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Review article

Optimal strategies for prevention and preparation of medical personnel for emergency response to an active shooter attack in a healthcare facility – scoping review

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Abstract
Goal: To seek and describe current scientific knowledge on the preparedness of medical personnel for an active shooter attack, with the identification of an optimal preparation strategy concerning prevention and potential management of this emergency on the premises of a medical facility.
Methods: A scoping study with five phases of methodological steps was applied on the basis of the identified research question. According to the PCC (population, concept, context) format, the research question was divided into individual keywords in selected languages used for the search. Primary studies published between 2000 and December 2023 were included in the selection process. The sources were searched in December 2023 and freely available. Licensed databases EBSCOhost, Cinahl Plus with Full text, Medline, Medline Complete, and Google were used to find relevant studies. We used the "find similar articles" function in many databases. Selected English language keywords were searched using Boolean operators and placeholders.
Results: The final analysis included nine studies. As precautions, the authors recommended the development of guidelines and establishment of a system, not only at the national level, but also within individual facilities interconnected with the police, regular training of employees with practical simulation, orientation signs in buildings, communication links for quick information and, last but not least, knowledge of warning behaviour.
Conclusion: Healthcare providers should be systematically prepared for an active shooter emergency.

Keywords: Active shooter; Healthcare facilities; Precautions; RHF method; Training

Introduction

Healthcare facilities are classified as "soft targets"; a term referring to places with a high concentration of people and a low level of security against violent attacks. Although attacks in hospitals are rather rare in our context, they cannot be neglected. In the Czech Republic, the most serious and widespread attack on persons in a healthcare facility (in terms of the number of victims) was the attack by an active shooter at the University Hospital Ostrava on 10 December 2019, when a total of 7 people were killed (FNO, 2019). Most healthcare facilities are open continuously, gathering a high number of visitors, patients, and medical staff, so shooting here results in both a high number of casualties and paralyzing the running of the hospital. Therefore, healthcare facilities can become a suitable target (Ministry of the Interior of the Czech Republic, 2017). The phenomenon of an active shooter is based on the increasing aggressive behaviour in the population caused by rising requirements on a person, influence of living conditions, as well as economic and livelihood demands. An active shooter is an aggressive perpetrator using firearms or other weapons to kill as many people as possible; and thus they seek out locations with a higher population turnover to carry out their crimes (Hrdličková, 2020). While some active shooter incidents are spontaneous and emotion-driven, most are pre-planned, often resulting from anger caused by a variety of confrontations between the active shooter and a medical facility, personal or interpersonal conflicts (Adashi et al., 2015). For example, in the United States of America (USA) between 2000 and 2011, there were 154 shootings in 148 hospitals, with 235 injuries, some of which were fatal (Kelen et al., 2012). Between 2012 and 2016, there were 88 shootings in 86 hospitals, resulting in 121 fatalities (Wax et al., 2019). In both cases, the most frequent assaults happened in emergency and outpatient departments. Emergency departments, by their nature and confined design, are highly vulnerable to such violent incidents, as there is a constant turnover of people (Drone et al., 2020). The num-

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ber of these incidents tends to increase every year and involves all types of hospitals, including smaller facilities. Even in the last two decades, approximately 50% of hospitals with less than forty beds in the US have experienced shootings. Smaller hospitals may become a target due to the possibility of lower security and better spatial orientation (Adashi et al., 2015; Schwerin et al., 2023). In 90% of the incidents, the shooter is male, and the motive tends to be: resentment, lack of care, revenge, limited treatment of an incurable patient, ideology, political beliefs, etc. In the United States, there is most often one victim in hospitals. In only 10% of incidents there were more than three victims, often innocent bystanders. After an incident, nearly 50% of shooters commit suicide and less than 10% are arrested alive. In more than 50% of cases, there is a relationship between the shooter and the victims in hospitals: an active personal relationship (32%), an estranged relationship (25%), a current or former patient or employee (Schwerin et al., 2023).

Healthcare facilities not only face "lone" active shooters, but also terrorist attacks. As reported by Adashi et al. (2015), terrorists see hospitals as viable targets and, knowing they can cause a significant number of deaths by disrupting care, they thus target a higher number of victims. In addition, by attacking a healthcare facility, a terrorist can divert the attention of the integrated emergency system from the primary area of necessary care in the field (Adashi et al., 2015), which also results in high public attention and a negative impact on the psyche of the population (Ministry of the Interior of the Czech Republic, 2017).

Security measures against violent incidents can be viewed from the perspective of three time periods (Kalvach, 2016):

1. Preparation prior to an incident to reduce the likelihood of its occurrence. The main tools are deterrence of an attacker and assertive communication, leading to calming the situation and de-escalation of the conflict.
2. Measures at the moment of an ongoing incident; it is important to detect an incident or breach of protected zones as soon as possible, preferably before the attack occurs. During an incident, immediate response by security personnel or other members of the security system is required, often according to a prepared plan.
3. After an incident, it is essential to mitigate its effects. The prepared management coordination plan and the priorities defined by management are followed. Another aim is to restore the organisation's operations as soon as possible.

