Terrorist Attacks Against Emergency Medical Services: Secondary Attacks are an Emerging Risk

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Abstract

Introduction: Terrorists increasingly aim at so-called soft targets, such as hospitals. However, little is known about terrorist attacks against Emergency Medical Services (EMS).

Objective: This study aims to review all documented terrorist attacks against EMS that occurred world-wide from 1970-2019 using the Global Terrorism Database (GTD).

Methods: Reports of terrorist attacks against EMS were extracted from the GTD from 1970-2019. Data collection included temporal factors, attack and weapon type, number of casualties, and if it was a primary or secondary attack (secondary attack: deliberate attack against the first responders of an initial terrorist attack). Reports were excluded if EMS were not a target or if it was unclear whether they were a target. Chi-square tests were performed to evaluate trends over time.

Results: There were 184 terrorist attacks against EMS, resulting in 748 deaths and 1,239 people injured. Terrorist attacks against EMS significantly increased over the past two decades. The "Middle East & North Africa" was the most frequently affected region with 81 attacks (44.0%) followed by "South Asia" with 41 attacks (22.3%). Bombings and explosions were the most common attack type (85 incidents; 46.2%) followed by armed assaults (68 incidents; 35.3%). Combined prehospital and hospital attacks were first reported in 2005 and occurred seven times. The first secondary attack against EMS dates from 1997, after which an increase was observed from 10 to 39 incidents in the periods 2000-2009 and 2010-2019, respectively.

Conclusions: This analysis of the GTD, which identified 184 terrorist attacks against EMS over a 50-year period, demonstrates that terrorist attacks against EMS have significantly increased during the years and that secondary attacks are an emerging risk. Bombings and explosions are the most common attack type. Terrorist attacks against EMS are most prevalent in countries with high level of internal conflicts, however, they have also occurred in western countries. These incidents may hold valuable information to prevent future attacks.

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Introduction

Terrorism has a history that goes back for thousands of years.[1] It has evolved over time[2] with the development of the modern variety of terrorism during the early 1990s and a sharp increase of incidents since 2001.[3] There is no definition of terrorism that covers all of its varieties throughout the decades,[1] but a common ground exists in the majority of

Abbreviations:
EMS: Emergency Medical Services
GTD: Global Terrorism Database
HEMS: helicopter Emergency Medical Services
VBIED: vehicle-borne improvised explosive device

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definitions.[4] The Global Terrorism Database (GTD) defines terrorism as "the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation."[5]

The last few years, there has been a decline in global terrorism, with 2019 being the fifth consecutive year of the decline after it peaked in 2014.[6] Despite this decline, there have been numerous incidents where an ambulance was used in a terrorist attack,[7,8] and a recent study observed an increase of these types of attacks since 2010.[9] Ambulances, along with helicopter Emergency Medical Services (HEMS) and the associated emergency responders, constitute the Emergency Medical Services (EMS). These are providers of out-of-hospital treatment and transport to definitive care.

Not only are ambulances increasingly used for terrorism purposes, studies also suggest that EMS represent capital targets.[3,10] Terrorists increasingly aim at so-called soft targets, including EMS, in order to destabilize health care systems and ultimately affect societies.[3] There are a number of reports that describe specific aspects of EMS-related terrorist attacks, such as the use of ambulances as vehicle-borne improvised explosive devices (VBIEDs) or the transport of weapons, explosives, combatants, and wanted terrorists by ambulance.[7–9,11] However, little is known about terrorist attacks *against* EMS in its broadest sense. Therefore, this study aims to review all documented terrorist attacks against EMS that occurred world-wide from 1970 through 2019.

Methods

Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standard, a database search of the GTD was performed.[12] The GTD is the most comprehensive, unclassified, open-source database containing information on world-wide terrorist attacks since 1970.[5] It is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland (College Park, Maryland USA),[13] which is a part of the collection of the Center of Excellence supported by the US Department of Homeland Security's Science and Technology Directorate (Washington, DC USA).[14] Spanning from 1970-2019, the GTD contains over 200,000 global terror incidents. The GTD translates the earlier mentioned definition of terrorism by using three criteria in the consideration of including an incident:

1. The act must be aimed at attaining a political, economic, religious, or social goal;
2. There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience than the immediate victims; and/or
3. The action must be outside the context of legitimate warfare activities.

