Review paper | Praca przeglądowa

LECZENIE RAN 2024; 21 (3): 83–87
DOI: 10.60075/lr.v21i3.71

POLSKIE TOWARZYSTWO LECZENIA RAN

The use of simulated wounds in the education of future medical staff

Zastosowanie ran symulowanych w kształceniu przyszłych kadr medycznych

Zofia Tekień-Jankowska [1],
Katarzyna Cierzniakowska [2]

[1] Department of Fundamentals of Clinical Skills and Postgraduate Education of Nurses and Midwives, Faculty of Health Sciences, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Torun, Poland
[2] Department of Interventional Nursing, Faculty of Health Sciences, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Torun, Poland

Address for correspondence:
Zofia Tekień-Jankowska, Department of Fundamentals of Clinical Skills and Postgraduate Education of Nurses and Midwives, Faculty of Health Sciences, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Torun, 15 Jagiellońska St., 85-067 Bydgoszcz, Poland, e-mail: zofia.tekien@cm.umk.pl

Received: 12.09.2024 Accepted: 3.10.2024

Abstract

The need for simulation in medical education is increasing, mainly because there are more students than available patients. Another reason is that patients often don't allow students to examine them, which requires adding simulated training sessions. Simulation technology has advanced a lot, making it more realistic. These classes occur in a safe and controlled environment, which can be repeated and include complex scenarios. Some research validates the use of simulated wounds, but it would be useful to study how this training improves real patient care, especially for Polish students.

The article discusses using simulated wounds in teaching to better prepare future medical professionals for clinical practice.

Key words: medical simulation, moulage, injury, wounds.

Streszczenie

Potrzeba symulacji w kształceniu przed- i podyplomowym rośnie głównie z powodu zwiększonej liczby studentów w stosunku do dostępności pacjentów. Kolejnym istotnym powodem jest brak zgody chorych na przeprowadzanie badania przez studentów, co wymusza poszerzenie oferty zajęć klinicznych, np. o zajęcia symulowane. Ogromny postęp technologii symulacji sprawia, że staje się ona coraz bardziej realistyczna. Zajęcia prowadzone tą metodą odbywają się w bezpiecznym, kontrolowanym przez osobę prowadzącą środowisku. Dużym atutem jest ich powtarzalność oraz możliwość tworzenia skomplikowanych scenariuszy. Wśród artykułów naukowych można znaleźć publikacje zawierające dane z badań walidujących symulacje z zastosowaniem ran pozorowanych. Jednak warto byłoby w przyszłości sprawdzić, szczególnie na populacji polskich studentów, jak ostatecznie przełoży się to na lepszą opiekę nad ranami u realnych pacjentów.

W artykule przedstawiono wykorzystanie różnego typu ran symulowanych do przeprowadzania zajęć dydaktycznych w celu przygotowania do prowadzenia opieki klinicznej przyszłych kadr medycznych.

Słowa kluczowe: symulacja medyczna, moulage, obrażenia, rany.

Introduction

Simulation using moulage wounds is used relatively frequently in classes on surgery, internal medicine, or life-threatening conditions, mainly in the pre-graduate education of nurses, physicians, and paramedics [1]. Few articles describe the use of simulated wounds in didactic classes. The several years of experience of simulation centre staff contribute greatly to improving technology and imitating wounds.

Realism in simulation

One of the most essential elements in creating a simulation scenario is the creation of adequate clinical realism. Fidelity, or the degree to which a simulation approximates reality, can encompass various dimensions. Conceptual fidelity means that all elements of the scenario or case realistically relate to each other so that the clinical picture makes sense to the participants (e.g., vital signs reflect the diagnosis). Physical or environmental fidelity means adequate preparation of the environment, equipment, room, props, and characterization of the characters. Psychological fidelity is the degree to which the simulated environment evokes the underlying psychological processes necessary in the natural environment for the participant (emotions, beliefs, self-awareness) [2].

Focusing on physical fidelity, the moulage technique should be mentioned. Moulage is the art of creating sham injuries, not only in life-threatening conditions but also in chronic wounds and skin diseases [3, 4].

Technique for creating simulated wounds

One key element of medical simulation is realistically reproducing wounds and injuries. These are usually created from materials such as silicone, latex, or polyurethane, attached with special glue or tapes. In addition, preparations based on water, food dyes, and glycerol are used to mimic blood, cerebrospinal fluid, and pus, for example. Adding devices that simulate bleeding or exudation from wounds enhances the participants' immersion in the scenario and their realistic performance [5, 6].

Wounds applied to simulators or simulated patients should be visually and tactilely similar to real ones. Many companies offer a wide range of wound simulation kits. Among them can be distinguished:

Wound care and dressing models also imitate internal structures, i.e. bones, muscles and blood vessels (Fig. 1). Mainly used for learning to assess the type of wounds,

Taped wounds and injuries in a roll need to be trimmed (Fig. 2). They have great variety and ease of application on simulators. They are more challenging to place on the body of the simulated patient; sets of silicone inserts dedicated to high-fidelity simulators and trauma modules (Figs. 3 and 4), step modules for pressure sores and other chronic wounds (Fig. 5). They require skill in application and have the advantage of high realism.