Precautions are primarily aimed at early recognition and mitigation of the effects. The response to an attacker's arrest is in most cases in the hands of professional teams that are tactically and technically trained and equipped (Kalvach, 2016). The basis of protection of "soft targets" is primarily their identification and their own co-responsibility. The number of "soft targets" is so high that ensuring their security solely at the state level is in fact impossible. Responsibility is thus placed on the facilities themselves, but co-responsibility also lies with their founder. Nevertheless, security measures to protect soft targets are generally adopted voluntarily by the facility managers themselves. The main principle of protection preparedness is mutual knowledge and cooperation between the staff of facilities and relevant security forces, i.e., knowledge of basic information on both sides and establishment of functioning communication channels. From a practical point of view, the preparedness is not based so much on technical issues and investments in material equipment as on the readiness and training of personnel in a given location (Ministry of the Interior of the Czech Republic, 2017).

There are various types of a response to an active shooter that have been developed in recent years and these can be grouped into three basic principles (Schwerin et al., 2023): run, hide, fight (RHF). The term run refers to the advice to leave the site of attack as quickly as possible, to warn and assist others when attacked, and to inform security forces. The term hide is used to refer to hiding out of sight of the shooter, where a person enters a room, locks, or barricades the door behind them and turns off the lights. Fight is the last resort, where life is in immediate danger. In this case, it is recommended to try to disarm the shooter (Police of the Czech Republic, 2017).

Aim

To search and describe current scientific knowledge on the possibilities of medical personnel preparedness for an incident involving an active shooter, along with the determination of the optimal strategy of preparation for prevention and possible solution of this type of emergency on the premises of a medical facility.

Materials and methods

Design

A scoping search with five phases of methodological steps according to Arksey and O'Malley (2005) was applied: (1) defining the research question; (2) identifying relevant studies; (3) selecting studies; (4) mapping the data; (5) collecting, describing, and summarizing the results.

We defined the research question: "Are there any evidence-based or expert recommendations on finding an optimal strategy to prepare healthcare personnel to prevent and potentially respond to an active shooter attack incident on the premises of a healthcare facility?" According to the PCC format (an outline of questions helping to articulate the question for the scoping review and to highlight important concepts for the literature search; population, concept, context), we divided the research question into individual keywords in selected languages used for the search – Table 1 (Aromataris and Munn, 2020).

Selection criteria

Selecting relevant studies commenced with the determination of inclusion and exclusion criteria. Primary studies (quantitative and qualitative methods) published between 2000 and December 2023, written in English, Czech, German, and French were included (Table 1). Only full-text articles or guidelines including grey literature were included due to the specificity of the topic. Papers that did not meet the criteria of the aim of our study were excluded.

Search strategies

The resources search was conducted in December 2023. Freely available and licensed databases EBSCOhost, Cinahl Plus with Full text, Medline, Medline Complete, and Google were used to search for relevant studies in English (Table 2). Simultaneously, we used manual searches in other languages, as this is a very specific topic. We searched online sources to find additional information beyond the database search, including editorials, conference proceedings, standard guidelines/methodologies, etc. We used the "find similar articles" function in many databases. We manually checked all references to the manuscripts relevant to our subject area.

Table 1. PCC question description and corresponding keywords in selected languages

Keywords	P = population	C = concept	C = context
English	nurse, physician, doctor, health care worker, medical person, medical professional, medical worker, medical providers	active shooter, workplace violence, physical force, shooting incident, victim, shooter response, soft targets, exceptional event, adverse event, education, program, training, violence prevention, preventive measures, prevention	health care, healthcare settings, hospital, emergency department, emergency room
Czech	všeobecná sestra, lékař, doktor, zdravotnický pracovník, zdravotnické zařízení	aktivní střelec, násilí na pracovišti, fyzická síla, střelecký incident, oběť, reakce střelce, měkké cíle, mimořádná událost, nežádoucí událost, vzdělávání, výuka, program, školení, prevence násilí, preventivní opatření, prevence	zdravotní péče, zdravotnické zařízení, nemocnice, pohotovost, urgentní příjem
French	infirmière, médecin, agent de santé, établissement de soins de santé	tireur actif, violence sur le lieu de travail, force physique, incident de tir, victime, réaction du tireur, cibles molles, incident, événement indésirable, éducation, enseignement, programme, formation, prévention de la violence, précautions, prévention	soins de santé, établissement de soins de santé, hôpital, salle d'urgence, soins urgents
German	Krankenschwester, Arzt, Gesundheitspersonal, Gesundheitseinrichtung	aktiver Schütze, Gewalt am Arbeitsplatz, physische Gewalt, Schießvorfall, Opfer, Reaktion des Schützen, weiche Ziele, Vorfall, unerwünschtes Ereignis, Erziehung, Unterricht, Programm, Ausbildung, Gewaltprävention, Vorsichtsmaßnahmen, Prävention	Gesundheitsversorgung, Gesundheitseinrichtung, Krankenhaus, Notufnahme

Selected English language keywords were searched using Boolean operators AND, OR and placeholders: "active shooter" AND "soft targets" AND (nurse* AND doctor* OR physician* OR "medical person*" OR "medical worker*" "medical professional*") AND ("health care provider" OR hospital OR "emergency department" OR "emergency room" OR "healthcare facility") AND ("education program" OR training OR "violence prevention" OR "precautions" OR prevent*). Other suitable keywords in the selected languages are listed in Table 1.

Selection of articles incl. PRISMA diagram

Nine studies meeting the criteria for a scientific article were included in the final analysis (Table 2). As the topic of an active shooter is very specific and since our aim was also to identify a prevention strategy, we included other articles addressing the issue, despite perhaps not complying with the exact IMRAD criteria (introduction, methods, results, and discussion) according to Batmanabane (2017). The progression of the search strategy is illustrated by the PRISMA diagram (Diagram 1).

