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Diagnosing Dermatological Conditions in the Non-caucasian Population

Mackenzie M. Mellum
Bethel University

Candace Joyce Nysted
Bethel University

Kassidy E. Westrom
Bethel University

DIAGNOSING DERMATOLOGICAL CONDITIONS IN THE NON-CAUCASIAN POPULATION

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BY

MACKENZIE MELLUM, PA-S

CANDACE NYSTED, PA-S

KASSIDY WESTROM, PA-S

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Abstract

There is currently a lack of resources available on dermatological conditions in the non-Caucasian population; therefore, additional educational materials are needed to supplement the education of healthcare professionals (Ebede & Papier, 2006). The researchers created an educational module with common dermatological conditions, the presentation of various dermatological conditions, and descriptive pictures of how each condition presents in the non-Caucasian population to use as a supplement to the current dermatology modules that are used throughout various health and social science programs at Bethel University in Arden Hills, MN. The topics of the module include basal cell carcinoma, squamous cell carcinoma, melanoma, acne vulgaris, acne keloidalis, lichen planus, psoriasis, atopic dermatitis, keloid scarring, Mongolian blue spots, tinea capitis, and tinea versicolor. The module was created by researching medical articles that discussed these common dermatological conditions; however, there was a lack of creditable resources, and the sources that were found lacked pictures with descriptions of how the conditions present. Continued efforts may be necessary for expansion of this module in the future, which can be accomplished by adding additional dermatological conditions through continued research, expanding to various healthcare professionals, and updating the module as more resources become available.

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Chapter 1: Introduction

Introduction

More than forty percent of the United States population is represented by non-Caucasian individuals, yet adequate medical information needed to properly care for this population is severely limited (Gorgos, 2006; U.S. Department of Commerce, 2019). Dermatological conditions are common across all populations, and they can negatively impact individuals in various ways by causing physical health complications, increased morbidity, and emotional distress (Narayan, 2017). Information regarding how to recognize dermatological conditions in non-Caucasian individuals is significantly lacking for healthcare professionals (Ebede & Papier, 2006). Non-Caucasian individuals require specialized care in order to achieve better health outcomes due to the uniqueness of their skin type (Gorgos, 2006). Chapter one contains the purpose and importance of the research project, limitations to the research conducted, and definitions of the terminology used throughout the research project.

Problem Statement and Purpose

Due to the lack of resources available regarding the presentation of skin conditions on non-Caucasian skin types, educational materials are needed to educate future healthcare professionals on the importance of identifying skin conditions in all individuals. The resources presented in this module are aimed to enhance education on non-Caucasian dermatological conditions, improve education equality, and correct healthcare disparities. Healthcare professionals educated on dermatological conditions must have an equal emphasis on all skin tones in order to be able to make an accurate diagnosis and treat all patients from all backgrounds. Additionally, this module is aimed to diminish the racial discrimination seen in present-day healthcare (Ebede & Papier, 2006).

Limitations

During the creation of this module, there were limitations and delimitations that impacted the way that the research project was conducted (see Appendix A). A major limitation was the lack of adequate resources currently available on the presentation of dermatological conditions in non-Caucasian patients to create the content for the module. An additional limitation was the current dermatological diagnostic practices for non-Caucasian patients, which are limited by dermatological scales. Numerous dermatological diagnostic scales rely on the presentation of erythema, which is not as easily recognized in non-Caucasian skin types. In addition to the limitations encountered throughout the creation of this project, there were biases such as expectation bias, which was shown through the researcher's expectation of a lack of resources available on this topic. Also, there was inclusion bias within the resources used due to the underrepresentation of the non-Caucasian population. Delimitations to this project include only making the module available to Bethel University, only researching a limited number of conditions, and a narrow time frame to fully conduct the research.

Research Definitions

Acne vulgaris "A chronic acne involving mainly the face, chest, and shoulders that is common in adolescent humans and various domestic animals and is characterized by the intermittent formation of discrete papular or pustular lesions often resulting in considerable scarring." ("Dictionary by Merriam-Webster," n.d.).

Actinic keratosis. "A rough, scaly, pink or white growth that occur on the surface of the skin in areas frequently exposed to sunlight and that may develop into squamous cell carcinoma." ("Dictionary by Merriam-Webster," n.d.).

Alopecia. "Loss of hair." ("Dictionary by Merriam-Webster," n.d.).

Caucasian. “Of or relating to a group of people having European ancestry, classified according to physical traits (such as light skin pigmentation), and formerly considered to constitute a race of humans.” (“Dictionary by Merriam-Webster,” n.d.).

Cutaneous lupus erythematosus. “A chronic, inflammatory, variable autoimmune disease of connective tissue that occurs chiefly in women and is typically characterized by fever, skin rash, fatigue, and joint pain and often by disorders of the blood, kidneys, heart, lungs, and brain (such as hemolytic anemia, nephritis, pleurisy, pericarditis, cognitive dysfunction, or meningitis).” (“Dictionary by Merriam-Webster,” n.d.).

Dennie morgan lines. “A fold under the eye is seen in association with atopic disease.” (Patel et al., 2011).

Discoid lupus erythematosus. “Characterized by persistent scaly, disk-like plaques on scalp, face and ears that may cause pigmentary changes, scarring and hair loss.” (“Discoid lupus erythematosus,” n.d.).

Lichenification. “The process by which skin becomes hardened and leathery or lichenoid usually as a result of chronic irritation.” (“Dictionary by Merriam-Webster,” n.d.).

Lichen planus. “A skin disease characterized by an eruption of wide flat papules covered by a horny glazed film, marked by intense itching, and often accompanied by lesions on the oral mucosa.” (“Dictionary by Merriam-Webster,” n.d.).

Morpheaform. “Localized scleroderma.” (“Dictionary by Merriam-Webster,” n.d.).

Nevi. Moles. (Russell & Ryan Jr., 2019).

Nevus sebaceous. “An uncommon type of birthmark that consists of overgrown epidermis, sebaceous glands, hair follicles, apocrine glands, and connective tissue.” (“Sebaceous naevus,” n.d.).

Nodule. “A solid skin lesion greater than 1 cm that may or may not be raised above the surface of the adjacent skin but might have more depth.” (Russell & Ryan Jr., 2019, p. 4).

Non-Caucasian. “A person who is not a member of the white race; a person who does not have the light-colored skin of people whose ancestors were European.” (“Dictionary by Merriam-Webster,” n.d.).

Papule. “A small solid usually conical elevation of the skin.” (“Dictionary by Merriam-Webster,” n.d.).

Prurigo nodularis. “Prurigo nodularis (PN) usually presents as multiple, intensely pruritic (itchy), excoriated nodules erupting on the extensor surfaces of the limbs secondary to itching or rubbing, and the etiology remains unknown.” (Prurigo Nodularis: Background, Pathophysiology, Etiology of Prurigo Nodularis, 2020).

Sarcoidosis. “A chronic disease of unknown cause that is characterized by the formation of nodules especially in the lymph nodes, lungs, bones, and skin.” (“Dictionary by Merriam-Webster,” n.d.).

