UDC 614.8:614.2:371.3(477)(075.8/.9)
DOI https://doi.org/10.32782/eddiscourses/2025-3-10

EXPERIENCE OF TEACHING THE "STOP THE BLEED" TRAINING PROGRAM IN DIFFERENT AGE GROUPS OF THE UKRAINIAN POPULATION

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Military conflicts significantly increase civilian casualties, with massive hemorrhage being the leading cause of death. This underscores the critical need for public education in bleeding control skills. In response, this study analyzes the experience of teaching the "Stop the Bleed" (StB ACS) course to various age groups of the civilian population in Ukraine. From January to December 2024, free training sessions were conducted for school teachers, adolescents (14–18 years), and university students, comprising theoretical lectures and practical sessions on direct pressure, wound packing, tourniquet application, and pressure bandage application. Training effectiveness was assessed using pre- and post-training tests covering general information, readiness to provide aid, and theoretical knowledge. Statistical analysis included means, standard errors, and relative frequency with 95% confidence intervals. Results demonstrated a significant increase in readiness to provide aid (from 63–68% to 91–95%) and improved theoretical knowledge (from 70% to 85–96% correct answers) across all groups post-training. Before training, the most common errors were found in questions related to personal safety and aid prioritization, especially among adolescents. The majority of participants expressed satisfaction with the training and recommended it. The study confirms the high effectiveness of the StB ACS teaching methodology for various age groups and professions, recommending its further implementation. The demonstrated interest among adolescents indicates the feasibility of their involvement in such programs. Future research will focus on developing individualized modules to address specific knowledge gaps and investigating the long-term retention of acquired skills.

Key words: hemorrhage, Stop the Bleed, first aid, training, civilian population, military conflicts, children, adolescents.

Старець Олена, Хіменко Тетяна, Пирогова Анастасія, Вєлікова Марія, Моргунова Єлизавета, Оверчук Аліна. Досвід викладання навчального тренінгу «Stop the Bleed» різним віковим групам населення україни

Воєнні конфлікти суттєво збільшують кількість жертв серед цивільного населення, спричиняючи масивні кровотечі, що є основною причиною смертності. Це підкреслює критичну потребу в розвитку в населення навичок зупинки кровотеч. У відповідь на це дослідження аналізує досвід викладання курсу «Stop the Bleed» (StB ACS) різним віковим групам цивільного населення в Україні. Із січня до грудня 2024 року проводили безоплатні тренінги для шкільних вчителів, підлітків (14–18 років) та студентів університетів, які передбачали теоретичні лекції та практичні заняття з прямого тиску, тугого тампонування, накладання турнікета та пов'язки, що тисне. Ефективність навчання оцінювалася за допомогою до- та післятренінгових тестів, що охоплювали загальну інформацію, готовність надавати допомогу та теоретичні знання. Статистичний аналіз містив середні значення, стандартні похибки та показники відносної частоти з 95 % довірчими інтервалами. Результати показали значне підвищення готовності до надання допомоги (з 63–68 % до 91–95 %) та покращення теоретичних знань (із 70 % до 85–96 % правильних відповідей) у всіх групах після тренінгу. Виявлено, що до навчання найчастіше помилки допускалися в питаннях особистої безпеки та пріоритетності надання допомоги, особливо серед підлітків. Більшість учасників були задоволені навчанням та рекомендували його. Дослідження підтверджує високу ефективність методики викладання StB ACS для різних вікових груп та професій, рекомендуючи її подальше впровадження. Виявлена зацікавленість підлітків свідчить про доцільність їх залучення до таких програм. Подальші дослідження будуть зосереджені на розробці індивідуалізованих модулів для усунення специфічних прогалин у знаннях та вивченні довгострокового збереження навичок.

Ключові слова: кровотеча, Stop the Bleed, перша допомога, тренінг, цивільне населення, військові конфлікти, діти, підлітки.

