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EDUCATIONAL TECHNIQUE

Teaching Dermatology Using a Cognitive Learning Theory Approach: An Educational Technique

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Context: Athletic trainers must develop the knowledge and skills to recognize signs and symptoms of dermatologic conditions in the physically active population.

Objective: To present an overview of an educational technique aimed at promoting the development of skills related to dermatological care that meets clinical practice needs and accreditation requirements for athletic training programs at all levels.

Background: Curricular content standards in athletic training education require learners to obtain the skills necessary to perform an evaluation, formulate a diagnosis, and establish a plan of care relevant to the integumentary system, including dermatological conditions. Cognitive Learning Theory uses specific sequencing of content and learning sessions to promote student engagement in the learning process.

Description: Within an evaluation course for nonorthopaedic conditions, a 3–class session learning module was developed to target instruction, application, and assessment of dermatological conditions. This article describes the development, overview of content, delivery methods, outcomes to date, and connection to the instructional standards in athletic training.

Clinical Advantage(s): Integrating evaluation of dermatological conditions into athletic training curricula enhances clinical decision-making skills and direct application of these skills to clinical practice.

Conclusion(s): Athletic trainers should be able to effectively identify, manage, and potentially refer patients with dermatological conditions. Educating future athletic trainers to be able to prevent the spread of infection, decrease disease transmission, and enhance their ability to recognize and manage dermatological conditions is vital to their development toward independent clinical practice.

Key Words: Integumentary system, skin infection, decision making, constructivist

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KEY POINTS

- Creative educational techniques using Cognitive Learning Theory can provide athletic training students with opportunities to learn skills in the didactic setting that mimic those they will require in clinical practice.
- Assessment opportunities that replicate real-life scenarios can be beneficial to both student learning and confidence in clinical practice.
- Instruction and assessment of dermatological conditions using silicone molds, moulage, and photographs can help to enhance learning outcomes and clinical decision-making skills.

INTRODUCTION

Athletic trainers must be trained in the ability to recognize signs and symptoms of dermatological conditions in the populations that they serve.[1] Additionally, athletic trainers must be able to prevent the spread of infection, decrease disease transmission, and enhance the ability to recognize and manage dermatologic conditions[1] (Table 1). In preparation for this level of practice, athletic training students should develop skills in evaluation and diagnosis of both infectious (viral, bacterial, and fungal) and noninfectious dermatologic conditions.[2]

Nearly 10% of high school and 21% of college medical conditions related to sports have been linked to dermatologic conditions.[3] In regard to these conditions, surveillance tracking in wrestling in particular indicates that about 21% of dermatologic infections are recognized during practice and result in an average of 24 hours of missed participation time.[4] Moreover, persons who have suspected dermatologic infections are instructed to be medically evaluated by a physician and/or athletic trainer before participation.[5,6] Given that so many of these infections are identified during practice, the athletic trainer is well suited to serve as the first point of evaluation for dermatological conditions and the continued point of contact in preparation for return to activity. Therefore, athletic trainers should be educated and trained in the prevention, recognition, and treatment of dermatological conditions. This article aims to describe the preparation, process, learning theory, strategies, and outcomes associated with a teaching module designed to improve learner knowledge, skills, and abilities related to dermatology.

Table 1. Summary of Appropriate Evaluation and Management of Dermatologic Conditions[a]

What should the athletic trainer know to evaluate dermatologic conditions?
• General evaluation approach to skin conditions
• Overview of causes/sources of infection/dermatological changes
• Recognition of conditions by sight, palpation, and/or process of elimination
• Strategies for prevention
What are the appropriate treatment methods and return to activity guidelines?
• Pharmacological considerations
• Participation guidelines (NCAA, state/local)
• Appropriate documentation practices

Abbreviation: NCAA, National Collegiate Athletic Association.

