Emergency Skills weekend is a feasible way to deepen and drill first aid skills in students, a longitudinal study

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Abstract

BACKGROUND: The Emergency Skills weekend is a part of the Student Emergency section. The first Emergency Skills weekend was in 2016. Students were joined by a paramedic, firefighters, and the Slovenian army, which have enriched the program with their knowledge and experience. The main purpose of the weekend is to offer medical students additional education in the field of first aid and emergency medicine. Further, the improvement of communication and social skills. By analyzing the exam results we want to determine the impact of our training program on medical students first aid skills.

METHODS: Emergency Skills weekend took place between 15th and 17th of October 2019. Experiment was longitudinal and had included a learning intervention. The participants were divided into the entry-level group (those who did not attend the weekend yet) and the advanced-level group (those who had already completed the basic part). The weekend was attended by 1st to 5th year medical students. Participants replied to 41 multiple-choice questions before and after intervention. They had 60 minutes available to solve the questions.

RESULTS: Pre-exam was solved by 9 (22 %) students in the advanced group and 31 (76 %) in the entry-level group. Average of the pre-exam was 22.7 / 41 and 24.7 / 41 respectively. Post-exam was solved by 7 students (17 %) in the advanced group and 23 (56 %) in the entry-level group. Average of the post-exam was 32.8 / 41 points and 32.4 / 41 points for latter. The result was significantly better in both, entry-level and advanced group ($p=0.008$ and $p<0.001$ respectively). The year of medical school proved not to be significantly correlated with the exam results ($p=0.781$). There was no significant difference between genders in both pre in post exam, $p=0.276$.

CONCLUSIONS: Emergency Skills weekend improves first aid skills significantly in our study.

First aid, medical student, cardiopulmonary resuscitation, basic life support, simulation training

I. INTRODUCTION

The Emergency Skills weekend is a part of the student project Student Emergency Section which is a part of the Maribor Medical Students' Association and International Federation of Medical Students Associations. The first Emergency Skills weekend was held in 2016, in 2019 we conducted the third Emergency Skills weekend for students of the Medical Faculty of the University of Maribor. The organizing team consists of aspiring students who are aware of the importance of good knowledge and first aid skills. Emergency medical technician, firefighters and the Slovenian Army also joined in, enriching the program, sharing their knowledge and experience. The main purpose of the weekend is to offer students of the Medical Faculty of the University of Maribor additional education in the field of first aid and emergency medicine as well as improving communication and social skills of the students while working as a team.

With improvement in teamwork and communication, medical error rate falls and the quality of care improves [1]. Despite proven added value of work-based learning in medical education, it is still not regularly utilised and medical students might not get the experience that would help them in learning and improving themselves as a colleague and medical professional [1]. Teamwork is essential for acquirement of non-technical skills [1,2]. Prehospital care is an integral part of giving care to the patients at the site of the injury to the best of ones' ability. The situations that emergency responders have to face differ from one to another widely [3]. Because such events are quite rare it is important that the response is drilled regularly [3]. The simulations with real actors are one way of addressing this challenge [3]. Even when army personnel is subjected to tough environment of mass casualty event they make mistakes [2]. That is why it is important for students to start early and try to improve their response. In our educational program we simulated patients, portrayed by trained actors to introduce participants to important pathological states that require immediate attention and action to save lives or prevent deterioration to a worse state. It is important for the both parties to commit to the scenarios they are playing out, as reluctance to commitment of role playing because of self-consciousness can

hinder experience [4]. Simulation scenarios that mimic reality promote integration of problem-solving and clinical reasoning amongst the participants [3]. The fidelity of simulations does not have to be high to achieve a good learning outcome [5]. In our program we even still try to give as much realism, as possible with the funding we get. Learning with simulation takes place in a controlled environment which gives the participants an unique ability to learn from their mistakes without harming their patients or themselves [4]. Reviewing and adherence to basic principles of emergency care, like triage and basic first aid, can make a big difference, even between life and death [2].

The simulations are perceived as a meaningful training and an effective educational method [3]. If the simulations are of just right difficulty, a little over the knowledge level of the participants, they create a learning opportunity with positive effects on participants' knowledge [3]. Added value lies in realism created with sounds and environment that participants might find themselves in, as it creates a level of anxiety and engagement which could not be achieved by simple didactics or cadaver training [3]. A two-way communication between an actor and participants gives the best illusion of realism, as this cannot yet be achieved by a high-fidelity mannequin [3].

