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The Effect of Emergency First Aid Simulation in Implementing Log Roll on Victims with Indications of Cervical Injury to Members of the Regional Disaster Management Agency of Jember Regency

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ABSTRACT
Introduction: Traumatic spinal cord injury occurs due to a sudden traumatic impact on the spine which causes fracture or dislocation of the spine. Therefore, in cases of traumatic spinal cord injury, systematic management is needed in the rescue and mobilization efforts by performing log roll maneuvers. This study aims to determine the effect of simulation in emergency first aid in the skill of carrying out log rolls on victims with indications of cervical bone injuries in Regional Disaster Management Agency members in Jember Regency.
Methods: This research used a one group pretest-posttest design involving 40 Regional Disaster Management Agency members in Jember Regency. Participants were selected using total sampling techniques. Data was taken using a procedural observation sheet. Data were analyzed using the paired sample t-test.
Results: The results of the study showed that more than half of them had adequate skills (52.5%) before carrying out the emergency first aid simulation (52.5%) and after that they had sufficient skills (47.5%). (22.5%) and good (30%). Statistical analysis shows that the average score before is 55.5 (SD ± 10.6) and after is 67.25 (SD ± 11.32) which shows that there is a significant effect of emergency first aid simulation on the skills of carrying out log roll on victims with indications of cervical spine injury among Regional Disaster Management Agency members (p-value: 0.000).
Conclusion: Improving the skills of carrying out log rolls among Regional Disaster Management Agency members in Jember Regency means that through the simulation program they provide practical and concrete examples so that they get a more real picture and are better able to visualize and ultimately are able to properly receive all the information in the skills of carrying out log rolls on victims with indications of cervical spine injuries.

***Keywords**: Simulation, Emergency First Aid, Casualty Log Roll, Cervical Injury*

Introduction

Emergency or commonly known as Emergency is a condition that is life-threatening and requires immediate help, and can occur to anyone, anytime, and anywhere (Sherman et al., 2014). One of the emergency conditions is the incidence of trauma to the spine or known as traumatic spinal cord injury (Alizadeh, 2019). Traumatic spinal cord injury usually occurs due to a sudden traumatic impact on the spine that causes fracture or dislocation of the spine. The initial mechanical force delivered to the spinal cord at the time of injury is known as the primary injury where "displaced bone fragments, disc material, and/or ligaments are bruised or torn into the spinal cord tissue" (Bennett & Emmady, 2021). Therefore, in cases of traumatic spinal cord injury, systematic management is needed in an effort to help and mobilize it (Stein & Pineda, 2015). One of these treatments is to perform a log roll maneuver (Alizadeh, 2019). According to WHO, globally there have been more than 12,500 new cases of spinal cord injury (Hachem & Ahuja, 2017). Etiologically, more than 90% of spinal cord injury cases are caused by traumatic incidents such as traffic accidents, violence, sports or falls (Stein & Pineda, 2015). Demographically, men are most commonly affected during their early and late adulthood (3rd and 8th decades of life), while women are at higher risk during adolescence (15–19 years) and their 7th decade of life (Bennett & Emmady, 2021).

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The spine moves in three axes: sagittal, flexion-extension; coronal lateral flexion, right and left; and transverse lateral rotation, right and left (Lebel & Boulay, 2018). Unstable bone fragments generated due to trauma to the cervical vertebrae can harm the spinal cord with even the slightest movement. This provides the reason that it is necessary to develop several maneuvers, strategies, and tools to avoid spinal damage,

one of which is done with the log roll maneuver (Shodari & Majdah, 2021). Log-rolling is basically used to minimize spinal movement (Basindwah & Alfahmi, 2021).

Patients with cervical spine injuries require skilled assessment, appropriate management and timely access to advanced care units. The most important thing in the post-injury phase is immediate treatment and mobilization mechanisms where failure to comply with guidelines and standards poses a serious risk of neurological damage (Todd & Skinner, 2015). Therefore considering the complex biomechanics of the spine, moving trauma patients without moving the spine is a challenge (Hyldmo & Horodyski, 2017).