Problem statement. Military conflicts always result in casualties among both military personnel and civilians. Since the full-scale invasion of Ukraine, 89 healthcare facilities and 346 educational institutions have already been destroyed, while other civilian buildings and residences have suffered significant damage [1]. Such destruction leads to numerous casualties. According to the UN Human Rights Monitoring Mission, from February 22, 2022, to February 2025, 42,505 civilian casualties have been reported, including 12,737 deaths and 29,768 injuries. As of February 2025, official figures document 603 children killed and 1,815 injured; however, the actual number of victims could be higher [1; 2]. Combat experience shows that massive hemorrhage is the most frequent consequence of mechanical and explosive injuries and accounts for 80% of fatalities among the population in armed conflicts [3; 4]. Therefore, it becomes evident how important it is to raise public awareness regarding life-threatening bleeding control skills, both for self-help and for helping others affected.

Analysis of recent research and publications. Over recent years, the "Stop the Bleed" (StB ACS) educational program, initiated by the American College of Surgeons in collaboration with the Hartford Consensus in 2015, has been actively implemented internationally. This program adapts military bleeding control experiences to civilian settings [5-9]. Mass shootings in educational institutions in the United States, military actions in Afghanistan and Iraq, and numerous road traffic accidents have prompted the development of training programs tailored for individuals without prior experience, aimed at reducing mortality.

Often, attempts by untrained rescuers to provide first aid to victims with life-threatening bleeding result in increased casualties due to their unpreparedness and lack of necessary skills. An example is the 2013 Boston Marathon bombing, where passersby applied improvised tourniquets, none of which were effective [10]. Prospective cohort studies document the appropriateness and effectiveness of conducting such classes using StB ACS training materials across various age groups. These studies statistically demonstrate increased indicators: 1) readiness and confidence to promptly initiate life-saving actions; 2) possession of the necessary knowledge and skills to aid victims [11-16]. A publication by Anderson M (2024) explicitly confirms that even children aged 5-13 adequately perceive the training material and remember 70% of the skills acquired after a year [12].

The risk of emergency events that potentially lead to life-threatening bleeding remains high, even without military actions. Improving public competency in providing first aid for bleeding remains relevant at all times, and previous positive teaching experiences only promote further high-quality implementation among the public.

Identification previously unresolved parts of the general problem. Despite the active international implementation of the StB ACS program and its proven effectiveness in increasing readiness and knowledge, there is still a need for deeper analysis and adaptation of this program for different age groups and social categories within specific regions, especially in conflict zones. It is necessary to identify specific knowledge and skill gaps among the civilian population and determine the most effective teaching

methods to address these gaps. It is also important to investigate how different age groups (e.g., adolescents) perceive information about their own safety and the priority of providing assistance, as this is key to effective first aid.

Formulation of article goals. The aim of the study was to analyze the teaching experience of the StB ACS course among civilian populations of various age groups.

Presenting the main material. As part of an educational project by the Department of Propaedeutics of Pediatrics at Odessa National Medical University, from January to December 2024, a series of free of charge StB ACS trainings were conducted for school teachers in Odesa, adolescents aged 14-18 years, and university students (hereafter "students"). The trainings included theoretical lectures and practical sessions where participants mastered skills such as direct pressure on wounds, tight wound packing, tourniquet application, and pressure bandage placement. Classes were conducted in groups of 16–20 participants by certified StB ACS instructors, both at the simulation classroom of the Department of Propaedeutics of Pediatrics and directly at educational institutions in the city.

Study design. This study aimed to evaluate the effectiveness of the StB ACS training program across different age groups within the Ukrainian population. A structured, anonymous survey was administered to all participants immediately before and after the training session to assess baseline knowledge, psychological readiness, and post-training knowledge acquisition.

Survey structure. The survey consisted of three sections and was identical for all age groups. It was developed in accordance with the official StB ACS curriculum and reviewed by medical educators for content validity.

Section 1: Demographic and Background Information. This section collected basic participant data and prior experience with bleeding control. It included: open-ended questions: age, occupation; closed-ended (Yes/No) questions: prior participation in similar training, personal experience in managing bleeding incidents. These data allowed for stratification by age, professional background, and prior exposure to emergency care.

