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Evaluating the effectiveness of ChatGPT4 in the diagnosis and workup of dermatologic conditions

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Abstract

ChatGPT is a publicly available chatbot released by OpenAI. Its usefulness in responding to medical questions has been assessed in several specialties, but there is limited literature in dermatology. This study seeks to understand how well ChatGPT4 can provide accurate diagnoses and appropriate workup suggestions for clinical vignettes describing common dermatologic conditions. Ten vignettes were input into ChatGPT4 representing presentations of common dermatologic conditions, written from the perspective of a physician not board-certified in dermatology. ChatGPT4 was asked to identify the top five most likely diagnoses and its recommended workup for each vignette. Responses were assessed quantitatively by calculating the percentage of correct diagnoses, with accurate diagnoses defined by three board-certified dermatologists, and qualitatively using Likert scales describing the accuracy of diagnoses and appropriateness of workups scored by eleven board-certified dermatologists. Overall, 52% of ChatGPT4's diagnoses were accurate and 62% of its recommended workup suggestions were deemed completely correct by board-certified dermatologists. ChatGPT4 was better at recommending an appropriate workup than identifying accurate diagnoses across vignettes. ChatGPT4 was able to accurately diagnose and workup common dermatologic conditions in slightly more than half of cases. ChatGPT4 was better at determining an appropriate workup than an accurate diagnosis.

Keywords: artificial intelligence, ChatGPT, dermatology, diagnosis, OpenAI, workup

Introduction

In recent years, natural language processing (NLP) models have improved dramatically. The ability of these artificial intelligence models (AI) to quickly respond to prompts and produce human-like dialogue have propelled its widespread use. The latest language AIs utilize large language models (LLMs) to accurately produce anthropomorphic text while simultaneously self-training on user data to improve subsequent outputs [1].

Leveraging these potent AI tools, OpenAI launched a publicly accessible chatbot called Chat Generative Pretrained Transformer (ChatGPT). This online conversational chatbot integrates data from 175 billion parameters and utilizes information from textbooks, articles, and other internet sources, making it one of the most powerful AI models to date [2,3]. ChatGPT's LLM as well as its vast database allow it to answer complex queries and perform a variety of tasks, such as writing articles, translating, and idea mapping. ChatGPT also responds to medical questions, making it a tool for possible use by both patients and their physicians. A recent study found that ChatGPT passed 350 USMLE questions provided for free on the USMLE website, including questions from USMLE Step 1, Step 2 Clinical Knowledge, and Step 3 Examinations [4]. ChatGPT's accuracy on Step 1

questions was 55.8%, on Step 2 CK was 59.1%, and on Step 3 was 61.3% [4]. Another study determined that ChatGPT4 correctly answered 90.5% of 84 multiple choice questions from the U.K. dermatology Subspecialty Certificate Examination question bank [5]. Although these studies have assessed ChatGPT's medical knowledge, there are concerns about its use in the clinic setting, including regarding its ethical use in practice. It can generate responses that sound factually correct with false information and it also lacks insight or the ability to make decisions based upon ambiguous evidence [6]. There has been a recent acceleration of research on the use of ChatGPT within different medical specialties, yet few studies have been published in dermatology.

The purpose of this study is to evaluate the ability of ChatGPT to provide an accurate diagnosis and an appropriate workup for a given clinical vignette describing a common dermatologic condition from the perspective of a physician not board-certified in dermatology. In doing so, we seek to understand the clinical acumen and reasoning skills of ChatGPT as compared to a board-certified dermatologist.

Methods

This IRB-exempt study examined the effectiveness of ChatGPT4 for diagnosing and working up common and rare dermatologic conditions from a physician (non-dermatologist) perspective. The study was performed in the division of dermatology at a large academic center in a major metropolitan city. Two medical students and one internal medicine intern created ten clinical vignettes describing common dermatologic conditions from the non-dermatologist physician perspective ([Table 1](#)). Three board-certified dermatology faculty members created a three to five diagnosis differential diagnosis list for each clinical vignette, ordered from most likely to least likely diagnosis. For each clinical vignette, two of the three dermatologists created a differential diagnosis list separately and each list was validated by a third dermatologist to create a final differential diagnosis list. These ten clinical vignettes were input into ChatGPT4 and the AI model was asked to provide its top five diagnoses ordered by

most to least likely and its recommended workup to determine the diagnosis. If ChatGPT4 did not include the actual diagnosis within its top five diagnoses, it was asked why the actual diagnosis was not considered and then asked to provide a recommended workup plan. ChatGPT4 conversation histories were cleared before the next clinical vignette was input into the model.

For each vignette, the differential diagnosis list created by the dermatologists was compared to the differential diagnosis list created by ChatGPT4. The accuracy of diagnoses provided by ChatGPT4 were determined using a previously published method [7]. For each vignette, the diagnostic accuracy rate by ChatGPT4 was determined in the following way.

The accuracy of diagnosis and appropriateness of clinical workup recommended by ChatGPT4 for each vignette were qualitatively evaluated using Likert scales defined in **Boxes 1, 2**. Eleven board-certified dermatologists rated the accuracy of diagnosis and appropriateness of workup for ChatGPT4's output for each clinical vignette using these Likert scales.

Finally, three board-certified dermatologists provided written commentary on their impressions of the overall effectiveness of ChatGPT4 in diagnosing and working up each clinical vignette ([Table 1](#)).

Results

Overall, 52% of ChatGPT4's diagnoses were also found on board-certified dermatologists' differential diagnosis lists across vignettes. The rates of accurate diagnoses by ChatGPT4 ranged from 20% to 100% across the ten vignettes (**Table 2**). ChatGPT4 was most capable of determining the accurate diagnoses for vignettes describing psoriasis (100% correct), followed by viral exanthem (60%), tinea corporis (60%), melanoma (60%), and Merkel cell carcinoma (60%). It was less effective at determining an accurate diagnosis for the vignette describing ecthyma (40%).

The most likely diagnosis provided by ChatGPT4 matched the dermatologists' differential diagnosis list in 50% (5/10) of the vignettes, including those

Box 1. Likert scale for accuracy of diagnosis.

Please rate the accuracy of the diagnosis recommended by ChatGPT for each clinical case.

1 Completely Incorrect: The suggested diagnoses have no basis in the clinical vignette and the justifications are completely inconsistent with the presented symptoms and patient history. All suggested diagnoses and their justifications are inconsistent with the case.

2 Mostly Incorrect: The response does not include the correct diagnosis. The justification includes a small amount of correct or relevant aspects, but the majority of it is not consistent with the patient’s presentation. There is significant omission of the important diseases to consider in the list of differential diagnoses.

3 Partially Correct: The response includes the correct diagnosis, but the justification has significant inaccuracies. The response fails to include important diagnoses to consider in the differential and/or does not provide a logical explanation for the pathologies listed in the differential.

4 Mostly Correct: The response includes the correct diagnosis with a logical and clear justification for its selection based on the information presented in the case. While the majority of the proposed diagnoses are mostly relevant and well-justified, the response fails to include some important diagnoses to consider in the differential.

5 Completely Correct: The response includes the correct diagnosis and a highly plausible list of important diagnoses to consider. The justification for each diagnosis perfectly aligns with the clinical vignette, accurately reflecting all the key details of the patient’s symptoms and history.

Box 2. Likert scale for appropriateness of clinical workup.

Please rate the appropriateness of the workup recommended by ChatGPT for each clinical case.

1 Completely Inappropriate: The suggested workup is out of context and has no grounding in standard dermatological practice for the presented case.

2 Mostly Inappropriate: The suggested workup has a loose connection to standard practice, but the key elements significantly deviate from what a board-certified dermatologist would do in a similar circumstance.

3 Moderately Appropriate: The suggested workup aligns with standard practice in some respects, but notable aspects would be considered unconventional or unnecessary by a board-certified dermatologist.

4 Mostly Appropriate: The suggested workup is generally in line with the actions that a board-certified dermatologist would suggest, with only minor discrepancies or unconventional elements.

5 Completely Appropriate: The suggested workup is entirely aligned with the actions a board-certified dermatologist would take, reflecting best practice for the presented case.

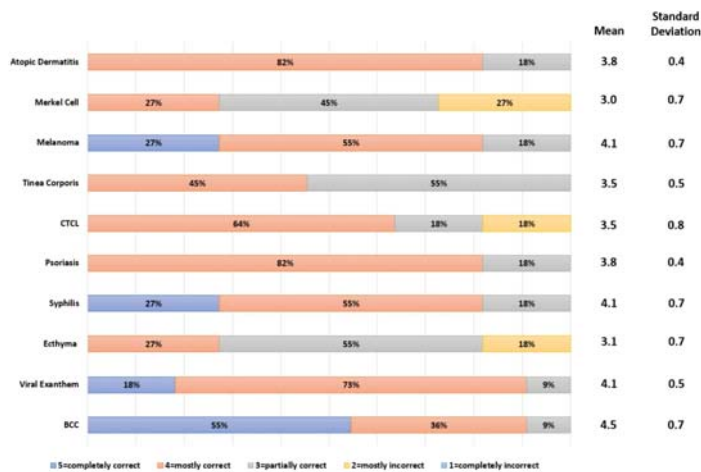


Figure 1. Likert scale evaluation of accuracy of ChatGPT4’s differential diagnosis with mean scale rating and standard deviation of ratings by vignette (N=11).