At least two criteria must be present to be included in the GTD. For an incident to be considered as exclusively terrorism, all three criteria must be met.[13]

The GTD was searched within the date range of 1970-2019 for the terms: "ambulance," "emergency," "paramedic," "helicopter," "EMS," "HEMS," and "first responder." Each entry was manually checked by the main researcher (CS). If EMS were not a target, or if it was unclear whether they were a target, the entry was excluded. There were a few entries that did not meet all three criteria to be considered as exclusively terrorism according to the GTD. These entries, as well as the duplicates, were excluded. The second author (DB) reviewed each entry, and in the case of discrepancies, a third reviewer made the final judgement (AB).

Data collected per incident included temporal factors, location (country, world region), attack and weapon type, successfulness of the attack, number of casualties and/or hostages, manner of EMS transportation (air versus ground), and whether the attack was solely aimed against prehospital targets or against prehospital and hospital targets combined (ie, ambulance used as VBIED and detonated in a hospital emergency department). An attack was considered successful by the GTD if the attack actually took place or the intended target of an assassination was killed. It was also determined if EMS was the primary or secondary target of the attack.

Primary attacks are incidents in which the EMS are the main and intended target of the attack. Secondary attacks are defined as incidents in which terrorists deliberately targeted the first responders of an initial terrorist attack.

All collected data were exported into Excel spreadsheets (Microsoft Corporation; Redmond, Washington USA) and analyzed descriptively. This study was approved by the medical-ethical review board of Maastricht University Medical Center (Maastricht, The Netherlands; 2021-2655).

Results

From 1970-2019, the GTD registered 184 incidents which fulfilled the inclusion criteria (Figure 1). There were no terrorist attacks against EMS reported in the GTD from 1970-1979. The attacks occurred in 37 countries and on five continents. The vast majority of attacks were successful (n = 174; 94.6%). This study found a total of 152 (82.6%) attacks that had EMS as a primary target. Also, EMS hijackings occurred 17 times during the investigated time period. Attacks where ambulances were used as VBIEDs occurred 15 times in total, of which 11 were in the last decade and four were from 2000-2010. Of the total 184 attacks, 12 (6.5%) attacks lasted more than 24 hours, 54 (29.3%) attacks were part of a multiple incident attack, and suicide attacks occurred 19 (10.3%) times.

Events per Year

Figure 2 shows that terrorist attacks against EMS significantly increased over the past decades. A rise of incidents was observed since 2008 accounting for 139 of total incidents (75.5%). The number of incidents peaked in 2014 (n = 19), after which the number of attacks varied between seven and thirteen per year but remained above the average of four attacks per year. A chi-square test to evaluate the difference in number of attacks per decade showed a significant different distribution of number of attacks: $X^2 = 160.65$; P <.001 (Appendix A; available online only).

Events per World Region

The "Middle East & North Africa" was the most frequently affected region with 81 (44.0%) out of 184 attacks followed by "South Asia" and "Sub-Saharan Africa" (41 [22.3%] and 26 [14.1%] attacks, respectively). "North America," "South America," and "Western Europe" combined accounted for ten (5.4%) attacks. The geographical distribution of terrorist attacks against EMS is shown in Figure 3. Most frequently affected countries were Iraq (n = 34; 18.5%), Pakistan (n = 17; 9.2%), Afghanistan (n = 15; 8.2%), and Egypt (n = 11; 6.0%). In 2014, the year with the highest number of attacks against EMS, the most frequently hit countries were situated in the "Middle East & North Africa," "South[east] Asia," and "Sub-Saharan Africa."

