Commentary

Utilizing artificial intelligence to address dermatology curriculum deficiencies in preclinical medical education

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Keywords: artificial intelligence, dermatology, disparities, education, learning, personalized

Dermatology Online Journal

Vol. 31, Issue 4, 2025

Abstract

There are deficiencies in preclinical dermatology education: only 12% of medical schools in the United States offer a dedicated preclinical curriculum. Students could use free artificial intelligence as an alternative to other expensive resources to prepare for United States Medical Licensing Examination board examinations. ChatGPT was prompted to generate a dermatology curriculum including lecture outlines, disease pathology, histology, pharmacology, and practice questions based on the United States Medical Licensing Examination Step 1 content outline. The result was analyzed for completeness, accuracy, and quality. ChatGPT created a dermatology curriculum with 8 topics: introduction, infectious disorders, inflammatory disorders, neoplasms, integumentary disorders, pathology/histology, pharmacology, and clinical case studies. The curriculum included placeholders for the visual learning components rather than incorporating clinical images. The clinical vignettes included were incomplete and not detailed. Artificial intelligence can provide accessible, personalized, and cost-effective resources for preclinical medical students learning dermatology. This has the potential to impact inequalities among medical schools in dermatology education. However, generated curriculums need to be evaluated by dermatology educators to ensure accuracy and quality.

Introduction

Only 12% of medical schools in the United States have a preclinical dermatology curriculum, largely due to challenges such as the lack of a dermatology department that can assist in curriculum development.[1] The absence of preclinical dermatology education can lead medical students to look to external resources to learn dermatology topics when studying for the United States Medical Licensing Examination (USMLE) examinations.[1] Medical school is expensive, and underrepresented minority and socioeconomically disadvantaged students disproportionately experience a greater burden of debt.[2] Supplemental resources can be beneficial but expensive[3,4]; cost-effective options are needed. The use of artificial intelligence (AI) could be an approach to addressing this concern. AI has provided learners with a cheaper alternative to resources to improve learning efficacy and efficiency.[5]

Large language models like ChatGPT could be utilized to generate a custom, student-specific dermatology content outline for examinations such as the USMLE Step 1 examination. Content outlines created with this technology can be utilized by preclinical medical school students, especially those without an official dermatology curriculum, to supplement their dermatology knowledge for the purposes of the USMLE Step 1 examination. We argue that this is a more equitable approach to addressing deficiencies in dermatology preclinical curriculum, as large language models like ChatGPT are cost-effective relative to resources like Amboss, which cost upward of $400 per year.[4]

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Methods

A dermatology curriculum was developed by uploading the dermatology topics outlined in the USMLE content outline to ChatGPT-40. ChatGPT-40 was instructed with the following prompt:

"Write a curriculum for dermatology based on these topics which are tested on the USMLE Step 1 examination. The curriculum should include lecture-style outlines for diseases, pathology, histology, and pharmacology in dermatology. Each disease should have a description of the cell signaling patterns affected. Physical examination descriptions should be provided for each disease. All pharmaceutical treatments should have mechanisms of action and adverse effects listed. Insert placeholders for images for disease pathology and histology. Each major topic should include 3 practice questions that are multiple choice, Step 1 vignette style and difficulty."

Results

ChatGPT generated a dermatology curriculum covering all topics outlined on the USMLE Step 1 examination content outline (see Supplementary Materials). It included diseases, pathology, histology, pharmacology, placeholders for histology and physical examination images, and multiple-choice practice questions. It generated 8 key lecture topics, including introduction to dermatology, infectious disorders, immunologic and inflammatory disorders, neoplasms, integumentary disorders, pathology and histology of skin disorders, pharmacology in dermatology, and clinical case studies and review. Each of the 8 sections had a corresponding three multiple-choice practice questions.

The generated curriculum was evaluated by a dermatologist. The content AI generated in the outline was accurate. However, the descriptions AI provided about basic dermatologic conditions were basic. The practice questions do not reflect the complexity of USMLE-style vignette questions. They lack key information such as duration of lesions and response to previous treatment and rather rely on keywords. ChatGPT was unable to add in physical examination or histological images of dermatologic conditions and instead inserted image placeholders.