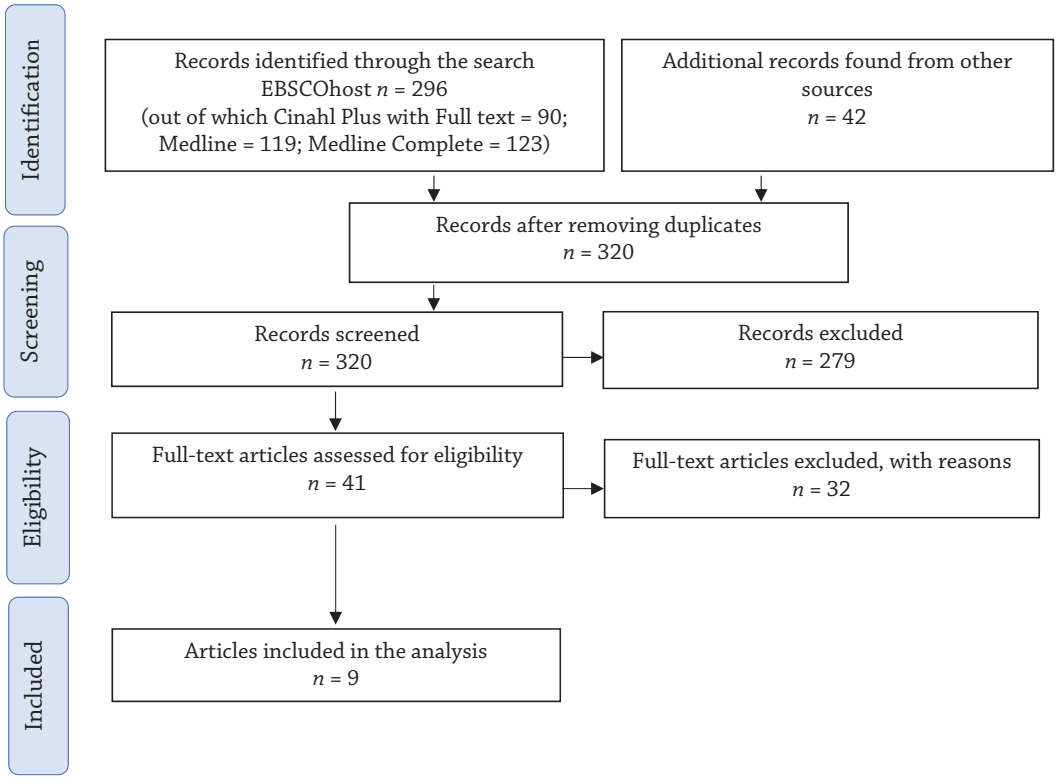

Diagram 1. PRISMA-sco diagram

Results

Based on the methodology, a total of 9 relevant studies were found (Table 2).

Hoffmann and Allwinn (2016) identified and analysed three cases of adult "rampaging" in German schools between 1913 and 1983. The aim was to assess to what extent psychiatric aspects are involved and whether there are risk factors that might be detected and used for prevention. A typology of warning behaviour was included, comprising eight behavioural factors. Psychiatric problems were identified in all three cases and warning behaviour typology factors were identified in varying degrees: (1) a pathway to violence (n = 3), involving the preparation of weapons and planning of action; (2) negative pathological fixation (n = 3); (3) identification (with a weapon) (n = 1); (4) a new form of aggression (in addition, another type of aggression towards persons prior to the act) (n = 1); (5) burst of energy (increasing level of activity) (n = 1); (6) Information leakage (that a violent act will occur is leaked to a third party) (n = 2); (7) warning behaviour as a last resort (n = 2); (8) directly communicated threat did not occur with any attacker.

Janairo et al. (2021) intended to use a simulation to determine physicians' and medical students' perceptions of their role in an active shooter attack incident, e.g., what level of personal risk physicians/nurses should take to protect patients who cannot avoid danger; whether physicians and nurses have the same specific responsibility as police officers/firefighters to protect patients. The aim was to evaluate the effect of pre- and post-simulation-based training on ethical dilemmas and to determine whether training can affect participants' ethical beliefs regarding personal responsibility and risk. The goal of the simulation was to provide an experience enabling participants to reflect on their roles when potentially confronting an active shooter. The simulation called for quick reaction, decision, and definite action during an emergency, and it was designed to elicit the same stress that may occur in healthcare professionals responding to an active shooter while caring for a patient. The research found that prior to the simulation, most participants felt responsible for protecting their patients during an active shooter attack and were willing to accept a high level of personal risk. Nevertheless, after the simulation, results showed a significant reduction in the perception of responsibility to protect patients.

The authors of the Keney et al. (2020) research focused their attention on patients and conducted a cross-sectional study to determine the public's perception of the extent of the duties and responsibilities of healthcare professionals to themselves and their patients during an active shooter incident. Emergency department visitors (patients and their attendants) were given a questionnaire containing four scenarios/model situations (illness and patient condition), and they were asked to select a response method for each AS situation. For most of these (depending on the severity of their condition), they chose to flee with medical staff or barricade themselves in a room and be prepared to fight. The option of leaving on their own by running away or hiding in a room after being instructed was chosen by a slight majority of respondents.

In their study, Landry et al. (2018) investigated whether there would be an increase in the knowledge of healthcare workers (n = 66) following an educational program on ensuring the safety of not only staff but also patients. Employees were presented with information on procedures, e.g., how to report an incident, how to cooperate with law enforcement, and were shown a video demonstrating different options of how to respond to an active shooter (RHF steps; run, hide, fight), etc. In the study, there was a significant increase in knowledge ($p < 0.001$) before and after the educating program, and also in organizational preparedness ($p < 0.001$). Healthcare workers' perceptions of the usefulness of the training were the same both before and after the education program ($p = 0.180$).