Very important part of the simulations is debriefing, which gives participants option to look back to what they did well, what could be improved and introspect to what their personal weaknesses and strengths were [3]. Only through debrief can participants improve in the future. Using simulation training gives a significant increase after the learning intervention in motivation and preparedness for future events [6,7]. By objective identification of weaknesses, we can start to improve on our skills and knowledge, where it is most necessary [2]. It is important that participants do not get embarrassed or have other negative emotional reactions to the simulation [6]. Everything that happens must be in a safe environment that supports healthy emotions, we think that this is better achieved by using actors that are students as well, as they are not distanced by the level of their education and might better understand their peers. Students taking part in such learning interventions find the experience engaging, worthwhile and memorable [5]. Participants prefer real life scenarios over training via pen and paper type multiple choice questions [5]. Participants also realise that there is an important loss of information that they would not expect if not being subjected to a realistic simulation, helping them to be better prepared for a real patient needing advanced care [5]. The experience is meaningful for the actors as they get to see how it feels and looks like to be taken care of in a trauma event, making them better understand future patients they will encounter [5]. For deeper evaluation of positive reflexion given by simulation participants we encourage reader to see this case report by Jorm et al. [5]. Participants also show better knowledge and scores after learning intervention with simulation [8].

Aim of this study was to determine whether the Emergency Skills weekend improves theoretical knowledge of the first aid in the participants and to find any individual data trends that could help improve future iteration of the event.

II. Materials and Methods

The Emergency Skills weekend took place between 15th and 17th October 2019 (3 days) at Centre for school and Outdoor Education Planinka on Pohorje. The research was longitudinal and included a learning intervention (Emergency Skills weekend itself). To participate, each student gave their informed consent via an online form.

Participants were divided into an entry-level group – EG (those who had not yet attended the weekend) and an advanced-level group – AG (those who had already completed the basic part). The contents have been adapted and updated for each level since last year. The participants were students from the 1st to the 5th year of the general medicine program at the Faculty of Medicine in Maribor (MFUM).

The EG only program consisted of the basic part of the first aid skills with following subjects included: triage, use of radio for communication, small simulations with a few participants and big simulation with all hands-on deck. The AG only program consisted of use of stretchers, helmet removal, rescue breathing (Ambu bagging) and C-spine immobilization, approach to the car collision victims together with a fire brigade, use of Lifepack 15, small simulations with a few participants. Both programs consisted of keynotes on Cardiopulmonary resuscitation, automated external defibrillator use, unconsciousness victims, initial assessment of critically ill, basic gear for first responders, immobilization, bleeding control, animal bites and toxins, and states requiring immediate medical attention.

Knowledge was assessed with an exam in quiz mode (Google Forms). Participants answered 41 multiple choice questions that had only one correct answer and no negative points. The questions were prepared by the organizing team of the weekend and reviewed by the study supervisor (MS).

The sequence of questions was randomised to make the exam more demanding. The participants did not receive any feedback on the results of the exam to eliminate the option of better performance in the post-exam. Questions on both exams were identical. The exam was performed on participants' smart phones. Time limit for solving the exam was set at 60 minutes.

The statistical analysis was performed in JASP (v0.9.2.) and IBM SPSS (v1.0.0.1461). We performed a paired-t test - to compare the difference in the individual results of the exam, Student's t-test - to compare groups and Mann-Whitney U test to test the results before and after the weekend for gender, ANOVA - to analyze the effects of age and gender on the results. We used descriptive statistics for a general insight into the characteristics of the data. For significance of the results, a two-tailed value of $p<0.05$ was considered significant.

III. Results

The Emergency Skills weekend was attended by 41 students. The pre-weekend exam was solved by 9 students (22 %) in the AG and 31 (76 %) in the EG of the weekend (Figure 1). The average in the EG was 27.2 / 41 points and in the AG 24.7 / 41 points. The lowest score in the AG was 22 / 41 points

and 17 / 41 points in the EG. The 95th percentile was 32 at both levels.