BCC, basal cell carcinoma; CTCL, cutaneous T-cell lymphoma; Ddx, differential diagnosis list; Dx, diagnosis or diagnoses; MCC, Merkel cell carcinoma; N, no; PsO, psoriasis; Y, yes.

describing basal cell carcinoma, viral exanthem, syphilis, psoriasis, and melanoma. The top diagnosis on the dermatologists’ differential diagnosis list was included in ChatGPT4’s differential diagnosis list in 8 of 10 (80%) cases. There was wide variability in the ability of ChatGPT4 to determine an accurate diagnosis based on these quantitative evaluations.

ChatGPT4 was rated as providing a completely correct workup an average of 62% of the time for any given clinical vignette and it was rated as providing a completely correct, or mostly correct workup in all vignettes except for those describing atopic dermatitis, Merkel cell carcinoma, and ecthyma. In these conditions, it provided a partially correct recommended workup according to 18% (N=2, atopic dermatitis and Merkel cell carcinoma) and 9% (N=1, ecthyma) of dermatologists’ evaluations.

Table 2. Quantitative assessment of ChatGPT4's diagnostic accuracy

Correct diagnosis rate (%)	Diagnosis being described by clinical vignette								
	BCC	Viral exanthem	Ecthyma	Syphilis	PsO	CTCL	Tinea corporis	Melanoma	MCC
ChatGPT4 Dx in dermatologist DDx	40% (2/5)	60% (3/5)	40% (2/5)	40% (2/5)	100% (3/3)	50% (2/4)	60% (3/5)	60% (3/5)	60% (3/5)
ChatGPT4 Dx matching top dermatologist Dx	Y	Y	N	Y	Y	N	N	Y	N

BCC, basal cell carcinoma; CTCL, cutaneous T-cell lymphoma; DDx, differential diagnosis list; Dx, diagnosis or diagnoses; MCC, Merkel cell carcinoma; N, no; PsO, psoriasis; Y, yes.

Results from the Likert scale evaluations of ChatGPT4's accuracy of diagnosis and appropriateness of workup are included in **Figures 1, 2**. Overall, ChatGPT4 was better at providing an appropriate clinical workup than an accurate diagnosis across vignettes. There is considerable variation in the ability of ChatGPT4 to provide an accurate diagnosis by clinical vignette and less variability in providing an appropriate workup.

ChatGPT4 was rated (**Figure 1**) as providing a completely correct differential diagnosis list for melanoma (27%, 3/11), syphilis (27%, 3/11), viral exanthem (9% 1/11), and BCC (55%, 6/11). In the remaining six vignettes, the diagnosis list was rated as mostly correct or worse on Likert scale evaluation.

Discussion

This study demonstrated a moderate ability of ChatGPT4 to provide an accurate diagnosis and a high ability to provide an appropriate workup for ten common dermatologic conditions presented from the perspective of a physician not board-certified in dermatology. A similar study examined 32 dermatologic clinical cases taken from educational materials for healthcare trainees. The authors input the clinical cases into ChatGPT3 and asked for differential diagnoses, which were scored for accuracy against differential diagnoses created by dermatologists [7]. ChatGPT determined the correct top diagnosis for 12 of 32 cases (37.5%), compared to 5 of 10 (50%) cases in this study. This study also found that ChatGPT3.5 listed the correct diagnosis somewhere in its differential diagnosis in 26 of 32 (81%) cases compared to 8 of 10 (80%) cases in our study.

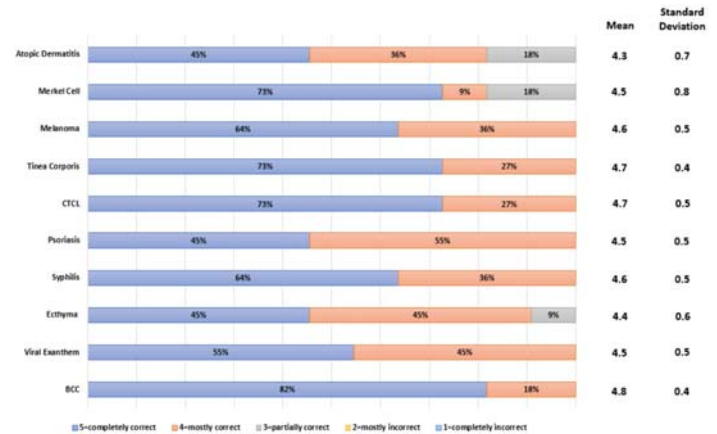


Figure 2. Likert scale evaluation of appropriateness of ChatGPT4's recommended clinical workup with mean scale rating and standard deviation of ratings by vignette (N=11).

BCC, basal cell carcinoma; CTCL, cutaneous T-cell lymphoma; DDx, differential diagnosis list; Dx, diagnosis or diagnoses; MCC, Merkel cell carcinoma; N, no; PsO, psoriasis; Y, yes.

Consistent with our study, Hirosawa et al. 2023 found that ChatGPT3 could create reasonably accurate differential diagnosis lists, with a total correct diagnosis rate of more than 90% for the ten differential diagnosis lists generated by ChatGPT3 and a total correct diagnosis rate of more than 80% for the five differential-diagnosis lists generated by ChatGPT3. ChatGPT3 determined the correct top diagnosis in more than 50% of vignettes, whereas physicians were able to do this more often [8]. Another study input 25 hypothetical melanoma-related patient questions into ChatGPT (unknown whether ChatGPT3 or -4), and had three board-certified dermatologists evaluate the appropriateness, sufficiency for clinical practice, and accuracy using Likert scales [9]. The study found high rates of accuracy of ChatGPT's responses (98%). Most responses (92%) were determined to be appropriate,

but only 64% were deemed to be sufficient for clinical practice.

Although the current literature evaluating the clinical efficacy of ChatGPT in dermatology demonstrates relatively good ability of the AI model to develop accurate differential diagnoses, the papers describe aspects of the AI model that require improvement before the tool can be reliably used in clinical practice. One of the main concerns about the use of ChatGPT in medicine is “artificial hallucination,” which is the model’s ability to present false information as if it was true [10]. Another concern is the variability in answers provided by ChatGPT to the same question at different times or if asked in slightly different ways, which we observed in our study [10]. Furthermore, the AI model that ChatGPT uses relies on data up to 2021, limiting its ability to provide up-to-date medical information [10].

A couple of studies have highlighted ChatGPT’s limitations related to clinical practice. One group input eight scenario-based questions relating to infections into ChatGPT (unclear whether ChatGPT3 or -4), and asked about antimicrobial management [11]. The study found that the AI model was able to understand the scenario and provide accurate summaries but was unable to determine clinically important aspects of the scenario when scenarios became more complex, provided different answers when asked the same question multiple times, and was unable to understand the importance of contraindications to antimicrobial therapy in clinical context. It sometimes also ignored advice it had given previously. A separate investigation in obstetrics and gynecology revealed similar limitations with ChatGPT3 [6]. They discovered a lack of insight into the complexities of human conversation and variation in responses when questions or clinical cases were presented slightly differently or even the same way multiple times, concluding that ChatGPT lacked the insight and ability to make informed clinical decisions.

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Our study has several limitations. One is the limited sample size, including only ten clinical vignettes to evaluate ChatGPT4’s clinical performance. There may be small differences in the amount of detail provided between clinical vignettes. Clinical vignettes were written from the perspective of a non-dermatologist physician comfortable with the use of commonly used terms in dermatology to describe skin lesions, which may not be generalizable to all non-dermatologist physicians. For instance, some vignettes include descriptors that are commonly associated with certain dermatologic diseases, such as “silvery scale” for plaque psoriasis and “telangiectatic vessels on dermoscopy” for basal cell carcinoma; not all non-dermatologist physicians may use these terminologies in their description of a condition. Lastly, this study did not include images as input into ChatGPT4 due to the lack of capacity of ChatGPT4 to process images at the time of this study, but visual inspection of dermatologic lesions is a major component of dermatologic clinical practice.

Conclusion

There is high potential for the use of ChatGPT and AI in improving healthcare access and quality. The question remains as to how competent ChatGPT4 is as a clinical decision tool across specialties. Our study and others indicate that ChatGPT4 is likely best used when clearly defined pieces of information are sought (e.g., the workup for an already known diagnosis), what might be termed the science of medicine. ChatGPT4 is less accurate when asked questions that require incorporating more nuanced factors, what might be termed the art of medicine. Based on this preliminary analysis, ChatGPT4, or a future iteration, will require further improvement before it can be safely implemented in clinical practice without proper oversight.