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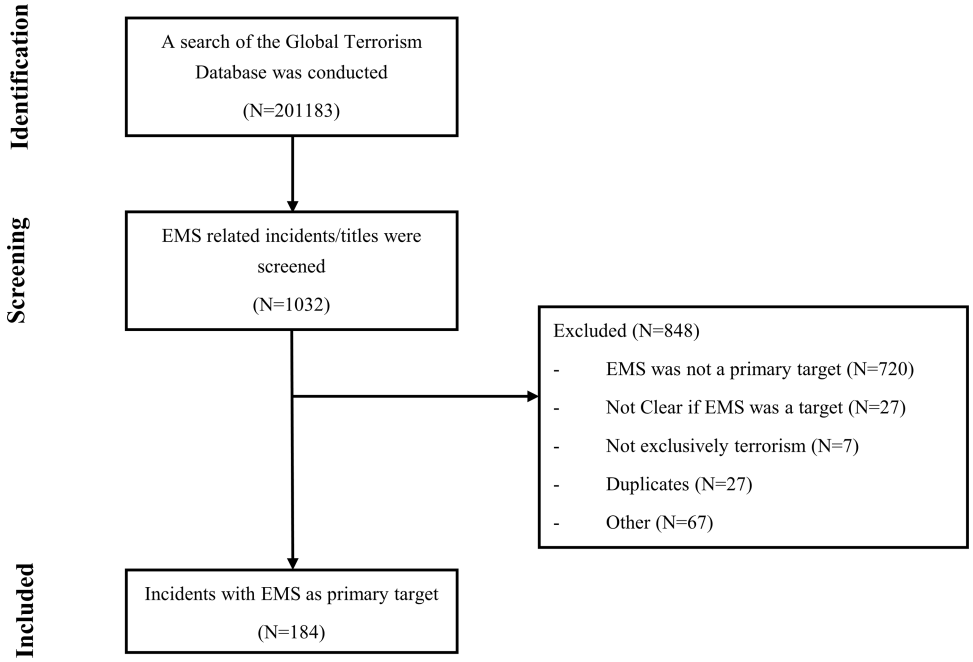

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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flowchart.
Abbreviation: EMS, Emergency Medical Services.