Martel-Perron (2015) issued a report looking at violence in public institutions in Quebec, covering four categories – schools, hospitals, courts, and government. They describe the profile of perpetrators of gun attacks and the vulnerabilities of public institutions as attack targets. They subsequently point out violence prevention policies, their management, and opportunities to raise awareness and resources among public institution employees. The research in this report confirms the incidence of violence in all the institutions mentioned, while suggesting that there are opportunities for prevention at several levels: e.g., taking precautions, analysing, and identifying risks and improving management of the institutions, and training and informing staff. A special chapter was dedicated to the issue of mass homicides, when prevention is based on relationships with the police, warning and communication systems, improved mental health services and social structures, regulation of firearms, and more judicious media coverage of incidents.

Reißmann et al. (2023) provided a document containing strategies and guidelines to implement violence precautions in emergency departments. This research report is based on four studies. The first is a presentation of an intervention and an observational study addressing violence prevention measures in emergency departments. The second collected data on the frequency, nature, and severity of violent acts against staff in emergency departments. The third analysed available violence precautions and subjectively perceived factors preventing their implementation. The fourth examined the correlation between mental strain and work environment. The aim was to provide scientifically based information on the subject and thus improve the management of aggression and violence in these exposed departments. The document contains facts about the cause of violence, followed by a list of preventive measures (such as alarm and camera systems, staff organisation, cooperation with the police, etc.) and individual measures for staff (basic training, de-escalation options, recognition of early warning signs, escape). It also includes the concept of follow-up care after an incident, automatically de-escalating the mental burden on the affected persons.

Sanchez et al. (2018) described an educational project on emergency preparedness for incidents involving an active shooter that included a didactic component, preliminary and follow-up survey, and simulation. The purpose of the project was to improve the knowledge, confidence, and response of personnel to an emergency situation. The primary outcome showed that more than 80% of emergency department nurses and more than 50% of supporting staff attended active shooter training. A total of 92% of employees reported that they felt better prepared. The study authors concluded that educational programs benefit emergency departments in improving staff preparedness for survival.

Ventzke and Segitz (2020) conducted extensive research aimed at finding a system to enhance the orientation of rescue units in a building in order to quickly locate the site of an emergency. Only 3 systems from Germany serving this purpose could be found: (1) the Unified School Orientation System (EOS, Einheitliches Orientierungssystem Schule) – a numerical logical marking of individual rooms; (2) the Colour

Table 2. Studies included

Author (year), country	Aim	Type of the study	Sample/documents size	Data collection method	Data analysis	Results
Hoffmann and Allwinn (2016), Germany	to determine the importance of psychiatric aspects in AS and whether risk factors exist to identify individuals and possibly prevent the incidents	case study	n = 3 AS	warning behaviour typology	psychological analysis	in all three cases, serious psychological problems were identified the factors of the warning behaviour typology were present in varying relevance: path to violence (n = 3); fixation (n = 3); identification (n = 1); new aggression (n = 1); burst of energy (n = 1); leakage (n = 2); last resort (n = 2); directly communicated threat (n = 0)
Janairo et al. (2021), USA	to evaluate the pre- and post-training impact of simulation-based training on ethical dilemmas and determine whether the training can affect healthcare professionals' ethical beliefs regarding personal responsibility and risk	cohort	n = 45, physicians and 4th year medical faculty students	a quantitative non-standardized questionnaire based on the Hartford Consensus, presented before and after simulation-based training	descriptive statistics, chi-square test	there was a significant decrease in attitudes in both areas: (1) from 60% to 25% (p = 0.008): doctors/nurses have a special responsibility as police officers/firefighters to protect patients who are unable to get out of danger from AS; (2) from 32% to 11% (p = 0.243) doctors/nurses have a special responsibility to protect their loved ones/patients
Keney et al. (2020), USA	to find out how the public perceives the extent of the duties and responsibilities of healthcare professionals towards themselves and their patients during an AS incident	cross-sectional	n = 127 visitors to the emergency department of the trauma centre at the university hospital: n = 82 patients n = 45 attendants	questionnaire survey with 4 scenarios with AS incidents	descriptive statistics, chi-square test	in each of the 4 case scenarios, at least 86.6% of respondents expected that in a situation with AS, health professionals would take care of the patient either by running away with them or by providing hiding
Landry et al. (2018), USA	to test educational program on employees´ knowledge and preparedness in response to an AS attack in a healthcare facility	descriptive, cross-sectional and correlation	n = 66, inpatient health workers with no knowledge or training in the given issue	quantitative non-standardized questionnaire presented before and after education	descriptive statistics, bivariate correlation, t-test, linear regression	knowledge (p < 0.001) and readiness of the facility (p < 0.001) increased after the training
Martel-Perron (2015), Canada	to provide a detailed overview of the scientifically based circumstances of violence and the possibilities of preventing and addressing them in public institutions	overview, thematic and cross-sectional	analyse violence in all Quebec public institutions	research	documents analysis	prevention options have several levels: e.g. taking precautions, analysing and identifying risks and improving their management, training employees
Reißmann et al. (2023), Germany	to create an overview document focusing on the prevention of aggression and violence against ER staff and options for subsequent support	review	15 studies found; 2× online surveys of emergency department staff; 27 telephone interviews with emergency department staff and managers; interview with 4 experts	research	analysis of documents, interviews, descriptive data description	the result is a methodological guideline on prevention, treatment, and subsequent therapeutic intervention of the affected persons

