Development and evaluation of an interprofessional teaching concept for modern wound management

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Summary

Background and objectives: The aim of the present study was to establish and evaluate a new interprofessional teaching concept on the topic of wound management.

Methods: After determining the status quo using a survey among medical students, we developed a new teaching concept that included a 150-minute course aimed at providing students with the opportunity to gain hands-on wound management skills. This interprofessional course was offered at the existing ‘SkillsLab’ teaching facility. The participants’ subjective level of knowledge was assessed by questionnaire before and after the course.

Results: Our survey among 190 medical students showed them to be very interested in gaining practical experience in the field of wound management. To date, 120 participants (54.8% medical students; 45.2% nursing students) have attended this new interprofessional course, which has been equally well received by both medical and nursing students. For all specific topics (diagnosis, treatment, use of wound dressings, debridement), course participation was associated with a significant increase in knowledge.

Conclusion: Given its relevance in clinical practice, it is important for medical students to learn about the various aspects associated with the care of patients with chronic wounds. By offering new teaching concepts, dermatology in particular is well suited to help students gain a better understanding of the challenges related to wound management and to improve their practical skills. Wound management is an ideal topic for interprofessional learning.

Introduction

Modern wound management not only includes stage-adjusted patient care using various modern wound dressings but also the differential diagnostic workup of ulcerations of unclear etiology and their causal treatment. While the overall responsibility for any therapeutic intervention lies with the physician, actual patient care is predominantly performed by the nursing staff. This is mainly due to the fact that various medical societies in Germany, such as the “Initiative chronische Wunde” (Chronic Wound Initiative) or the German Society for Wound Healing, offer numerous continuing education courses for nurses. The opportunity to obtain the additional qualification as ‘wound expert’ has been very well received, and graduates subsequently have the skills to competently assess chronic wounds.

In medical school, the topic of wound management is not clearly represented. While it is addressed in the context of various specialties, such as surgery, angiology, internal medicine, and dermatology, the clinical focus is usually on the differential diagnostic workup. Practical aspects, such as wound debridement, choice of suitable wound dressings, and planning of adequate therapeutic measures, are only conveyed as part of certain core clinical rotations and electives, and only if the courses chosen focus on these aspects in particular. This is against the backdrop of approximately one
million affected patients in Germany [1], who commonly first consult their family physician and/or a general practitioner. Given that medical students often have not decided on their future specialty at this stage, it is desirable that they obtain an appropriate level of basic knowledge about proper wound management. The German National Competency-based Catalog of Learning Objectives in Medicine lists no fewer than eleven different specialties that may be involved in the treatment of patients with “wounds and ulcers of the skin and mucous membranes” [2]. With respect to “leg ulcers, peripheral artery disease, and chronic venous insufficiency”, the German Society of Dermatology has issued learning objectives, including advanced knowledge (level 2) about symptoms as well as diagnostic and therapeutic options, that medical students are supposed to meet [3].

The aim of the present study was to first determine the students’ actual interest in learning about issues related to wound management and to subsequently develop and validate a practical teaching concept.

Material and methods

Status quo

The medical school curriculum at the University of Erlangen-Nuremberg (Germany) has previously included no specific courses dealing with the topic of “wound management/care of patients with chronic wounds”. The lectures and courses offered by the various departments address ulcerations as a manifestation of certain systemic diseases and discuss specific therapeutic approaches. The dermatology curriculum, in particular, includes a one-hour lecture on the topic of “chronic wounds” during the 8th semester (as part of the main dermatology lecture). During the core clinical rotation in dermatology (one week during the 9th semester), the care of patients with chronic wounds (e.g., leg ulcers) is usually discussed only if an inpatient or outpatient is being treated during that particular period. Detailed knowledge on the care of patients with chronic wounds may be obtained in the context of clinical electives.

Given this deficit in the medical school curriculum, we set out to develop a hands-on course to familiarize students with this topic, based on the six-step approach to curriculum development proposed by Kern and colleagues [4].

