

Application of modern first aid techniques for penetrating wounds (Occlusive Dressing and Tamponade) to improve emergency response skills integrating Islamic values of Hifz al-Nafs (Preservation of Life) in emergency medical practices

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Abstract

Penetrating wounds are injuries that result in a disruption of tissue continuity, often caused by sharp force trauma. Prompt and effective first aid is a crucial factor in reducing mortality and preventing disability. This study aimed to assess the effect of modern first aid techniques specifically occlusive dressing and tamponade on improving emergency response skills among members of the PSHW pencak silat group, Sub Bolon Colomadu. This research employed a quantitative, pre-experimental design using a one-group pretest-posttest approach without a control group. A total sampling technique was applied, involving 40 respondents. Data collection was conducted using a standardized procedure based on a First Aid Standard Operating Procedure (SOP) checklist. Data were analyzed using the Wilcoxon signed-rank test. The results showed a statistically significant difference between pretest and posttest scores (p -value = 0.000; $p < 0.05$), indicating a positive effect of the intervention. In conclusion, the application of modern first aid techniques for penetrating wounds significantly improved the emergency response skills of the pencak silat group at PSHW Sub Bolon Colomadu Karanganyar.

Keywords: emergency response skills; first aid; occlusive dressing; penetrating wounds

1. Introduction

The Penetrating trauma is defined as any injury caused by a foreign object piercing the skin and underlying tissues, creating an open, Common examples include stab wounds (from knives, broken glass, etc.) and gunshot wounds (Jamal et al., 2021). In stab wounds, a pointed object is thrust into the body, typically producing a wound that is deeper than it is wide and tearing tissues along the path of penetration (Latina et al., 2021). Crucially, embedded blades or other objects may actually tamponade (plug) injured vessels, so removal of impaled objects in uncontrolled settings can precipitate massive bleeding. Because of their depth, penetrating wounds carry high risks of severe hemorrhage, organ laceration or puncture, pneumothorax (if in the chest), and infection (Littlejohn et al., 2015). Even small or seemingly minor puncture wounds can be hazardous: puncture wounds bleed little externally, but are “dangerous because of their high susceptibility to infection,” potentially leading to sepsis if not cleaned and treated (Elionote & Sutono, 2020). In the torso, any deep penetrating injury is treated as a life-threatening emergency due to the proximity of vital organs. Uncontrolled bleeding from such wounds can rapidly cause hypovolemic shock and death, underscoring the critical importance of immediate care (Zahra et al., 2021).

Injuries in general are a major global health burden. An estimated 4.34 million people die from injuries worldwide each year (approximately 247.8 million DALYs in 2021). In the ASEAN region, injuries remain among the top causes of mortality: in 2021 there were about 35.5 million new injury incidents, resulting in roughly 317,000 deaths (Rahman Hutapea, 2023). Indonesia bears a particularly high burden within this region: the 2021 Global Burden of Disease estimates ~12.3 million injury cases and 92,500 injury-related deaths in Indonesia. While many of these injuries are due to road traffic or falls, a substantial fraction arise from violence (Islamy et al., 2023). Globally, stabbing is now the predominant form of homicidal violence, reflecting the wide availability of sharp weapons. In

Indonesia, forensic experts note that violent crime with sharp objects is a common problem because such weapons are easily accessed (Nugroho, 2022). These penetrating assaults – often involving knives, machetes, or other blades – contribute significantly to the national injury toll. Indeed, knives were implicated in over 97,000 homicides worldwide in 2017 ($\approx 22\%$ of global homicides, a pattern consistent with regional crime data (Wahdaniyah Ismail et al., 2022).

Given this burden, prompt first aid in trauma can save lives, Uncontrolled hemorrhage is the leading cause of preventable death in trauma patient, Massive blood loss from penetrating injuries can lead to shock within minutes, so “immediate intervention” is essential to maintain circulation (Starosolski et al., 2024). First-aid actions aim to control bleeding and support vital functions until advanced care is available, Even bystanders can make a critical difference: for example, guidelines emphasize that any deep penetrating wound (especially on the torso) should be treated as a serious emergency (Vrancken et al., 2023). Failure to address such bleeding promptly “greatly harms” the injured person. In fact, even among athletes, inadequate initial management of injuries can worsen outcomes and prolong recovery. These considerations underline the urgency of equipping non-medical responders (athletes, coaches, and community members) with effective bleeding-control skills (Saif et al., 2020).