Seborrheic keratoses. “A benign hyperkeratotic tumor that occurs singly or in clusters on the surface of the skin, is usually light to dark brown or black in color, and typically has a warty texture often with a waxy appearance.” (“Dictionary by Merriam-Webster,” n.d.).

Subungual. “Situated or occurring under a fingernail or toenail.” (“Dictionary by Merriam-Webster,” n.d.).

Telangiectasias. “An abnormal dilation of red, blue, or purple superficial capillaries, arterioles, or venules typically localized just below the skin’s surface.” (“Dictionary by Merriam-Webster,” n.d.).

Ulcer. “A loss of dermis and epidermis that will heal with some scarring.” (Russell & Ryan Jr., 2019, p. 5).

Wood’s lamp. “A lamp for producing ultraviolet radiation in which a filter made of nickel-containing glass is used to block all light having a wavelength above 365 nanometers and which is used especially to detect various skin conditions (as some fungus infections) by the fluorescence induced in the affected areas by ultraviolet radiation.” (“Dictionary by Merriam-Webster,” n.d.).

Xeroderma pigmentosum. “A genetic disorder inherited as a recessive autosomal trait that is caused by a defect in mechanism that repair DNA mutations (such as those caused by ultraviolet light) and is characterized by the development of pigment abnormalities and multiple skin cancers in areas exposed to the sun.” (“Dictionary by Merriam-Webster,” n.d.).

Xerosis. “Abnormal dryness of a body part or tissue (as the skin or conjunctiva).” (“Dictionary by Merriam-Webster,” n.d.).

Conclusion

Dermatological conditions are prevalent throughout all populations, and it is important for healthcare professionals to be able to effectively diagnose these conditions in all individuals. Additional resources need to be created and made available to healthcare educational programs in order to bridge the gap that is seen in properly treating all individuals regardless of race. This module aims to accomplish the goal of creating an easily accessible educational tool to provide information on the diagnosis of non-Caucasian dermatological conditions in order to improve morbidity and mortality for this population (see Appendix A). Certain dermatological conditions present with varying characteristics that can be differentiated between Caucasian and non-Caucasian individuals, which will be addressed in this module. Chapter two will present the

literature review of the dermatological conditions selected for this research project including basal cell carcinoma, squamous cell carcinoma, melanoma, acne vulgaris, acne keloidalis, lichen planus, psoriasis, atopic dermatitis, keloid scarring, Mongolian blue spots, tinea capitis, and tinea versicolor.

Chapter 2: Literature Review

Introduction

Dermatological conditions are assessed and diagnosed through a variety of techniques depending on provider preference (Narayan, 2017). Current guidelines and resources provide information on how to efficiently recognize and treat dermatological conditions in Caucasian populations; however, there is a significant lack of information that discusses how to properly do so in non-Caucasian populations (Narayan, 2017). Overall, the information currently available on how to assess skin conditions in non-Caucasian individuals including photographic comparisons is inadequate (Ebede & Papier, 2006). In order to improve current practices, additional resources need to be created and made available to increase the knowledge that healthcare professionals have to ensure all patient populations are treated with exemplary standards of care (Ebede & Papier, 2006). Various dermatological conditions present differently based on skin tone including basal cell carcinoma, squamous cell carcinoma, melanoma, acne vulgaris, acne keloidalis, lichen planus, psoriasis, atopic dermatitis, keloid scarring, Mongolian blue spots, tinea capitis, and tinea versicolor.

Cancer

Basal Cell Carcinoma

Nonmelanoma skin cancers are less common in non-Caucasian individuals than Caucasian individuals, but non-Caucasian individuals experience higher incidence of morbidity and mortality with these conditions (Love & Kundu, 2015). Dermatological malignancies oftentimes go undiagnosed and untreated for extended periods of time in non-Caucasian individuals because of the lower index of suspicion that these conditions will arise in this population (Love & Kundu, 2015). Basal cell carcinoma (BCC) is currently the most common

form of skin cancer across all populations combined and the second most common form in individuals of African descent (Love & Kundu, 2015; Russell & Ryan Jr., 2019).

The largest risk factor for developing BCC is ultraviolet radiation (UVR) exposure. Because darker pigmented skin tones have more natural protection from UVR, BCC is oftentimes missed or overlooked (Love & Kundu, 2015). Basal cell carcinoma is also seen more often in individuals over 50 years old because of the UVR exposure that has accumulated over time (Love & Kundu, 2015). Additional risk factors for developing BCC in non-Caucasian individuals include various scarring processes, ulcers, chronic infections, immunosuppression, previous radiation treatment, and trauma (Love & Kundu, 2015). "The head and neck region are the most common location of BCCs in all ethnicities" (Love & Kundu, 2015, p. 82).

The most common form of BCC seen in non-Caucasian individuals is nodular, which "usually presents as a round, pearly, flesh-colored papule with telangiectasias, infiltrative, micronodular, morpheaform, and superficial" (Love & Kundu, 2015, p. 83). One major difference in the presentation of BCC between Caucasian and non-Caucasian individuals is the presence of pigmentation (Love & Kundu, 2015). Over half of BCC tumors present with pigmentation on non-Caucasian individuals; whereas, only 5% of BCC tumors present with pigmentation on Caucasian individuals (Love & Kundu, 2015). The pigmentation that is noted in non-Caucasian individuals is typically brown or black with the same pearly appearance that appears across all populations (Love & Kundu, 2015).

Due to the clinical manifestations and characteristics of BCC, it is often misdiagnosed as seborrheic keratoses, malignant melanoma, or nevus sebaceous in non-Caucasian individuals (Love & Kundu, 2015; Zhu et al., 2018). The reason BCC may be missed in non-Caucasian individuals is because telangiectasia and the pearly, rolled border of the papule is oftentimes hard

to identify in this population (Love & Kundu, 2015). Whenever a papule appears suspicious in any population, it is important to investigate further and get a biopsy of the tissue to obtain a correct diagnosis (Love & Kundu, 2015; Russell & Ryan Jr., 2019). Non-Caucasian individuals also need to be educated on the importance of proper UVR exposure prevention due to the misconception that they are at less of a risk from developing various skin cancers (Gupta et al., 2016).

Squamous Cell Carcinoma

Squamous cell carcinoma (SCC) is the leading cause of skin cancer in individuals of both Indian-Asian and African descent (Love & Kundu, 2015; Russell & Ryan Jr., 2019). Ultraviolet radiation exposure is the most common risk factor for SCC (Love & Kundu, 2015). Other risk factors for SCC in non-Caucasian individuals include various genetic disorders, radiation exposure, xeroderma pigmentosum, arsenic exposure, previous human papillomavirus (HPV) exposure, and individuals with chronically diseased skin (Love & Kundu, 2015). The most common risk factors for SCC seen in the African American population are individuals who have chronic scarring processes and chronic inflammation occurring such as with chronic discoid lupus erythematosus (Bradford, 2009; Love & Kundu, 2015).