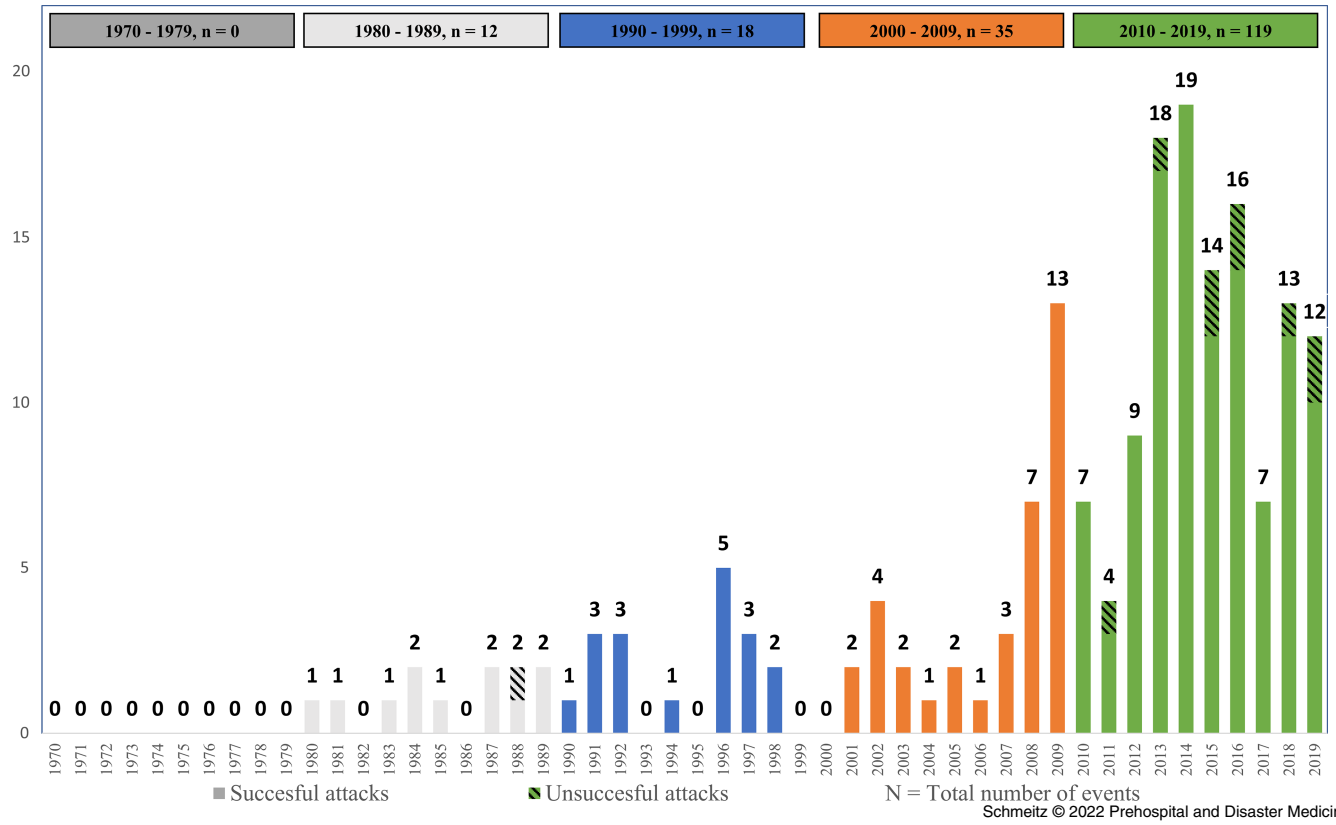

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Figure 2. Number of Terrorist Attacks against EMS per Decade, 1970-2019.
Abbreviation: EMS, Emergency Medical Services.

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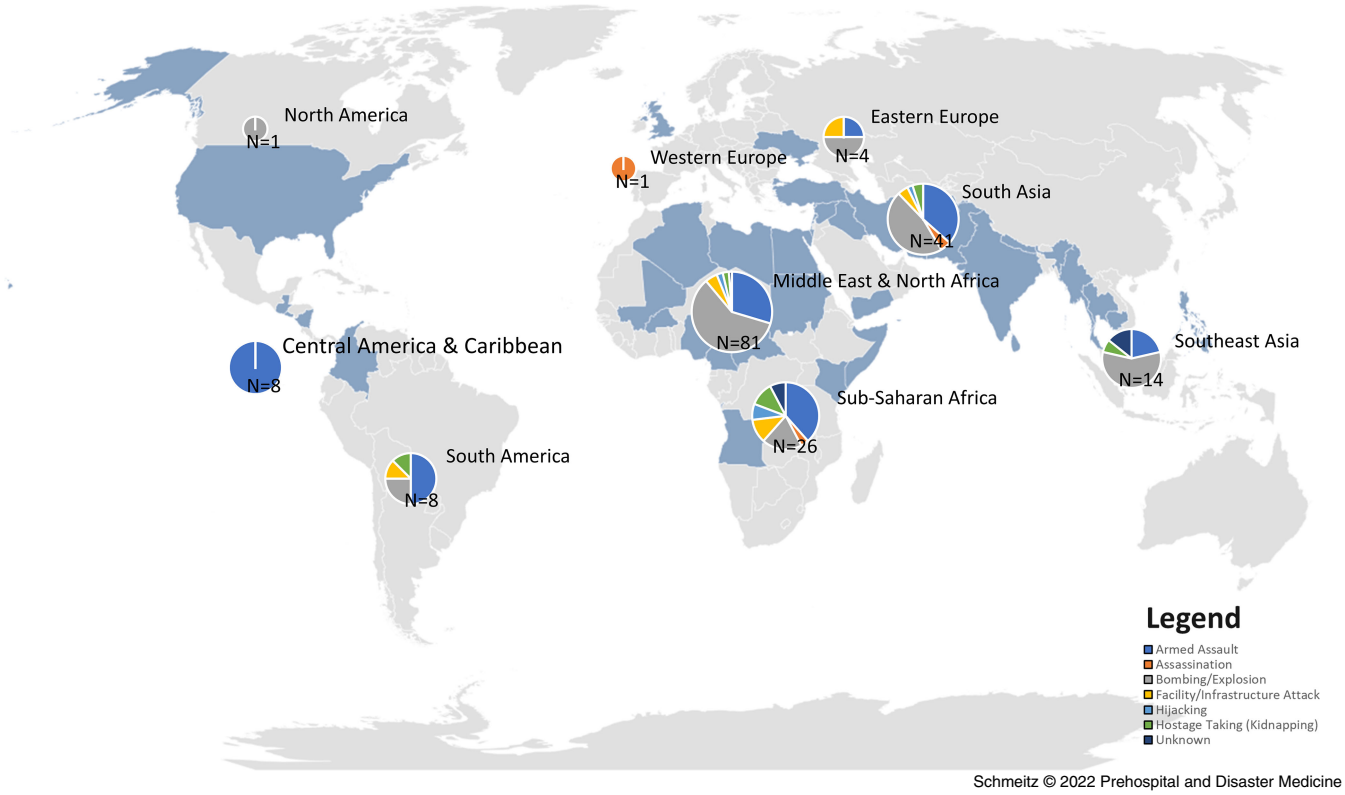