Potential conflicts of interest

The authors declare no conflicts of interest.

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Table 1. Clinical vignettes, ChatGPT4 output, and dermatologist commentary.

Question	ChatGPT DDx	Dermatologist differential diagnosis list
<p>1. Basal cell carcinoma</p>		
<p>A 63-year-old man presents to clinic after a referral from a primary care physician for a lesion on his forehead. The patient worked in construction for most of his life and states that he never wore sun block. He states that the lesion has been growing for six months and tends to bleed easily. On examination, the lesion is pink colored and pearly. Overlying ulceration and telangiectatic vessels are seen on dermoscopy</p>		
<p>What are the top five differential diagnoses in order by most likely?</p>	<p>The presentation and history provided are highly suggestive of a skin condition likely related to sun exposure. Here are the top five differential diagnoses based on the symptoms described, in order from most likely to less likely:</p> <p><i>Basal cell carcinoma (BCC):</i> This is the most common form of skin cancer and it's often related to chronic sun exposure. It presents as a pink, pearly nodule that may have telangiectasia (tiny blood vessels) and overlying ulceration is common. The fact that it bleeds easily is another characteristic of BCC. It tends to grow slowly and is rarely metastatic, but it can cause significant local damage if not treated</p> <p><i>Squamous cell carcinoma (SCC):</i> This is the second most common skin cancer and is also associated with sun exposure. It tends to present as a crusted or scaly lesion with a red, inflamed base. It can sometimes appear similar to BCC, hence it is a part of the differential. It is more likely than BCC to metastasize, particularly if it is on the lip or ear</p> <p><i>Actinic keratosis (AK):</i> AK is a precancerous skin condition caused by sun exposure. It appears as a rough, scaly patch on the skin that may be painful or itchy. However, the presence of ulceration and pearly appearance makes it less likely in this case</p> <p><i>Keratoacanthoma (KA):</i> This is a rapidly growing, dome-shaped lesion that looks similar to SCC. It often has a central keratin plug. Though it typically resolves on its own, it can be difficult to clinically distinguish from SCC, and thus is often surgically removed</p> <p><i>Cutaneous horn:</i> This is a conical, hyperkeratotic (hardened, thickened skin) projection that typically arises from actinic keratosis or SCC but can also be associated with benign conditions. It is less likely given the description, but its relationship with sun exposure makes it a possibility</p> <p>Further investigation will be required to confirm the diagnosis, typically involving a skin biopsy. The patient should be counseled on the importance of sun protection to prevent further skin damage</p>	<ol style="list-style-type: none"> 1. Basal cell carcinoma 2. Squamous cell carcinoma 3. Nevus 4. Sebaceous hyperplasia 5. Seborrheic keratosis
<p><i>Dermatologist consensus</i></p>		
<p>ChatGPT correctly identified neoplasms commonly seen in chronically sun exposed skin. It correctly identified many features of these conditions, including for example, SCC of the lip and ear being higher risk for metastasis. It did include several minor errors: BCC sometimes is a nodule, but may also present in other ways (e.g., patch or ulcer); AK may be a patch but may also be a plaque; some KAs may resolve, but not all. ChatGPT did not include benign neoplasms commonly seen on the face</p>		
<p>How would you work up basal cell carcinoma in this case scenario?</p>	<p>Given the patient's history and presentation, the suspicion for BCC is high. Here is a step-by-step process for working up this case:</p> <p><i>History and physical examination:</i> Detailed history taking is crucial. Ask about the duration, changes in size, symptoms such as itching or bleeding, sun exposure history, past skin cancer history, family history of skin cancer, and use of protective measures against the sun. Additionally, the patient's immunization status, smoking history, and any immunosuppressive conditions or medications should be noted as they can affect the risk of skin cancers</p> <p><i>Dermoscopy:</i> This tool can enhance the visualization of skin lesions and is useful for distinguishing BCC from benign lesions. However, the diagnosis should be confirmed with a biopsy. In this case, the</p>	

	<p>dermoscopy has already shown features suggestive of BCC, like the pearly appearance with overlying ulceration and telangiectatic vessels</p> <p><i>Biopsy:</i> This is the gold standard for the diagnosis of BCC. It involves removing a part or the entirety of the suspicious lesion, which is then sent to the laboratory for histopathologic analysis. The method of biopsy (e.g., shave, punch, excisional) depends on the lesion's size, location, and other factors</p> <p><i>Staging:</i> Unlike other types of cancer, BCC is usually not staged because it rarely spreads to other parts of the body. However, BCCs are classified as low-risk or high-risk based on their size, location, histologic subtype, and whether they are primary or recurrent. This classification helps guide treatment decisions</p> <p><i>Management:</i> Treatment will depend on the biopsy and the classification (low-risk versus high-risk). Options include topical therapies, excision, Mohs micrographic surgery, curettage and electrodesiccation, radiation, and systemic therapy for advanced disease</p> <p><i>Follow-up:</i> After treatment, regular skin checks are necessary, as individuals who have had one BCC are at risk for developing others. Educating the patient on skin cancer signs and the importance of sun protection is essential</p> <p>Lastly, it would be appropriate to review the patient's other medications and overall health status. Some conditions and medications can increase the risk of skin cancers, and modifications may be warranted</p>
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Dermatologist consensus

The workup is appropriate and detailed. Immunization and smoking status are not typically assessed initially as they have less overall contribution as to whether a lesion is concerning for skin cancer. ChatGPT is correct in asserting that skin biopsy is the gold standard for diagnosis. The management options listed are all reasonable but are not listed in any particular order (i.e., not rank ordered by cure rate)

2. Viral exanthem

A 40-year-old woman presents to clinic with a 24-hour history of fever and itchy rash. She has a personal history of hypertension and HIV and a family history of breast cancer and type two diabetes mellitus. She works at a daycare. Upon physical examination, there are erythematous macules and papules scattered around the trunk. The rest of the physical examination is unremarkable

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Given this patient's symptoms, history, and physical examination findings, the following are the top five differential diagnoses, ordered by likelihood:</p> <p><i>Viral exanthem</i> - This is often the most common cause of a fever and rash. A variety of viral infections can present in this way, including those caused by <i>enteroviruses</i>, <i>adenoviruses</i>, and <i>herpesviruses</i>. Given the patient's work at a daycare, exposure to viruses is quite common</p> <p><i>Drug reaction</i> - This can include either a drug allergy or a drug eruption and can often present with a rash and fever. The rash could be maculopapular in presentation. Given that she has hypertension (and possibly on antihypertensives), it is essential to consider this possibility</p> <p><i>Secondary syphilis</i> - Given the patient's HIV status, she is at increased risk for other sexually transmitted infections, including syphilis, which can present with a fever and a rash that often involves the trunk</p> <p><i>HIV rash</i> - The patient's known HIV status could explain her symptoms. HIV itself can cause a rash and fever, especially in the early acute stage or due to an opportunistic infection</p> <p><i>Varicella (chickenpox)</i> - Although less common in adults, chickenpox can present as a fever with a maculopapular and vesicular rash, especially in those with exposure to children as in this patient's case. Given her age, it's less likely, but if she hasn't had chickenpox or been vaccinated it's a possibility</p> <p>It's important to note that while these are potential diagnoses based on the information provided, further investigations such as skin biopsy, blood tests, and possibly lumbar puncture might be required for a definitive diagnosis</p>	<ol style="list-style-type: none"> 1. Viral exanthem 2. Drug eruption 3. Contact dermatitis 4. Syphilis 5. Pityriasis rosea
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Dermatologist consensus

ChatGPT correctly identified several infectious diagnoses based upon this vignette, but did not include non-infectious causes in its differential diagnosis, including contact dermatitis. HIV rash is not a diagnosis, as it is nonspecific; possible diagnoses under this umbrella would include primary HIV infection syndrome and papular pruritic eruption of HIV. As for varicella, even if the patient had been vaccinated, breakthrough varicella is a possibility, especially as she is immunosuppressed. The mention of a lumbar puncture is incorrect and would be unnecessary given the details included in the vignette

How would you work up a viral exanthem in this case scenario?