Determining the students’ level of interest for the topic of wound management

During the 2016/17 winter semester and the 2017 summer semester, a total of 190 eighth–twelfth-semester medical students (note: medical school in Germany is a six-year program) (60.8 % females; median age: 24 years) were surveyed. The questionnaire included questions regarding the students’ existing knowledge (evaluation of 21 Likert items), subjective self-assessment of the current level of knowledge by visual analog scale (0–100 %), as well as questions with regard to their interest in the topic of “managing chronic wounds”. The questionnaires were distributed among medical students during the main dermatology lecture. Nursing students were not surveyed in the aforementioned manner.

Given the students’ high level of interest in this topic, we developed a hands-on learning concept that was offered at our existing teaching facility “SkillsLab PERLE” (“Praxis erfahren und lernen” [practical experience and learning]) at the University Medical Center, Erlangen, Germany.

Development of the learning concept

Students and medical staff of the Department of Dermatology and the “PERLE” teaching facility developed the learning objectives of the intended learning concept and determined the teaching method to be employed. The formal structure was guided by that of other courses usually offered at the teaching facility. Consequently, the course is 2.5 hours long and is held three to four times during the semester; participation is voluntary. It is offered to all medical and nursing students as part of the overall curriculum of the “SkillsLab”. During course development, we made sure to strike an appropriate balance between hands-on training and providing basic knowledge about the diagnostic workup and treatment of chronic wounds, including modern concepts as regards topical treatment [5].

Implementation of the practical learning concept

Once we had settled on the various topics to be included, their didactic implementation, and the intended time frame (Table 1), the course was first offered in the winter semester of 2017/18. We made a deliberate effort to have an equal number of nursing and medical students participate (a total of twelve participants per course). During the hands-on training in small groups, students of both professions were deliberately mixed together to implement the intended interprofessional approach. Since its inception, the course has been very well received, as seen by the number of applicants. As is common practice in the SkillsLab, after initial supervision by an experienced wound expert (physician), we have increasingly trained and deployed student tutors as course instructors to enable peer-assisted learning.

Evaluation of the teaching concept

Parallel to the implementation of the developed course, the teaching concept was evaluated by comparing the answers to
Table 1. Concept of the newly developed course on wound management. Listed are the various aspects to be discussed and the time (in minutes) provided for each subject.

| Part 1: History and diagnostic workup               | 60’ |
|---------------------------------------------------|-----|
| Causes of chronic wounds including case presentations | 10’ |
| Measurement of ankle-brachial index (instruction by short movie, hands-on exercise) | 15’ |
| Swab collection (presentation of the Essen Rotary technique; procedure; interpretation of possible findings; differences with other techniques) | 10’ |
| Wound documentation (photo-based quiz; exercise among all participants and in small groups) | 25’ |

| Part 2: Wound cleansing                             | 30’ |
|---------------------------------------------------|-----|
| Options for wound cleansing (all participants are asked to contribute; supplementary presentation) | 5’ |
| Advanced methods for wound cleansing (short movies on surgical debridement; biosurgery; ultrasound-assisted wound debridement) | 5’ |
| Wound cleansing (use of curettes on pig specimens) | 20’ |

| Part 3: Wound dressing                              | 60’ |
|---------------------------------------------------|-----|
| Wound dressings (lecture with demonstration of materials and liquids) | 15’ |
| Wound treatment (deep and superficial wounds on specimens) | 30’ |
| Compression bandage (presentation, photo-based quiz) | 10’ |
| Summary and conclusion                             | 5’ |

During the survey period between 10/15/2016 and 08/01/2017, 368 medical students of the University of Erlangen-Nuremberg were signed up for the main dermatology lecture. Overall, 190 (51.6%) students participated in the survey on their interest in the topic of wound management. Figure 1 depicts the results of the students’ self-assessment with respect to their level of knowledge about wound management. A similar survey of nursing students was not feasible for organizational reasons.