Figure 3. Terrorist Attacks and Attack Types per Region.

Attack Types

Bombings and explosions occurred 85 times (46.2%) and were the most frequently identified attack type. Hence, explosives were the most frequently identified weapon type (n = 85; 46.2%) which included exploding vehicles (n = 30; 16.3%) and explosives of unknown types (n = 21; 11.4%). Armed assaults were the second most common attack type (n = 65; 35.3%).

Most of the attacks were aimed against ambulances (ground transportation) compromising 166 (90.2%) of all incidents. Another seven attacks (3.8%) were aimed against helicopters (air transportation) and eleven attacks (6.0%) were primarily aimed against EMS personnel. Combined prehospital and hospital attacks occurred seven times (3.8%) and were first reported in 2005. Most of the combined attacks were part of multiple related attacks with high numbers of casualties (in total: 103 dead [13.8% of total] and 88 wounded [6.8% of total]).

Hijacking of ambulances was first observed in 1998. It occurred 17 times in total, of which 14 times in the last decade. A total of 34 people were killed (including 15 perpetrators) and nine people were wounded. There was no information regarding casualties in four hijacking cases (Figure 4).

Secondary Attacks

A secondary attack against EMS was first observed in 1997. In the subsequent decade, it occurred ten times and the number of secondary attacks increased to 39 times during the last decade. Bombings and explosions were the most frequently identified attack type in secondary attacks (n = 39; 78.0%). Explosives were the most frequently identified weapon type (n = 39; 78.0%) including exploding vehicles (n = 18; 36.0%) and explosives of unknown type (n = 10; 20.0%). A total of 338 people were killed (including 16 perpetrators) and 666 people were wounded (45.2% and 51.5% of total, respectively; Figure 5).

Casualties and Hostages

As a result of the 184 terrorist attacks against EMS, 748 people were killed (including 69 perpetrators) and 1,293 were wounded (including six perpetrators), as shown in Table 1. The majority of attacks resulted in five or less people killed (n = 140; 76.1%) or wounded (n = 132; 71.7%), but there were also 21 attacks with 10 or more deadly casualties (11.4%). The deadliest year in this analysis was 2018 with 170 casualties. This was also the year in which the attack with the highest number of casualties occurred. On January 27, 2018 in Kabul, Afghanistan, a suicide bomber detonated an explosive-laden ambulance in a crowded street after passing a security checkpoint by telling the police that he was taking a patient to a nearby hospital; 104 people were killed and another 235 wounded. For 10 attacks, information on the number of casualties was unavailable.

Hostages were taken in 14 attacks (7.6%). The attack with the highest number of hostages occurred in 2019 in Nigeria; assailants attacked civilians and soldiers in a hijacked ambulance and 20 civilians were abducted in the ensuing clash. They were successfully recovered the same day.