The first step in the workup for a suspected viral exanthem is to take a detailed history and perform a thorough physical examination. This will help to narrow down the possibilities based on the characteristics of the rash, associated symptoms, and potential exposures

Here's a potential approach for this patient:

Detailed history: This should include questions about onset and progression of symptoms, associated symptoms such as cough, sore throat, runny nose, joint pains, and recent exposures (including travel history and sick contacts). Since she works in a daycare, it's important to ask about recent outbreaks of illness in the children she works with. Additionally, ask about medications to rule out drug eruptions

Physical examination: The pattern and distribution of the rash should be examined carefully. Check for involvement of palms, soles, and mucous membranes which can suggest certain conditions. Assess for any signs of systemic illness

Laboratory tests: Depending on the history and physical examination, consider laboratory tests such as complete blood count with differential, liver function tests, and renal function tests. In some cases, specific viral serology or PCR testing might be useful. Given her known HIV status, it may also be appropriate to check her recent CD4 count and viral load, as certain viral exanthems are more common in those with more advanced HIV disease

Skin biopsy: If the diagnosis remains uncertain after these steps, a dermatologist might need to perform a skin biopsy

Consultation: If the diagnosis remains unclear, or if the patient's condition worsens despite appropriate treatment, consider consultation with a dermatologist or an infectious disease specialist

For treatment, the management of a viral exanthem is generally supportive, including rest, hydration, and over-the-counter remedies for itching (such as *antihistamines* or calamine lotion) If the patient's symptoms are severe or persistent, or if the viral exanthem is due to a specific virus with an effective *antiviral* treatment (such as varicella), specific antiviral medications might be indicated

Dermatologist consensus

The workup listed is reasonable, especially the focus on a detailed history and physical examination (to point to etiology as well as rule out other conditions). It was correct in mentioning that additional testing (laboratory tests and skin biopsy) is helpful in some cases, but maybe should have emphasized they are not needed in the vast majority of cases. ChatGPT did not mention topical corticosteroids for itch, which would be a common recommendation

3. Ecthyma

A 25-year-old woman with well managed SLE presents to clinic due to a rash on her lower extremity that started a few days ago and has progressively worsened. She has a history of eczema and a family history of hypothyroidism and hypertension. She states that some of the blisters scabbed over in the last day and that one of the lesions started oozing white/yellow fluid after she picked the scab off. Physical examination is positive for numerous vesicles and crusted lesions with an erythematous base distributed along the lower extremities. Additionally, multiple circular scars are noted diffusely on the upper and lower extremities. When questioned, the patients states that she is "really bad about picking scabs" and that she frequently gets mosquito bites since she lives next to a large pond

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Given this patient's presentation, the following five diagnoses should be considered, in order of most likely:</p> <p><i>Impetigo:</i> This is a common and highly contagious skin infection that causes sores and blisters. It's most commonly caused by the bacteria <i>Staphylococcus aureus</i> or <i>Streptococcus pyogenes</i>. Impetigo often presents as oozing sores that later crust over, which matches this patient's symptoms. Additionally, this patient's habit of picking at her skin may have allowed bacteria to enter and cause infection</p> <p><i>Bullous pemphigoid:</i> This is an autoimmune disorder that causes blistering of the skin. Given that this patient already has a diagnosed autoimmune disorder (SLE),</p>	<ol style="list-style-type: none"> 1. Ecthyma 2. Impetigo 3. Eczema 4. Neurotic excoriations 5. Eczema herpeticum
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	<p>it's possible that she could have another. However, the fact that the lesions are oozing pus and the habit of skin picking makes impetigo more likely</p> <p><i>Dermatitis herpetiformis</i>: This condition is an intensely itchy, chronic autoimmune skin condition that leads to the development of blisters. The history of autoimmune disease and presentation of the skin lesions could point towards this; however, the oozing pus is not characteristic</p> <p><i>Eczema (dyshidrotic eczema)</i>: Given the patient's history of eczema, it's possible that this could be a severe or different form of the condition, such as dyshidrotic eczema which can cause small, itchy blisters on the edges of the fingers, toes, palms, and soles of the feet. However, the distribution and the oozing pus make other diagnoses more likely</p> <p><i>Cutaneous lupus erythematosus</i>: As a patient with systemic lupus erythematosus (SLE), it's possible that the skin symptoms are a manifestation of cutaneous lupus erythematosus. This can manifest with various types of skin lesions, but they typically do not have pus unless they are secondarily infected</p> <p>Given the clinical findings and the history of scab picking, impetigo seems the most likely. However, in the presence of an established autoimmune disorder like SLE, other autoimmune skin diseases should be considered as well. It is important to note that without further diagnostic testing (like a skin swab for culture or biopsy), it can be hard to definitively diagnose the condition</p>	
<p><i>Dermatologist consensus</i></p> <p>ChatGPT was correct in identifying this as most likely in the impetigo spectrum. While the vignette was targeted at a diagnosis of ecthyma, a deeper form of impetigo, the clinical presentation was intentionally somewhat ambiguous between the two diagnoses. It did assume that drainage from the lesion was pus, but this was never explicitly stated and would more likely have been serum. Given the history of autoimmune disease in the vignette, ChatGPT placed autoimmune etiologies (bullous pemphigoid and dermatitis herpetiformis) high on its differential diagnosis list. However, given their rarity and the information provided in the vignette, those entities would be much less common than some other diagnoses</p>		
<p><i>Why was ecthyma not considered in the differential?</i></p>	<p>Ecthyma, a deeper, ulcerative form of impetigo caused by the same bacteria (<i>Streptococcus</i> or <i>Staphylococcus</i> species), could certainly be a consideration in the differential diagnosis given this patient's symptoms. However, the description of her presentation with "numerous vesicles and crusted lesions with an erythematous base" is generally more typical of impetigo</p> <p>Ecthyma tends to present as 'punched-out' ulcers with a necrotic base and a surrounding erythematous halo, which then crust over. These ulcers often extend into the dermis, making it a more serious infection than impetigo, which is largely superficial</p> <p>The presence of pus or yellowish fluid could occur in either impetigo or ecthyma, but the fact that this patient has numerous vesicles and the description of the rash overall seems more typical of impetigo</p> <p>That being said, it is certainly possible that this could be a case of ecthyma, especially if the lesions continue to worsen or if they don't respond to typical treatment for impetigo. Further evaluation and possible bacterial culture could help distinguish between the two if the clinical picture remains unclear. Thank you for pointing this out, the differential diagnosis list could indeed be expanded to include ecthyma</p>	
<p><i>How would you work up ecthyma in this case?</i></p>	<p>If ecthyma is suspected based on the patient's symptoms and physical examination, the following steps could be considered for the workup:</p> <p><i>Detailed history and physical examination</i>: You've already done this, but it's worth revisiting to specifically look for signs of ecthyma - such as the characteristic "punched-out" ulcers with a yellowish-brown crust, or any systemic symptoms that might indicate a more serious, widespread infection</p> <p><i>Bacterial culture and sensitivity</i>: If the lesions are oozing, a sample of the pus can be taken for bacterial culture to identify the exact bacterial species causing the infection and their sensitivity to antibiotics. Both impetigo and ecthyma are typically caused by <i>Staphylococcus aureus</i> or <i>Streptococcus pyogenes</i>, but other bacteria may be involved</p>	

Blood tests: While not always necessary for a straightforward case of ecthyma, blood tests could be helpful if there's any concern about the patient's overall health or immune status, given her history of SLE. A full blood count could show signs of inflammation or infection, such as a raised white cell count

Skin biopsy: In rare cases, if the diagnosis is still uncertain after these steps, a skin biopsy could be performed to confirm the diagnosis and rule out other possibilities

The management of ecthyma typically involves oral antibiotics, due to the deeper nature of the infection compared to impetigo. Topical antibiotics alone are usually not sufficient. Good hygiene practices should be emphasized to prevent spread to others or other parts of the body, and the patient should be counseled to avoid scratching or picking at the lesions to promote healing and avoid scarring

Dermatologist consensus

Overall, the workup is appropriate. Bacterial culture of the drainage (not necessarily pus) can be helpful but is often not necessary. A bacterial culture will not differentiate impetigo from ecthyma, which is more of a clinical distinction. Blood tests are typically not needed and would usually only be ordered if there were concerns for a systemic infection. ChatGPT was correct in emphasizing that oral, as opposed to topical, treatment is typically needed in cases of ecthyma and that the patient should avoid manipulating lesions

4. Syphilis

The patient is a 35-year-old man with past medical history significant for mild comedonal acne using a topical retinoid who presents with sudden onset of a non-pruritic papulosquamous rash including the palms and soles present for two weeks. Associated symptoms include a decreased appetite and mild headache, as well as a few ulcers in the mouth. The rash is slightly tender on the palms and soles but non-tender elsewhere. Physical examination is otherwise normal