Section 2: Psychological Readiness to Assist. Participants were presented with five hypothetical scenarios involving victims with massive bleeding (e.g., in public places, at home, or in the workplace). For each scenario, they selected one of the following self-reflective responses: I am ready to help; I don't want to help; I am afraid I might make things worse; I don't know what to do. They then rated their agreement with their chosen response using a three-point Likert scale: I agree / I disagree / I'm not sure how to answer. This section assessed emotional and cognitive readiness to intervene in emergencies.

Section 3: Theoretical Knowledge Assessment. This section included 10 multiple-choice questions covering the full algorithm of bleeding control, based strictly on the StB ACS course content. Topics included: personal safety and scene assessment; activation of emergency medical services (EMS); application of direct pressure; wound packing; tourniquet use; basic victim triage principles. Each question had three answer options, with only one correct answer. This section was used to assess both baseline knowledge and knowledge gained after the training.

Post-Training feedback. The post-training survey also included questions to assess participant satisfaction with both the theoretical and practical components of the course. Additionally, participants were asked whether they would recommend the training to friends, relatives, or colleagues, providing insight into perceived value and potential for community-level dissemination.

Survey administration. The survey was conducted anonymously using Google Forms. Participants accessed the forms by scanning a QR code with their personal smartphones at the beginning and end of the training session. This method ensured ease of access, real-time data collection, and minimal disruption to the training process.

Time allocation. The pre-training survey took approximately 5 to 10 minutes to complete, with an average duration of 6.2 minutes. The post-training survey was shorter, requiring 3 to 6 minutes, with an average of 4.5 minutes. The concise format ensured that the survey was not cognitively demanding or time-consuming, and it did not significantly extend the overall training schedule.

Ethical considerations. All procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments. For adolescent participants, training sessions were conducted only after obtaining informed consent from their parents or legal guardians. Participation in the survey was voluntary and anonymous. No personal identifiers were collected, and all data were used exclusively for research and educational quality improvement purposes. The use of digital forms ensured confidentiality and minimized data handling risks.

Statistical Analysis. Descriptive and inferential statistical analyses were performed to evaluate the effectiveness of the training program. The following indicators were calculated: Arithmetic means (M) to represent average values, Standard errors of the mean (m) to assess variability, Relative frequencies (%) to describe categorical responses. All proportions were reported with 95% confidence intervals (CI) to ensure statistical reliability. These metrics were used to compare pre- and post-training responses and to assess changes in knowledge, readiness, and participant satisfaction.

Results. Over the course of the study period, more than 300 individuals participated in the StB ACS training sessions. Of these, 281 participants (approximately 93.7%) completed both the pre-training and post-training surveys, providing a robust dataset for analysis.

Demographic characteristics. The participant pool included three primary groups: school teachers, university students, and adolescents. Among school teachers, the majority were women aged 23 to 75 years, reflecting the gender distribution typical of the profession in Ukraine. The student group consisted predominantly of female participants aged 19 to 25 years, most of whom were enrolled in non-medical academic programs. The adolescent group included participants aged 14 to 17 years, with a predominance of male respondents, often recruited through school-based outreach programs (Tab. 1).

Prior experience with first aid. The survey revealed a notable lack of prior first aid training across all groups: only 25 % of teachers reported previous participation in first aid or bleeding control training. Among students, this figure dropped to approximately 20%. In the adolescent group, just 10% had any prior exposure to such training. These findings underscore the urgent need for accessible and regular first aid education across all segments of the civilian population (Table 1).

Personal experience with bleeding incidents. When asked about personal experience in assisting victims with bleeding injuries, responses were consistently low across all groups, ranging from 3% to 6%. This limited exposure further highlights the importance of structured training programs to build both competence and confidence in emergency response (Tab. 1).

Analysis of Section 2 of the survey, which assessed participants' psychological readiness to assist a victim with massive bleeding, revealed important trends both before and after the training (Fig. 1).