Discussion

From 1970-2019, the GTD registered 184 terrorist attacks against EMS. The "Middle East & North Africa" and "South Asia" are the world regions with the highest number of attacks. Bombings and explosions were the most frequently identified attack type followed by armed assaults. The majority of incidents concerned ground transport attacks (90.2%). Altogether, 1,293 people were wounded

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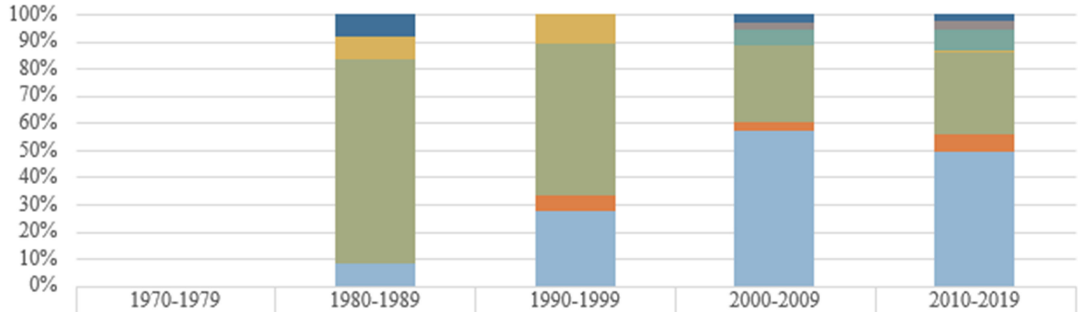
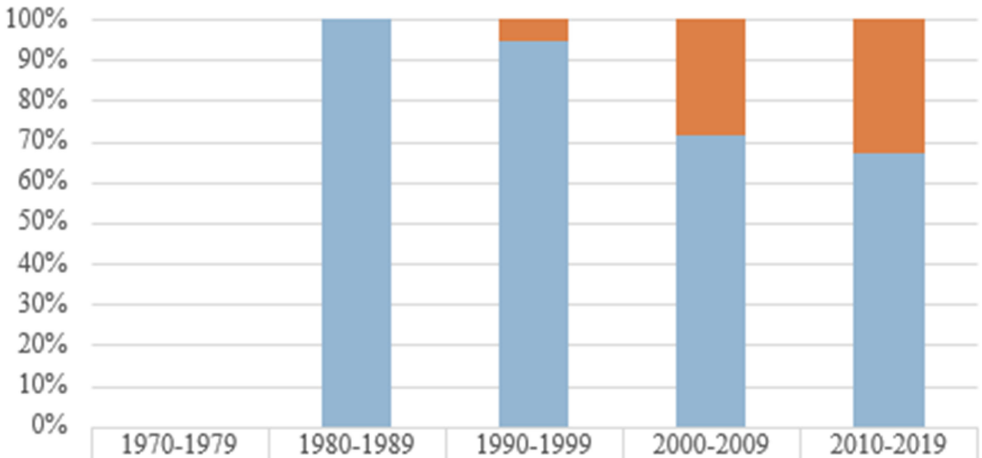


	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Unknown	0	1	0	1	3
Hijacking	0	0	0	1	4
Facility/Infrastructure Attack	0	0	0	2	9
Assassination	0	1	2	0	1
Armed Assault	0	9	10	10	36
Hostage Taking (Kidnapping)	0	0	1	1	7
Bombing/Explosion	0	1	5	20	59

Figure 4. Attack Type as Percentage.



	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Secondary attack (=second blast)	0	0	1	10	39
Primary attack	0	12	17	25	80

Figure 5. Primary Attack versus Secondary Attack as Percentage.

and 784 people were killed. Alarmingly, the frequency of attacks increased and secondary attacks appear to be an emerging trend.

The EMS, and ambulances in particular, are vulnerable for possible (hijacking for) terrorism purposes since they enjoy a relative immunity from many societal restraints due to the time-sensitive nature of their mission. A recent study demonstrated that several factors regarding the daily practice of EMS, such as the identification and confirmation of EMS personnel including the EMS vehicle, and the course of events of an ambulance in the hospital's ambulance bay (arrival, parking, and departure) allows for possible terrorist use.[15] In addition, Jasani, et al and Tin, et al observed that ambulances are increasingly used as "trojan vehicles" where an ambulance represents a VBIED.[9,16] What this study adds to this previous work is that the number of terrorist attacks with EMS as a primary target are on the rise and that ambulance snatchings for terrorism purposes only comprise the tip of the iceberg. The majority of the attacks were primarily aimed at EMS, but incidents in which ambulances were hijacked or used as VBIEDs are increasing. This can be considered as an alarming development since ambulances can carry more explosives than most conventional vehicles or suicide bombers (ambulance 1,800kg versus suicide bomber 5-12kg) and may therefore increase the destructive burden of terrorist attacks directly.[9,17,18] Moreover, the use of ambulances for terrorist purposes may also increase the indirect destructive burden since an ambulance can gain access to vulnerable sites such as hospitals.[7] Such combined prehospital and hospital attacks occurred seven times during the studied time period and accounted for 13.8% of all casualties.