Table 2. ***(continued)***

Author (year), country	Aim	Type of the study	Sample/documents size	Data collection method	Data analysis	Results
Sanchez et al. (2018), USA	to improve emergency department staff knowledge, confidence, and response to an AS incident	cohort	*n* = 204, healthcare facility personnel	quantitative non-standardized questionnaire presented before and after training based on education and simulation	descriptive statistics	there were improvements in preparedness (92%), knowledge (70%); first response would be to flee the scene (66%); protect patients (15%), hide (7%), fight (6%) and call 911 (4%)
Ventzke and Segitz (2020), Germany	to find systems to help rescue units intuitively navigate the building	overview	non-specified	research	document analysis	found 3 systems from Germany, serving for orientation of rescue services in buildings and enabling targeted localization of the site of the damage: (1) EOS – numerical logical marking of individual rooms; (2) FLS – colour marking of doors, entrances, and paths; (3) GM – marking inside buildings with light lettering on a blue background
Wallen et al. (2023), USA	to determine the extent to which emergency department staff are familiar with the hospital's AS response methodology	cross-sectional	*n* = 60 emergency department healthcare workers	electronic non-standardised questionnaire via the Qualtrics® platform	statistical analysis using JMP 14.0	only 10% of respondents participated in an AS drill in the past year; staff who did not know the hospital's emergency action plan for AS were significantly more likely to feel unprepared for AS ($p < 0.0001$), as were those who were not trained ($p = 0.0002$)

Note: AS – Active shooter; EOS – Einheitliches Orientierungssystem Schule; FLS – Farbleitsystem; GM – Gütersloher Modell; N – number.

Orientation System (FLS, Farbleitsystem) – colour marking of doors, entrances, and pathways; (3) the Gütersloh Model (GM, Gütersloher Modell) – marking inside buildings with light lettering on a blue background. They all originated after the 2009 school shooting incident, and all enable emergency services to orientate in the building by systematically marked rooms, staircases, and entrances.

Wallen et al. (2023) conducted a study with emergency department employees via an anonymous electronic questionnaire using the Qualtrics® platform (employee interest survey software using artificial intelligence). The questionnaire was distributed to approximately 2,300 employees of Hospital Corporation of America (HCA), medical centres in Florida with a total of 60 emergency department respondents completing the questionnaire. 90% of respondents claimed not to have received any active shooter response training, and only 2% of respondents reported being prepared for these incidents. 72% of respondents were familiar with the "run, hide, fight" method, and 85% were unfamiliar with the "avoid, deny, defend, treat" method.

Discussion

The aim of the scoping review was to seek evidence-based or expert guidelines on finding the optimal strategy to train healthcare personnel to prevent and potentially deal with an active shooter incident on the premises of a healthcare facility. Healthcare facilities are specific institutions, for which it is highly difficult to plan a quick response. This is due to the fact that they are visited by a large number of patients daily, often with limited mobility, and the buildings have numerous entrances and exits (Schwerin et al., 2023). Therefore, a preventive training plan/methodology to protect soft targets is needed, not only at the state level (Healthcare and Public Health Sector Coordinating Council, 2017; Kalvach, 2016; Ministry of the Interior of the Czech Republic, 2017, 2023; Schwerin et al., 2023), but also as part of healthcare facility standards (Garceau et al., 2011; Martel-Perron, 2015; Reißmann et al., 2023; Sanchez et al., 2018; Schwerin et al., 2023). It is necessary to establish a network of connections, including sending alert text messages to selected soft target representatives, to make those at the site of the attack be aware of and informed about what is happening in the vicinity (Ministry of the Interior of the Czech Republic, 2017).

An active shooter incident is also complicated for it usually happens very quickly and often ends before law enforcement arrives (Schwerin et al., 2023). Agh (2011) adds the term "active shooter" to the term "mad shooter" coined by the media and defined by the police as an armed perpetrator whose attack is not random and whose actions tend to be well-considered. He or she does not have a plan of retreat and is unwilling to negotiate and surrender; the aim is usually to kill as many people as possible before being stopped. The attack often ends within nineteen minutes, either with the arrival of the SWAT team, a jammed weapon, or running out of ammunition (Schwerin et al., 2023). For this reason, during the initial phase, the use of situational precautions (personal and technical) is essential to prevent the active shooter from killing or at least make reaching the target more difficult (Martel-Perron, 2015). The Ministry of the Interior of the Czech Republic (2017) wants to create conditions that enable a substantial proportion of soft targets to be able to respond to a threat – and thus either prevent the attack or significantly reduce the potential damage. The concept assumes that the protection of soft targets is an

issue for all involved as they must actively cooperate with each other and have an established communication and coordination activities. This also includes the necessary involvement of the police.