Pre-Training Readiness. Before the training, the proportion of participants who expressed readiness to provide aid in various emergency scenarios was moderate and relatively consistent across all groups: school teachers: 63.58% (95% CI: 59.70–67.29); University students: 64.52% (95% CI: 59.04–69.63); adolescents: 68.33% (95% CI: 64.04–72.34).

Approximately 13% of respondents in each group indicated that they were not ready or unwilling to help, citing fear of causing harm or a lack of confidence. An additional 18–23% reported uncertainty, stating they were unsure how they would act in such situations. These findings suggest a widespread lack of preparedness and self-efficacy in responding to bleeding emergencies prior to the training.

Post-Training Readiness. Following the completion of the StB ACS course, there was a statistically significant increase in the proportion of participants who reported being ready to assist: school teachers: 91.05% (95% CI: 88.45–93.13); University students: 95.33% (95% CI: 92.32–97.20); adolescents: 94.42% (95% CI: 91.83–96.22). This marked improvement demonstrates the effectiveness of the training in enhancing psychological readiness across all age groups. The proportion of participants who remained unsure or expressed unwillingness to help dropped to 5–8%, a statistically significant reduction compared to pre-training levels.

Table 1

General characteristics of trainee groups by age, gender, and previous experience in training and providing assistance

Indicator	Teachers N – 123	Students N – 62	Adolescents N – 96
Mean age, years (M±m)	47,62±1,23	20,98±0,2	15,17±0,09
Gender (female), %, 95% CI	91,87% (85,68 – 95,52)	80,65% (69,15 – 88,57)	25% (17,41 – 34,51)
Experience in attending pre-medical aid courses, %, 95% CI	26,02 % (19,07 – 34,41)	19,35% (11,43 – 30,85)	10,42 % (5,76 – 18,12)
Personal experience in providing aid for bleeding, %, 95% CI	4,88 % (2,25 – 10,23)	3,23% (0,89 – 11,02)	6,25% (2,90 – 12,97)

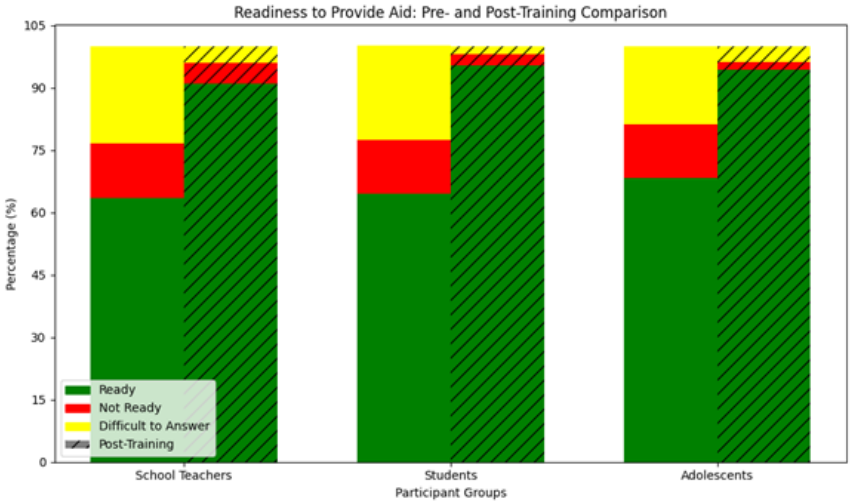

Fig. 1. Comparison of pre- and Post-Training Readiness to Provide Aid

These results highlight the course's success not only in transferring technical knowledge but also in building confidence and reducing psychological barriers to action in emergency situations.

Section 3 of the survey evaluated participants' understanding of the core theoretical concepts presented in the *StB ACS* training, using a set of 10 structured test questions. These questions were directly aligned with the official curriculum of the *StB ACS* program and covered the following key topics: ensuring personal safety and recognizing when a scene becomes unsafe; activating EMS and involving bystanders; the algorithm of priority actions when encountering a bleeding victim; use of personal protective equipment (PPE); management of foreign objects in wounds; recognition and response to internal bleeding; proper application of commercially recommended tourniquets; basic principles of victim triage in multi-casualty scenarios.