Poor management of trauma patients can be fatal. Critically though, there is no precise way to guarantee adequate spinal immobilization competence of trauma care professionals. Studies have shown that factors contributing to the successful of a log-roll include communication, team synchrony, time efficiency, and alignment thus requiring specialized training in the management of traumatic cervival emergencies (Sun & Cai, 2020). One form of training that can be provided in emergency cases is by simulating Emergency First Aid (Rahim & Wahyuni, 2021).

Ausubel's Theory of Meaningful Learning emphasizes that meaningfulness in learning will make activities more interesting, useful and more challenging so that the concepts and procedures of learning models will be easier to understand. The simulation model is a learning model that can make it easier for individuals to learn simulated experiences designed in the form of games rather than in the form of explanations or lectures. In the context of Nursing, the theory proposed by Ausubel can be used for education and training of health professionals and lay people through the application of simulation (Sousa et al., 2015).

Based on this background, a further study is needed to assess the effect of emergency first aid simulation in carrying out log rolls on victims with indications of cervical injury among Jember Regional Disaster Management Agency members.

Method

The method in this study is a pre-experimental design method type one group pretest-posttest. The population in this study were Jember Regional Disaster Management Agency members based on 2022 data. This research involved 40

respondents who were obtained using a non-random sampling technique of total sampling type. This research was conducted at the Regional Disaster Management Agency Jember Hall.

The intervention was carried out in series per group from March 1-14, 2023. Initial data collection (pretest) was implemented on March 1, 2023, posttest data was implemented on March 15, 2023. This research data was taken using an instrument in the form of an observation sheet. Respondent characteristics were analyzed using the univariate test. Bivariate testing using paired sample t-test.

This study was conducted after obtaining ethical approval from the Health Research Ethics Commission of the Faculty of Health Sciences, University of Muhammadiyah Jember Number 0182/KEPK/FIKES/XII/2023 dated February 06, 2023 and a certificate of completion of research number 800.2/0766/416/2023 dated April 1, 2023.

Results

This research involved 40 Regional Disaster Management Agency members in Jember Regency using an instrument in the form of an observation sheet. Respondent characteristics were analyzed using univariate tests. Bivariate testing uses the paired sample t-test.

Table 1. Age Characteristics of Regional Disaster Management Agency Members in Jember Regency in 2023 (n=40)

Characteristics	Frequency	Percentage
21-30 years old	3	7,5
31-40 years old	6	15
>40 years old	31	77,5
Total	40	100

Table 1 shows that in general, the majority of Jember Regency Regional Disaster Management Agency members are over 40 years old, namely 31 respondents (77.5%).

Table 2. Gender Characteristics of Regional Disaster Management Agency Members in Jember Regency in 2023 (n=40)

Characteristics	Frequency	Percentage
Man	37	92,5
Woman	3	7,5
Total	40	100

Table 2 shows that in general the Jember Regency Regional Disaster Management Agency members are mostly male, namely 37 respondents (92.5%)

Table 3. Educational Characteristics of Regional Disaster Management Agency Members in Jember Regency in 2023 (n=40)

Characteristics	Frequency	Percentage
Senior High School	32	80
Diploma/ Bachelor	8	20
Total	40	100

Table 3 shows that in general the majority of Jember Regency Regional Disaster Management Agency members have high school level education, namely 32 respondents (80%).

Table 4. Characteristics of Length of Membership of Regional Disaster Management Agency Members in Jember Regency in 2023 (n=40)

Characteristics	Frequency	Percentage
1-5 years	38	95
6-10 years	2	5
Total	40	100

Table 4 shows that in general most of the Jember Regency Regional Disaster Management Agency members have been members for between 1-5 years, namely 38 respondents (95%).