[a] Note: Summary statements have been adapted from the National Athletic Trainers' Association Position Statement: Skin Diseases.[1]

CONTENT DEVELOPMENT

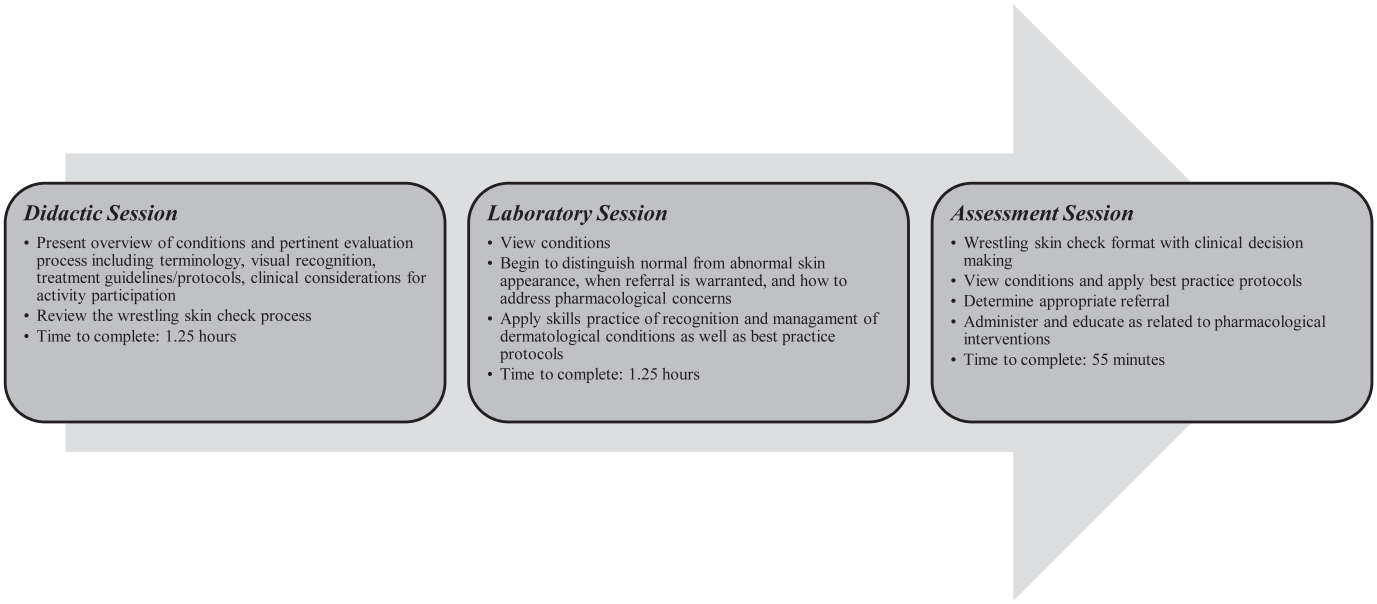
Creation of the objectives for this teaching module were established through review of the National Athletic Trainers' Association (NATA) Position Statement: Skin Diseases,[1] curricular content standards for athletic training education,[2,7] and the National Collegiate Athletic Association (NCAA) *Wrestling Rules Book*.[6] Additionally, because no one person can be an expert in everything, discussion with clinically practicing athletic trainers and consultation with the medical director for our athletic training program, as well as with faculty in the physician-assistant studies program with expertise in dermatology, occurred to ensure accuracy of information and intended outcomes. Specific objectives for this module are provided in Figure 1, and the application to the Commission on Accreditation of Athletic Training Education (CAATE) Curricular Content Standards are described in Table 2.

In preparing content and areas of emphasis for class and assessment, surveillance tracking for dermatologic infections in NCAA wrestling[4] has been considered. For example, because viral infections are 1.7 times as common as bacterial infections and 2 times more common than fungal infections,[4] content focuses more on viral and bacterial conditions than on fungal conditions, although common conditions in all categories are presented. In addition, because dermatological conditions are not isolated to skin infections, more generalized conditions such as sunburn, contact dermatitis, and perichondritis (eg, cauliflower ear) are included in this module.