The post-weekend exam was solved by 7 students (17 %) in the AG and 23 (56 %) in the EG. The average in the EG was 32.8 / 41 points and in the AG 32.4 / 41 points. The lowest score

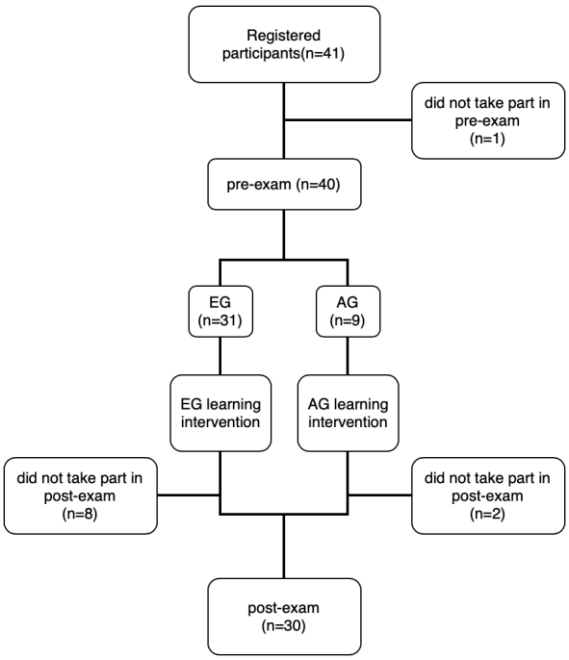

Figure 1 Outline of the Emergency Skills weekend. EG: entry-level group, AG: advanced-level group, pre-exam: exam taken before the learning intervention, post-exam: exam taken after the learning intervention.

in the AG was 24/41 points and 28 / 41 points in the EG. The 95th percentile was 37 in EG and 36 in AG.

We compared the average score separately by groups before and after the weekend. We found that the results of both groups were significantly better after the weekend, in the EG the difference was more significant ($p < 0.001$) than in the AG ($p = 0.008$) (Figure 2).

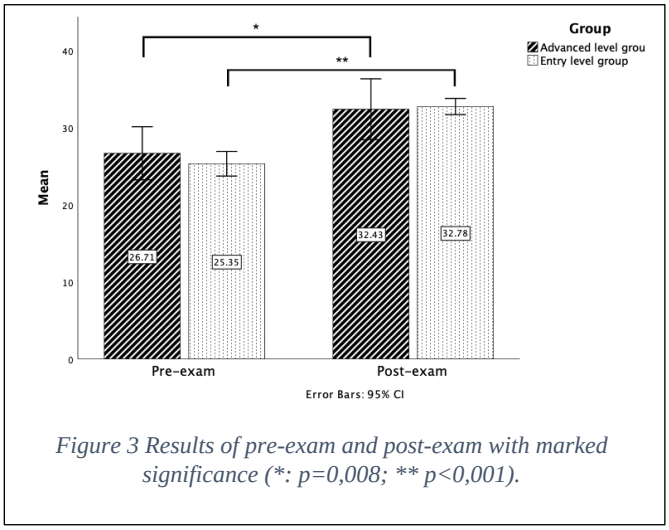

Figure 3 Results of pre-exam and post-exam with marked significance (: p=0,008; ** p<0,001).*

The weekend was attended by students between 1st and 5th year of medicine. We found that knowledge differs between different years, but the ANOVA test did not find a significant difference between years that the students are in and their knowledge at the exam ($p = 0.781$). Despite the statistically insignificant difference between the years attended, senior students roughly achieved better results (Figure 3).

The Emergency Skills weekend was attended by 10 men (24 %) and 31 women (76 %). We made a comparison by gender.

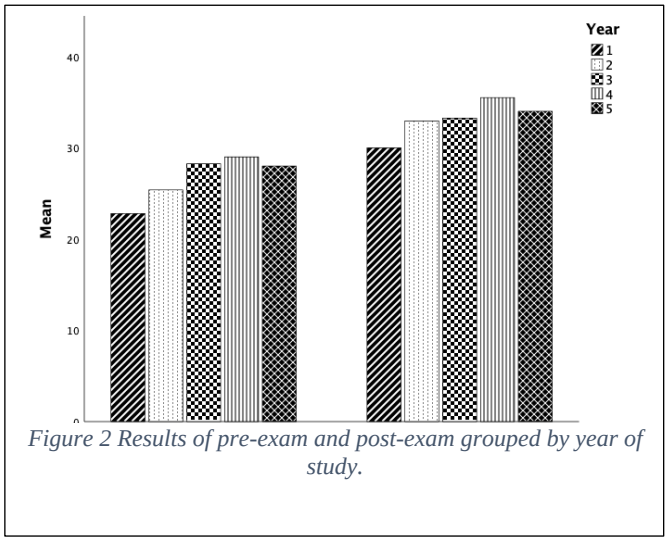

Figure 2 Results of pre-exam and post-exam grouped by year of study.

