radiol* 2021;50:555–9. [CrossRef]
- Lin PI, Fei L, Barzman D, Hossain M. What have we learned from the time trend of mass shootings in the US? *PLoS One* 2018;13:e0204722.
- Moran ME, Blecker N, Gothard MD, George RL. A critical pathway for mass casualty incident preparedness. *J Trauma Nurs* 2021;28:275–80.
- Giannou C, Comité International de la Croix-Rouge, Baldan M. *La Chirurgie de Guerre: Travailler avec des Ressources Limitées Dans les Conflits Armés et Autres Situations de Violence*. Central Institute for Cotton Research; 2010.
- Edwards DS, Mcmenemy L, Stapley SA, Patel HD, Clasper JC. 40 years of terrorist bombings-a meta-analysis of the casualty and injury profile. *Injury* 2016;47:646–52. [CrossRef]
- Institute for Economics and Peace. *Global terrorism index 2020 measuring the impact of terrorism*. Institute for Economics and Peace; 2020.
- Sarani B, Martin N. overview of damage control surgery and resuscitation in patients sustaining severe injury. Available from: https://www.uptodate.com/contents/overview-of-damage-control-surgery-and-resuscitation-in-patients-sustaining-severe-injury?search=%20Overview%20of%20Damage%20Control%20Surgery%20and%20Resuscitation%20in%20Patients%20Sustaining%20Severe%20Injury&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1#H102173490.
- Cannon JW, Khan MA, Raja AS, Cohen MJ, Como JJ, Cotton BA, et al. Damage control resuscitation in patients with severe traumatic hemorrhage: A practice management guideline from the Eastern association for the surgery of trauma. *J Trauma Acute Care Surg* 2021;82:605–17.
- Spinella PC, editor. *Damage control resuscitation: Identification and treatment of life-threatening hemorrhage*. Berlin, Heidelberg: Springer; 2019. [CrossRef]

11. Roberts DJ, Zygun DA, Faris PD, Ball CG, Kirkpatrick AW, Stelfox HT, et al. Opinions of practicing surgeons on the appropriateness of published indications for use of damage control surgery in trauma patients: An international cross-sectional survey. *J Am Coll Surg* 2016;223:515–29.
12. The Medic Portal. Age requirements for medicine. Available from: <https://www.themedicportal.com/application-guide/choosing-a-medical-school/minimum-age-requirements-for-medicine>. Accessed Dec 12, 2021.
13. Study in Turkey. Available from: https://www.studyinturkey.gov.tr/StudyinTurkey/ShowDetail?r_ID=Ec/rgHEN8Zg=&&cI=PE4Nr0mMoY4 [Last accessed on 2021 Dec 28].
14. SBU. Available from: <https://www.sbu.edu.tr/tr/duyuru/jGniwS-2021-yili-cobanbey-tip-fakultesi>. Accessed Dec 29, 2021.
15. University of Health Sciences. Available from: <https://cobanbeytip.sbu.edu.tr/GenelBilgiler/IlkelerDegerler>. Accessed Dec 29, 2021.
16. Mohammad A, Branicki F, Abu-Zidan FM. Educational and clinical impact of advanced trauma life support (ATLS) courses: A systematic review. *World J Surg* 2014;38:322–9. [CrossRef]
17. Hansen KS, Uggem PE, Brattebø G, Wisborg T. Team-oriented training for damage control surgery in rural trauma: A new paradigm. *J Trauma* 2008;64:949–54. [CrossRef]
18. Pfeifer R, Kalbas Y, Coimbra R, Leenen L, Komadina R, Hildebrand F, et al. Indications and interventions of damage control orthopedic surgeries: An expert opinion survey. *Eur J Trauma Emerg Surg* 2021;47:2081–92.
19. Tourtier JP, Palmier B, Tazarourte K, Raux M, Meaudre E, Ausset S, et al. The concept of damage control: Extending the paradigm in the prehospital setting. *Ann Fr Anesth Reanim* 2013;32:520–6. [CrossRef]
20. Duchesne JC, Kimonis K, Marr AB, Rennie KV, Wahl G, Wells JE, et al. Damage control resuscitation in combination with damage control laparotomy: A survival advantage. *J Trauma* 2010;69:46–52. [CrossRef]
21. Chakraverty S, Zealley I, Kessel D. Damage control radiology in the severely injured patient: What the anaesthetist needs to know. *Br J Anaesth* 2014;113:2507. [CrossRef]
22. Kushimoto S, Arai M, Aiboshi J, Harada N, Tosaka N, Koido Y, et al. The role of interventional radiology in patients requiring damage control laparotomy. *J Trauma* 2003;54:171–6. [CrossRef]
23. Parr MJ, Alabdi T. Damage control surgery and intensive care. *Injury* 2004;35:712–21. [CrossRef]
24. Manzano-Nunez R, Chica J, Gómez A, Naranjo MP, Chaves H, Muñoz LE, et al. The tenets of intrathoracic packing during damage control thoracic surgery for trauma patients: A systematic review. *Eur J Trauma Emerg Surg* 2020;47:423–34. [CrossRef]
25. Ugur M, Akkucuk S, Koca YS, Oruç C, Aydoğan A, Kilic E, et al. Where should the damage control surgery be performed, at the nearest health center or at a fully equipped hospital? *Ulus Trauma Acil Cerrahi Derg* 2016;22:273–7. [CrossRef]
26. Kilis Health Directorate. Available from: <https://kilisgg.saglik.gov.tr/TR-69175/cobanbey-hastanesi.html>. Accessed May 05, 2022.
27. Kilis Health Directorate. Available from: <https://kilisgg.saglik.gov.tr/TR-69179/azez-vatan-hastanesi.html>. Accessed May 11, 2022.
28. Kilis Health Directorate. Available from: <https://kilisgg.saglik.gov.tr/TR-69176/mare-hastanesi.html>. Accessed May 05, 2022.
29. T.R. Ministry of Health Jerablus Hospital. Available from: https://rapor.saglik.gov.tr/TABLO/cerablus/cerablus_takip.pdf. Accessed May 05, 2022.
30. Sanliurfa Health Directorate. Available from: <https://sanliurfaism.saglik.gov.tr/TR,160194/rasulayn-hastanesi-saglik-hizmeti-sunmaya-basladi.html>. Accessed May 11, 2022.