LEARNING THEORY AND STRATEGIES

This educational technique incorporates a combination of the Cognitive Learning and Constructivist Learning theories.[8] Specific to Cognitive Learning Theory, this learning module is carefully sequenced to allow for building of material from one session to the next. Additionally, learners are tasked through meaningful engagement to work through recognition and management of dermatologic conditions. Through this process, they become active participants in their learning as they attempt to relate their prior knowledge to the real-world scenarios provided. While the first session features the instructor providing a lecture on related dermatologic topics, her involvement in leading content delivery lessens over the remaining sessions to allow learners to take on more active

Figure 1. Dermatology module objectives and content by session.



roles in the discovery and application of content. This transition in learning style is accomplished in alignment with the Constructivist Theory; as the learning continues, the instructor becomes more of a guide rather than a lecturer.[8]

In support of these theories, several learning strategies are included in this educational technique that align with recommendations for teaching dermatology.[9] First, multiple sensory channels are incorporated as learners are instructed verbally about the conditions, shown images to accompany the verbal descriptions, and physically carry out the inspection, demonstrating kinesthetic learning. The incorporation of mixed practice is also used to compare and contrast multiple conditions at once rather than focusing on one condition at a time. Learning over time is also evident in this module because the students have 2 in-class sessions followed by 7–9 weeks of application in the clinical setting while also continuing independent review of materials before assessment. Lastly, this technique employs multiple exposures to the conditions rather than a single viewing opportunity. For example, learners benefit when there is more than one sample of impetigo to view; providing several photographs in class,

Table 2. Learning Objectives and Associated Curricular Content Standards for Dermatological Conditions Module[a]

Standard No.	Summary of Standard	Module Instructional Aspects Related to Standard
61	Practice in collaboration with other health care professionals	Refer patients with integumentary conditions to dermatologists, physicians, physician assistants, and/or nurse practitioners, as appropriate
71	Perform an examination to formulate a diagnosis; obtain a medical history from the patient; select and use tests and measures that assess the integumentary system; evaluate all results to determine a plan of care, including referral, when indicated	View skin conditions, identify these conditions and likely origin efficiently
72	Perform or obtain appropriate diagnostic or laboratory tests to facilitate diagnosis, referral, and treatment planning	Either perform the culture or refer the patient for culture
74	Educate patients regarding appropriate pharmacological agents for the management of their condition, including indications, contraindications, dosing, interactions, and adverse reactions	Provide direct communication to patient, including documentation that describes the risks for transmission, guidelines for treatment, and correct dosage of prescribed medications
75	Administer medications or other therapeutic agents by the appropriate route of administration upon the order of a physician or other provider with legal prescribing authority	Work with the patient regarding correct administration of medications in collaboration with physicians, pharmacists, and others

[a] Note: Standard number and summary have been adapted from the 2020 Commission on Accreditation of Athletic Training Education Curricular Content Standards.[6]

Figure 2. Sample skin conditions utilized during dermatology module. Note: A, Methicillin-resistant *Staphylococcus aureus,* or MRSA (actual patient); B, *Varicella zoster,* or shingles (actual patient); C, Psoriasis (moulage); D, Bull's eye rash (moulage). Actual patient photos have been used with permission from both the patient and the affiliated athletic trainer providing care.

laboratory sessions, potentially during their clinical experiences, and requiring them to search on their own increases the students' exposure count and ability to differentiate this condition from others.[9]

TECHNIQUE DESCRIPTION

This dermatology module typically involves 2 class sessions (Figure 2), with additional time required of the learner outside of class time including application during clinical education experiences and on his own time. The lecture overview and laboratory session occur on 2 subsequent class days, while the assessment occurs 7–9 weeks later to give learners ample time to apply the skills in clinical practice and to review the numerous conditions.

Overview of Conditions

For the didactic session, a photograph-laden PowerPoint is used to guide learners through the types of lesions and appearance of common dermatologic conditions. This session first covers relevant terminology for lesion appearance (ie, vesicle, bullous, papule) and appearance of rashes. From there, specific conditions are visually presented according to source: viral, bacterial, fungal, or other. Each condition is accompanied by typical history presentation, relevant questions to ask during the evaluation process (Table 3), and suggested over-the-counter treatments or prescription medications that meet the requirements for sport participation. The didactic session concludes with an overview of the wrestling skin check process and its importance in recognizing these conditions quickly by sight.

An overview of each PowerPoint slide is provided alongside photograph and supplemental real-life presentations of the conditions. These presentations often include clinical practice examples through story telling as well as clinical pearls of application. Photographs for use in the didactic sessions were compiled from Internet searches, textbooks, and personally supplied photographs from the instructor and colleagues within our professional practice network; all real-life photographs were supplied with permission from those featured in the photos.