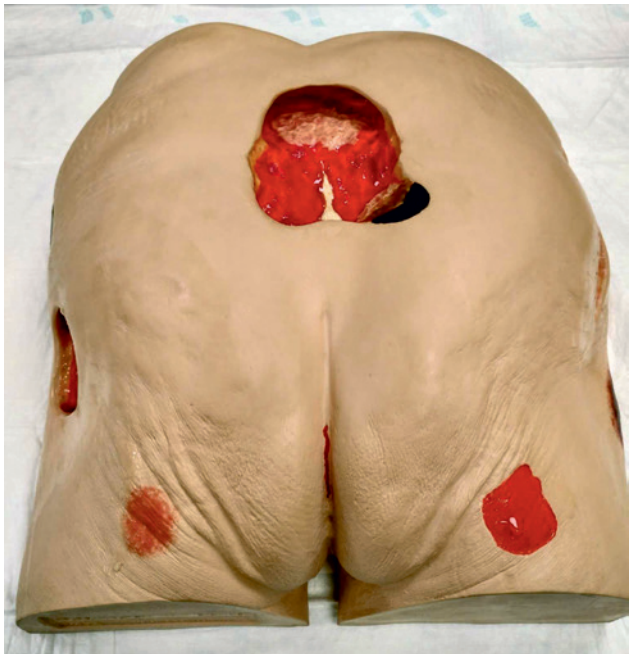

Figure 1. A wound care model. Own source.

Figure 2. Various types of taped wounds. Own source.

Figure 3. Limb amputation trauma module connected to a high-fidelity simulator. Own source.

Figure 4. Simulated lower limb injury with active bleeding. Own source.

Figure 5. Interchangeable foot modules for assessing the severity of wounds and creating practice opportunities for wound care. Own source.

Figure 6. Products used for characterization. Own source.

Figure 7. Simulated patient with characterized wounds. Own source.

In addition, simulation technicians apply characterization techniques used in the film industry, such as petroleum jelly, liquid latex, and specialized cosmetics (Fig. 6).

New technologies, 3D printing, and familiarity with characterization techniques allow for an even more realistic reproduction of anatomical structures, which increases the effectiveness of the training provided (Fig. 7) [5, 6].

An exciting area of the use of simulated wounds is the study of the effects of damaging factors on tissues. This helps to understand the impact of forces on the human body during the development of an injury. This is especially true for gunshot wounds since gelatin and glycerin soap have approximately the same density as human tissue. The effects of gunshots are comparable to those in human tissue [1, 7].

Articles also report the use of simulation models in teaching surgical development of abscesses (Fig. 8)

or escharotomies using not only ready-made models but also those created by technicians from everyday substances such as toothpaste, orange peels, sponges, and silicone skin [8–10]. Creativity and using such products significantly reduce the cost of producing wound models.

Advanced high-fidelity simulators in medical simulation make it possible to relate many injuries to physiological effects. With such technology, it is possible to create "clinical states" of patients, including physiological disorders such as airway obstruction, hypovolemia, fever or circulatory failure (Fig. 9). This allows the critical thinking component to be perfected during the didactic sessions [5, 11, 12].

Using crafted wounds on simulated patients is one of the more modern teaching methods. A study conducted by a research team from Australia found that the simulation intervention facilitated the development of basic wound care skills. Students were eager to work with simulated patients, recognizing the value they bring during simulation sessions [13]. Working with an actor provides students with a safe, structured learning environment and the acquisition and refinement of communication skills, preparing them for the complexity of situations they encounter in clinical practice [13–15]. Using crafted wounds or creating casts of particular types of wounds and using them on a simulated patient increases the participants' perception of the realism of the injuries and the immersion in the scenario. Additionally, this enhances the learning experience and authenticity of clinical simulations [12, 16].

Using in situ simulation, that is, simulation in a natural patient care environment such as a hospital ward, also seems promising. However, this type of training has yet to be widespread in Poland. In situ simulation improves reliability and safety, especially in areas involving high patient risk [17].

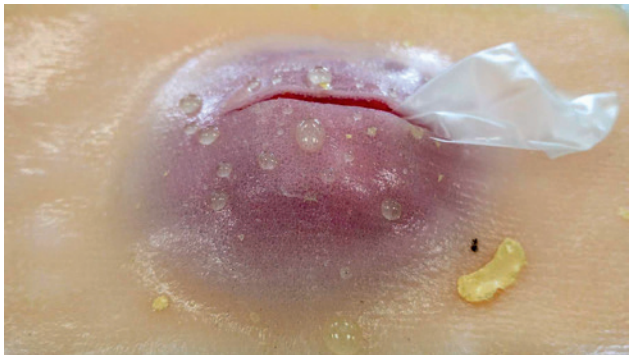

Figure 8. A model for teaching surgical development of an abscess. Own source.

Figure 9. Advanced high-fidelity simulator with connected monitoring of essential vital functions. Own source.