The results of the pre-exam are normally distributed and statistically insignificant ($p = 0.772$) - The comparison is shown in Figure 4 left. The results of the exam after the weekend are not normally distributed and statistically insignificant ($p = 0.276$) (Figure 4).

We compared the success of solving the exam (number of points achieved on the exam) according to the level that the individual attended. We found that the difference between the two levels before the weekend was statistically insignificant (p

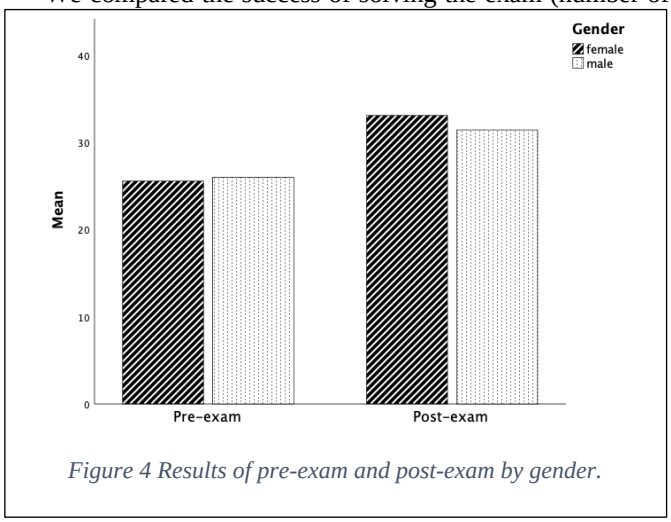

Figure 4 Results of pre-exam and post-exam by gender.

= 0.077); however, the trend of better knowledge at the advanced level is indicated (27.2 points at the advanced level compared to 24.7 at the entry level). After the weekend, the results are comparable between the two levels and statistically insignificantly different (p = 0.781).

IV. Discussion

Our study shows that medical student's theoretical knowledge in first aid significantly improves after the participation in a 3-day Emergency Skills weekend. It seems as an useful program for upgrading and revising knowledge of first aid. Due to the difficulties of carrying out practical testing, we decided only for the theoretical assessment. We assume that the actual knowledge (including first aid skills?) of each individual deviates to some degree from the theoretical knowledge shown in the exam; practical exam tends to be easier to pass than theoretical [9].

Our study design differs from those in the literature, as we organized two different levels instead of only one [10]. We did not limit ourselves to only one massive casualty event, but rather used numerous real-life simulations and upgraded them with a number of medical keynotes encompassing the theoretical background of scenarios practiced [7]. Students in our study were not part of a single generation like in the study by House et al., but rather from year 1 to 5 of general medicine [10]. Testing knowledge with an exam, like in our study, is not always carried out in other study designs, with some of the studies only reporting the qualitative improvements, but not quantitative [11].

Better results of the exam after the weekend, compared to those taken before the weekend, were observed for both groups (EG and AG) which is in accordance with other studies [7,8,10]. As expected, we found in our study that the knowledge of students who had already attended the Emergency Skills weekend (AG) was indicated to be better than that of those attending the weekend for the first time. The problem with the reliability of the results in this study could be that the participants solved the same exam; however, we mitigated this by randomizing the sequence of questions, not reporting feedback on success after the pre-exam - participants did not know which answers were correct and found it harder to remember the questions because they were randomized in a lengthy exam.

A comparison by gender showed that there was no significant difference between the two. This result, however, may deviate from the real situation, as we had far fewer male than female participants, which is in accordance with Alyahya K et al. [12]. This finding is due to the fact that more women compared to man are enrolled in MFUM program of general medicine.

The AG did not have significantly better results of the exam after the Emergency Skills weekend than the EG. On the other hand, Abbas A et al found that the knowledge of students with prior training is better than of those without [13]. This observation from our study could be attributed to the fact that the students at the AG had different educational contents than those at the EG. Therefore, the efficacy of further implementation of the AG should be questioned - perhaps it would be better to carry out only the EG program with smaller groups with the remaining capacities left from not organizing the AG program. When organization of the Emergency Skills weekend remains, general knowledge could be improved by adding a quick overview of all the important contents of the EG of the weekend for participants at the AG.

Noncorrelation between the students' year and scores of the two exams given were already recognized and described by other authors [14]. It was hypothesized that the more advanced year the students are in, the better their knowledge would be; however, this was not the case. On contrary, trend of reverse correlation between the students' year and first aid knowledge in a European medical school was found [14]. Thus, a yearly refresher first aid courses among the medical students were proposed [13,14]. A study by Berden et al. goes even further, recommending a refresher course of CPR every six-months [15].