The RHF method is the most common guideline cited by the authors Beaudry and Martel (2016), Inaba et al. (2018), Lindekilde et al. (2021), McGill University (2024), Rondeau and Soucy (2017), Schwerin et al. (2023), Université de Sherbrooke (2022) and Wallen et al. (2023). This method has been adopted throughout Europe from the Norwegian security forces in 2018 and paralleled the American guidelines (Lindekilde et al., 2021). We also encountered ethical dilemmas associated with this situation, with Janairo et al. (2021) elaborating on the first step "run away" – as healthcare workers, according to respondents who have not yet undergone emergency training, are supposed to protect patients rather than their own lives, just like other units of the integrated rescue system. After the simulation, the results showed a demonstrably large reduction in the perception of the responsibility to protect patients. The ethical dilemma was also addressed by Giwa et al. (2020) in their review article. As a result, opinions on the issue are inconsistent, but more authors are in favour of the duty of health professionals to protect patients. The authors conclude, however, that after extensive literature research, the decision to stay or flee is a personal one, and no professional, federal, or regulatory agency/command can mandate it. Those who choose to stay do so based on their personal moral code and duty to serve in emergency situations. This is confirmed by Price (2020) who states that regardless of the dangers involved, despite avoiding a shooter, healthcare professionals are reluctant to leave patients who are undergoing surgery, delivering a baby, or are otherwise immobile. The research of Keney et al. (2020) found that patients expect help from health care professionals and that protection issues in this situation cross various boundaries: medical, ethical, moral, psychological, and legal. They reported a potential conflict between healthcare provider training and a patient's expectations. Landry et al. (2018) recommend intervening against the shooter only as a last resort (the "fight" step), and if escape is not possible, find a safe shelter, restrict entry to the building, and provide shelter for others. Another method of "secure, preserve, fight" is mentioned by Inaba et al. (2018). In the mentioned strategy, healthcare workers should ensure safety for both themselves and patients in step two "maintain". They recommend staying away from windows and doors, moving with patients to safe areas if possible, and providing only such necessary medical care required to sustain life. There are also other recommendations from the UK such as "run, hide, tell," which are defensive behaviours (Lindekilde et al., 2021). In addition to these methods, Wallen et al. (2023) also reported the "avoid, deny, defend, treat" method, where the first three points share the principles of the RHF method. However, they add a final instruction "treat" to streamline follow-up comprehensive first aid to the injured, especially in emergency rooms. At the same time, however, this procedure is unfamiliar to most of the public.

The importance of methodological guidelines is essential (Beaudry and Martel, 2016; Garceau et al., 2011; Martel-Perron, 2015; McGill University, 2024; Pigeon et al., 2017; Université de Sherbrooke, 2022). Beaudry and Martel (2016) recommend four levels of protection: prevention, preparedness, response and recovery; McGill University (2024) recommends escape, shelter and fight. Garceau et al. (2011) divided the methodology into three sections: identification, risk analysis and assessment, preparation, and recovery response. Pigeon et al. (2017) divided the guidance according to the type of emergency into codes. For the active shooter, "Code Argent" is assigned. There is a description of the different options, mainly of escape and hiding. Furthermore, the duties of the different parties involved are presented; from staff, security personnel, and operators, to emergency coordinators. The Université de Sherbrooke (2022) has issued a brief guideline (with recommendations for situations with or without a free escape route) on how to respond until the arrival of a police unit. The recommendation includes a link to an instructional video. The methodologies have the advantage of aligning interventions with local police to help promote a safe environment and comply with legal obligations (Garceau et al., 2011).

There is little research on how healthcare facilities/managers prepare their staff for the possibility of an active shooter attack (Landry et al., 2018). Preparedness of healthcare workers for the possibility of an active shooter incident in healthcare facilities is essential (Beaudry and Martel, 2016; Garceau et al., 2011; Landry et al., 2018; Martel-Perron, 2015; Ministry of the Interior of the Czech Republic, 2017; Reißmann et al., 2023; Rondeau and Soucy, 2017; Sanchez et al., 2018; Université de Sherbrooke, 2022; Wallen et al., 2023). In the studies and in other documents we have found, beyond the general search strategy definition, the authors (Janairo et al., 2021; Ministry of the Interior of the Czech Republic, 2017; Sanchez et al., 2018; Wallen et al., 2023) saw great importance in staff training, as staff preparedness for an event may safe not only staff lives but also the patients, according to Landry et al. (2018). Janairo et al. (2021) and Kotora et al. (2014) recommend active exercises over theoretical training, such as simulation practice, improving situational response knowledge and skills. Université de Sherbrooke (2022) has created a methodological guideline with an instructional video for the given option. Sanchez et al. (2018) cite the ENA10 (Emergency Nurses Association) recommendation for emergency departments to have an action plan and drills concerning active shooter incidents, and based on feedback from staff, consider training in other departments. Healthcare workers should also be instructed on how to interact with law enforcement (Landry et al., 2018; Rondeau and Soucy, 2017). In addition, staff training should be regular (Terry, 2017).

Among other incident-based preventive measures, the authors cite identification and designation of evacuation/escape routes (Landry et al., 2018; Université de Sherbrooke, 2022), interconnected communication throughout the facility (Landry et al., 2018), and connectivity with police or security agencies (Healthcare and Public Health Sector Coordinating Council, 2017). Nevertheless, knowledge of possible psychological triggers that may lead to attacks (Hoffmann and Allwinn, 2016) is equally important. This is also related to the education of staff to recognise warning signs of aggressive behaviour in patients and accompanying persons, enabling early recognition of the potential perpetrator and possible de-escalation of impending conflict (Reißmann et al., 2023).

Limitations of study

Despite the extension of the search to other languages, we were limited by the very small number of studies found. As a result, we included articles that did not meet the exact IMRAD criteria.