Pre-training knowledge levels. Prior to the training, the average percentage of correct responses across all participant groups was approximately 70%, indicating a moderate baseline level of theoretical knowledge (Table 2). This suggests that while some participants had prior exposure to first aid principles, there were notable gaps in understanding specific to bleeding control protocols.

Post-training knowledge gains. Following the training, a control survey using the same set of questions demonstrated a statistically significant improvement in theoretical knowledge across all age groups. The percentage of correct answers increased to a range of 85–96%, reflecting a high level of assimilation of the course material (Tab. 2).

This improvement was consistent across school teachers, university students, and adolescents, and highlights the effectiveness of the training in delivering essential life-saving knowledge. Participants also reported that the post-training test helped them consolidate and structure their understanding, contributing to greater confidence in their ability to act in real-life emergencies.

Beyond overall performance, a detailed analysis of individual question responses was conducted to identify the most frequent errors made by participants. This analysis is essential for refining the content and

Table 2

Total number of correct answers to theoretical questions regarding bleeding control rules BEFORE and AFTER the training among school teachers, students, and adolescents

Age group	BEFORE training, %, 95% CI	AFTER training, %, 95% CI
Teachers	70,43, (67,97 – 72,78)	95,16, (93,84 – 96,20)*
Students	72,42, (68,77 – 75,79)	96,61, (94,88 – 97,77)*
Adolescents	70,00, (66,34 – 73,42)	85,56, (82,34 – 88,27)*

«*» – statistically significant result

delivery of both theoretical and practical components of the *StB ACS* training, particularly when adapting materials for different age groups.

The most common mistakes prior to training were associated with personal safety and situational awareness: only 30–37% of school teachers and adolescents correctly identified the need to assess the safety of the scene before approaching a bleeding victim. Similarly, just 50–60% recognized the importance of relocating themselves or the victim if the environment became unsafe. In contrast, university students demonstrated a stronger baseline understanding of these concepts, with 75% and 87% answering these questions correctly, respectively (Fig. 3).

Another area of difficulty across all groups was the appropriate response to internal bleeding and the ability to perform basic medical triage–specifically, identifying which victim should receive aid first in a multi-casualty scenario. These topics appeared to be less intuitive and may require more focused instructional strategies, such as case-based learning (Fig. 3).

Interestingly, participants across all age groups showed relatively strong pre-training knowledge in certain areas: the correct use of commercial tourniquets was well understood. Most respondents also correctly answered questions related to the management of foreign bodies in wounds, indicating either prior exposure or intuitive understanding of these specific procedures.

These findings suggest that while the training effectively improves overall knowledge, certain critical topics–such as scene safety, internal bleeding, and triage–require additional emphasis. Tailoring the instructional approach to the cognitive and experiential levels of each age group may further enhance learning outcomes.

While the overall post-training results demonstrated a significant improvement in theoretical knowledge across all participant groups, a closer analysis of individual question performance revealed residual challenges, particularly among adolescent participants (Fig. 4).

Despite the overall success of the training, adolescents continued to struggle with certain critical concepts: approximately 28% of adolescents still neglected personal safety, failing to correctly identify the need to assess the safety of the scene before approaching a victim. Around 30% incorrectly answered questions related to internal bleeding, indicating uncertainty about appropriate actions at the pre-medical stage. Similarly, 29% had difficulty with basic triage, misidentifying which victim should receive aid first in a multi-casualty scenario (Fig. 4).

These findings suggest that while adolescents are capable of absorbing technical content, they may require additional reinforcement and clarification of more abstract or judgment-based topics, such as situational awareness and prioritization. The persistence of these errors among adolescents may be attributed to several factors: limited life experience and exposure to real-world emergencies; lower baseline knowledge of medical and safety protocols; potential difficulty in maintaining attention during theoretical instruction or interpreting complex written scenarios.