Laboratory Session

The semi-guided laboratory session allows learners to review and identify common dermatological conditions found in the physically active population. As part of this low-stake activity, learners are asked to recognize dermatologic conditions based on visualization and to provide specific information related to the management of each category of condition, as required in clinical practice. Using an instructor-generated sample of dermatological conditions of various types/origins, learners first view the selected conditions. While some examples are included as photographs, real-life appearance of some dermatological conditions is enhanced through use of 3-dimensional silicone molds and moulage[10] (moldings simulating dermatologic conditions of common conditions), such as

Table 3. Key History Questions and Components of Dermatologic Assessment

Relevant history questions
• How long has the lesion been present (duration)?
• Does it hurt?
• Is it itchy?
• What treatment have you tried? What makes it worse/better?
• Do you know anyone that has had a dermatologic condition recently?
• Have you changed any hygiene products (laundry detergent, soap, lotion, etc)?
Relevant observation/palpation
• Where is the lesion (face, extremities, isolated, diffuse, along a dermatome, etc)?
• What is the general appearance (oozing, dry, color, crusted, vesicled, umbilicated, etc)?
• When pressed, is it blanchable?
• Is the tissue itself, or area surrounding it, hot to the touch?
• Is the lesion tender to the touch?

Table 4. Sample Condition Identification Table

Column Prompt	Learner Response (Left Blank for Learner to Complete)
What is this condition?	
If applicable, what is the date that this skin condition appeared and/or was diagnosed?	
What is the likely cause of this condition and is it considered contagious (bacteria, fungus, virus, parasite, other, etc)?	
What is the immediate course of action for this patient/condition?	
What pharmacological treatment is appropriate to this condition?	
Is this patient cleared for participation today with this condition?	
If no, please detail what must occur for this patient to become eligible.	

those depicting psoriasis, tinea corporus, or herpes simplex. These silicone mold applications were purchased from a medical effects artist using departmental funds. Additional moulage renderings of appropriate conditions (eg, Bull's eye rash) are hand-created by the instructor, who has training in moulage application. In addition to identifying conditions from sight, the relevance of palpation for some conditions, such as rashes, with the use of gloves is also introduced. For example, the importance of texture (eg, smooth, flat, bumpy, rough), determination of whether the skin can be blanched with pressure, and assessment of tenderness and temperature are all aspects of the skin examination that may help to differentiate among conditions.

Once the conditions have been viewed and identified, and once group discussion related to learner responses has occurred, learners take the correct condition identification responses and complete an activity in small groups. As part of this small group, learners further discuss what they viewed in the images, their personal process of differential diagnosis, and why they identified one condition as opposed to another, and then they move forward toward reviewing and applying content from the NATA Position Statement: Skin Diseases[1] to ensure application of appropriate best practices for management of dermatological conditions. Additional resources that support the prevention, evaluation, recognition, diagnosis, and management of dermatologic conditions (eg, NCAA *Wrestling Rules Book*[6]) are provided so that learners can triangulate information.

To synthesize information, the previously listed items are condensed into chart format (titled *Condition Identification Table*; Table 4). More specifically, learners are asked to list the condition, its typical source/cause (eg, viral, bacterial, fungal), whether it is contagious, and, if applicable, what treatment/pharmacological intervention is beneficial in treating the condition. For pharmacological management, learners are instructed to identify a general category of medication and, when possible, to provide a specific brand/type of drug that could be utilized for treatment. When applicable, dates of presentation of the condition are provided to enhance decision making. For example, an identified case of impetigo may be allotted a time frame of "present" of 2 days, and learners must determine whether the patient is cleared to participate in team activity today. Lastly, learners must make specific recommendations of any actions that should be taken as appropriate to the indicated condition and/or what criteria must be satisfied before return to activity can be accomplished. It should be noted that the table provided in the laboratory session is formatted the same as that used during the assessment portion of this learning activity; learners are made aware of this fact during the laboratory session to ease their concern over how they will be assessed in the future on the higher stakes assessment.

Dermatological Assessment: Recognition and Clinical Decision Making

Assessment Part 1: Condition Viewing and Identification. During the assessment portion of this learning module, condition identification is achieved through a mock wrestling skin check to replicate clinical practice. Volunteer models are recruited and asked for their willingness to participate by having a dermatologic condition applied through moulage or silicone molding. For silicone mold applications, it should be noted that there is a latex ingredient in the glue used for application, so ensuring that the volunteers do not have a latex allergy is necessary. Conditions that are part of the exam but that cannot be accomplished through moulage, or silicone mold are included as photographs (Figure 2).