Conclusion

Healthcare facilities are characterized by high turnover of people in widely communicating spaces. Thus, it is desirable for each country to prepare standards to address an active shooter emergency, applicable at the local level for individual healthcare providers. These emergencies happen very quickly and often end before emergency responders arrive, and therefore, prevention is a critical strategy for healthcare workers' preparedness. There is a consensus on the need to train them for these incidents, rehearse and collaborate with law enforcement. There are several possible ways to respond to an active shooter, the most widely used being RHF. Additionally, for health care professionals, the dilemma of responsibility to care for patients at the time of the incident arises and is not clearly answered. Due to the nature of medical facilities, staff should be trained in first aid for the injured. Although it is possible to benefit from the training methodologies developed by foreign countries, where the occurrence of such emergencies is more frequent, the availability of studies concerning the specific environment of a healthcare facility is still limited.

Ethical aspects and conflict of interest

The authors have no conflict of interest to declare.

References

1. Adashi EY, Gao H, Cohen IG (2015). Hospital-based active shooter incidents. JAMA 313(12): 1209–1210. DOI: 10.1001/jama.2015.1733.
2. Agh K (2011). Aktivní střelec 2011. In: Procházka M, Ježek B, Vaněk J, Antoš K. Sborník příspěvků 8. ročníku konference. Medicína katastrof, zkušenosti, příprava, praxe, pp. 7–10. Hradec Králové: Zdravotní a sociální akademie.
3. Arksey H, O'Malley L (2005). Scoping studies: towards a methodological. Framework. Int J Social Research Methodology 8(1): 19–32. DOI: 10.1080/1364557032000119616.
4. Aromataris E, Munn Z (Eds) (2020). JBI Manual for evidence synthesis. JBI. Available from: https://synthesismanual.jbi.global. DOI: 10.46658/JBIMES-20-01.
5. Batmanabane G (2017). The IMRAD Structure. Reporting and Publishing Research in the Biomedical Sciences, pp. 1–4. DOI: 10.1007/978-981-10-7062-4_1.
6. Beaudry J, Martel C (2016). Usage menaçant d'une arme à feu code argent [Threatening use of a firearm silver code]. [online] [cit. 2023-12-17]. Available from: https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageFichier.aspx?idf=170689
7. Drone E, Wallen M, Ganti L (2020). 261 Assessment of emergency department staff awareness of policy and expert opinion protocol regarding active shooter event. Ann Emerg Med 76(4): S100–S101. DOI: 10.1016/j.annemergmed.2020.09.275.
8. FNO – Ostrava University Hospital (2019). Úterní útok střelce si vyžádal sedm obětí. © Fakultní nemocnice Ostrava 2023. [online] [cit. 2023-12-27]. Available from: https://www.fno.cz/novinky/uterni-utok-strelce-si-vyzadal-sedm-obeti
9. Garceau M, Paradis C, Lapointe A (2011). Faire face à un tireur actif – Guide à l'intention des établissements de santé et de services sociaux [Dealing with an active shooter – A guide for health and social services establishments]. Montréal: Service de police de la Ville de Montréal, 33 p. [online] [cit. 2023-12-17]. Available from: https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageFichier.aspx?idf=84993
10. Giwa A, Milsten A, Vieira D, Ogedegbe C, Kelly K, Schwab A (2020). Should I stay or should I go? A bioethical analysis of healthcare professionals' and healthcare institutions' moral obligations during active shooter incidents in hospitals – A narrative review of the literature. J Law Medic Ethics 48(2): 340–351. DOI: 10.1177/1073110520935348.
11. Healthcare and Public Health Sector Coordinating Council (2017). Active Shooter Planning and Response. In: Sector Coordinating Council Healthcare and Public Health. 115 p. Available from: https://www.jointcommission.org/-/media/tjc/documents/resources/workplace-violence/2017_active_shooter_planning_response_healthcare_settingpdf.pdf
12. Hoffmann J, Allwinn M (2016). Amokläufe an Schulen durch Außenstehende – Psychiatrische Auffälligkeiten und Risikomarker [School shootings by outsiders – psychiatric abnormalities and risk markers]. Zeitschrift für Kinder- und Jugendpsychiatrie und Psychotherapie 44(3): 189–197. DOI: 10.1024/1422-4917/a000421.
13. Hrdličková Š (2020). Bezpečnostní hrozby násilných útoků ve zdravotnictví – příležitosti a výzvy. Diplomová práce. Kladno: ČVUT – FBMI.
14. Inaba K, Eastman AL, Jacobs LM, Mattox KL (2018). Active-shooter response at a health care facility. N Engl J Med 379: 583–586. DOI: 10.1056/NEJMms1800582.
15. Janairo MP, Cardell AM, Lamberta M, Elahi N, Aghera A (2021). The power of an active shooter simulation: changing ethical beliefs. West J Emerg Med 22(3): 510–517. DOI: 10.5811/westjem.2021.4.51185.
16. Kalvach Z, Soft Targets Protection Institute, z. ú. (STPI) (2016). Základy ochrany měkkých cílů: Metodika, p. 42. Ministerstvo vnitra České republiky. [online] [cit. 2023-11-16]. Available from: https://www.mvcr.cz/soubor/metodika-zaklady-ochrany-mekkych-cilu-pdf.aspx
17. Kelen GD, Catlett CL, Kubit JG, Hsieh YH (2012). Hospital-based shootings in the United States: 2000 to 2011. Ann Emerg Med 60(6): 790–798. DOI: 10.1016/j.annemergmed.2012.08.012.
18. Keney K, Nguyen K, Konecki E, Jones C, Kakish E, Fink B, Rega PP (2020). What do emergency department patients and their guests expect from their health care provider in an active shooter event? WMJ 119(2): 96–101.
19. Kotora JG, Clancy T, Manzon L, Malik V, Louden RJ., Merlin MA (2014). Active shooter in the emergency department: a scenario-based training approach for healthcare workers. Am J Disaster Med 9(1): 39–51. DOI: 10.5055/ajdm.2014.0140.
20. Landry G, Zimbro KS, Morgan MK, Maduro RS, Snyder T, Sweeney NL (2018). The effect of an active shooter response intervention on hospital employees' response knowledge, perceived program usefulness, and perceived organizational preparedness. J Healthc Risk Manage 38(1): 9–14. DOI: 10.1002/jhrm.21313.
21. Lindekilde L, Pearce J, Parker D, Rogers B. (2021). "Run, hide, tell" or "run, hide, fight"? The impact of diverse public guidance about marauding terrorist firearms attacks on behavioral intentions during a scenario-based experiment in the United Kingdom and Denmark. Int J Disaster Risk Reduct 60(8): 102278. DOI: 10.1016/j.ijdrr.2021.102278.
22. Martel-Perron R (2015). Étude sur la prévention de la violence dans les institutions publiques [Study on violence prevention in public institutions]. Québec: Centre international pour la prévention de la criminalité, 143 p. [online] [cit. 2023-12-18]. Available from: https://numerique.banq.qc.ca/patrimoine/details/52327/2505372?docref=mmJ2ZibSYPUvMxdfwHz37Q
23. McGill University (2024). Protocole tireur actif [Active shooter protocol]. [online] [cit. 2023-12-18]. Available from: https://www.mcgill.ca/campussafety/fr/gestion-des-urgences/protocoles-durgence/protocole-tireur-actif
24. Ministry of the Interior of the Czech Republic (2017). Koncepce ochrany měkkých cílů pro roky 2017-2020 [online]. Praha: PostSignum Qualified CA 2, 2017. [online] [cit. 2020-03-01]. Available from: https://www.mvcr.cz/clanek/vlada-schvalila-koncepci-ochrany-mekkych-cilu-pro-roky-2017-2020.aspx
25. Ministry of the Interior of the Czech Republic (2023). Bezpečnostní politika. Ochrana měkkých cílů. [online] [cit. 2020-03-01]. Available from: https://www.mvcr.cz/clanek/ochrana-mekkych-cilu.aspx