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Based on the symptoms, here are the top five conditions in the differential diagnoses, in order of likelihood:</p> <p><i>Secondary syphilis:</i> The patient's rash, particularly the involvement of palms and soles, along with the systemic symptoms such as decreased appetite and mild headache, suggest secondary syphilis. Oral ulcers may also occur in this stage of the infection. Confirmation would require serological testing</p> <p><i>Hand, foot, and mouth disease (HFMD):</i> Although this is more common in children, adults can get it as well. The rash on the hands and feet and oral ulcers are characteristic, though usually it is associated with more discomfort and possibly fever</p> <p><i>Drug reaction or drug eruption:</i> Given the patient's use of topical retinoids, this could be a drug-induced rash. Although these types of rashes can vary in presentation, they may sometimes appear as a papulosquamous rash and may include systemic symptoms</p> <p><i>Guttate psoriasis:</i> This type of psoriasis can present as a sudden onset rash and could involve the palms and soles. The presence of systemic symptoms and oral ulcers is less typical, though</p> <p><i>Kawasaki disease:</i> Though it is very rare in adults, the systemic symptoms along with rash and oral ulcers might suggest this, especially if the patient has had a recent febrile illness</p> <p>Diagnostic tests and further evaluation will help narrow down these differential diagnoses. For example, a rapid plasma reagin (RPR) or venereal disease research laboratory (VDRL) test could be done to test for syphilis. Full blood count, liver function tests, kidney function tests, and urinalysis may be helpful in excluding some systemic causes. Dermatologic consultation may also be beneficial</p>	<ol style="list-style-type: none"> 1. Syphilis 2. Viral exanthem/hand foot moth disease 3. Pustular psoriasis 4. Eczema 5. Contact (irritant) dermatitis
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Dermatologist consensus

ChatGPT correctly identified infectious causes as its top diagnostic concerns. A drug reaction to a topical retinoid would be very unlikely. The more likely subtype of psoriasis, given the distribution would be pustular psoriasis as opposed to guttate psoriasis. Again, ChatGPT included a very rare disease in its differential diagnosis (especially given the absence of sustained fever in the vignette), which would be much less likely

<p><i>How would you work up secondary syphilis in this case scenario?</i></p>	<p>If syphilis is suspected in this case scenario, the following steps should be taken for diagnostic workup:</p> <p><i>Serological testing:</i> The first-line test is usually a nontreponemal test, such as the rapid plasma reagin (RPR) or the venereal disease research laboratory (VDRL) test. If this test comes back positive, it should be followed up with a confirmatory treponemal test like the fluorescent treponemal antibody absorption (FTA-ABS) or the <i>Treponema pallidum</i> particle agglutination assay (TP-PA)</p> <p><i>Clinical examination:</i> A careful physical examination, including a detailed examination of the rash and oral ulcers, should be conducted. The clinician should also look for signs of lymphadenopathy</p> <p><i>Medical history:</i> A detailed sexual history should be obtained, including information on sexual partners, condom use, history of sexually transmitted infections (STIs), and drug use</p> <p><i>Additional STI testing:</i> Because people with one STI may have others, additional testing for HIV, gonorrhea, chlamydia, and hepatitis B and C should be considered</p> <p><i>Lumbar puncture:</i> This is not routinely done in all patients with syphilis, but is indicated in patients with neurologic or ocular symptoms, treatment failure, or late latent syphilis</p> <p>Once a diagnosis is confirmed, the patient would be treated with antibiotics, usually intramuscular penicillin G. If the patient is allergic to penicillin, other antibiotics like doxycycline or azithromycin may be used. The patient's sexual partners should also be notified, tested, and treated if necessary to prevent further spread of the disease</p> <p>This patient should be counseled on safer sexual practices to prevent future STIs and should have follow-up testing to ensure treatment is successful</p> <p>The above steps provide an overview of the syphilis workup and management, but the actual workup and treatment plan may vary depending on individual patient factors and clinical judgment</p>
<p><i>Dermatologist consensus</i></p> <p>ChatGPT emphasizes many important steps in the workup and management of syphilis. It mentions serologic testing, including nontreponemal and treponemal tests, in the diagnosis of syphilis. Although it is correct that nontreponemal tests have historically been algorithmically performed first, another popular algorithm (reverse screening) uses treponemal testing first. We agree with the mention of testing/screening for other coincident STIs and the fact that lumbar puncture is not indicated unless there is some concern for neurosyphilis. The mainstay of the treatment of syphilis is penicillin G, as mentioned. However, if alternative treatments are needed, there is some nuance and likely azithromycin would not be a preferred regimen. From a public health perspective, it is appropriate to focus on sexual partner notification, STI prevention education, and clinical and laboratory testing follow up to ensure disease clearance. In addition to this, syphilis is a reportable disease to local or state health departments in the USA</p>	
<p>5. Psoriasis</p> <p>The patient is a 30-year-old woman with past medical history significant for Hashimoto thyroiditis on levothyroxine and seborrheic dermatitis. She comes to the clinic for evaluation of a worsening scaling and itching of the scalp. She has been applying ketoconazole shampoo without relief. On physical examination, she has several silvery scaly plaques on the vertex and occipital scalp</p>	
<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>This patient's presentation could suggest a few possible conditions. Here are the top five conditions in the differential diagnosis in order of likelihood:</p> <p><i>Psoriasis:</i> The presentation of silvery scaly plaques, particularly on the scalp, is quite characteristic of psoriasis, an autoimmune condition. Psoriasis often presents with an itch, and ketoconazole shampoo may not be effective as it's not a primary treatment option</p> <p><i>Dermatitis herpetiformis:</i> Although less common, this autoimmune blistering disorder associated with gluten sensitivity can present with itching and scaling. However, it often presents on extensor surfaces like elbows or knees rather than the scalp</p> <p><i>Seborrheic Dermatitis:</i> Although this patient already has a diagnosis of seborrheic dermatitis, the worsening of her symptoms might indicate that her condition is becoming more severe or is not responding to the current treatment</p>

	<p><i>Tinea capitis:</i> This is a fungal infection of the scalp. Although this condition more commonly presents in children, it can occur in adults. Ketoconazole shampoo might not have been effective if not used properly or if the infection is severe</p> <p><i>Lichen planopilaris:</i> This is a form of cicatricial alopecia, or scarring hair loss, associated with lichen planus. This condition often leads to scaly plaques, itching, and hair loss</p> <p>It would be important for this patient to see a dermatologist for further evaluation, which could include a skin biopsy, KOH test, or other diagnostic measures to help confirm the diagnosis. Further management would then be guided by the confirmed diagnosis</p>	
<p><i>Dermatologist consensus</i> ChatGPT correctly identified the top items on the differential diagnosis. However, it prioritized a rare autoimmune condition (dermatitis herpetiformis) over a more common diagnosis (tinea capitis). Lichen planopilaris is unlikely given the lack of alopecia in the vignette</p>		
<p><i>How would you work up psoriasis in this case scenario?</i></p>	<p>Given the patient's symptoms and the findings on physical examination, the primary suspicion would be psoriasis, particularly scalp psoriasis given its location</p> <p><i>History taking:</i> Start with a thorough history including the onset, duration, and progression of the scalp condition. Any history of joint pains or a family history of psoriasis could be additional supporting information</p> <p><i>Physical examination:</i> During physical examination, inspect the entire skin surface, not just the scalp, looking for plaques elsewhere such as on the elbows, knees, or lower back which are common sites for psoriasis. Also, assess the nails for pitting, ridging or onycholysis which can be associated with psoriasis. A joint examination should be done to evaluate for psoriatic arthritis</p> <p><i>Skin biopsy:</i> If the diagnosis is uncertain after history and physical examination, a skin biopsy can be performed. This can confirm the diagnosis and rule out other items in the differential diagnosis. In psoriasis, the biopsy would typically show parakeratosis, acanthosis, and elongation of the rete ridges</p> <p><i>Laboratory tests:</i> Although there are no specific laboratory tests to diagnose psoriasis, certain tests may be performed to rule out other conditions and assess the patient's overall health. These can include a complete blood count, liver function tests, renal function tests, and tests for inflammatory markers like ESR and CRP. If there's suspicion for joint involvement, rheumatoid factor and anti-CCP antibodies can be useful</p> <p><i>Management:</i> Once psoriasis is diagnosed, management will depend on the severity of the disease and the impact on the patient's quality of life. Topical treatments, like corticosteroids, vitamin D analogues or calcineurin inhibitors can be used. For more severe disease, phototherapy or systemic medications like methotrexate, cyclosporine, biologics, or new small molecules may be considered. Lastly, it's also important to screen for and manage comorbidities often associated with psoriasis, such as cardiovascular disease, obesity, diabetes, and depression. The patient should also be educated about the chronic nature of the disease and lifestyle modifications, including diet and stress management, which can help control the disease</p>	
<p><i>Dermatologist consensus</i> Overall, this is an excellent overview of the diagnosis and management of psoriasis. Key points of the physical examination, as well as histologic features on skin biopsy were mentioned. Laboratory tests are typically not indicated in the diagnosis of psoriasis. As for joint involvement, the use of RF and anti-CCP are more useful in ruling out other causes of arthritis (for example, rheumatoid arthritis)</p>		
<p>6. Cutaneous T cell lymphoma The patient is a 55-year-old man with past medical history significant for hypertension and hyperlipidemia who presents with several years of an itchy rash all over his body. He has tried topical corticosteroids without relief and briefly dupilumab for suspected atopic dermatitis, which made the rash break out more extensively with worsening dryness and flaking of the skin. He has had several biopsies in the past which showed nonspecific spongiotic dermatitis. His physical examination is significant for thin, scaly plaques on his trunk and extremities, especially on the buttocks and mild cervical and axillary lymphadenopathy</p>		
<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Based on the clinical history and physical examination findings, here are the top five conditions in the differential diagnosis, in order of likelihood:</p> <p><i>Psoriasis:</i> The patient's symptoms, including itchy rash, dry and flaking skin, and thin, scaly plaques, are suggestive of psoriasis. Psoriasis often manifests on the</p>	<ol style="list-style-type: none"> 1. Cutaneous T-Cell lymphoma 2. Drug eruption