Before the exam, the instructor begins positioning the "conditions" on the patients. To replicate clinical practice, conditions are positioned according to typical presentation (eg, shingles on the back or along a dermatomal pattern, impetigo on an extremity) and are varied among models. Once the conditions have been applied, the models stand in a line or are spaced throughout the room to corresponding numbers that match the chart that learners complete during the identification process. In preparation for viewing, the instructor greets all learners outside of the assessment area and provides them with the 3-column list with the following headings: column 1 = condition number, column 2 = skin condition, and column 3 notes area. The remaining cells of the table are blank to allow learners to complete the table as they view each condition. The learners are then permitted into the assessment area to inspect the skin of each patient for any conditions that may be present. They are provided time after all conditions have been viewed to revisit any patient they need to view again and are then instructed to move on to Assessment Part 2: the Condition Identification Table portion of the assessment.

Assessment Part 2: Condition Identification Table. Based upon the responses recorded for conditions present, learners then complete the Condition Identification Table

(Table 4). As outlined in the laboratory session overview, learners complete this table with the same categories of information they completed previously, including the consideration of the date on which the condition presented. For all aspects of this assessment, learners are required to spell out all terms and are not permitted to use abbreviations to ensure mastery of terminology.

Assessment Part 3: Clinical Decision Making. After completion of the Condition Identification Table, learners are instructed to complete documentation for 2 conditions that warrant monitoring of the patient before clearance for participation in athletics. Documentation occurs through completion of an NCAA Wrestling Skin Evaluation and Participation Status form[11] (available at www.ncaa.org/playingrules) for one condition, and the state high school–level Medical Release for Wrestler to Participate with Skin Lesion form[12] for the other condition. In addition to completion of these forms, learners are asked 4–5 multiple-choice/short-answer questions pertinent to dermatological condition skill application and clinical decision making.

QUALITY IMPROVEMENT

This technique aligns with everyday educational practices and continuous quality improvement (CQI), as defined by the Common Rule,[13] and as such does not require ethics approval from an institutional review board. Over the past 6 years, this teaching module and assessment have gone through changes in response to data tracking and learner feedback to improve its quality and learner-centeredness. For example, specific timing of presentation of condition/lesions were added in year 2 to provide more context to allow learners to critically think about recognition, diagnosis, and management as relevant to acute versus more mature conditions. In response to learner feedback that learners found it difficult to identify nuances of conditions in 2-dimensional images, moulage and silicone molds were included beginning in year 4. The texture and addition of make-up for shading and skin irritation has increased learner ability to identify conditions by sight. During the first 2 offerings of this module we did not disclose to learners that the laboratory session Condition Identification Table was in fact the same table they would complete on the final assessment. This adjustment in transparency beginning in year 3 has yielded significant improvement in learner responses on the assessment itself as well as in feedback related to the clarity of module expectations.

Another adjustment that has led to increased positive learner outcomes can be seen in the length of time between initial presentation of content and assessment; this length has increased from 3 weeks to almost 9 weeks over the years. By providing more time for learners to review and apply course content in the clinical setting, they have demonstrated increased proficiency in dermatology.

Those seeking to adapt or replicate this technique should consider allowing a similar time frame that spans the course from beginning to end when possible. Additionally, this educational technique could be implemented at either the undergraduate or graduate professional level with relative ease. Implementation of the described module is currently occurring at the undergraduate level; considerations for the graduate level may include expanded clinical application or emphasis during immersive clinical education experiences. For example, inclusion of time with a dermatologist or immersive clinical education with a preceptor assigned to wrestling or other sports/locations in which dermatological conditions are prevalent may positively affect learner ability to reach proficiency sooner. The cost associated with this module does vary depending on how instructors approach the content and what resources are available. If a program is affiliated with a medical school, there may be an opportunity to include dermatologists or physician assistants in the educational process while also expanding the available bank of condition photographs/descriptions of treatment. While purchase of silicone molds and moulage materials is not a required component to successfully teach dermatology, inclusion of these resources may help to increase visual inspection opportunities for students.

