EFFECTIVENESS OF SURGICAL SKILLS TRAINING FOR SURGICAL WOUND DEBRIDEMENT USING ANIMAL TISSUE AS SIMULATOR

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Abstract

Background: To evaluate the effectiveness of surgical skills training for wound debridement using animal tissue as simulator.
Methods: House officers (HOs), Senior House officers (SHOs) and Medical Officers (MOs) were taught basic surgical skills during a 3-day intensive course at the Tamale Teaching Hospital Basic Surgical Skills Training centre. Wound debridement forms part of the training. Results of treatment of dirty wounds by participants were compared with those of a control group.
Results: Eighty-three (83) patients with dirty wounds were randomised for treatment by the study group and the control group. General characteristics of patients in both groups were comparable: the median age was 25.5±13.1SD; sex and age was similar between groups. Wound infection was found in 3(7.9%) patients treated by simulation-trained participants and 18 (40%) patients in the control group p<0.0001. Simulation-trained doctors prescribed antibiotic for less than five days in 33 (86.8%), as compared to 2 (4.4%) in the control group (p<0.001). Mean hospital stay in the study group and control group was 1.55 ± 2.35 and 2.29 ± 1.16 days respectively (p=0.07).
Conclusion: Surgical skills training for wound debridement, using animal tissue as simulator is effective. It is suggested that all HOs, SHOs and MOs should undergo similar training before undertaking any surgical rotation or before they start surgical residency. Simulation of surgical procedures using animal tissues, if incorporated at each level of the curriculum, would make significant impact.

Key Words: simulation, wound debridement, training.

Introduction

The old paradigm of "see one, do one, teach one" has now changed to "see several, learn the skills and simulation, do one, teach one"[1]. A series of surgical simulation exercises using an animal model to allow trainees to practice basic instrument handling and develop psychomotor skills[2] is a common practice in most training institutions worldwide. Surgical training has undergone many changes in the last decade; one outcome of these changes is the interest that has been generated in the possibility of training surgical skills outside the operating theatre[3]. Several techniques of simulation are available including artificial tissues, animal models and virtual reality computer simulation. Artificial tissues and virtual reality simulation are resource intensive and may not be viable alternatives in all settings. Simulation of surgical procedures using animal tissues, if adequately reflective of human anatomy and wound patterns, allows transfer of techniques and philosophy learnt in a skills laboratory directly to the operating theatre. The Council on Scientific Affairs of the American Medical Society concluded in 1989 that progress in cancer, trauma, shock treatment, as well as in diabetes and cardiovascular disease, is proportional to good animal models[4].

The aim of this study was to determine the effectiveness of using a dirty stab wound on a chicken thigh as a simulator for wound debridement in a surgical skills laboratory of the Tamale Teaching Hospital (TTH)-School Health and Medical Sciences (SMHS), University for Development Studies (UDS) in the preparation of House Officers (HOs), Senior House Officers (SHOs) and Medical Officers (MOs) as pre-rotation preparation.

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Materials and Methods

From 15th to 18thMarch 2010, HOs, SHOs and MOs in the study group underwent a 3-day intensive training in basic surgical skills at the skills laboratory of TTH (a tertiary referral centre serving Northern, Upper East, Upper West and Brong-Ahafo Regions of Ghana) after formal apprenticeship type of training. The control group (HOs, SHOs, and MOs) underwent only formal apprenticeship training by following a trainer. As part of the training participants were taught wound debridement on day 2 during the afternoon section. A dirty stab wound, using a chicken leg contaminated with sand and foreign material embedded in the wound was used as the simulation. Patients with dirty wound were treated by the simulation-trained doctors and the control group. The investigator took no hand in assigning patients to the groups (TTH Institutional Review Board and approval). Eighty-three (83) patients with dirty wounds

without underlying bony fractures confirmed with x-ray were treated. The outcome of treatment was recorded. Independent observers assessed wound postoperatively with wound infection confirmed by bacteriological study. All the data were entered and analysed using EPI Info v3.5.1.

Results

The demographic characteristics of both groups showed no statistical difference. The ages of the patients ranged from 6 months to 73 years (median age was 25.5±13.1SD). There were 69 (83.1%) males and 14 (16.9%) females (Table 1).