Summary

Simulation has permanently established itself in medical education. The basis for improving future medical personnel should be contact with a real patient. Still, using modern technologies and creating realistic methods of learning care and treatment without endangering the patient should be vital in both pre and postgraduate education [10, 13]. Commercially available simulators and virtual reality technologies support training, including those for wound care. At the same time, simulation techniques serve as methods for assessing nursing students' and nurses' competency in wound care, including identifying wound infection and refining wound cleansing techniques or dressing selection [18].

Disclosures

The authors declares no conflict of interest.
This research received no external funding.
Approval of the Bioethics Committee was not required.

References

1. Pai DR, Singh S. Medical simulation: Overview, and application to wound modelling and management. Indian J Plast Surg 2012; 45: 209–214. DOI: 10.4103/0970-0358.101280.
2. Beatty K, Layman S, Copeman A. Practice makes perfect: the role of simulation in postgraduate paediatric education. Paediatrics and Child Health 2024; 34: 63–68.
3. DCosta S, Zadow G, Reidlinger DP, et al. The impact of moulage on learners' experience in simulation-based education and training: systematic review. BMC Med Educ 2024; 24: 6. DOI: 10.1186/s12909-023-04976-w.
4. Korimbocus B, Wilson H, McGuckin A, Gormley GJ. 'Having skin in the game': guiding principles for incorporating moulage into OSCEs. Adv Simul (Lond) 2024; 9: 34. DOI: 10.1186/s41077-024-00307-1.
5. Mills BW, Miles AK, Phan T, et al. Investigating the Extent Realistic Moulage Impacts on Immersion and Performance Among Undergraduate Paramedicine Students in a Simulation-based Trauma Scenario: A Pilot Study. Simul Healthc 2018; 13: 331–340. DOI: 10.1097/SIH.0000000000000318.
6. Santomauro C, Host D, Arthur D, et al. Simulating a self-inflicted facial gunshot wound with moulage to improve perceived realism, immersion, and learning in simulation-based airway management training. BMJ Simul Technol Enhanc Learn 2020; 6: 289–292. DOI: 10.1136/bmjstel-2019-000492.
7. Thali MJ, Kneubuehl BP, Zollinger U, Dirnhofer R. The "skin-skull-brain model": a new instrument for the study of gunshot effects. Forensic Sci Int 2002; 125: 178–189. DOI: 10.1016/s0379-0738(01)00637-5.
8. Sinha SN. Wound debridement: Doing and teaching. Prim Intent 2007; 15: 162–164.
9. Heiner JD. A new simulation model for skin abscess identification and management. Simul Healthc 2010; 5: 238–241. DOI: 10.1097/SIH.0b013e3181d87f0f.
10. Davis JT. Enhancing wound-débridement skills through simulated practice. Suggestion from the field. Phys Ther 1986; 66: 1723–1724. DOI: 10.1093/ptj/66.11.1723.
11. Adamczuk J, Cisoń-Apanasewicz U, Kuzera G, et al. Podręcznik symulacji medycznej, Wydawnictwo Naukowe Państwowej Wyższej Szkoły Zawodowej w Nowym Sączu, 2021.
12. Dąbrowski M, Kuras A. Alternatywne i zaawansowane formy symulacyjne nauczycieli akademickich w kształceniu symulacyjnym. W: Kompetencje nauczycieli akademickich w kształceniu symulacyjnym. Dąbrowski M, Jóźwiak J (ed.). Uniwersytet Opolski, Opole 2023; 135–145.
13. MacLean S, Geddes F, Kelly MA, Brown J. High-Fidelity Simulation in Wound Care Education: A Qualitative Evaluation of Efficacy and Acceptability. Clin Simulat Nurs 2024; 94: 101573. DOI: 10.1016/j.ecns.2024.101573.
14. Uzelli Yilmaz D, Akin E, Yildirim D, et al. Nursing students performance and satisfaction regarding the classification of pressure injuries using simulation with Moulage. Journal of Client-Centered Nursing Care 2021; 7: 311–318. DOI: 10.32598/JCCNC.7.4.395.1.
15. Shariff FU, Deladisma AM, Menard JW, et al. Use of a hybrid-abdominal wound simulated patient in the ACS/ASE medical student simulation skills curriculum. Am J Surg 2019; 217: 250–255. DOI: 10.1016/j.amjsurg.2018.07.039
16. Pywell MJ, Evgeniou E, Highway K, Pitt E, Estela CM. High fidelity, low cost moulage as a valid simulation tool to improve burns education. Burns 2016; 42: 844–852. DOI: 10.1016/j.burns.2015.12.013
17. INACSL Standards Committee (2016, December). INACSL standards of best practice: Simulation SM Simulation glossary. Clin Simulat Nurs 2016; 12: S39–S47. DOI: http://dx.doi.org/10.1016/j.ecns.2016.09.012.
18. Kielo-Viljamaa E, Ahtiala M, Suhonen R, Stolt M. Simulated Wound Care as a Competence Assessment Method for Student and Registered Nurses. Adv Skin Wound Care 2021; 34: 588–595. DOI: 10.1097/01.ASW.0000792916.93340.68.