There has been a statistically significant increase in terrorist attacks against EMS from 2008 onwards with a peak of attacks in 2014. This corresponds with specific time periods such as the "post-9/11 period," the start of the war in Syria, and armed conflicts in Iraq and Afghanistan after 2011.[3,19] However, the changing data-collection method of the GTD during the years, along with the understandable under-reporting of data during the 1970s and

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	People Killed (n)	Perpetrators Killed (n)	People Injured (n)	Perpetrators Injured (n)
Middle East & North Africa	380 (50.8%)	23 (33.3%)	729 (56.4%)	0 (0.0%)
South Asia	222 (29.7%)	17 (24.6%)	379 (29.3%)	6 (100%)
Sub-Saharan Africa	113 (15.1%)	29 (42.0%)	61 (4.7%)	0 (0.0%)
Southeast Asia	16 (2.1%)	0 (0.0%)	96 (7.4%)	0 (0.0%)
Central America & Caribbean	12 (1.6%)	0 (0.0%)	3 (0.2%)	0 (0.0%)
South America	3 (0.4%)	0 (0.0%)	12 (0.9%)	0 (0.0%)
Eastern Europe	1 (0.1%)	0 (0.0%)	7 (0.5%)	0 (0.0%)
Western Europe	1 (0.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Australasia & Oceania	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
North America	0 (0.0%)	0 (0.0%)	6 (0.5%)	0 (0.0%)
Total	**748**	**69**	**1293**	**6**

Table 1. Number of Registered Casualties per World Region during Attacks against EMS, 1970-2019
Abbreviation: EMS, Emergency Medical Services.

1980s, may have partially contributed to this increase.[13,20] At the time of analysis, the data for the year 2020, a year that has been marked by the COVID-19 pandemic, were not yet available. A recent study by de Cauwer, et al suggested that health care systems were more susceptible to terrorism as a result of the current pandemic.[21] Possibly, the COVID-19 pandemic also increased the vulnerability of EMS to become a soft target for terrorism, but this warrants further research.

Some regions are more prone to terrorism than others, and it particularly seems to commonly occur in countries with high levels of internal conflict.[20] This study affirms this observation as most of the attacks occurred in the "Middle East & North Africa" and "South Asia" where numerous (armed) conflicts took place in recent years. In comparison, there have been only ten terrorist attacks against EMS in Western Europe and the Americas. One of these attacks occurred in Atlanta (Georgia USA) in 1997 and was related to multiple attacks carried out by the same individual. There was one attack in Western Europe (Belfast, Northern Ireland) in 1980, which was associated with the "Northern Ireland conflict" (1968-1998).[20] The remaining eight attacks occurred in South America during 1991-2019 and six of them were attributed to a specific guerrilla movement: the Revolutionary Armed Forces of Colombia (FARC). Although it appears that terrorist attacks in western countries are relatively rare, they do occur, and EMS organizations should prepare accordingly.

In 2014, Thompson, et al[10] reported that there have been remarkably few secondary attacks against EMS. This statement should now be revised. This data set compromises 50 secondary attacks (deliberate follow-up attacks) against EMS. This type of attack was first identified in 1997 and has been increasingly observed with 39 attacks during the last decade. Therefore, secondary attacks against EMS are regarded as an emerging risk. This is a worrying development, since it suggests that secondary attacks may become a specific strategy of terrorist groups. Furthermore, this study demonstrates that a shift has taken place with regards to the attack types used. From 1980-2001, armed assaults were the preferred type of attack. Bombings and explosions were rarely reported. However, numbers significantly increased from the start of the 21st Century and remain to be the most important attack type during recent years. This same trend has been observed in terrorism globally and can be explained because explosives are relatively easy and inexpensive to manufacture, simple to activate, and easy to execute needing only a single or a few perpetrators.[18] This also brings new challenges as terrorist bombings may differ from other explosion incidents. For example, this attack type is purposefully designed to maximize the number of casualties. This observation is confirmed by this study; 699 of the total 748 casualties occurred after 2001 and the "deadliest attack" during the studied time period was caused by a bomb (an ambulance was used as a VBIED).