In an evaluation of predefined statements relating to wound management using a five-point Likert scale, 51.9% of the students rated their knowledge about the content of medical guidelines on the topic as completely inaccurate; 48.1% were not aware of any opportunities for continued education on the topic; 38.5% stated their lack of knowledge about wound dressings and their indication. The fact that 87% of the respondents reported to feel uncertain about how to deal with patients with chronic wounds suggests a significant demand for continued education and training.

**Statistical analysis**

Data analysis was performed using the program SPSS. Descriptive data are given as absolute or relative frequencies as well as mean or median values. The significance of group differences was analyzed using Mann-Whitney U test.

**Results**

**Student survey**

![Possible causes of chronic wounds](image)

![Treatment options for chronic wounds](image)

![Practical wound management](image)

![Self-assessment of level of knowledge](image)

Figure 1. Self-assessment of medical students (n = 190) regarding their subjective level of knowledge about wound-related topics using a visual analog scale (0–100%).
In addition, we asked the students whether they would be interested in additional didactic content on the topic of wound management and which topics should be addressed in what way. Here, students stated their preference for hands-on practical exercises (93.7%) and patient presentations (52.1%) over mere lectures or seminars. Topics they were particularly interested in included treatment options (86.3%), use of wound dressings (79.5%), and wound cleansing procedures (75.8%).

**Course evaluation**

During the period from November 2017 to February 2019, 120 medical and nursing students attended the newly established course. Overall, 115 participants (response rate 95.8%) returned the course evaluation form (73.9% females; 54.8% medical students; 45.2% nursing students).

As expected, the general interest of the participants in the topic of wound management was already very high at the beginning of the course (93.9%). Figure 2 depicts the arithmetic mean and the standard deviation of the Likert values for those statements that showed a significant increase (p < 0.005) in the level of knowledge after course attendance compared to the time prior to the course (diagnostic measures, wound documentation, wound debridement, wound dressings and their indication, and treatment methods). There was no significant change after the course (p > 0.05) in any of the other topics surveyed. Given their voluntary participation, all students reported a high general interest in wound management before and after the course, as could be expected (mean value on the Likert scale prior to course attendance 3.4 ± 0.66; thereafter, 3.6 ± 0.67; a value of 4 corresponds to complete agreement). The fact that patients with chronic wounds are cared for in an interdisciplinary manner was also rated as important before (mean value 2.9 ± 0.9) and after (3.26 ± 0.6) the course. Likewise did the participants believe that adequate wound management requires a lot of time (3.03 ± 0.86); this remained unchanged after the course (3.37 ± 0.75). Both before and after the course, there was similarly low agreement (2.4 ± 1.7 vs. 2.55 ± 0.95) with regard to the statement that physicians are primarily responsible for caring for patients with chronic wounds. In addition, the course evaluation forms submitted by nursing and medical students were analyzed separately. While there were no intergroup differences in terms of the increase in knowledge about the aforementioned topics, nursing students showed significantly higher values than medical students in the initial self-assessment with respect to wound measures, wound documentation, wound debridement, wound dressings and their indication, and treatment methods).

**Figure 2** Self-assessment of participants (n = 115) regarding their level of knowledge directly before and after the course based on evaluation of predefined statements. The assessment was done using a Likert scale (0 = I fully disagree to 5 = I fully agree).
Discussion