It is worth noting that, post-training, participants across all age groups continued to perform strongly on questions related to the use of tourniquets and

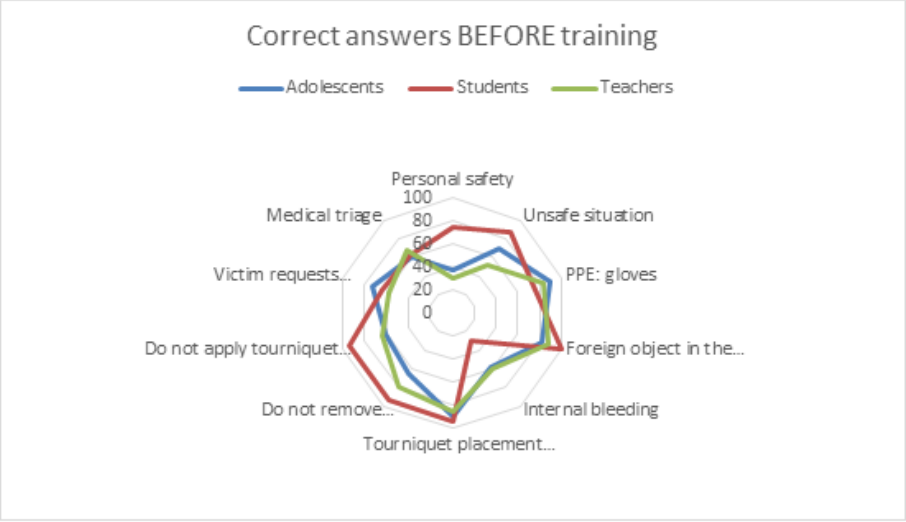

Fig. 3. Results of assessing basic theoretical knowledge on providing aid to a victim with bleeding BEFORE the training

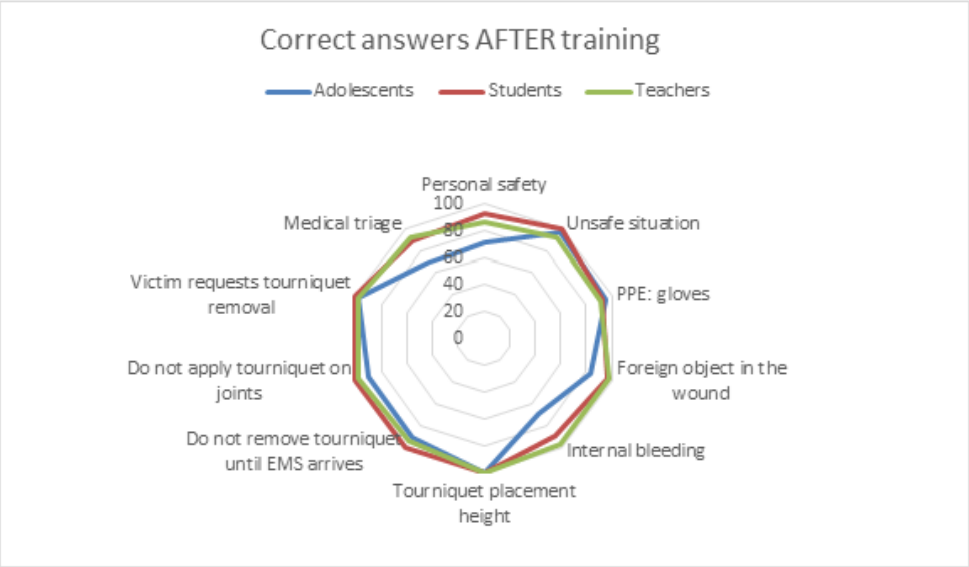

Fig. 4. Results of assessing basic theoretical knowledge on providing aid to a victim with bleeding AFTER the training

the management of foreign bodies in wounds. These topics appear to be more concrete and procedural, making them easier to understand and retain.

Participant feedback and practical outcomes. The overwhelming majority of participants expressed high levels of satisfaction with both the theoretical and practical components of the training. Many indicated that they would recommend the course to family members, friends, and colleagues, recognizing its relevance and life-saving potential. In informal conversations, several participants shared their regret at not having received such training earlier, and emphasized the importance of regularly refreshing this knowledge to maintain readiness.