Squamous cell carcinoma often presents as “solitary, firm erythematous papules with central ulceration arising from an indurated, rounded, and elevated base” (Love & Kundu, 2015, p. 93). Squamous cell carcinoma can also present as “pruritic or painful non healing wounds that bleed” (Love & Kundu, 2015, p. 93). Numerous precancerous lesions can develop into SCC, with actinic keratosis being the leading culprit (Love & Kundu, 2015; Russell & Ryan Jr., 2019). SCC that is considered invasive most commonly presents on the head, neck, and trunk (Love & Kundu, 2015). Because SCC oftentimes goes unnoticed or misdiagnosed, it is important to

recognize that if a lesion is not healing and has been present for an extended period of time, it should be biopsied (Love & Kundu, 2015).

Squamous cell carcinoma presents in Caucasian populations in areas of high UVR exposure, which is a significant difference in presentation with non-Caucasian individuals in which SCC presents in areas less prone to UVR exposure (Bradford, 2009; Love & Kundu, 2015). Albeit the head, neck, and trunk are the most common areas SCC presents in all populations, non-Caucasian individuals also have high rates of SCC presentations on the lower extremities (Love & Kundu, 2015). It is important to perform a thorough dermatological examination of all areas of the skin to ensure proper diagnosis and further treatment plans are developed (Love & Kundu, 2015).

Melanoma

Melanoma is the most fatal form of skin cancer and the third most common skin cancer across all populations combined (Love & Kundu, 2015). Melanoma is much more commonly seen in Caucasians than in non-Caucasians, but it is associated with poorer prognosis in non-Caucasian individuals including high rates of mortality (Gorgos, 2004; Love & Kundu, 2015). The risk factors for melanoma vary among populations with UVR exposure being a significant risk factor for Caucasians but not significant in non-Caucasians (Love & Kundu, 2015). Risk factors for melanoma in non-Caucasian individuals include individuals with dysplastic nevi, freckles, and family history of melanoma (Gorgos, 2004; Love & Kundu, 2015).

The clinical presentation of melanoma typically manifests as an asymmetric, ill-defined, dark brown or black patch that is greater than six millimeters in diameter (Love & Kundu, 2015). Melanoma pathologically presents in four different forms, and superficial spreading is the most common across all populations (Love & Kundu, 2015; Russell & Ryan Jr., 2019; Wu et al.,

2011). Acral lentiginous melanoma (ALM) is another form and accounts for the highest incidence of melanoma in the African American population (Love & Kundu, 2015; Russell & Ryan Jr., 2019; Wu et al., 2011). Superficial spreading melanoma is commonly seen on the trunk and proximal extremities; whereas, ALM is more commonly seen on the palms of the hands and soles of the feet (Russell & Ryan Jr., 2019; Wu et al., 2011). Superficial spreading melanoma typically presents as a larger than 8 mm patch with irregular, asymmetric borders that is variable in color (Wu et al., 2011). Acral lentiginous melanoma presents with similar characteristics as superficial spreading melanoma, but the anatomical location of the lesions is key in differentiating between them (Wu et al., 2011). A majority of African Americans have nevi, which is thought to be related to the increased prevalence of ALM in this population (Love & Kundu, 2015).

Melanoma typically presents in Caucasians in areas that have higher UVR exposure; whereas, it is more commonly seen in non-Caucasian skin types on the palmar and plantar surfaces of the hands and feet and subungual area (Bradford, 2009; Love & Kundu, 2015). Subungual melanoma (SM) in people of color often presents with "a pigmented band on the nail with width greater than 3 mm (Hutchinson's sign), variable pigment, rapid increase in size, and the presence of solitary lesions" (Love & Kundu, 2015, p. 104). Subungual melanoma is also more commonly diagnosed on the fingers than the toes (Zhu et al., 2018). The reasoning behind why the plantar surfaces are impacted more in the non-Caucasian population is linked to the higher friction amount and trauma induced in this area combined with the increased concentration of melanocytes, but this reasoning is not fully supported (Love & Kundu, 2015).

More research is needed to determine why the mortality and morbidity rate for melanoma is elevated in non-Caucasian individuals (Gorgos, 2004). Suspicious lesions need to be evaluated

in all populations and providers need to be aware of the higher incidence of melanoma occurring in various locations of the body to ensure thorough evaluations are performed for all individuals (Russell & Ryan Jr., 2019). Providers can play a crucial role in preventing skin cancer and diagnosing skin cancer at earlier stages by properly educating their patients on the risks of developing skin cancer and by remaining aware of the various presentations seen in each type of skin cancer (Gupta et al., 2016).

Acne

Acne Vulgaris

Acne is prevalent in all persons, regardless of skin color; however, acne vulgaris is becoming more prevalent amongst the non-Caucasian population (Yin et al., 2014). The location of acne cysts, the clinical presentation, and consideration of ethnicity makes up the main diagnosing strategy for acne (Love & Kundu, 2016). In addition, acne vulgaris presents with greater signs and symptoms in non-Caucasian individuals (Love & Kundu, 2016). Acne vulgaris is evident in the non-Caucasian population specifically due to their skin type, which often involves genetically enlarged pores and an increased inflammatory response (Love & Kundu, 2016; Yin et al., 2014).

The etiology of acne vulgaris is hyperkeratinization of skin in the glands, enlargement of glands, the amount of sebum production, and hormone changes (Love & Kundu, 2016). The hyperkeratinization causes the pores to be clogged which leads to cyst formation (Love & Kundu, 2016). In addition, *Propionibacterium acne* colonizes within glands, and when in contact with the overactive sebum production, inflammation occurs (Yin et al., 2014). The etiology is shared amongst all individuals; however, the degree to which it affects each individual depends

on the amount of inflammation, recurrence rates, and presentation of the cysts (Love & Kundu, 2016).

Acne vulgaris presents as cysts or papules that are open or closed (Love & Kundu, 2016). The cysts are located on the face, jawline, chest, or the upper back (Love & Kundu, 2016). The prevalence of cyst formation can range from mild with a few papules to severe with nodules and a fever (Yin et al., 2014). In particular to the non-Caucasian population, acne vulgaris can present more similar to scar tissue versus a cyst, which makes diagnosing upon physical exam more difficult (Love & Kundu, 2016; Yin et al., 2014). The scarring and hyperpigmentation is known as postinflammatory hyperpigmentation (PIH) (Love & Kundu, 2016).

In addition, PIH is one of the most important factors and physical findings within the non-Caucasian population due to acne vulgaris (Yin et al., 2014). The presentation of PIH are scars that occur before or after the cysts are physically present (Love & Kundu, 2016; Yin et al., 2014). The scarring can occur with or without the presence of inflammation and this is commonly seen in non-Caucasian individuals due to their skin type and histological differences compared to Caucasians (Yin et al., 2014). In addition, PIH is common in non-Caucasian individuals due to the specific treatment used or the body's response to the cysts (Love & Kundu, 2016). The body's immune response to the cysts causes scarring and is common in non-Caucasian individuals because of the histology of their skin type (Love & Kundu, 2016). The body's immune responses to the cysts cause collagen overproduction and eventually scarring, which is why non-Caucasians are seeking more dermatological attention and specific diagnosing and treatment options to prevent PIH (Love & Kundu, 2016; Yin et al., 2014).

The diagnosis for acne vulgaris is clinical; however, understanding that the clinical presentation differs amongst skin types and ethnicity is important to ensure PIH is treated in an efficient manner for non-Caucasian individuals (Love & Kundu, 2016).