Table 5. Proportion of Capability to Perform Log Roll for Cervical Injury Victims Before Simulation of Emergency First Aid for Regional Disaster Management Agency members in Jember Regency in 2023 (n=40)

Ability Category	Frequency	Percentage
Less Capable	19	47,5
Moderately Capable	21	52,5
Capable	0	0
Total	40	100

Table 5 shows that more than half of the Regional Disaster Management Agency members in Jember Regency had sufficient skills before carrying out the emergency first aid simulation before carrying out the emergency first aid simulation in Jember Regency, namely 21 people (52.5%).

Table 6. Proportion of Capability to Carry Out a Log Roll on Victims with Indications of Cervical Injury After Carrying Out an Emergency First Aid Simulation for Regional Disaster Management Agency Members in Jember Regency in 2023 (n=40)

Cability Category	Frequency	Percentage
Less Capable	9	22,5
Moderately Capable	19	47,5
Capable	12	30
Total	40	100

Table 6 shows that the skill ability to carry out a log roll on victims with indications of cervical injury after carrying out emergency first aid simulations among Regional Disaster Management Agency members in Jember Regency mostly had sufficient skills, namely 19 people (47.5%).

Table 7. Average difference in ability to carry out a log roll on victims with indications of cervical injury before and after carrying out the Emergency First Aid simulation for REGIONAL DISASTER MANAGEMENT AGENCY Members in Jember Regency in 2023 (n=40)

Category	*Mean*	*SD*	*Mean*	*lower*	*Upper*	*p-value*
Before	55,5	7,472	-11,7	-14,1	-9,3	0,000
After	67,25					

Table .7 shows that the average capability of carrying out log rolls on victims with indications of cervical injuries before simulating emergency first aid on Regional Disaster Management Agency members in Jember Regency is 55.5 (SD ± 10.6). While the average score of the ability to carry out log rolls on victims with indications of cervical injuries after simulating emergency first aid for Regional Disaster Management Agency members in Jember Regency is 67.25 (SD ± 11.32) so it can be proven that the average pretest score is 11.7 (SD ± 7.47) lower than the posttest score. The test results show a p-value of 0.000 so based on statistical assumptions if the significance value (2-tailed) <0.05, H0 is rejected and H1 is accepted, which means that there is a significant effect of simulating emergency first aid in carrying out log rolls on victims with indications of cervical injuries on Regional Disaster Management Agency members in Jember Regency.

Discussion

Ability to carry out log rolls on victims with indications of cervical injury before carrying out Emergency First Aid simulations for Jember Regional Disaster Management Agency members

The results of this study indicate that carrying out log rolls on victims with indications of cervical injuries before simulating Emergency First Aid on members of Regional Disaster Management Agency Jember more than half have sufficient capability, namely 21 people (52.5%). This means that of the ten procedures performed in carrying out the log roll only half are done well while the rest are not implemented.

Solberg (2018) explains that vertebral injuries are generally caused by high-energy injuries, usually due to motor vehicle accidents or falls from heights. This injury can be caused by a combination of flexion, extension, compression, distraction, torsion, and shear. The most dangerous cervical injuries result from a combination of flexion and rotation. Ligaments and joint capsules are stretched to their limits; can then tear, joint surfaces can fracture or the top of one vertebra can be cut off. The result of this mechanism is a forward shift or dislocation of the vertebrae above, with or without bone damage. All fractures and dislocations are unstable and there is a high risk of neurological damage. Hoogenboom et al., (2018) explained that it is very important for sufferers who are suspected of having a spinal cord injury to receive initial assistance with good position management, one of which is using a log roll which aims to immobilize spinal cord injury sufferers.

The results of this study are in line with a study by Mohammed et al., (2021) which in his study revealed that the majority of ordinary people have low knowledge about first aid for spinal injuries. Based on the level of education, it is known that the majority (80%) of Regional Disaster Management Agency members in Jember Regency are graduates of high school/vocational level, which can be assumed that these members are not from the health community or can be said to be lay individuals.