For school teachers, the training held particular significance. As individuals responsible for the safety and well-being of children during emergencies–such as air raid alerts–they reported feeling more confident and calm after completing the course. The training provided them with not only technical skills but also psychological reassurance in high-stress situations.

All participants actively engaged in learning about recommended bleeding control tools and successfully practiced assembling a personal bleeding control kit, reinforcing the practical applicability of the course content.

These findings support the recommendation that *StB ACS* training be integrated into the routine educational and safety programs of schools, universities, and other socially significant institutions. Regular implementation of such courses has the potential to significantly increase civilian preparedness and reduce mortality in incidents involving traumatic bleeding or mass casualties.

Discussion. Given the ongoing war in Ukraine, the risk of traumatic injuries among civilians remains high. This underscores the urgent need to scale up bleeding control education as a component of national resilience and public health preparedness. Training should be made widely available in schools, universities, workplaces, and community centers.

The study revealed that participants of all age groups demonstrated strong interest and motivation to acquire both theoretical knowledge and practical skills. This enthusiasm should be leveraged by: expanding outreach and recruitment efforts, offering flexible training formats (e.g., in-person, hybrid, mobile units), encouraging peer-to-peer promotion and community-based learning.

The analysis highlighted important differences in how various age groups engage with and retain the material. Teachers tend to be more attentive and cautious, often expressing fear of making mistakes. Training for this group should emphasize confidence-building, hands-on practice, and reassurance through repetition. Adolescents are typically fast learners and eager to help, but may overlook critical safety steps or misinterpret complex scenarios. Instruction for this group should include: simplified language and visual aids, interactive simulations and gamified learning, frequent reinforcement of key safety principles

Despite overall improvements, certain topics–such as scene safety, internal bleeding management, and victim triage–remained challenging for some participants, especially adolescents. These areas should be given additional instructional time,

supported by: scenario-based learning, real-life case discussions, decision-making flowcharts.

To maintain both theoretical knowledge and practical skills over time, it is essential to repeat the training at regular intervals. Refresher courses should be: short and focused, practice-oriented, easily accessible (e.g., through schools, workplaces, or online platforms). Regular repetition will help ensure that civilians remain confident and capable of providing effective aid in emergency situations.

Conclusions. The results of this study clearly demonstrate the high effectiveness of the *StB ACS* training program in improving both theoretical knowledge and practical readiness to provide pre-medical aid for massive bleeding across diverse segments of the civilian population. Key outcomes include:

Significant improvement in theoretical knowledge: after training, participants achieved 86–96% correct responses on questions covering essential bleeding control principles, indicating strong assimilation of the course material.

Increased confidence and readiness to act: post-training, 92–95% of participants reported being ready to provide aid in emergency situations, reflecting a substantial gain in self-efficacy and psychological preparedness.

High motivation and engagement: all participants demonstrated active involvement and diligence in mastering practical skills, with 100% completing hands-on components of the course.

These findings support the conclusion that the *StB ACS* methodology is highly suitable for widespread implementation among civilians of various age groups and professional backgrounds. The structured, evidence-based approach of the *StB ACS* curriculum ensures that participants not only acquire life-saving knowledge but also develop the confidence to apply it effectively.

Furthermore, the study highlights the value of including adolescents in such training. Despite some residual challenges in areas like scene safety and triage, adolescents showed strong motivation, rapid learning, and a willingness to help, comparable to adult participants. With age-appropriate instructional strategies, this group can become a vital part of community-level emergency preparedness.

Finally, the findings emphasize the importance of regular refresher training to maintain both theoretical understanding and practical competence over time. In the context of ongoing conflict in Ukraine, where civilians face daily risks, such training should be considered a critical component of national resilience and public health strategy

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Дата надходження статті: 24.07.2025
Дата прийняття статті: 15.08.2025
Опубліковано: 14.10.2025