Our study was limited by the theoretical examination of knowledge only. Since the practical skills were not tested, the performance of the medical students in a real-life emergency simulation could differ. In the future we could store the data and analyze it for a longer period and thus obtain more data points. Taking the exams on the phone can potentially make it difficult to solve - due to the small screen and the unaccustomedness of students to this way of testing. Also, the phone may lose its connection and as a result we did not get all the exams solved. This could be remedied by solving the exam on a computer - as this reduces the chances of a device failure (because of connectivity or other reasons) and thus obtain all the data.

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References

[1] Jorm C, Roberts C, Lim R, et al. A large-scale mass casualty simulation to develop the non-technical skills medical students require for collaborative teamwork. BMC Med Educ. 2016;16:1–10.

[2] King DR, Patel MB, Feinstein AJ, et al. Simulation Training for a Mass Casualty Incident: Two-Year Experience at the Army Trauma Training Center. J Trauma Inj Infect Crit Care [Internet]. 2006 [cited 2020 Oct 31];61:943–948. Available from: http://journals.lww.com/00005373-200610000-00028.

[3] Abelsson A, Rystedt I, Suserud B-O, et al. Learning by simulation in prehospital emergency care - an integrative literature review. Scand J Caring Sci [Internet]. 2016 [cited 2020 Oct 31];30:234–240. Available from: http://doi.wiley.com/10.1111/scs.12252.

[4] Grundberg Å, Hansson A, Religa D, et al. Simulation-based assessments in health professional education: A systematic review. J Multidiscip Healthc. 2016;

[5] Norman G, Dore K, Grierson L. The minimal relationship between simulation fidelity and transfer of learning. Med Educ. 2012;46:636–647.

[6] Abelsson A, Lundberg L. Trauma Simulation in Prehospital Emergency Care. J Trauma Nurs [Internet]. 2018 [cited 2020 Oct 31];25:201–204. Available from: http://journals.lww.com/00043860-201805000-00012.

[7] Bentley S, Iavicoli L, Boehm L, et al. A Simulated Mass Casualty Incident Triage Exercise: SimWars. MedEdPORTAL [Internet]. 2019 [cited 2020 Oct 31];15:mep_2374-8265.10823. Available from: http://www.mededportal.org/doi/10.15766/mep_2374-8265.10823.

[8] Vincent DS, Burgess L, Berg BW, et al. Teaching Mass Casualty Triage Skills Using Iterative Multimanikin Simulations. Prehospital Emerg Care [Internet]. 2009 [cited 2020 Oct 31];13:241–246. Available from: http://www.tandfonline.com/doi/full/10.1080/10903120802706088.

[9] Tan ECTH, Severien I, Metz JCM, et al. First aid and basic life support of junior doctors: A prospective study in Nijmegen, the Netherlands. Med Teach [Internet]. 2006 [cited 2020 Nov 7];28:189–192. Available from: http://www.tandfonline.com/doi/full/10.1080/01421590500312847.

[10] House AK, House J. IMPROVING BASIC SURGICAL SKILLS FOR FINAL YEAR MEDICAL STUDENTS: THE VALUE OF A RURAL WEEKEND. ANZ J Surg [Internet]. 2000 [cited 2020 Nov 7];70:344–347. Available from: http://doi.wiley.com/10.1046/j.1440-1622.2000.01824.x.

[11] Mazoyer P, Hardern RD. Lessons learned on a wilderness medicine “teaching weekend.” Wilderness Environ Med. 2011;22:277–280.

[12] Alyahya K, Alsaad S, Alsuliman S, et al. Awareness about first aid management of epistaxis among medical students in Kingdom of Saudi Arabia. J Fam Med Prim Care. 2019;8:914.

[13] Abbas A, Bukhari SI, Ahmad F. Knowledge of first aid and basic life support amongst medical students: A comparison between trained and un-trained students. J Pak Med Assoc. 2011;61:613–616.

[14] Grześkowiak M. The effects of teaching basic cardiopulmonary resuscitation - A comparison between first and sixth year medical students. Resuscitation. 2006;68:391–397.

[15] Berden HJJM, Willems FF, Hendrick JMA, et al. How frequently should basic cardiopulmonary resuscitation training be repeated to maintain adequate skills? Br Med J. 1993;306:1576–1577.