ORİJİNAL ÇALIŞMA - ÖZ

Hasar kontrol cerrahisi ve resüsitasyonu uygulama farkındalıkları: Suriye’de kitlesel travmalı olgularda akılcı acil cerrahi uygulama eğilimleri

Dr. Bahadır Karaca,¹ Dr. Burak Çelik²

¹Sancaktepe Şehit Prof. Dr. İlhan Varank Eğitim ve Araştırma Hastanesi, Acil Servis Bölümü, İstanbul

²Kırşehir Eğitim ve Araştırma Hastanesi, Acil Servis Bölümü, Kırşehir

AMAÇ: Kitlesel travma olayı, hasta sayısının sağlık personelinin en uygun bakımı sağlama kapasitesini geçici olarak aştığı bir olaydır. Global terörizm indeksine bakıldığında Ortadoğu’da terörizmden en çok etkilenen ülkelerin başında Suriye gelmektedir ve kitlesel travmalara neden olabilecek terör riski devam etmektedir. Kitlesel travmaya yaklaşım denilince hasar kontrol yaklaşımı son yıllarda öne çıkmaktadır. Biz de çalışmamızda terör saldırıları ve toplumsal olaylar nedeniyle kitlesel travmaların çok görüldüğü Suriye’nin kuzeybatısında, acil ve cerrahi branş hekimlerinin hasar kontrol cerrahisi ve resüsitasyonu konularında farkındalığını ve eğitim etkinliğini değerlendirmeyi amaçladık.

GEREÇ VE YÖNTEM: Suriye’nin kuzeybatısındaki Çobanbey Hastanesi’nde bir travma ekibi tarafından “Hasar kontrol cerrahisi ve resüsitasyonu” konularında eğitim verildi. Bu eğitime katılan Suriyeli hekimlere eğitim öncesi ve sonrası hasar kontrol cerrahisi ve resüsitasyonu açısından farkındalık anketi yapıldı.

BULGULAR: Çalışmaya toplam 43 kişi dahil edildi ve yaş ortalamaları 44.04±9.01 yılı. Eğitime katılan hekimlerin çoğunluğu Elbab (%23.3), Afrin (%23.3) ve Çobanbey’den (%20.9) gelmişti. Hekimlerin ortalama mesleki tecrübesi 14 yılı ve son bir yılda elektif olmayan ameliyat sayısı median 47.5’ti. Eğitim öncesi öntest toplam puan ortalaması 67 iken, eğitim sonrası sontest toplam puan ortalaması 72’ye yükselmişti ve bu farklılık anlamlıydı (p=0.008). İntratorasik klemp yara kelepçesi yerleştirme ve travma laparotomisi eğitimi alan ve uygulamayı yapmış olanların ön test ve son test puanları eğitimi almamış ve uygulamamış olanlara göre anlamlı olarak fazla iken (p<0.05), eğitimi almayan ve uygulamayanların ön test son test puanları arasındaki farklılık anlamlıydı (p<0.05).

TARTIŞMA: Suriye’nin kuzeybatısında 10 yıldan uzun süredir iç karışıklık ve terör eylemlerinin mevcut olduğu bilinmektedir. Bu bölgedeki hekimler için hasar kontrol stratejilerinin bilinmesi önem arz etmektedir. Bu bağlamda verdiğimiz hasar kontrol cerrahisi ve resüsitasyonu eğitimi ile hekimlerde farkındalığın arttığı görülmüştür. İnsani yardım amaçlı açılan hastanelerde bu tarz ve benzeri ileri düzey eğitimlerin faydalı ve hayat kurtarıcı olacağını düşünmekteyiz.

Anahtar sözcükler: Acil servis; hasar kontrol cerrahisi; hasar kontrol resüsitasyonu; kitlesel travma; Suriye.

Ulus Travma Acil Cerrahi Derg 2022;28(8): I 100-I 108 doi: 10.14744/tjes.2022.70887