	<p>trunk, extremities, and particularly the buttocks. However, biopsy results are not typical for psoriasis, which may suggest a less common variant or other conditions</p> <p><i>Lichen planus</i>: This is an inflammatory skin condition that can present with pruritic (itchy), flat-topped bumps that might form scaly plaques over time. Biopsy findings in lichen planus can sometimes be nonspecific, although usually more characteristic changes are seen</p> <p><i>Cutaneous T-cell lymphoma (mycosis fungoides)</i>: Though less common, this diagnosis should be considered given the lack of response to typical dermatitis treatments, chronic nature of the rash, and the presence of mild cervical and axillary lymphadenopathy. Mycosis fungoides, a type of cutaneous T-cell lymphoma, can have nonspecific biopsy results in its early stages and can appear similar to more common skin conditions</p> <p><i>Contact dermatitis</i>: If the patient has exposure to an allergen, they could be experiencing a chronic contact dermatitis. This condition often presents with itching, redness, and inflammation of the skin, which might look like the scaly plaques described. The worsening of the condition with dupilumab might be coincidental or due to an allergic reaction</p> <p><i>Eczema (atopic dermatitis)</i>: Even though the patient didn't respond to dupilumab, it's still possible that the patient has a severe form of atopic dermatitis. Sometimes, a secondary infection, such as with <i>Staphylococcus aureus</i>, can complicate the treatment and management of atopic dermatitis, leading to a lack of response to typical therapies</p> <p>It's important for the patient to have a follow-up with their dermatologist or primary care provider for further evaluation, as this list is not exhaustive, and other potential diagnoses may exist. Further tests, such as a repeat skin biopsy, complete blood count, or imaging for the lymphadenopathy, might be warranted based on the individual's history and symptoms</p>	<p>3. Contact dermatitis 4. Tinea corporis</p>
<p><i>Dermatologist consensus</i> ChatGPT identified several entities that would be considered in the differential diagnosis but incorrectly prioritized psoriasis and lichen planus over the correct answer, cutaneous T-cell lymphoma. Lymphadenopathy is a concerning finding and most board-certified dermatologists would have cutaneous T-cell lymphoma as the leading diagnosis in their differential of chronic dermatitis with lymphadenopathy. The physical examination findings are less consistent with lichen planus and this should be at the end of the differential diagnosis (or not included at all) rather than second on the list. The differential failed to include other common entities that can be consistent with the physical examination features mentioned such as drug eruption or tinea corporis</p>		
<p><i>How would you work up cutaneous T-cell lymphoma in this case scenario?</i></p>	<p>Cutaneous T-cell lymphoma (CTCL), including its most common form, mycosis fungoides, can be difficult to diagnose, particularly in the early stages when it can resemble eczema, psoriasis, or other dermatoses. However, if there is a strong clinical suspicion based on the patient's chronicity, lack of response to standard treatments, physical examination findings (especially lymphadenopathy), and the nondescript biopsy results there are a few steps we can take to further investigate:</p> <p><i>Repeat skin biopsy</i>: A repeat skin biopsy can be very helpful, as changes over time may allow more specific findings to become apparent. CTCL often has characteristic findings, including atypical T-cells in the epidermis (epidermotropism), but these may not always be present or evident in early disease. Requesting special stains (CD3, CD4, CD7, CD8, CD20, and CD30) or T-cell receptor (TCR) gene rearrangement studies can be useful</p> <p><i>Complete blood count (CBC) with peripheral smear</i>: A CBC can evaluate for Sézary syndrome, a leukemic form of CTCL. An increased number of atypical T-cells (Sézary cells) in the blood can be a clue to this diagnosis</p> <p><i>Flow Cytometry</i>: This can be done on the blood to look for an abnormal population of T-cells, which would be another clue towards CTCL. Flow cytometry can detect immunophenotypic abnormalities in lymphocytes that could indicate lymphoma</p> <p><i>Imaging</i>: Given the presence of lymphadenopathy, imaging studies such as a CT or PET scan may be necessary to evaluate for lymph node or internal organ involvement</p>	

Lymph node biopsy: If the lymph nodes remain enlarged or if imaging shows concerning findings, a lymph node biopsy may be needed to check for lymphoma

Consultation with hematology/oncology: Given the potential for systemic involvement and complexity of managing CTCL, consultation with a hematologist/oncologist would be recommended if the diagnosis is confirmed or strongly suspected

Remember that the diagnosis of CTCL is often challenging and requires the integration of clinical, histopathological, and sometimes molecular findings. In ambiguous cases, close follow-up and repeated biopsies may be required. The involvement of a dermatologist or dermatopathologist experienced in CTCL can be very beneficial

Dermatologist consensus

Overall, this is an excellent overview of the workup for cutaneous T-cell lymphoma. ChatGPT correctly identified key features in the essential first step in making the diagnosis—skin biopsy—including epidermotropism, special stains, and gene rearrangement. Board-certified dermatologists would likely do additional laboratory testing such as lactate dehydrogenase, complete metabolic panel, uric acid, and occasionally magnesium, given that CTCL can be associated with hypomagnesemia and supplementation can improve outcomes. Flow cytometry, further imaging, lymph node biopsy and consultation with hematology/oncology are not indicated in every case but rather dependent on T staging based on NCCN guidelines. ChatGPT did not mention any of the first-line therapies for patch stage IA CTCL (topical corticosteroids or phototherapy), but it recommended treatment for other vignettes

7. Tinea corporis

The patient is a 27-year-old man with no significant medical history who presents with one itchy red spot on his upper chest. The lesion has been present for two weeks and does not seem to be spreading. He has tried low strength topical steroids from the drugstore, which helped reduce the itch but did not make the lesion go away. He has no associated symptoms. He works as an elementary school teacher and works out at the gym every day. On physical examination, he has a discoid erythematous plaque with scaling along the edges on the central chest. The rest of his examination is unremarkable

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Given the patient's age, the presentation, and the details of the physical examination, the top five items in the differential diagnosis could include:</p> <p><i>Nummular dermatitis (discoid eczema):</i> The primary indication for this diagnosis is the presence of the itchy, red, discoid (round or oval) lesion that has persisted even after the use of topical corticosteroids. Nummular dermatitis is characterized by such lesions which can sometimes have a scaly border</p> <p><i>Psoriasis:</i> Psoriasis often presents as well-demarcated, erythematous plaques with silvery scales, which matches the description of the lesion. However, the presence of a single lesion is less common for psoriasis, and itchiness is variable in psoriasis</p> <p><i>Tinea corporis (ringworm):</i> This is a fungal infection of the skin that can present as round, scaly, erythematous plaques. It could have been contracted from the gym or from his students. However, most cases of tinea corporis are more clearly annular (ring-shaped) and often improve with corticosteroid application, which didn't happen in this case</p> <p><i>Cutaneous lupus erythematosus:</i> This autoimmune condition can present as discoid, red, scaly plaques, but it is less likely given the patient's lack of other symptoms and the fact that it's more common in females</p> <p><i>Lichen planus:</i> Lichen planus usually presents as purple, itchy, flat-topped bumps. A plaque form does exist, but the color and description provided lean away from this diagnosis</p> <p>Given the patient's history and presentation, it would be prudent to conduct further tests and perhaps a skin biopsy if the lesion persists despite adequate treatment. Additionally, an antifungal treatment trial may be warranted to rule out tinea corporis. It is also important to monitor for the appearance of any new lesions</p>	<ol style="list-style-type: none"> 1. Tinea corporis 2. Eczema 3. Discoid lupus erythematosus 4. Pityriasis rosea 5. Tinea versicolor
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Dermatologist consensus

ChatGPT correctly identified several entities in the differential diagnosis but prioritized nummular eczema and psoriasis over the correct answer, tinea corporis. It included psoriasis and lichen planus in its differential and these entities rarely, if ever, present as solitary lesions (it did comment on this for psoriasis). ChatGPT correctly pointed out that most cases of tinea corporis include “annular” lesions and perhaps the prompt including the word “discoid” pointed ChatGPT in the wrong direction