Acne Keloidalis

Acne keloidalis is a dermatological condition most commonly seen in post-pubertal African American males (Love & Kundu, 2016). Acne keloidalis is defined as benign erythematous/brown, pruritic lesions that are located within the hairline and occipital region (Love & Kundu, 2016). The etiology is unknown, possibly genetic, irritation, or due to the structure of coiled hair in non-Caucasian individuals (Love & Kundu, 2016).

Acne keloidalis presents as papules that are about 2-4 mm on the posterior scalp and neck that are erythematous, brown, and pruritic, and can develop into nodules over time (Love & Kundu, 2016). Acne keloidalis can also present as scar tissue and is very common amongst the non-Caucasian population (Yin et al., 2014). The physical findings of early stage acne keloidalis is that the individuals are asymptomatic and have papules on the back of the neck and hairline (Love & Kundu, 2016). As the stages progress, the pruritis becomes worse and the papules become more inflamed with some pain association (Love & Kundu, 2016). The papules may become infected due to a secondary bacterial infection, and the papules would then have purulent drainage (Love & Kundu, 2016). The clinical findings are common across all populations; however, the stages progressively worsen as they go undiagnosed (Love & Kundu, 2016).

Acne keloidalis is oftentimes considered more significant than just a typical acne cyst. Acne keloidalis may lead to poor quality of life in the non-Caucasian population due to the formation of scar tissue that is untreatable (Yin et al., 2014). Therefore, understanding how to

properly diagnose acne keloidalis and knowing the most effective treatment for the non-Caucasian population will lead to better patient outcomes.

Autoimmune Conditions

Lichen Planus

Lichen planus is an autoimmune inflammatory skin condition that can present similarly to other dermatological conditions making it difficult to diagnose (Orfanos et al., 2018). It is thought that lichen planus is caused by an inflammatory reaction to an allergen in the environment, other contact allergens, or most commonly idiopathic (Love & Kundu, 2016; Orfanos et al., 2018). Lichen planus can present within mucous membranes and on the skin (Orfanos et al., 2018). In the African population, lichen planus, in particular mucosal lichen planus, is often associated with Hepatitis C (Love & Kundu, 2016; Orfanos et al., 2018). There are subtypes to lichen planus and it presents similarly to other dermatological conditions, which makes for a difficult diagnosis (Love & Kundu, 2016; Orfanos et al., 2018).

Oral lichen planus and cutaneous lichen planus are an autoimmune inflammatory response to an idiopathic event that causes an infiltrate of lymphocytes in the subepithelial layer, resulting in a clinical presentation of cutaneous papules (Yoshida et al., 2020). Cutaneous lichen planus presents as flat, dark purple or grey/blue, pruritic papules that are located commonly in skin folds such as the antecubital fossa, genitalia, and wrists (Love & Kundu, 2016). The papules are often symmetrically arranged and can present on the extremities or in areas of high friction (Orfanos et al., 2018). In addition, lichen planus can present on the soles of the feet and palms of the hands, and are more pruritic and scaly than on the extremities (Orfanos et al., 2018). Also, the papules are waxy and have grey streaks called Wickham Striae (Love & Kundu, 2016). In the non-Caucasian population, the papules may be more hyperpigmented due to higher melanin

levels (Orfanos et al., 2018). Due to the multiple subtypes of lichen planus, the cutaneous papules can present at different spots on the body depending on the ethnicity of the patient (Love & Kundu, 2016).

In addition, plaques can present on the mucosa. In the mucosa, lichen planus presents with white striae and an erythematous patch (Love & Kundu, 2016). Oral lichen planus presents with painful white patches on the buccal mucosa, tongue, or gingiva (Love & Kundu, 2016). It is important to note that the oral patches look similar to leukoplakia in the non-Caucasian population and can be a sign of pre-malignancy (Love & Kundu, 2016; Orfanos et al., 2018). In addition, an individual may present with either oral lichen planus, cutaneous lichen planus, or both (Orfanos et al., 2018).

The diagnosis of lichen planus can be difficult due to the colored papules found in the non-Caucasian skin type (Zhu et al., 2018). When considering diagnosing a patient with lichen planus, the time frame of when the papules first appeared is important. Oral lichen planus can last for five years or be chronic (Love & Kundu, 2016; Yoshida et al., 2020). Oral lichen planus presents longer than cutaneous lichen planus and cutaneous lichen planus can last for eighteen months or less, or on average about one to two years (Love & Kundu, 2016; Yoshida et al., 2020). Cutaneous lichen planus can result in PIH, which occurs commonly in non-Caucasian individuals, and can scar with treatment (Love & Kundu, 2016). The cutaneous papules present on skin as the initial dark purple color; however, in non-Caucasian population the papules may change overtime to be hypopigmented (Orfanos et al., 2018).

The different clinical presentations and subtypes can make it difficult to properly diagnose lichen planus in the non-Caucasian population (Love & Kundu, 2016). Hypopigmented

papules and the possibility of developing PIH in the non-Caucasian population may make the clinical presentation of lichen planus different than in Caucasians (Kaufman et al., 2018).

Psoriasis

Psoriasis is an immune mediated skin and joint disorder that is characterized by chronic inflammation (Boehncke & Schön, 2015). The clinical presentation of psoriasis may appear different across various races, which attributes to diagnostic difficulties (Alexis & Blackcloud, 2014). Non-Caucasian individuals with psoriasis have overlapping clinical presentations with other papulosquamous disorders of the skin (Alexis & Blackcloud, 2014). It is important to detect psoriasis in early stages, to prevent disease progression and irreversible joint damage for patients with the development of psoriatic arthritis (Mease & Armstrong, 2014). It is reported that up to forty percent of patients will develop psoriatic arthritis within five to ten years of cutaneous onset (Mease & Armstrong, 2014).

The clinical presentation of psoriasis for Caucasian and African Americans lies on a spectrum that ranges from almost identical to distinctive (Alexis & Blackcloud, 2014). Clinical presentations such as erythema and pigment changes can differ along with severity and disease distribution (Alexis & Blackcloud, 2014). Subtle unique clinical features may need to be identified to diagnose psoriasis in a non-Caucasian patient (Alexis & Blackcloud, 2014).

Psoriasis in non-Cacasian individuals will likely present with less conspicuous erythema and appear more hyperpigmented or violet colored (Alexis & Blackcloud, 2014). After inflammation, areas of the skin may appear hypopigmented with lighter colored patches (Alexis & Blackcloud, 2014). Hypertonic type lichen planus and cutaneous lupus erythematosus may be differential diagnosis for psoriasis as the clinical features overlap (Alexis & Blackcloud, 2014).

Psoriasis is often misdiagnosed, and the diagnosis of psoriatic arthritis is further complicated by a waxing and waning course (Mease & Armstrong, 2014).

African Americans with psoriasis may tend to present with more extensive disease involvement (Alexis & Blackcloud, 2014). It is reported that African American patients present with three to ten percent of body surface area affected by psoriasis, compared to only one to two percent body surface area for Caucasian patients (Alexis & Blackcloud, 2014). Hispanic and Asian patients are reported to have the most body surface area of psoriasis involvement compared to African American and Caucasian patients at baseline (Alexis & Blackcloud, 2014). The observed difference at baseline across various races may be attributed to racial discrepancies in access to healthcare (Alexis & Blackcloud, 2014).