Sharif et al., (2018) revealed that a person's educational background is closely related to the capability and attitude of individuals in an effort to treat emergencies. This is evidenced in the first procedure, namely the procedure regarding stabilizing the head and neck in a neutral position without traction. The helper must hold the patient's shoulder at the neck and gently position the patient's head between the forearms only half of which is done. This provides evidence that the educational background of the helper has implications for the practice of helping victims.

Capability to carry out log rolls on victims with indications of cervical injuries after simulation of Emergency First Aid on members of Regional Disaster Management Agency Jember

The results of this research show that carrying out log rolls on victims with indications of cervical injury after carrying out Emergency First Aid simulations among Regional Disaster Management Agency Jember members mostly had sufficient abilities,

namely 19 people (47.5%), but there was a good increase, namely 12 people (30%). This provides scientific evidence that after the simulation there was an increase in understanding, but it was still in the sufficient category, meaning that not all of the ten procedures were carried out correctly, especially there was an increase in the 1st rescue procedure by carefully keeping the head and neck in a neutral position during the roll. Rescuers 2 and 3 roll the patient onto their side. The patient's arms remain locked at their sides to maintain the effect of the splint. The head, shoulders and pelvis remain aligned during the roll (procedure 7) and a backboard is positioned next to the patient and held at a 30 to 45 degree angle by rescuers 2 and 3 (procedure 9).

Based on age, it is known that in the age range of 21-30 years, all of them have good abilities after simulation. In the age range 30-40 shows that all have good abilities after simulation. Whereas at the age of more than 40 years shows that the proportion is dominated by less ability (29%) and enough (61.3%) while the good ability only reaches 9.7%. Krammel et al., (2018) in their study revealed that age has a relationship with individual willingness in emergency response efforts. Younger age (<40 years) has a higher capability (highest willingness) to manage emergencies.

Based on gender, it is known that in male members the ability to help victims of cervical bone injury after simulation in the good category reached 21.3% while in women all were in good ability (100%). This study is consistently in line with research by Mohammed et al., (2019) that gender is related to individual abilities in emergency management. Furthermore, Mohammed et al., (2019) in their study revealed that women are easier to understand emergency management associated with high concern for seeking information through various methods. The same thing was also revealed by Krammel et al. (2018) that women have a higher willingness to understand emergency management compared to men.

Based on the level of education, it is known that members with high school education have the ability to help victims of cervical bone injuries after simulation in the good category reaching 12.5%, while members with undergraduate / diploma educational backgrounds are all in good ability (100%). Consistent with these findings, Al-Johani et al. (2018) in their study revealed a relationship between education level and the ability to provide first aid, consistently the findings also revealed that individuals with higher education levels were able to provide better first aid. This

research provides adequate reasons that education is able to support individuals in interpreting first aid, especially through simulation methods or other terms of emergency management training.

Based on the length of time as a Regional Disaster Management Agency member, it is known that members with a length of service of 1-5 years have the ability to help victims of cervical bone injuries after simulation in the good category reaching 31.6%, while members with a length of service of 6-10 years are proportionally in sufficient ability (100%).

This study proves that the ability of Regional Disaster Management Agency members to help victims of cervical spine injuries after simulating the log roll method in handling victims of cervical spine injuries has increased, which is mediated by several factors including age, gender, and education. We assume that simulation is a method of delivering information that is constructively easier for younger individuals to accept. In addition, the education factor is also a determinant in mediating the ease/ or difficulty of individuals in receiving information. This is also supported by the gender factor that the female gender has the ability to capture information because they have good literacy and orientation skills compared to men. Age, gender and education factors constantly contribute to facilitating the process of mediating skills through the simulation method.