<p><i>How would you work up tinea corporis in this case scenario?</i></p>	<p>In this scenario, a potential workup for suspected tinea corporis would involve the following steps:</p> <p><i>Clinical examination:</i> First, take a more detailed history regarding potential exposures, including whether the patient has been in close contact with anyone with similar skin lesions, has any pets (who can transmit fungal infections), or has used any shared gym equipment recently. Inquire about any changes in the lesion and any associated symptoms</p> <p><i>KOH:</i> The main diagnostic step for suspected tinea corporis is a potassium hydroxide (KOH) preparation of skin scrapings. This involves scraping the edge of the lesion with a scalpel blade, placing the scrapings on a glass slide, adding a drop of 10-20% KOH solution, and examining it under a microscope. The KOH dissolves the non-fungal cells, making it easier to spot the hyphae characteristic of a fungal infection</p> <p><i>Fungal culture:</i> If the KOH preparation is negative but clinical suspicion remains high, or if you need to identify the exact species of fungus, a fungal culture may be performed. However, this test can take several weeks to return results, and it is less commonly used in primary care settings due to the time and expense involved</p> <p><i>Wood's lamp examination:</i> Certain species of fungi fluoresce under a Wood's lamp (a special UV light), but this is less commonly used and not as reliable as the above tests</p> <p>In terms of management, if tinea corporis is confirmed or highly suspected, a course of topical or oral antifungal medication would be appropriate. It's important to advise the patient about good hygiene practices to avoid spreading the fungus to others, and to thoroughly clean any potentially contaminated items, such as gym equipment, towels, or clothing</p>
<p><i>Dermatologist consensus</i> ChatGPT provided a very reasonable workup for tinea corporis including the most common next step after physical examination, an in-office KOH examination. It also mentioned the nuance that fungal cultures can take weeks to result and are less often used. ChatGPT also correctly made the standard recommendations for management of tinea corporis</p>	
<p>8. Melanoma A 70-year-old man with a past medical history of Type two diabetes mellitus, hypertension, and arthritis presents to the clinic for an annual dermatology appointment. During his skin examination, you notice a dark colored lesion on his forearm. Upon further questioning, the patient admits that the lesion has been present for two years but has not noticed any changes. The lesion is asymmetric with a mixture of brown and black pigment. A shave biopsy is performed and the specimen is sent for microscopic evaluation.</p>	
<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Based on the information provided, the following differential diagnoses are possible:</p> <p><i>Melanoma:</i> This is the most serious type of skin cancer, often appearing as a mole that changes in color, shape, or size. The presence of an asymmetric lesion with mixed pigmentation raises suspicion for melanoma, particularly given the patient's age and the lesion's persistence</p> <p><i>Seborrheic keratosis:</i> These are benign skin growths that can appear anywhere on the body and are common in older adults. They are often brown or black and can resemble melanoma, but are typically more symmetric and uniform in color</p> <p><i>Actinic keratosis:</i> Actinic keratoses are precancerous skin lesions caused by sun damage. They often appear on sun-exposed areas, such as the forearm, and can sometimes resemble melanoma</p> <p><i>Solar lentigo:</i> Also known as a "liver spot" or "age spot", these are benign pigmented lesions that occur in sun-exposed areas, particularly in older adults. They are usually more uniform in color than a melanoma, but their appearance can sometimes overlap</p> <p><i>Dysplastic nevus (atypical mole):</i> This is a type of mole that looks different from a common mole. It is generally larger and has irregular and indistinct borders. Although it is not a type of skin cancer, having dysplastic nevi can increase a person's risk of developing melanoma</p> <p>Although these differentials are listed in order of likelihood, the true diagnosis will ultimately depend on the histopathological examination of the biopsy specimen</p>
<p><i>Dermatologist consensus</i></p>	

ChatGPT has a good differential diagnosis for this vignette. It does mention that melanoma is "the most serious type of skin cancer," which is not necessarily true if this means highest risk for metastasis and death; for example, Merkel cell carcinoma has a higher risk for metastasis and death than melanoma. It also mentioned that melanoma is "often appearing as a mole that changes in color," while likely only a minority of melanomas arise in a pre-existing nevus

How would you work up melanoma in this case scenario?

If a melanoma is suspected based on the clinical examination and shave biopsy, several steps can be taken to confirm the diagnosis, determine the extent of the disease, and develop a treatment plan. The following steps may be included in the workup:

Histopathological diagnosis: The biopsy specimen should undergo microscopic examination by a pathologist for definitive diagnosis. The biopsy can identify the melanoma and also provide information on the type of melanoma, the depth of invasion (Breslow depth), ulceration status, and the mitotic rate, all of which are critical for staging and management decisions

Full body skin examination: To check for any additional suspicious lesions or lymphadenopathy, a full-body skin examination should be performed. This can sometimes reveal other lesions that might have been overlooked or new lesions that suggest a more advanced stage of the disease

Staging investigations: If the biopsy confirms melanoma, further staging investigations may be required depending on the thickness and other features of the primary lesion. This might include imaging studies such as a CT scan, PET scan, or MRI to evaluate for potential metastasis to other organs or the brain. Sentinel lymph node biopsy may also be considered in melanomas with a Breslow thickness greater than 1.0 mm or if other high-risk features are present

Multidisciplinary team evaluation: The patient should ideally be evaluated by a multidisciplinary team that includes a dermatologist, surgical oncologist, medical oncologist, and possibly a radiation oncologist, to discuss the best management plan

Genetic testing: Some melanomas may harbor specific genetic mutations (such as *BRAF*, *NRAS*, or *KIT*) that could potentially guide targeted therapies. So, molecular profiling of the tumor tissue can be considered in advanced stages or when adjuvant therapy is being contemplated

Patient counseling: Patient counseling regarding the diagnosis, prognosis, potential treatments, and the importance of sun protection, and regular follow-ups are important components of the workup for melanoma

Each patient is unique, and the exact workup should be tailored to the individual's clinical situation

Dermatologist consensus
Overall, this is an excellent overview of the workup for melanoma. A minor point would be that per NCCN guidelines, SLNB is discussed for melanomas that are Breslow thickness 0.8 - one mm and offered for Breslow greater than one mm (taking into consideration the patient's age and other comorbidities)

9. Merkel cell carcinoma
A 53-year-old woman with a past medical history of breast cancer, hypothyroidism, and kidney transplantation presents with a red bump on the dorsal surface of her right foot. The patient spent most of her early life outdoors and participated in many surfing competitions. Further examination of the lesion revealed a 1.2 x 1.5 cm non-tender shiny pink nodule with central ulceration. She states that the lesion has been present for a few months and has been growing rapidly in size

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Given the history, presentation, and the physical examination findings, the top five items in the differential diagnosis in this case, in order by most likely, would be:</p> <p><i>Squamous cell carcinoma (SCC):</i> This type of skin cancer can present as a firm, pink, shiny nodule that may ulcerate, similar to what is described. Its occurrence can be related to sun exposure, which fits the patient's history of spending much of her early life outdoors. Also, immunosuppressive medications, which are often required after organ transplantation, can increase the risk of developing SCC</p> <p><i>Basal cell carcinoma (BCC):</i> This is the most common form of skin cancer and often appears as a shiny pink or pearly nodule, sometimes with central ulceration (creating a "rodent ulcer" appearance). Like SCC, it can be related to sun exposure and immunosuppression. BCC tends to grow slowly, but the patient's report of rapid growth is more suggestive of SCC or other more aggressive cancers</p> <p><i>Malignant melanoma:</i> This is a more aggressive form of skin cancer that often presents as a rapidly enlarging pigmented lesion, but it can also be non-pigmented. As with the other skin cancers, sun exposure and immunosuppression increase the risk</p>	<ol style="list-style-type: none"> 1. Merkel Cell Carcinoma 2. Melanoma 3. Basal Cell Carcinoma 4. Squamous Cell Carcinoma 5. Nevus
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	<p><i>Kaposi sarcoma:</i> This is a cancer that can occur in immunosuppressed patients, particularly those with HIV, but it can also occur in patients who are immunosuppressed for other reasons, such as after organ transplantation. It often presents as red or purple plaques or nodules on the skin</p> <p><i>Pyogenic granuloma:</i> This is a benign growth that can look similar to some skin cancers. It often grows rapidly, but it would not have the risk factors associated with the other conditions listed</p> <p>These are not the only possibilities, and the exact diagnosis would depend on further investigation, including a biopsy of the lesion. It's also important to note that skin lesions can be difficult to diagnose based on appearance alone and some of these conditions can have variable presentations</p>	
<p><i>Dermatologist consensus</i> ChatGPT correctly identifies the lesion mentioned in the vignette as a neoplasm, most likely malignant. Its order of differential diagnoses appears mostly related to incidence in an immunosuppressed population. A small point is that SCC is not typically shiny and is typically more scaly/keratotic in appearance</p>		
<p><i>Why was Merkel cell carcinoma not considered in the differential?</i></p>	<p>Merkel cell carcinoma (MCC) is indeed a possible diagnosis in this case, especially considering the patient's immunosuppressed status due to her kidney transplantation and her history of extensive sun exposure. MCC often presents as a rapidly growing, painless, firm, shiny nodule, typically red or pink, which matches the patient's presentation</p> <p>MCC is an aggressive neuroendocrine carcinoma of the skin, and while it's much less common than the other skin cancers mentioned in the initial differential, it can be quite serious. It's frequently associated with <i>Merkel cell polyomavirus</i> and UV light exposure, and immunosuppression is a known risk factor</p> <p>The reason I didn't initially include MCC in the top five conditions in the differential diagnosis is mainly due to its relatively lower incidence compared to the other diagnoses mentioned. However, given the patient's specific risk factors and the clinical presentation, MCC could certainly be considered as part of the differential diagnosis. It's always important in medicine to consider the balance between common and uncommon diagnoses, as well as the specific features of a patient's history and presentation</p>	
<p><i>How would you work up Merkel cell carcinoma in this case?</i></p>	<p>The diagnosis of Merkel cell carcinoma (MCC) is usually confirmed with a biopsy of the suspicious lesion. The workup for a suspected MCC case would typically involve the following steps:</p> <p><i>Skin biopsy:</i> A biopsy of the lesion is required for histological examination. This is usually done as an excisional biopsy (the entire lesion is removed), although an incisional biopsy (only part of the lesion is removed) may be done in some cases</p> <p><i>Histopathological examination:</i> The biopsy sample will be examined under a microscope by a pathologist. MCC is characterized by small, round, blue cells on histology. Immunohistochemical staining may also be done to detect the presence of specific markers, such as cytokeratin 20 (CK20), which is usually positive in MCC</p> <p><i>Imaging:</i> If the biopsy confirms the diagnosis of MCC, further imaging studies will be needed to assess the extent of the disease. This might include ultrasound of the regional lymph nodes, a computed tomography (CT) scan, a positron emission tomography (PET) scan, or a magnetic resonance imaging (MRI) scan</p> <p><i>Sentinel lymph node biopsy or lymph node dissection:</i> This might be done to check for metastasis if the imaging suggests that the cancer has spread to the lymph nodes</p> <p><i>Laboratory tests:</i> Blood tests may be performed to assess the patient's overall health status and to help evaluate whether the patient is fit for treatment</p> <p>The choice of further management and treatment would depend on the stage of the disease at diagnosis and the overall health of the patient. Treatment options could include surgery, radiation therapy, and/or chemotherapy. In recent years, immunotherapy has also become an important part of the treatment for advanced MCC</p> <p>It's important to have a multidisciplinary team, including dermatologists, oncologists, and surgeons, to guide the patient through diagnosis, treatment, and follow-up care</p>	
<p><i>Dermatologist consensus</i></p>		