A common concern for non-Cacasian individuals with psoriasis is dyspigmentation that results in lighter or darker patches of skin after periods of inflammation (Alexis & Blackcloud, 2014). Psoriasis is frequently assessed with a Psoriasis Area and Severity Index (PASI) score, which uses erythema, induration, scaling, and body surface area as clinical indicators (Carlin et al., 2004). There is a discrepancy in the PASI score for patients of color, because they typically do not present with red-pink erythema like Caucasian patients (Alexis & Blackcloud, 2014). Psoriasis is commonly described as well-defined erythematous plaques with overlying scales (Choi et al., 2018). Non-Cacasian individuals would most likely present with darker brown or violaceous hues rather than redness (Alexis & Blackcloud, 2014).

Further diagnostic difficulties arise for patients with heavily pigmented skin classified as Fitzpatrick skin type VI (Alexis & Blackcloud, 2014). Psoriasis in these patients may have a clinical appearance that overlaps with sarcoidosis, cutaneous lupus, and hypertrophic type lichen planus (Alexis & Blackcloud, 2014). Due to clinical mimickers, a skin biopsy may be indicated

for a proper diagnosis (Alexis & Blackcloud, 2014). Additional clinical findings to confirm the diagnosis of psoriasis include nail changes and distinguishable scaly plaques located at the anatomical areas of the scalp, trunk, buttocks, and extremities (Choi et al., 2018).

Inflammatory Conditions

Atopic Dermatitis

Atopic dermatitis is a common chronic inflammatory skin condition that has a higher prevalence among African American and Asian populations when compared to Caucasian populations (Kaufman et al., 2018). This noncontagious condition typically presents in early childhood or infancy (Sidbury et al., 2014). It is reported that African American children are 1.7 times more likely to develop atopic dermatitis when compared to Caucasian children (Kaufman et al., 2018).

Pacific Islander and Asian patients are seven times more likely to be diagnosed with atopic dermatitis compared to Caucasian patients (Kaufman, et al., 2018). Asian patients with atopic dermatitis are more likely to present with more epidermal hyperplasia and parakeratosis compared to Caucasian patients (Kaufman et al., 2018). The physical presentation of atopic dermatitis may appear different for various ethnic groups (Kaufman et al., 2018). The routinely taught clinical presentation of atopic dermatitis is pruritic erythematous plaques containing thin overlapping scales on the face, neck, and flexor surfaces of the body (Sidbury et al., 2014).

In addition to a higher prevalence, Asian individuals tend to present with more well-defined boundaries, lichenification, and scaling than Caucasian individuals (Kaufman et al., 2018). A prominent feature for African American patients is a higher likelihood for extensor involvement rather than the development of flexural dermatitis (Kaufman et al., 2018). It is more

common for non-Cacasian individuals to present with distributed papules and perifollicular accentuation on the trunk and extensors of the body (Kaufman et al., 2018).

In current dermatological practice, the common scoring systems of the Nottingham Eczema Severity Score (NESS), Eczema Severity Index (EASI), Scoring atopic dermatitis scale (SCORAD) the Six Area, Six Sign, Atopic Dermatitis Score (SASSAD) impede the diagnosis of atopic dermatitis for non-Caucasian individuals because they rely on the clinical finding of erythema (Sidbury et al., 2014). Non-Caucasian patients may present with a classic distribution and lesion morphology of atopic dermatitis and still be misdiagnosed due to the lack of information regarding how to recognize dermatological conditions in the non-Caucasian population (Ebede & Papier, 2006; Kaufman et al., 2018). Current diagnostic criteria may include the associated features of facial pallor and delayed blanch response, which is less likely to be recognized in non-Cacasian individuals (Sidbury et al., 2014). Non-Caucasian patients are likely to present with a more violaceous color instead of erythema (Kaufman et al., 2018).

The presence of skin warmth or edema may help providers detect underlying erythema in patients with darker skin tones (Kaufman et al., 2018). Additional clinical indicators for non-Cacasian individuals include pityriasis alba, xerosis, periauricular lesions, and hyperlinearity of the palms (Sidbury et al., 2014). African American patients are also more likely to present with darkened periorbital circles, prurigo nodularis, and lichenification compared to Caucasian patients (Kaufman et al., 2018).

Populations with darker skin are at an increased risk for developing post inflammatory dyspigmentation (Kaufman et al., 2018). Hypopigmented skin in non-Cacasian individuals may appear more prominent due to the contrast in skin tones (Kaufman et al., 2018). The skin depigmentation may be permanent for individuals suffering from chronic excoriation, which is

associated with severe atopic dermatitis (Kaufman et al., 2018). The pigmentation also may diminish and return to normal within months depending on the severity of the disease state (Kaufman et al., 2018).

Scars

Keloids

Keloid disease involves benign dermal fibroproliferative lesions that result from abnormal wound healing following a laceration or trauma to the skin (Ud‐Din & Bayat, 2013). Keloid lesions tend to grow over time, and can cause pruritus, inflammation, pain, and discomfort for patients (Ud‐Din & Bayat, 2013). African American and Hispanic populations have an ethnic predisposition to keloid scarring with higher recurrence rates (Ud‐Din & Bayat, 2013).

Deep injuries to the dermis can result in permanent keloid scarring that are characterized by extensive growth beyond the borders of the original wound (Limandjaja et al., 2020). In contrast to hypertrophic scars that remain within the original boundaries, keloid scars notoriously expand and spread to surrounding tissue (Ud‐Din & Bayat, 2013). Keloid scarring does not regress whereas hypertrophic scars are likely to regress over the course of several months (Limandjaja et al., 2020).

There are numerous clinical findings that distinguish hypertrophic scars from keloid scars (Ud‐Din & Bayat, 2013). Hypertrophic scarring is characterized by raised, linear and firm lesions that develop within four to eight weeks of cutaneous injury (Limandjaja et al., 2020). Hypertrophic scars are more common than keloid scarring, however keloids are generally unique to non-Cacasian individuals and have a strong familial association (Limandjaja et al., 2020).

Keloid scarring typically presents as a raised and hard dermal outgrowth that can develop for more than a year from the original cutaneous injury (Ud-Din & Bayat, 2013).

Keloid scarring has a high prevalence among African American, Asian, and Hispanic populations (Ud-Din & Bayat, 2013). The symptoms of pruritus, inflammation, and pain are typically more severe during the early proliferative phase of keloid disease and may persist for months for long-standing keloid scars (Ud-Din & Bayat, 2013). The growth pattern of keloids differs from hypertrophic scars, as they have the capacity to grow and expand over several years (Limandjaja et al., 2020). Common dermal injuries that contribute to keloids are ear piercings, acne, trauma, burns, and surgery (Ud-Din & Bayat, 2013). Keloid scars can develop at any age with the highest occurrence seen in patients between the ages of ten to thirty years old (Ud-Din & Bayat, 2013).