Discussion

Role of AI in medical education

AI in medical education is still in its early stages, but it has significant potential to enhance the learning process. It can be utilized to develop curricula, train faculty, organize student assessments, and generate problem-based clinical cases.[5] AI has also been utilized to assess curriculum effectiveness through student feedback, enabling rapid identification and correction of knowledge gaps.[6] Some of the benefits of learning with AI are that it is more objective, fast, and cost-effective.[7]

Large language models, such as ChatGPT, offer great potential for medical education through personalization of learning experiences. These models can adapt to individual student needs by updating memory based on prior interactions, therefore providing custom learning resources, explanations, and practice materials.[8,9] Students can receive targeted practice and feedback on areas where they need improvement, making their study experience more effective and efficient.[10] As AI continues to evolve, it could become an essential tool in medical education, enhancing both the quality of instruction and student outcomes while also being a cost-effective resource for medical students of all socioeconomic classes.

Current deficiencies in dermatology education and dermatology as a field

Certain medical specialties are chosen at the expense of others when creating a medical school preclinical curriculum. Out of 137 medical schools, 12% have a course dedicated to dermatology, whereas 36% included dermatology lectures combined with other systems.[1] Only 1% of the surveyed schools required a third-year clinical rotation in dermatology, whereas 62% offered an elective dermatology rotation.[1] In the past, 97% to 99% of surveyed medical residents stated they had zero to four weeks of dermatology training.[11] Time spent teaching dermatology in medical school has decreased or stayed the same. Meanwhile 75% or more of dermatologists expect a medical student rotating in dermatology consultations to be able to diagnose or treat 33 skin diseases.[12]

According to the United States Medical Licensing Examination (USMLE) guidelines, 8-12% of the Step 1 examination and 6-10% of the Step 2 examination pertains to questions on topics including musculoskeletal, skin, and subcutaneous tissue.[13] The lack of dermatology content in the preclinical coursework results in students needing to look elsewhere to learn. Students may feel the need to purchase external resources such as Amboss, Boards and Beyond, and Med School Bootcamp, spending over $1,000 to adequately prepare for board examinations.[14] On average, underrepresented groups like women, minorities, and those from lower income families have lower Step 1 scores. Low Step 1 scores historically reduced chances of entering competitive specialties like orthopedic surgery and dermatology.[14] Dermatology, the second least diverse specialty, significantly lacks minority representation.[15] Black and Latinx trainees are consistently underrepresented in dermatology compared to other fields, with no notable improvement in their representation from 2005 to 2020.[16]

It is crucial to provide cost-effective learning resources that can level the playing field for socioeconomically disadvantaged students to help address the underrepresentation of minorities in dermatology. AI-driven educational tools, such as this ChatGPT generated dermatology curriculum, have the potential to reduce the financial burden of external resources. By offering affordable and personalized learning options, AI can potentially help in-

crease diversity in dermatology and improve opportunities for underrepresented groups to pursue competitive specialties.

A ChatGPT-generated dermatology curriculum also has limitations. Notably, ChatGPT does not solely pull information from peer-reviewed, evidence-based clinical decision support resources such as UpToDate. A dermatologist should review AI-generated curriculums to ensure accuracy of the information or determine if it reflects the most current evidence-based practices. Another limitation of this AI-generated curriculum is the lack of ability to incorporate physical examination and histological images in the generated results. Dermatology as a field heavily relies on a visual learning component, and an AI-generated curriculum with placeholders for images may not fully meet this need. It would rely on students seeking out additional image resources, like VisualDx or Google Images. Finally, the practice questions that ChatGPT generated were not USMLE Step 1 quality. They focused on keywords and lacked descriptions such as duration of lesions and response to previous treatment. Although these questions may help students learn basic dermatology terminology and curriculum, they are not to be representative of the actual USMLE Step 1 examination questions.

Conclusion

AI has the potential to address deficiencies in dermatology education by providing personalized, accessible, and cost-effective learning tools. Integrating AI into medical education can help bridge gaps for students preparing for the USMLE Step 1 examination, particularly for schools without a formal preclinical dermatology curriculum.

Potential conflicts of interest

Feldman has received research, speaking and/or consulting support from a variety of companies including Galderma, GSK/Stiefel, Almirall, Leo Pharma, Boehringer Ingelheim, Mylan, Celgene, Pfizer, Valeant, Abbvie, Samsung, Janssen, Lilly, Menlo, Merck, Novartis, Regeneron, Sanofi, Novan, Qurient, National Biological Corporation, Caremark, Advance Medical, Sun Pharma, Suncare Research, Informa, UpToDate, and National Psoriasis Foundation. He is also the founder and majority owner of www.DrScore.com and founder and part owner of Causa Research, a company dedicated to enhancing patients' adherence to treatment.

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Supplementary Materials

Download: https://doj.scholasticahq.com/article/143017-utilizing-artificial-intelligence-to-address-dermatology-curriculum-deficiencies-in-preclinical-medical-education/attachment/296955.pdf?auth_token=QuQIg_FsudrQ7x7-vUpU