Modern first-aid protocols have developed specialized techniques to manage penetrating wounds. One key method is the use of occlusive dressings for chest wounds. An occlusive dressing (often prepared with tape on three sides) completely seals an open chest wound except for one edge, creating a flutter-valve effect This configuration allows air and fluid to exit the pleural space during exhalation while preventing outside air from entering on inhalation (Stretch et al., 2022). In practice, as an emergency measure for “sucking” chest wounds, first responders are taught to apply an occlusive dressing immediately over the penetrating injury. Doing so can rapidly mitigate an open pneumothorax and stabilize breathing. Research and training materials stress that a three-sided (valve) occlusive dressing is “commonly used in emergency trauma care” for chest penetrations In contrast, simple bandaging is inadequate for such wounds because it can allow air trapping. Thus, mastering occlusive dressing application is a core skill in modern trauma first aid (Beysard et al., 2021).

Another essential technique is wound tamponade by packing. When bleeding occurs from deep, narrow, or junctional wounds (e.g. in the groin, axilla, or deep chest/abdomen), direct pressure or tourniquets may not be applicable (Lee et al., 2024). In these cases, first responders pack the wound cavity tightly with gauze or a hemostatic dressing to compress the bleeding vessels. This internal pressure effect is literally a tamponade of the vasculature. Tactical medicine guidelines note that wound packing “helps in hemostasis by creating pressure and causing tamponade on the vessels” (Yamasaki, 2024). The process typically involves inserting gauze strips deeply into the wound until the cavity is filled and then applying firm pressure (often 3–5 minutes) to establish a clot. Afterward, a pressure bandage or wrap is applied to maintain compression. This method has been shown to significantly control hemorrhage when used correctly, and it is endorsed by trauma protocols for non-compressible hemorrhage. In short, wound packing with hemostatic gauze is a modern lifesaving first-aid method for penetrating trauma (Spahn et al., 2013).

Within Indonesia’s martial arts communities, these issues are acutely relevant, Pencak silat is a full-contact martial art native to Indonesia that often incorporates weapons training. Common silat weapons include machetes (parang), kris daggers, sickles, spears, and the curved kerambit knife (Nugroho, 2022). These blades are frequently used in traditional silat forms and sparring. Accordingly, silat practitioners can sustain high rates of injury, For example, data from multi-sport events show pencak silat among the sports with the highest incidence of injuries. Although many of those reported injuries are sprains or contusions, the prevalence of physical combat implies frequent minor and some major trauma. Beyond the competitive arena, violence involving silat groups has occurred (Spahn et al., 2013). In a recent case, two rival silat schools in Taiwan engaged in a violent altercation, during which assailants wielded

knives, machetes, swords and other blades. The brawl resulted in one death (a stabbing fatality) and another victim left with critical stab wounds. This incident illustrates that members of the silat community (whether in sport or conflicts) face genuine risk of severe penetrating wounds (Jamal et al., 2021).

Despite this risk, preliminary information suggests first-aid knowledge gaps in such groups. A small survey of Indonesian martial-arts club members (including pencak silat students) revealed that the vast majority did not use evidence-based bleeding control for injuries. In that study, only 5% of athletes applied a dressing/bandage for compression after an injury; many simply massaged the area or did nothing. Such inadequate immediate care can exacerbate bleeding and delay healing (Nugroho, 2022). As one review notes, proper first aid is needed “to minimize the symptoms of severity,” whereas poor handling “can greatly harm the athlete”. Thus there appears to be a critical gap in emergency-response skills in this population.

These considerations justify focusing on pencak silat communities for intervention. This group is sizeable, organized, and at heightened risk for penetrating trauma (due both to sport and occasional violence). They are also a population in which preliminary assessments show poor first-aid practices. Therefore, teaching modern bleeding-control techniques (occlusive dressing for chest wounds, wound packing/tamponade for others) to pencak silat practitioners could substantially improve outcomes for traumatic injuries. By strengthening the emergency response skills of this community, one can address an unmet need: reducing preventable morbidity and mortality from penetrating wounds in a local, high-risk context (Riamah et al., 2023).

2. Methods

The method should be structured as follows:

2.1. Research Design

This study employed a quantitative approach using a pre-experimental design. Specifically, the design applied was a one-group pretest-posttest design without control, in which the respondents were not randomly assigned. In this model, participants were first given a pretest to assess their baseline emergency response skills before receiving the intervention—modern first aid training for penetrating wounds using occlusive dressing and tamponade techniques. After the intervention, a posttest was administered to evaluate any improvement in their skills. The primary objective of this research design was to measure the effectiveness of the application of modern first aid techniques for penetrating wounds on the emergency response skills of participants from the PSHW Sub Bolon Colomadu pencak silat group. This design allows researchers to determine whether there is a significant change in the skills of the group after the educational and practical intervention, even though there is no comparison with a control group (Wahdaniyah Ismail et al., 2022).