It is important in clinical assessment to take a detailed keloid scar history, family history, psychosocial assessment, and complete medical history (Ud-Din & Bayat, 2013). It is crucial for a scar assessment to include and have proper documentation of scar location, color, size, pain, pruritus, and pliability (Ud-Din & Bayat, 2013). Although keloid disease does not have a cure, the condition is manageable through various treatment modalities that reduce inflammation and proliferative growth (Limandjaja et al., 2020). The treatment goal for keloid management is to prevent exacerbations of symptoms and recurrence after therapy (Ud-Din & Bayat, 2013). Diagnostic tools that can be utilized to diagnose keloids include subjective evaluation, the Manchester Scar Scale, ultrasound scan, punch biopsies, and comparison of photographs before and after treatment (Ud-Din & Bayat, 2013).

Follow up visits are encouraged for patients with keloid scarring at three-month intervals for up to a year (Ud-Din & Bayat, 2013). Continued follow up appointments are recommended

yearly for the subsequent three years (Ud‐Din & Bayat, 2013). Follow up appointments should involve the re-evaluation of symptoms and involve the inspection for new lesions (Ud‐Din & Bayat, 2013). Multiple attempts of various treatment options may be necessary for patients (Ud‐Din & Bayat, 2013). The psychosocial aspect and quality of life should be assessed along with the most appropriate treatment option for each individual to ensure that the highest quality of care is provided to all patients (Ud‐Din & Bayat, 2013).

Congenital Conditions

Mongolian Blue Spots

Mongolian blue spots are congenital birthmarks that most commonly occur over the lumbosacral area of Native American, Asian, Hispanic, and African American neonates (Liora et al., 2020). The prevalence of Mongolian spots occur in approximately ten percent of Caucasians, fifty percent of Hispanics, and ninety to one-hundred percent of Asians and African Americans (Gupta & Thappa, 2013). It is reported that over ninety percent of Native American neonates present with Mongolian blue spots (Ashrafi et al., 2006). Dyspigmented skin spots on pediatric patients may be mistaken as a sign of child abuse, therefore it is important to recognize the clinical manifestations of Mongolian blue spots and bruising (Bista & Pandey, 2014).

Mongolian spots range in color from black, grey, and bluish-green (Liora et al., 2020). The characteristic spots are generally oval or irregular in shape (Liora et al., 2020). Typical Mongolian spots are benign skin markings that are not associated with medical conditions (Ashrafi et al., 2006). The lesions of Mongoalian spots may be single or multiple, and usually involve less than five percent of the patients total body surface area (Gupta & Thappa, 2013). Mongolian spots are classically identified as non-blanching, flat, hyperpigmented patches that present over the gluteal region at birth or within the first few weeks of life (Gupta & Thappa,

2013). Mongolian spots may also occur over the occiput, shoulders, limbs, mandibular area, and temples (Gupta & Thappa, 2013).

Lesions of Mongolian spots have a tendency to spontaneously regress and disappear throughout early childhood (Leung et al., 2005). Mongolian spots may fade during the first few years of life and often resolve by puberty (Ashrafi et al., 2006). Widespread, extracranial, and darkly pigmented Mongolian spots have the potential to persist into adulthood for some individuals (Gupta & Thappa, 2013). Due to potential confusion of Mongolian spots with bruising secondary to child abuse, documentation of Mongolian spots at birth is imperative (Gupta & Thapta, 2013).

Mongolian spots can be clinically differentiated from bruising by the absence of tenderness, swelling, and pattern of evolution over time (Gupta & Thappa, 2013). Bruises have a tendency to change colors and fade more rapidly when compared to Mongolian spots (Harris, 2010). A child may be evaluated in a week from an initial evaluation in order to further distinguish a Mongolian blue spot from a bruise in cases of uncertainty (Harris, 2010). Bruising patterns indicative of child abuse may involve grabmarks which coincides with two to four closely aligned bruises (Kaczor et al., 2006). Locations in children that are not common for accidental bruising include the back, buttocks, genitals, face, and neck (Harris, 2010). Suspicion for child abuse may arise from bruising patterns that appear to arise from belts, cords, household objects, or distinguished slap marks (Harris, 2010).

Fungal Infections

Tinea Capitis

Tinea capitis is a fungal infection of the scalp and hair follicles (Love & Kundu, 2016; The Skin of Color Society, n.d.a). It is often referred to as scalp ringworm, and it is most

prevalent in the adolescent population (Love & Kundu, 2016; The Skin of Color Society, n.d.a). "In the United States, tinea capitis most commonly affects children of African heritage between three and nine years of age" (Ely et al., 2014, para. 8). Common risk factors for tinea capitis include individuals who are immunocompromised, have additional chronic diseases, or are malnourished (Russell & Ryan Jr., 2019). Tinea capitis is often spread to children through adult carriers, and living in a crowded household poses the highest risk for spread (Love & Kundu, 2016). "*Trichophyton tonsurans* is the most common pathogen causing tinea capitis in the United States" (Love & Kundu, 2016, p. 118). There are three types of tinea capitis, which are gray patch, black dot, and favus with black dot, which is the most common type in the United States (Ely et al., 2014).

There are numerous signs and symptoms associated with tinea capitis including "hair loss with black dots on the scalp, scaling, erythema, edematous boggy plaques often studded with pustules called kerions, tenderness, and scarring" (Love & Kundu, 2016, p. 118). Less common signs and symptoms include cervical lymphadenopathy, low-grade fevers, and pruritus of the affected scalp (Love & Kundu, 2016). Tinea capitis can also present either with or without inflammation (Russell & Ryan Jr., 2019). If scaling of the scalp is present in a child, tinea capitis should be considered as a possible diagnosis (Love & Kundu, 2016; The Skin of Color Society, n.d.a). Scalp hyperkeratosis in Caucasian children is typically linked to atopic and seborrheic dermatitis, but hyperkeratosis in African American and Hispanic children is typically linked to tinea capitis (Love & Kundu, 2016).

In order to properly diagnose tinea capitis, a culture and/or KOH preparation should be performed (Ely et al., 2014). A Wood's lamp examination can also be used to help aid diagnosis, but dermatoscopy is generally deemed unnecessary (Russell & Ryan Jr., 2019). If tinea capitis

goes untreated, it can lead to excessive scarring and alopecia development, which is why an efficient and correct diagnosis is essential in ensuring proper care is provided to the patient (Love & Kundu, 2016).

Tinea Versicolor

Tinea versicolor, also known as pityriasis versicolor, is a common skin condition in non-Caucasian individuals and can persist for years without treatment (Love & Kundu, 2016; Russell & Ryan Jr., 2019). *Malassezia furfur* is the most common species responsible for this condition, which is a yeast (Love & Kundu, 2016; Russell & Ryan Jr., 2019). *M furfur* is a part of the normal flora found on skin, which makes this condition not contagious to others (The Skin of Color Society, n.d.b). Tinea versicolor is more likely to occur in individuals with excessive amounts of fatty acid on the skin's surface (Love & Kundu, 2016). "Additional contributing factors include corticosteroid administration, application of oily preparations, exposure to sunlight, warm and humid climates, genetic predisposition, malnutrition, immunosuppression, and hyperhidrosis" (Love & Kundu, 2016, p. 109). Tinea versicolor most commonly impacts individuals beginning at puberty and going through young adulthood (Russell & Ryan Jr., 2019). This condition is also common in the athletic population especially athletes who persistently sweat (Russell & Ryan Jr., 2019).