The workup mentioned does differ from current clinical practice in a few important details, including deviation from NCCN guidelines. IHC is usually performed as panel of markers to rule out other tumor mimics. For example, TTF1 (negative in MCC) is performed to rule out small cell lung cancer metastasis to skin. NCCN guidelines do recommend imaging patients diagnoses with MCC; the most sensitive imaging modality is whole-body PET/CT. The section on SLNB/LND is incorrect. SLNB is usually performed even if imaging does not find LN involvement. LND is typically performed when after a positive SLNB. As for laboratory tests, per NCCN, quantitation of serum *Merkel cell polyomavirus* oncoprotein antibodies may be considered as part of the initial workup. Chemotherapy was mentioned as a possible treatment option. A greater emphasis on immunotherapy (over chemotherapy) for the treatment of metastatic MCC would have been more accurate and in keeping with NCCN

10. Eczema (pediatric)

A 2-year-old girl with no significant past medical history was recently brought into the clinic today by her mother due to concern of a rash which has appeared on the extensor surfaces of her elbows and knees for the last week. She states that her child has experienced similar rashes in the past that resolve on their own and that she notices her child rubbing on them multiple times of the day. On examination, the lesions appear as dry, scaly plaques with an erythematous base

<p><i>What are the top five differential diagnoses in order by most likely?</i></p>	<p>Based on the clinical presentation and the age of the child, here are the top five potential diagnoses in order of likelihood:</p> <p><i>Atopic dermatitis (eczema):</i> This is the most likely diagnosis. Atopic dermatitis is a common condition in young children that typically presents as dry, itchy, and erythematous skin. The lesions can present as plaques and are often located on the extensor surfaces of the limbs. The history of similar episodes that resolved on their own also suggests this diagnosis</p> <p><i>Psoriasis:</i> This condition is characterized by thick, red skin with flaky, silver-white scales. It can occur at any age and can appear on the extensor surfaces of the limbs. However, it's less common in children, especially under 10 years old, but still possible</p> <p><i>Contact dermatitis:</i> This is an allergic or irritant reaction that causes a skin inflammation. It's usually associated with a known exposure to a potential irritant or allergen, such as a new soap or detergent, which may not be clearly identified in this case</p> <p><i>Seborrheic dermatitis:</i> Although more commonly seen in infants as "cradle cap", it can affect any age. It's characterized by red, scaly, and greasy plaques. However, it more typically affects the scalp, face, and flexural areas rather than the extensor surfaces</p> <p><i>Lichen planus:</i> Lichen Planus can present as flat-topped, shiny, violaceous papules and plaques. However, this condition is extremely rare in children and usually doesn't appear until middle age. The only reason it's in the differential is the mention of plaques</p> <p>Remember, these diagnoses are based on the provided symptoms and the typical presentation of common skin conditions. The exact diagnosis should be confirmed by a qualified healthcare provider through additional diagnostic methods and potential referral to a dermatologist may be needed</p>	<ol style="list-style-type: none"> 1. Eczema 2. Psoriasis 3. Viral exanthem 4. Pityriasis rubra pilaris
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Dermatologist consensus

ChatGPT has a good differential diagnosis for this vignette. Eczema can be present on either the flexural or extensor surface, with the extensor surfaces more typical in psoriasis. Pediatric eczema, in the anatomic locations mentioned in the vignette, is much more common than the other conditions listed. One could place lichen planus above seborrheic dermatitis due to location, but seborrheic dermatitis is much more common, including in children

<p><i>How would you work up atopic dermatitis in this case?</i></p>	<p>Atopic dermatitis (AD) is often diagnosed based on clinical presentation and history. There is no single test that can confirm AD, but here are some steps you could take:</p> <p><i>Complete history:</i> A thorough history is essential to make the diagnosis. The recurrent nature of the rash, its typical distribution on the body (in children, it often appears on the face, and the extensor surfaces of the arms and legs), associated pruritus, and chronic or relapsing course are all suggestive of AD. It's also important to inquire about family history of atopic diseases like AD, asthma, and allergic rhinitis, as they tend to run in families. Furthermore, ask about possible triggers, including environmental factors (e.g., irritants, allergens), emotional factors (stress), and physical factors (e.g., heat, sweating)</p>
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Physical examination: On examination, note the location and characteristics of the lesions. In AD, the skin may show erythematous, scaly patches or plaques, which can be dry. Chronic scratching may lead to lichenification (thickening of the skin with visible skin lines)

Skin prick testing or specific IgE testing: If there is a strong suspicion of a food or environmental allergen that might be contributing to AD flares, allergy testing could be considered. However, food allergies are typically only responsible for about 10% of AD cases and testing is often not necessary. These tests should be performed under the guidance of an allergist

Skin swab or culture: If the skin shows signs of secondary infection (weeping, crusting, pustules), a skin swab and culture can help identify the responsible bacteria, which is usually *Staphylococcus aureus*

Patch testing: In selected cases, if contact dermatitis is suspected as a contributing factor, patch testing may be done

Once diagnosed, management usually consists of skin hydration (using emollients), avoiding triggers, and topical anti-inflammatory medications like corticosteroids or calcineurin inhibitors. Severe cases might require systemic therapies. Consultation with a dermatologist can be helpful in complex or refractory cases

Dermatologist consensus

The work up seems very appropriate and consistent with a standard work up. Work up for pediatric eczema is based upon history, including inquiring about exacerbating factors, and physical examination. Family history of other atopic diseases are an important piece of information. Skin prick testing and patch testing may be done, but with a 2-year-old with mild eczema would not typically have been recommended. With extensive crusting and scaling, a skin swab for bacteria would be considered an important piece of information for treatment, but not necessarily for this patient

AD, atopic dermatitis; AK, actinic keratosis; BCC, basal cell carcinoma; CBC, complete blood count; CCP, cyclic citrullinated peptide; CRP, C reactive protein; CT, computed tomography; CTCL, cutaneous T cell lymphoma; ESR, erythrocyte sedimentation rate; FTA-ABS, fluorescent treponemal antibody absorption test; HIV, human immunodeficiency virus; IHC, immunohistochemistry; KA, keratoacanthoma; LND, lymph node dissection; MCC, Merkel cell carcinoma; NCCN, National Comprehensive Cancer Network; PET, positron emission tomography; RF, rheumatoid factor; RPR, rapid plasma reagin; SLE, systemic lupus erythematosus; SLNB, sentinel lymph node biopsy; STI, sexually transmitted infection.