OUTCOMES

Evaluation of this educational technique through the CQI process indicates that the learning objectives outlined for this module are being met. First, assessment scores have risen consistently over the past 6 years, indicating increased learner ability to identify, diagnose, and select pharmacological treatments for dermatologic conditions. Average scores for the first 2 years were 72% and 77%, respectively, while the average on the assessment for the past 2 years is 86%. These values directly connect to the syllabus for the course, which requires learners to obtain an 80% on the assessment to establish proficiency in the recognition of dermatologic conditions. Those who do not meet the benchmark are required to retake the dermatologic assessment until an 80% or greater is achieved. The first 3 years of this technique demonstrated that a range of 10% to 25% of course enrollees needed to retake the assessment one time to reach the benchmark score. Over the past 2 years, no learners have needed to retake the assessment because they have all met the 80% benchmark on the first attempt. In relation to the other learning objectives, learners indicate that they are more confident in identifying which conditions warrant culturing, when a patient may need to be referred to another health care professional, and to which type of health care professional that referral should occur.

In further support of the CQI process and this educational technique, semester teaching feedback indicates specific appreciation of the use of moulage and silicone molds for replication of the dermatologic conditions. Additionally, learners have identified this learning activity as the most "real-life" application of content within the course. A previous student who was enrolled in the course and who is now practicing in the high school setting as an athletic trainer had this to say when reflecting on her class experience:

> *The wrestling skin check exam [assessment] was so realistic and was set up exactly how a skin check occurs in wrestling. Using real-life pictures during labs and the exam, [that were] attached on the body where the infections normally occur prepared me to confidently diagnose the infections correctly when seeing the infections in real life for the first time. Following this experience, I felt more than prepared doing wrestling skin checks on my own.*

Furthermore, another student became so interested in dermatology during the class and her simultaneous clinical

education experience that she applied a case from her placement to create a successful presentation on erythema multiforme minor (a rare herpes simplex variant) that was shared at the 2016 Pennsylvania Athletic Trainers' Society Meeting as well as an oral presentation at the NATA Convention.[14] Additional learner engagement with material is evidenced by the fact that previously enrolled students continue to send examples of dermatological conditions they have managed in their clinical practice back for use in class. Each year, we receive approximately 3–5 new photographs of conditions with permission for use from previous students and their patients.

CLINICAL ADVANTAGES

While learners in this activity are not considered dermatology experts at the end of the module, they should have achieved a foundational level of knowledge, confidence, and proficiency that can translate to clinical practice. Specifically, learners who are educated through this educational technique develop the necessary clinical skills to efficiently identify the features of viral, bacterial, and fungal dermatologic conditions, as well as those that are considered noninfectious. Through this diagnostic reasoning development, they begin to formulate the process for how to recognize, manage, treat, and ultimately return patients with dermatological conditions to activity. Lastly, but no less importantly, learners are educated in effective methods to prevent spread of these contagions and potential contamination of the athletic environment. All these skills directly align with the CAATE Curricular Content Standards[2] and as such are applicable to the everyday practice of athletic trainers, particularly those working in school or collegiate settings who have wrestling, football, or other sports for which close contact and equipment are required components of sport participation.

In consideration of the transition toward online modes for learning, clinical education, and clinical practice, this module and assessment could occur in an online format through tele-education and/or telemedicine. The specific application of telemedicine for this purpose is known as *teledermatology* and has been deemed a reliable tool for consultation of dermatologically based conditions.[15] Because there is already a foundation for practice in this manner, athletic trainers can be part of this provision of care, and, thus, it makes sense to train our future practitioners for potential teledermatology.

CONCLUSIONS

Given the nature of dermatologic conditions and the environments in which they occur, athletic trainers are well poised to serve as a primary point of recognition and care for patients experiencing these conditions. Educating future athletic trainers using a Cognitive Learning Theory approach appears to be an effective method for achieving proficiency in dermatology. The specific skills learners can develop through this approach include accurate conduction of dermatologic checks, patient education on self-skin checks and appropriate personal hygiene/sport equipment cleaning, and effective management of dermatological conditions. Ensuring that athletic trainers are trained to recognize these conditions and to collaborate with appropriate medical and coaching personnel on relevant dermatologic conditions can decrease missed time for patients.

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