Recommendations

Prevention of terrorist attacks against EMS is challenging but should receive priority by EMS providers. Particular attention should be paid to the emerging risk of secondary attacks against EMS. The counter-terrorism approach is complicated because some measures have the potential to affect the wounded (ie, delaying treatment and evacuation until the area is secured). However, some general recommendations can be made. A first step to prepare EMS against terrorist attacks is education and training. Every individual working in the field of EMS should be aware of and acknowledge the current threat of terrorism and the methods used by terrorists. Training is also essential to minimize the impact of a terrorist attack when it occurs. A second step is the identification of potential vulnerabilities of EMS, and the corresponding third step is to try and remove or reduce these vulnerabilities. For example, daily EMS practice shows room for improvement. It is essential to constitute impeccable protocols for the correct identification and authorization of EMS personnel and the EMS vehicle to prevent that EMS becomes prone to (hijacking for) terrorism purposes.[15,22] Furthermore, the risk of stealing/hijacking ambulances when residing in the ambulance bay can be reduced by simple measures, such as shutting off and securing the vehicle

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and minimizing the time that it is left unattended. An ignition bypass system and GPS mapping/satellite tracking may also contribute to the prevention of ambulance hijacking.[15,22] Finally, wearing protective gear, including bulletproof vests, may reduce the risk of sustaining injuries from a terrorist attack, but there is a heated debate about possible benefits and disadvantages.[23]

Limitations

Like any other database, the GTD database that was used for this study has its limitations. The GTD only uses high-quality sources for compiling the database, and although this generates the most reliable information, it also bears an inherent risk of registration bias. It is a given fact that there are less high-quality sources in certain geographic areas which could lead to under-reporting of events in these areas. There is also a possibility of selection and publication bias since only media publications are being used as sources.[13]

Another limitation is the completeness of the database over time; data for the first-half of the dataset are likely to be an under-estimate since the access to and availability of source materials has varied over time.[13,20] Besides the varying access and availability, the manner of data collection also varied during the years. Most of the data were collected in real time, but the data from 1998 until 2007 were collected retrospectively, and some media sources have since become unavailable, reflecting a decline in reported data from 1998-2007.[5,24] Consequently, trends over time should be interpreted with caution.

Although the GTD has several limitations as described above, it still is considered the most reliable, comprehensive, up-to-date, and open-access database known to this day and is well-respected and highly-regarded as a comprehensive data source on global terrorism.[20]

With the technologic health care revolution, there also appears to be an increasing vulnerability for the health care system to become a target of cyber-attacks. This is especially applicable to emergency medicine such as EMS, since systems used by EMS are becoming increasingly interconnected and dependent on information technology for daily operations.[25,26] Even during the COVID-19 pandemic, health care systems were prone to cyberterrorism.[21] The GTD does not include cases of cyberterrorism, which may be regarded as a limitation of this study. Furthermore, the GTD does not include plots, threats, or conspiracies that are not enacted, which is also a potential source for missing data on terrorist attacks against EMS.[13]

Finally, this study does not account for the heterogeneous organization of EMS around the world (including ambulance design, EMS uniforms, access to and security of ambulances and hospitals, employer and infrastructure security, and the response model).

Conclusion

This analysis of the GTD, which identified 184 terrorist attacks against EMS over a 50-year period, demonstrates that terrorist attacks against EMS have significantly increased during the years and that secondary attacks are an emerging risk. Bombings and explosions are the most common attack type. Terrorist attacks against EMS are most prevalent in countries with high level of internal conflicts, however, they have also occurred in western countries. These incidents may hold valuable information to prevent future attacks. The prevention of ambulance hijacking is paramount since ambulances can be used as VBIEDs and for other terrorism purposes.

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Supplementary Materials

To view supplementary material for this article, please visit https://doi.org/10.1017/S1049023X22000140

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