The Effect of Emergency First Aid Simulation in Carrying out log rolls on victims with indications of cervical injuries on Regional Disaster Management Agency Members in Jember Regency

This study shows that the average ability to carry out log rolls on victims with indications of cervical spine injuries before simulating emergency first aid for Regional Disaster Management Agency members in Jember Regency is 55.5 (SD ± 10.6). While the average score of the ability to carry out log rolls on victims with indications of cervical bone injuries after simulating emergency first aid is 67.25 (SD ± 11.32) so It can be proven that there is an increase in the average score of 17.70. The statistical test results significantly show that there is a difference before and after simulation (p-value = 0.000), this provides emperical evidence that there is an effect of emergency first aid simulation in carrying out log rolls on victims with indications of cervical injuries.

Pollak et al., (2018) explain that simulation is a two-way traffic method. In this method the speaker and target are active and are given the opportunity to express opinions and also ask questions so that the target can be active and creative. According to Nursalam & Efendi (2011) there are three types of simulation, namely simulation exercise, simulation game, and role playing, all of which aim to enrich knowledge, attitudes, and skills, as well as experiences that are not directly given in dealing with various social problems.

Hyldmo et al., (2017) in their study revealed that the importance of emergency management training, especially regarding rescue protocols for spinal injuries. Consistently, a study by Gharsan & Alarfaj (2019) revealed that first aid training is positively correlated with an increase in individual knowledge in performing rescue protocols in emergency management. The study also provided evidence that regular training can increase awareness in individuals to be prepared and proficient in implementing first aid protocols. Consistent with these findings, a study by Seham et al. (2015) revealed an increase in knowledge in individuals after attending a first aid and emergency management training program.

We argue that the difference in ability before and after simulation provides experimental evidence that PPGD simulation in the skill of implementing log rolls for victims with indications of cervical injuries can improve the ability of Regional Disaster Management Agency members in the management of cervical bone injuries. The importance of emergency management training through simulation methods should not be ignored because it can increase knowledge. This is the first step towards proper practice and behavior modification especially in individuals working in disaster management and mitigation. The significant increase in the skill of implementing log rolls on victims with indications of cervical bone injuries in Regional Disaster Management Agency members in Jember Regency provides an assumption that through the simulation program provides practical and concrete examples so that participants get a more real picture so that they will be better able to visualize which in turn is able to properly receive all information in the skill of implementing log rolls on victims with indications of cervical spine injuries.

At the time the intervention was carried out, the subject's behavior could not be controlled which included talking to himself, and lack of attention to the researcher so

that it affected the disruption of understanding. Subjects were not intervened simultaneously due to the situation and conditions that did not allow it so that several sessions were carried out in each group at the same time.

This study proves the low understanding of lay participants in emergency management, especially in handling emergencies, so that improvement efforts are needed by providing regular training. Emergency training allows lay individuals to be able to perform emergency care as a life saving effort for patients so that further complications in the form of disability and death can be minimized. This study proves that training can improve the ability to manage emergencies, so it is relevant that such trainings are conducted routinely and periodically, especially for individuals working in the field of disaster mitigation.

Conclusion

The ability to help cervical injuries in Regional Disaster Management Agency Jember members before PPGD training in carrying out log rolls on victims with indications of cervical injuries more than half had sufficient ability, namely as many as 21 people (52.5%) and after PPGD training showed an increase, namely as many as 12 people (30%) had good abilities with an average score of 67.25.

Simulation of emergency first aid in carrying out log rolls proved effective in improving the ability of Regional Disaster Management Agency Jember members in carrying out log rolls on victims with indications of cervical injuries.

The results of this study provide emperical evidence that simulation is an important training management in disaster management so it is very important to do and outlined in the policy to conduct regular training programs. This finding indicates a low understanding of emergency management in patients with suspected spinal cord injury so that in the future the participants actively improve their understanding by finding reference sources and asking the leadership for training.

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