2.2. Setting and Sample/Participants

The research was conducted in July 2024 at a pencak silat training group located in Central Java, Indonesia. The study setting was selected due to the high risk of injury, especially from training with sharp weapons, and the absence of previous first aid education for penetrating wounds among its members.

The sampling strategy used was non-probability sampling with a total sampling technique, meaning that all members of the population who met the inclusion criteria were selected as participants. The total sample consisted of 40 individuals, which also represented the entire population of pencak silat members in the group. According to Sugiyono (2019), total sampling is appropriate when the population size is less than 100

Inclusion criteria:

- a. Registered as a member of the pencak silat group.

- b. Actively participating in training activities.
- c. Willing to become a respondent and attend the intervention session.

Exclusion criteria:

Members who were unable to attend the research activities due to illness or personal leave.

Drop-out criteria:

- a. Participants who did not complete the intervention.
- b. Participants who missed either the pre-test or post-test

2.3. Intervention (Applicable to Experimental Studies)

The intervention provided in this study was modern first aid training for penetrating wounds, with a focus on occlusive dressing and tamponade techniques. The intervention was delivered by a qualified instructor (paramedic certified in Basic Trauma and Cardiac Life Support/BTCLS) and supported by two research assistants.

The intervention included, Educational material on types of penetrating wounds, A demonstration of occlusive dressing for chest wounds, A hands-on simulation on tamponade using gauze for deep bleeding control, A question-and-answer session.

Participants practiced the procedures individually following the demonstration. The intervention lasted approximately 90 minutes per group, conducted in four subgroups of 10 participants each. No control group was involved in this study.

2.4. Measurement and Data Collection

The instrument used in the study was an observational checklist based on a Standard Operating Procedure (SOP) for stab wound first aid. This SOP and checklist were developed by the researcher and validated through expert review.

- Content validity was assessed by a nursing expert, resulting in a rating of "high relevance" for each checklist item.
- Reliability was maintained by using standardized procedures for assessment and by training observers (research assistants) to ensure consistent evaluation.

Data were collected in three phases:

1. **Preparation Phase:**

- Literature review and tool development.
- Ethical and administrative approvals.
- Recruitment and screening of eligible participants.

2. **Implementation Phase:**

- Delivery of informed consent.
- Pre-test** assessment of participants' first aid skills using the SOP checklist.
- Intervention** (training session as described).
- Post-test** assessment of the same skills using the same checklist.

3. **Final Phase:**

- Thanking and debriefing participants.
- Data analysis and report writing.

2.5. Data analysis

Data were analyzed using the Wilcoxon Signed-Rank Test, appropriate for paired samples in non-parametric data, to determine if there was a statistically significant difference in emergency response skills before and after the intervention.

Data were processed and analyzed using Microsoft Excel and SPSS version 23. Additional steps included: Editing for checking completeness, Coding for converting qualitative to numerical data, Entry and cleaning to check for consistency or missing values, Tabulation to present frequency distributions.

2.6. Ethical considerations

This study received ethical approval from the Health Research Ethics Committee of Dr. Moewardi General Hospital, under reference number: 1.942 / II / HREC / 2025. Participants were informed about the purpose of the research and their right to withdraw at any time without penalty. Written informed consent was obtained from each participant before data collection began. Confidentiality and anonymity were strictly maintained throughout the research process

3. Results and Discussion

This section presents the findings from the pre-test and post-test of emergency response skills related to first aid for stab wounds among members of a pencak silat group. The data is divided into univariate and bivariate analyses to show participant characteristics and the effect of the intervention.

3.1. Results

3.1.1. Respondent Characteristics

The research included 40 participants who were members of the pencak silat group. The distribution of respondents by age and education level is presented below.

Table 1. Respondent Characteristics Based on Age and Educational Background

Characteristic	Frequency (n)	Percentage (%)
Age		
12–15 years	10	25.0%
16–19 years	18	45.0%
20–25 years	12	30.0%
Education Level		
Junior High School	10	25.0%
Senior High School	22	55.0%
College/University	8	20.0%

Most participants (45%) were aged 16–19 years, and the majority had completed senior high school education.