The care of patients with chronic wounds is not only time consuming but also expensive. A 2007 multicenter study found a total annual cost of nearly €10,000 per individual for patients with chronic venous leg ulcers [6]. Early diagnosis and initiation of a causal treatment can significantly shorten the disease course and reduce costs. In practice, however, there are frequently deficits in the care of affected patients, both in terms of the diagnostic workup and the implementation of treatment recommendations [7]. This applies to physicians as well as the nursing staff. According to the Nursing Quality Report issued by the Medical Services of the Statutory Health Insurance Funds in Germany, nearly 25% of nursing home inpatients with chronic wounds (such as decubitus ulcers) are not adequately positioned with respect to pressure relief [8]. In our own department, we found that 38% of patients referred to our wound clinic had not undergone basic diagnostic tests such as measurement of the ankle-brachial index or examination of lower-extremity veins [9]. It is therefore essential to address the challenges associated with caring for patients with chronic wounds already in medical and nursing school and to incorporate these aspects in the curriculum, as this will promote a better understanding of the needs of this particular patient group. Our pre-course survey shows that medical students are highly interested in this topic. However, there is a lack of opportunities for hands-on training that would allow students to become more confident in this area and to deepen their knowledge base. By contrast, members of the nursing staff significantly more often take advantage of opportunities for continuing education in the field of wound management. Here, too, it has been recognized that nursing students usually do not develop sufficient skills with regard to wound management during their regular training [10], which has led to the development of additional programs. Since 2005, for example, more than 40,000 participants have completed training courses offered by the Initiative chronische Wunde (Chronic Wound Initiative, CWI) to become an “expert wound care nurse”. To date, the number of “medical wound experts CWI” is still substantially lower (300); it should be pointed out, though, that this particular course has been offered by CWI only since 2016 [11].

Thus far, the number does reflect the situation in everyday practice, where hands-on wound care is commonly performed by highly trained nurses. And still, therapeutic decisions and treatment monitoring are primarily the responsibility of the treating physician, even though he/she may not have the expertise or knowledge base, especially with respect to topical wound management. A 2016 German study showed that a large number of medical students (at the end of their medical school training) felt ill-prepared to independently perform a variety of practical tasks. In a self-assessment, only 46% of the respondents stated that they could securely apply a compression bandage [12]. Obviously, it is impossible to say whether the actual application would have been properly done. In other countries, too, studies have shown medical students not to be familiar with adequate wound management, contrary to the expectations of their professors [13]. Wound management in particular usually involves the cooperation of various medical professions. In order to meet patient needs, it is essential that physicians and nurses act as a team and that both have the required expertise [14]. Interprofessional care of patients with chronic wounds is associated with improved diagnostic and therapeutic interventions and facilitates the wound healing process [15]. By incorporating this topic in the curriculum, it is possible to address wound management-related challenges already during medical school and to convey basic knowledge of practical aspects as well. In this context, the field of dermatology may seize the opportunity to demonstrate that the care of patients with chronic wounds is one of the core competencies of dermatologists, an aspect that is likely underappreciated by many medical students [16]. The differences in the pre-course self-assessment between medical and nursing students reflect the differences in the level of knowledge. Against the background of interprofessional teaching, this may be considered conducive in terms of the exchange between the two professions [17]. Our teaching concept has also proven to foster an active exchange between participants at various levels of training. A 2014 US study of medical school curricula revealed that only seven of 50 medical schools offered courses that focused on wounds [18]; students considered these courses to be very important for their medical training. Especially given the intended fostering of cooperative skills in medical school, the topic of wound management provides a strong basis for teaching a wide variety of different contents and aspects contained in the aforementioned catalog of learning objectives.

A limitation of our study is the fact that predominantly motivated students (those with high baseline interest in the topic) signed up for this course. It would be desirable to sensitize all medical and nursing students to this topic. Making this newly developed teaching concept available to all medical and nursing students will require a large amount of personnel in order to be able to continue to offer hands-on experience. Certain parts of this new concept may be readily incorporated in the regular curriculum, for example, as part of the core clinical rotation in dermatology. Likewise would it be conceivable to create interprofessional training wards where patients with chronic wounds are jointly cared for. Future studies are required to analyze the long-term
effects of the increase in knowledge associated with participation in the course. While the course is primarily intended to provide students with a basic understanding of the topic, it may prompt them to subsequently become involved even further. Advanced teaching modules, for example on diabetic foot syndrome, compression therapy, or decubitus ulcers, are currently being planned and will be incorporated in the course based on the aforementioned approach to curriculum development.

Note
The present article is part of the doctoral thesis submitted by Mr. Lukas Bergendahl.

Conflict of interest
Dr. Erfurt-Berge has received honoraria for lectures and travel grants from Urgo GmbH. The other authors declare no conflict of interest.

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