26. Pigeon F, Rondeau J, Soucy N (2017). Plan des mesures d'urgence. Centre hospitalier de l'Université de Montréal. 133 p. [online] [cit. 2020-03-01]. Available from: https://www.24jours.ca/files/PMU_Revise_V21.pdf
27. Police of the Czech Republic (2017). Policie České republiky – KŘP hlavního města Prahy. Utíkej, schovej se, bojuj! [cit. 2023-12-25]. Policie.cz. 2017. Available from: https://www.policie.cz/clanek/utikej-schovej-se-bojuj.aspx
28. Price S (2020). Under the gun: how texas hospitals, clinics can prepare for active shooter situations. Tex Med 116(3): 36–39.
29. Reißmann S, Beringer V, Wirth T, Schablon A, Vaupel C, Nienhaus A, et al. (2023). Prävention von Aggressionen und Gewalt gegenüber Beschäftigten in der Notaufnahme. Forschungsergebnisse und Praxistipps [Prevention of aggression and violence towards employees in the emergency department. Research results and practical tips]. Hamburg: Universitätsklinikum Hamburg-Eppendorf, p. 125. [online] [cit. 2023-01-22]. Available from: https://www.uke.de/dateien/institute/universitaetsprofessur-f%C3%BCr-arbeitsmedizin/dokumente/gewaltpr%C3%A4vention_in_notaufnahmen.pdf
30. Rondeau J, Soucy N (2017). Plan des mesures d'urgence [Emergency response plan]. [online] [cit. 2023-12-17]. Available from: https://www.24jours.ca/files/PMU_Revise_V21.pdf
31. Sanchez L, Young VB, Mary Baker M (2018). Active shooter training in the emergency Department: a safety initiative. J Emerg Nurs 44(6): 598–604. DOI: 10.1016/j.jen.2018.07.002.
32. Schwerin DL, Thurman J, Goldstein S (2023). Active shooter response. National Library of Medicine. [online] [cit. 2023-02-13]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK519067/#
33. Terry L (2017). Training healthcare workers to protect patients from active shooters. J Healthc Prot Manage 33(1): 48–52.
34. Université de Sherbrooke (2022). Tireur actif [Active shooter]. [online] [cit. 2023-12-18]. Available from: https://www.usherbrooke.ca/urgence/mesures-urgence/tireur-actif
35. Ventzke MM, Segitz O (2020). Orientierung für Einsatzkräfte bei internen Gefahrenlagen im Krankenhaus [Orientation for emergency services in the event of internal hazards in the hospital]. Die Unfallchirurgie 6. [online] [cit. 2023-01-22]. Available from: https://www.springermedizin.de/orientierung-fuer-einsatzkraefte-bei-internen-gefahrenlagen-im-k/17189670
36. Wallen MF, Drone E, Lee J, Ganti L (2023). Assessment of emergency department staff awareness of policy and expert opinion protocol regarding active shooter events. Disaster Med Public Health Prep 17: e168. DOI: 10.1017/dmp.2022.116.
37. Wax JR, Cartin A, Craig WY, Pinette MG (2019). U.S. acute care hospital shootings, 2012–2016: a content analysis study. Work 64(1): 77–83. DOI: 10.3233/WOR-192970.