3.1.2. Participant Skill Levels Before and After the Intervention

This study measured the skill levels of participants in providing first aid for stab wounds using a Standard Operating Procedure (SOP)-based checklist, both before and after the intervention.

Table 2. Skill Levels of Participants Before and After Intervention

Skill Category	Pre-Test (n/%)	Post-Test (n/%)
Skilled (90–100)	4 (10.0%)	26 (65.0%)
Moderately Skilled (65–89)	18 (45.0%)	12 (30.0%)
Less Skilled (0–64)	18 (45.0%)	2 (5.0%)

There was a substantial improvement in skill levels after the intervention. Before the training, only 10% of participants were categorized as "Skilled", whereas after the intervention, this increased to 65%. The percentage of participants in the "Less Skilled" category dropped from 45% to 5%.

3.1.3. Bivariate Analysis

To determine whether the observed changes in skill were statistically significant, the **Wilcoxon Signed-Rank Test** was used to compare pre-test and post-test scores.

Table 3. Wilcoxon Signed-Rank Test Result

Variable	Z-Value	p-Value
Pre-test vs. Post-test Skill Score	-5.491	0.000*

* $p < 0.05$ indicates significant difference

The **p-value of 0.000** ($p < 0.05$) indicates a statistically significant improvement in emergency response skills after the intervention. This demonstrates that the modern first aid training using **occlusive dressing and tamponade techniques** had a **positive and measurable effect** on participants' first aid skills.

3.2. Discussion

The aim of this study was to examine the effect of first aid for stab wounds specifically modern techniques such as occlusive dressing and tamponade on the emergency response skills of pencak silat members. The hypothesis stated that there would be a significant difference in participants' skills before and after the intervention. The research results support this hypothesis.

3.2.1. Table 1: Respondent Characteristics Based on Age and Educational Background

This table shows that most participants were between 16–19 years old (45%), with a dominant educational background of senior high school (55%). According to the researcher, this age group is ideal for skill-based interventions because adolescents tend to be more responsive to structured, hands-on learning. Their active involvement in pencak silat also implies they are physically capable and mentally prepared to acquire new emergency skills (Andrianys & Asriadi, 2023).

Compared to previous research such as Listiana et al. (2019), which focused on high school students, the present study confirms that young age and mid-level education do not hinder the acquisition of advanced trauma first aid knowledge. In fact, it enables it. The researcher notes that this demographic is often exposed to risky environments yet lacks access to appropriate emergency training further justifying the importance of this intervention (Anggi Putri Utami et al., 2023).

3.2.2. Table 2: Skill Levels Before and After Intervention

The second table reveals a significant increase in skill level following the intervention. Before the training, only 10% of respondents were in the "Skilled" category, while 45% were "Less Skilled." After the training, the proportion of "Skilled" participants rose to 65%, and the "Less Skilled" group decreased dramatically to 5%.

According to the researcher, this result aligns strongly, who found similar improvements in first aid skills after bandaging and splinting training. However, the uniqueness of the current study lies in its focus on penetrating trauma, which is far more dangerous and less commonly taught in public settings (Littlejohn et al., 2015).

This suggests that even complex emergency procedures like tamponade and occlusive dressing can be effectively taught to laypeople when supported by structured instruction, guided practice, and motivation. The results also demonstrate that participants not only retained knowledge but also successfully applied it during simulation, reflecting true skill acquisition.

3.2.3. Table 3: Wilcoxon Signed-Rank Test Results

The Wilcoxon Signed-Rank Test yielded a p-value of 0.000, confirming a statistically significant difference in emergency response skills before and after the intervention. From the researcher's point of view, this statistical finding validates the hypothesis that modern first aid training improves practical skills in non-medical populations.

This result is not only statistically significant but also practically impactful. It shows that martial artists a group often exposed to sharp weapon training can become competent first responders in stab wound cases, potentially preventing complications like hemorrhagic shock or death (Elionote & Sutono, 2020).

The researcher also emphasizes that prior to this intervention, most participants had never received training in trauma management. This highlights a critical gap in community-level first aid education that this study successfully addressed.

The researcher observed the following:

The participants showed high engagement during the training sessions, especially due to the realism of the simulations and relevance to their martial arts practice. Despite their young age, participants demonstrated mature responses and quickly adapted to the procedural steps involved in hemorrhage control. Many participants expressed that they had feared handling stab wounds prior to training but felt empowered afterward to provide assistance if faced with such an emergency. This emotional and psychological shift, though not quantitatively measured, was clearly evident during post-intervention interactions (Starosolski et al., 2024).