The most common presentation for tinea versicolor in non-Caucasian individuals is secondary dyspigmentation including both hypopigmentation and hyperpigmentation depending on the individual (Love & Kundu, 2016). The dyspigmentation presents as either spots or patches and hyperpigmentation usually appears first followed by hypopigmentation as the condition progresses (The Skin of Color Society, n.d.b). This condition is typically asymptomatic or may exhibit mild pruritus, but patients typically seek treatment because of the skin discoloration that

is often present (Russell & Ryan Jr., 2019; The Skin of Color Society, n.d.b). Tinea versicolor most commonly presents on the trunk and proximal arms, but it can also be present on other areas of the body especially areas with large amounts of sebaceous glands (Love & Kundu, 2016; Russell & Ryan Jr., 2019; The Skin of Color Society, n.d.b). Tinea versicolor "appears as sharp margined macules that will vary in size" (Russell & Ryan Jr., 2019, p. 107). A fine scale may also be present (Russell & Ryan Jr., 2019).

Diagnosis of tinea versicolor is usually through physical examination and a clinical determination, but microscopy and Wood's lamp examination can be used to aid in the diagnosis (Russell & Ryan Jr., 2019). It's important to note that the dyspigmentation may occur for months following treatment of tinea versicolor (Love & Kundu, 2016). Tinea versicolor has a high recurrence rate due to the causative agent being found naturally on the skin (The Skin of Color Society, n.d.b).

Treatment Pearls

Special consideration needs to be made when treating non-Caucasian individuals due to PIH, hypopigmentation, and possible scarring (Love & Kundu, 2016). Certain medications can alter the pigmentation of non-Caucasian individuals skin color (Love & Kundu, 2016). In particular, acne treatment can cause pigmentation changes and treating acne in the non-Caucasian population will be individualized based on patient preference. Acne treatment may cause bleaching of the skin in the non-Caucasian population due to the skin's sensitivity (Love & Kundu, 2016). The first line treatment for most acne diagnoses in the non-Caucasian population is a topical retinoid, because "retinoids mitigate hyperpigmentation by inhibiting melanosome transfer" to the site of treatment (Yin et al., 2014).

In addition, the treatment for acne keloidalis is similar to acne vulgaris. Acne keloidalis is treated with an anti-inflammatory, steroids, or topical retinoids (Love & Kundu, 2016; Yin et al., 2014). In later stages, an antibiotic is considered if there is a secondary bacterial infection in combination with incision and drainage (Love & Kundu, 2016). A proper diagnosis of dermatological conditions in the non-Caucasian population can lead to more effective and timely treatment and an enhanced outcome of acne clearance (Love & Kundu, 2016).

Conclusion

Dermatological conditions present differently depending on numerous factors including skin pigmentation. Current resources demonstrate a variety of dermatologic presentations on Caucasian skin types but are significantly lacking for the non-Caucasian population. Due to the lack of resources and knowledge on how dermatological conditions present in the non-Caucasian population, this population often suffers from misdiagnoses, improper treatment, and an increase in mortality for certain conditions. Additional resources need to be made available in order to improve the overall standard of care that is provided to all patients.

Additional educational materials, such as a module can help providers learn to diagnose non-Caucasian dermatological conditions. The module created within this project consists of some of the most common skin conditions in the non-Caucasian population, and how to properly recognize and diagnose these conditions (see Appendix A). In addition, the module serves as a tool to provide educational information to all healthcare institutions, which can be readily updated at any time (see Appendix A). The goal of this module is to decrease the amount of healthcare discrepancies seen in current practice in order to provide equal care for all populations (see Appendix A). Chapter three will outline the rationale for the research project, provide a description of each of the organizations who have access to the module, lay out the research

project plan and implementation, discuss the project tools used to create the module, and discuss barriers that were met during the creation of the module (see Appendix A).

Chapter 3: Methodology

Introduction

Learning how to diagnose dermatological conditions in all skin types will increase the knowledge of healthcare providers in order for healthcare providers to consistently provide the highest quality of care to all patients. Future healthcare professionals are not currently being provided with the necessary information on how dermatological conditions present in non-Caucasian skin types due to the lack of resources available on this topic (Ebede & Papier, 2006). This research project aims to provide additional educational resources that can be used to increase education of how dermatological conditions present in the non-Caucasian population in order to improve health outcomes and reduce the healthcare disparities this population is currently faced with (Ebede & Papier, 2006). Chapter three contains the rationale for this research project, the population that served through this project, and how the project was conducted.

Rationale for Project

The need of the health, social science, and nursing educational programs at Bethel University (EPBU) is to learn how to correctly identify and diagnose dermatological conditions in the non-Caucasian population. Due to the lack of resources currently available regarding the presentation of skin conditions on non-Caucasian skin types, educational materials are needed to educate future healthcare professionals on how to identify skin conditions in all individuals (Ebede & Papier, 2006; Narayan, 2017). The resources presented in this module, Common Dermatological Conditions in the Non-Caucasian Population, will be used to enhance the education of healthcare professionals on non-Caucasian dermatological conditions, improve education equality, and correct healthcare disparities (see Appendix A). Healthcare professionals

educated on dermatological conditions must have an equal emphasis on all skin tones in order to be able to make an accurate diagnosis and treat all patients equally. Additionally, this module is aimed to diminish the racial discrimination seen in present-day health care (Ebede & Papier, 2006) (see Appendix A). The module that was created with this project helps supplement the dermatology section of healthcare education by implementing photos and descriptions of skin conditions on non-Caucasian skin types (see Appendix A). The predicted outcome of this project is to assess the efficacy of the online module, and the use of a pre and post quiz allows course instructors the ability to ensure healthcare students have an enriched understanding of the identification and diagnosis of highlighted skin conditions on non-Caucasian skin (see Appendix B).

Population

This module is aimed at reaching Bethel University's health and social science programs including an undergraduate Nursing program, graduate Physician Assistant (PA) program, graduate Athletic Training program, graduate Post-baccalaureate Nursing program, and graduate Certified Nurse-Midwifery program. Within these health and social science programs at Bethel University, the population that is primarily being targeted with this module includes the course instructors and the students. The goal of this module is to increase the knowledge of the students in each of these programs on how to properly diagnose various dermatological conditions in the non-Caucasian population (see Appendix A).

Bethel University is located in Arden Hills, Minnesota with undergraduate and graduate programs. Bethel's mission statement is: "Boldly informed and motivated by the Christian faith, Bethel University educates and energizes men and women for excellence in leadership,

scholarship, and service. We prepare graduates to serve in strategic capacities to renew minds, live out biblical truth, transform culture, and advance the gospel" (Bethel University, n.d.a).