Table 1: Demographic characteristics of patients (n=83)

Variable	Patients (%)	Controls (%)
Gender:		
Male	31 (81.6)	38 (84.4)
Female	7 (18.4)	7 (15.6)
Median age/years	25 ± 12.9	26 ± 13.3
Mechanism of injury:		
RTA	51 (61. 5)	
Gunshot	12 (14.5)	
Fall from height	8 (9.6)	
Cutlass	5 (6)	
Others	4 (4.8)	
Domestic	3 (3.6)	

There were thirty-eight (38) patients in the simulation trained group: male – 31, female - 7; median age 25 ± 12.9SD. The total number of patients in the control group was 45: males – 38 and females - 7; with a median age of 26 ± 13.3. The most common cause injury was road traffic accident (RTA) representing 51 (61.4%) followed by gunshot wounds in 12 (14.5%) and fall from height in 8 (9.6%), cutlass wound were seen in 5 (6%), and domestic wounds were observed in 3 (3.6%) of patients. Other causes were observed in 4 (4.8%) of patients treated in this series.

Wound complications were observed in 3 (7.9%) patients treated by simulation-trained doctors as compared to 18 (40%) patients in the control group $p<0.0001$. Examples of outcome of treatment are shown in figures 1and 2.

Antibiotic usage: 33 (86.6%) patients treated by the simulation-trained group received antibiotic for less than 5 days whilst 2 (4.4%) patients in the control group received antibiotic also for less than 5 days.

The Mean hospital stay of patients treated by the study group and control group was 1.55 ± 2.35 and 2.29 ± 1.16 days respectively. The difference was significant with a p-value of 0.07.

Figure 1: Outcome of treatment of gunshot wound

Figure 2: Outcome of a machete (cutlass) wound

Discussion

This study was undertaken to establish the effectiveness of using animal tissues as simulators for surgical skills training in wound debridement. Simulation of surgical procedures using animal models, allowed complete transfer of techniques acquired in the skills laboratory directly to the operating theatre[3,5]. Therefore, medical educators are turning to simulator-based training to meet training needs in the recent times[4,6]. More advanced techniques of inanimate artificial tissues and organs, virtual reality and computerised simulation are expensive and may not be cost effective in developing countries of the Sub-Sahara for example Ghana, especially in the resources constrained regions.

Using animals under the banner of medical advancement has always been controversial, evoking protest from animal rights groups and some of the general public. The Cruelty to Animals Act of 1876 forbade the use of animals in the UK to gain proficiency in surgical skills[7]. However, there is no restriction to the use of animal parts in the UK and pig trotters are often used to teach suturing and excision biopsy in the basic surgical skills course. Moreover the use of anaesthetised animals, particularly pigs, is widespread on courses in Europe and America. As far as the author is concerned, simulation-based training using advanced technology is as good as animal-based training from the evidence-based studies. The author believes that the knowledge necessary to produce effective training can be impacted

using the combination of simulation technology and supervised operating room training, without risk to patients and with improved outcome of treatment.

Wound debridement refers to the process of removing necrotic, devitalized, or contaminated tissue and/or foreign material to promote healing[8,9] which the most common emergency procedure performed by junior doctors during surgical rotation at the department of surgery of the TTH and all other healthcare facilities in the three northern regions of Ghana. Simulation-training provided the pedagogical context for skills training, linking together all of the required elements for mastering the procedure. Seevinck*et al.*[10] found that simulation-based training system is effective in surgical wound debridement after addressing many technical challenges. One of the important benefits of simulation-based training in wound debridement is that trainees can acquire much of the fundamental knowledge and skills needed to perform elementary activities largely on their own without the need for constant supervision by an instructor especially in northern Ghana with inadequate medical professionals. It is no longer acceptable or economically efficient to train doctors using the age-old apprenticeship model. For this reason Aggarwal *et al*.[11] recommended that simulation training at each step of the curriculum must begin in the skills laboratory, utilising tools such as synthetic models, virtual reality simulation including animal tissue.

The findings of this study suggested that simulator-based training for surgical wound debridement using simple and inexpensive animal tissue is effective in resources constrained Sub-Sahara developing countries. Although this study is limited by lack of large number of patients, it has demonstrated significant reduction in prescribed antibiotics, wound complications in the simulated trained group.

Conclusion

Surgical skills training for wound debridement, using animal tissue as simulator is effective. It is suggested that all HOs, SHOs and MOs should undergo similar training before undertaking any surgical rotation or before they start surgical residency.

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