Compared to earlier studies that focused on general first aid (e.g., fractures or blunt trauma), this study is unique for several reasons: It introduces advanced trauma care techniques to a non-medical population. It targets a high-risk group (pencak silat practitioners) that has historically lacked access to emergency training. The intervention was delivered in a grassroots, community-based setting, which enhances scalability and relevance for public health efforts (Wahdaniyah Ismail et al., 2022).

Several factors may explain the significant improvement in participants' skills:

Interactive Methodology: The use of direct demonstrations, return demonstrations, and feedback ensured effective knowledge transfer. **Motivated Participants:** The training was directly relevant to their real-life activities (martial arts), increasing intrinsic motivation. **Hands-On Simulation:** Practicing tamponade and sealing wounds with occlusive dressing allowed participants to develop muscle memory and confidence. **Supportive Environment:** The involvement of trained facilitators and structured SOPs reduced the likelihood of error and confusion (Vrancken et al., 2023).

Expand the Sample: Future studies should involve participants from other martial arts organizations or high-risk groups like scouts, youth clubs, or community watch programs. **Longitudinal Follow-Up:** Assess retention of skills over time to determine whether refresher training is needed. **Psychological Impact:** Examine how trauma first aid training affects self-efficacy, anxiety, and readiness to help during actual emergencies. **Include a Control Group:** To strengthen causal inference, subsequent research should consider randomized controlled trial designs (Saif et al., 2020).

First aid for penetrating wounds is not only an emergency medical procedure but also a concrete manifestation of Islamic humanitarian values. The Quran explicitly emphasizes the importance of saving human life, as stated in Surah Al-Maidah, verse 32: "Whoever saves a life, it is as if he has saved all of humanity." This verse provides a moral and spiritual foundation that every life-saving action is a valuable act of worship. In this context, the application of modern techniques such as occlusive dressings and tamponade is part of the actualization of this value. These techniques have been proven to stop bleeding in penetrating wounds, reduce the risk of death, and improve the emergency response

skills of the community, particularly members of the Pencak Silat (Special Forces) PSHW (Special Forces) in the Sub-Bolon (Colomadu) area. A study showed that first aid training based on modern practices significantly improved respondents' knowledge and skills in treating acute wounds (Wahyuni et al., 2021). The implementation of these techniques is not merely a matter of medical technicalities but also a reflection of the Islamic command to preserve life and prevent damage to the earth. Therefore, strengthening community capacity in first aid must be part of ongoing social outreach.

In addition to references from the Quran, Islam also encourages preparedness and rapid response in emergency situations through numerous hadiths of the Prophet. In a hadith narrated by Bukhari, the Prophet Muhammad (peace be upon him) said: "Whoever alleviates a believer's hardship in this world, Allah will alleviate his hardship on the Day of Resurrection." (Narrated by Bukhari and Muslim). This principle aligns with efforts to improve emergency response skills through first aid training, as conducted in this study. Equipped with the skills to use tampons and occlusive dressings, the pencak silat participants not only become self-defense trainers but also lifeguards in emergencies. Their preparedness is a tangible representation of the value of mutual assistance in goodness (Quran, Al-Ma'idah: 2). A study shows that first aid training significantly strengthens a community's ability to deal with medical incidents before professional assistance arrives (Putri & Harahap, 2022). This demonstrates that emergency skills development programs have a long-term impact on building a resilient, prepared, and ethically Islamic society. Therefore, integrating modern medical science with Islamic ethics is a strategic step in developing a generation that is not only technically proficient but also noble in intentions and actions.

4. Conclusion

This study aimed to assess the effectiveness of modern first aid techniques, particularly occlusive dressing and tamponade, in improving the emergency response skills of pencak silat members. The findings revealed a statistically significant improvement in participants' skills after receiving the intervention, as indicated by the Wilcoxon signed-rank test ($p = 0.000$). Prior to the intervention, a large proportion of participants lacked the necessary skills to respond appropriately to penetrating injuries. However, post-intervention data showed a significant shift toward higher skill levels. These findings confirm the research hypothesis and underscore the importance of structured, skill-based first aid education, particularly in high-risk community groups such as martial arts practitioners. The implications of this research suggest that equipping non-medical individuals with modern trauma care skills could significantly enhance pre-hospital emergency care and potentially reduce mortality and morbidity associated with penetrating trauma.

It is recommended that future research involve larger and more diverse populations, include control groups, and assess the long-term retention of skills. Further exploration could also evaluate psychological readiness and confidence in real-life emergency situations

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