Bethel was founded by John Alexis Edgren in 1871 who started Bethel University as Baptist Union Theological Seminary to educate pastors. After World War II, the name was changed to Bethel College and Seminary and started four-year degrees. The college began to expand and in 1989 graduate programs were started. In 2004, Bethel College changed its name to Bethel University and is a private, Christian university. Once Bethel became a University, the programs increased to over 100 different degrees and enrolled over 4,500 students. Currently, Bethel University still follows the mission of John Edgren to provide an excellent education to men and women while following the Christian faith (Bethel University, n.d.e).

The nursing department at Bethel University includes the following programs: undergraduate Nursing, graduate Post-baccalaureate Nursing, and graduate Certified Nurse-Midwifery. The mission statement of the nursing department is "to provide leadership in nursing education, scholarship and practice that reflects a Christ-like presence as we prepare nurses to serve, with excellence, a diverse and changing society" (Bethel University, n.d.b). The Bethel University Nursing program was established in 1984 (Bethel University, n.d.b). The graduate Post-baccalaureate Nursing program is a two to three-year program, and the undergraduate Nursing program is a four-year program (Bethel University, n.d.b). The Nurse-Midwifery program has been established since the fall of 2016, and it is a two to three-year program. The Commission on Collegiate Nursing Education (CCNE) approved Bethel's nursing department for 10-year reaccreditation in 2016 (Bethel University, n.d.f).

The graduate Athletic Training program is a part of the graduate school at Bethel University. The mission statement for Bethel University's Graduate programs including the

Athletic Training program is “designed for adult students with busy lives who want to advance their careers, reach their goals, and become leaders in their fields. We’ll help you grow personally and professionally so you’re prepared to make a difference in your workplace, your community, and our world” (Bethel University, n.d.d). The Bethel University Athletic Training program was established in 1993 and is a two to three-year program (Bethel University, n.d.c).

The PA program is also a graduate program at Bethel University. The Bethel PA mission statement is the following: “Boldly motivated by the Christian faith and in the spirit of Bethel University's academic excellence and ministry focus, the Bethel Physician Assistant program will educate students to become physician assistants who develop the skills for competent and excellent medical practice, live out ethical principles and Bethel's academic excellence, serve their community and all cultures, and possess integrity and compassion” (Physician Assistant, 2021). The Bethel PA program has been established and accredited since March of 2013 and the program has been granted accreditation continued status through September of 2026 (Physician Assistant, 2021). The Bethel PA program is a 27-month long program (Physician Assistant, 2021).

The population that has access to this project are healthcare students and professors of participating EPBU. All individuals in this population have a basic knowledge of medical literacy and medical background that allows them to better understand the information provided in the module. This module is aimed at improving the medical knowledge that the individuals currently have on this topic (see Appendix A). Numerous individuals will be impacted by this project including non-Caucasian patients presenting with dermatological conditions and healthcare students and professionals who will be educated on how to properly diagnose the conditions included in this module.

Project Plan and Implementation

The plan of the project is to provide supplemental educational resources to future healthcare professionals in order to improve education equality by increasing knowledge and awareness of how certain dermatological conditions present in the non-Caucasian population. The project began by selecting a research chair, Lisa Naser, PA-C, to help implement the project. Lisa Naser is a professor for the PA program at Bethel University and is also a practicing certified PA with nineteen years of experience. Alicia Klein, PA-C was then selected to serve as a committee member for the project who assisted with editing the project. Alicia Klein is a professor at the PA program at Bethel University, and she has eleven years of experience as a certified PA.

To determine what dermatological conditions were to be included in the module, extensive research was performed. The initial conditions that were selected to be included in the module were melanoma, basal cell carcinoma, squamous cell carcinoma, acne keloidalis, acne vulgaris, psoriasis, lichen planus, atopic dermatitis, and keloid scarring. These conditions were selected because they were deemed to be the most prevalent, severe, and had the most reliable information available at the time that the research was conducted. Information for the module was found through the use of medical books, databases, peer-reviewed literature reviews, and scholarly journals. After the conditions were confirmed, a module generator was chosen to provide the project's information in the most accessible and efficient way (see Appendix C).

The module generator, Thinkific, was suggested by Lisa Naser, because it has been successful in the past with previous Bethel PA program research projects (see Appendix C). The

creators of the module were Mackenzie Mellum, PA-S, Candace Nysted, PA-S and Kassidy Westrom, PA-S. The instructors to each program were provided with a URL to access the module, and each instructor then gave the URL to the students of that program. In advance, the creators provided each of the participating EPBU with an outline of the module that depicted what conditions are found in each of the chapters of the module (see Appendix D). A pre and post quiz was made available within the module to enhance student engagement and education (see Appendix B). The pre and post quiz includes questions that are applicable to the entire module (see Appendix B). The module can only be edited by the creators. In order to receive accurate and valid feedback on the scores of the quizzes, the individual professors may be responsible for ensuring that the quizzes are proctored and only the first attempt for both the pre and post quiz is reported by each student (see Appendix B). The researchers and research committee reviewed and edited the pre and post quiz questions. All of the quiz questions were trialed by second-year physician assistant students who completed the module and gave feedback on the readability of the questions. Feedback from the second-year PA students stated that the module was clear, concise, easy to follow, informative, and helpful in increasing their knowledge on this topic. The only change made to the module based on the feedback was two grammatical updates.

Various health, social science, and nursing educational programs at Bethel University were contacted to determine who would benefit from the information provided in this module. All of the programs that were contacted requested access to the module and provided a statement of approval for the use of the module to be included in their classes (see Appendix E). The programs included the undergraduate Nursing program, graduate PA program, graduate Athletic Training program, graduate Post-baccalaureate Nursing program, and graduate Certified

Nurse-Midwifery program. Each of the participating EPBU were contacted as to which dermatological conditions they would like in addition to our already researched conditions. Mongolian blue spots and fungal infections including tinea capitis and tinea versicolor were selected to be included in the module based upon available and applicable information that was found upon further research. Numerous conditions requested by the participating EPBU were not able to be included in the module due to the lack of resources and information on how to differentiate various dermatological conditions between Caucasian and non-Caucasian skin types.

After confirming the dermatological conditions that were to be included in the module, completing a thorough literature review, and developing a methods plan, the module was organized and sent to the research committee to review and edit. Final edits were made to the module, and a proposal defense was conducted. Once the module was finalized, it was provided to each of the participating EPBU in order to supplement the educational resources that they currently use to educate students about dermatological conditions (see Appendix A).

Project Tools

An online module was created for the participating EPBU with a pre and post-quiz embedded into the module (see Appendix B). The module was created using Thinkific for each disease state. Thinkific is an online platform where editors can write information on each slide, create quizzes, can be continuously updated in real-time, and can be accessed by anyone with the module URL. Thinkific is an online platform that enables an individual to create a module or a learning tool that can be made available to organizations easily. The mission of Thinkific is to change the way people learn, make learning more accessible, and to allow individuals to create their own business (About Thinkific, 2020). Thinkific allows educational material to be

accessible to more people worldwide (About Thinkific, 2020) (see Appendix C). The module includes definitions, clinical presentations, clinical pearls, and pictures for each dermatological condition. The module currently includes fungal conditions such as tinea capitis and tinea versicolor; cancers such as melanoma, basal cell carcinoma, and squamous cell carcinoma; acne conditions such as acne vulgaris and acne keloidalis; autoimmune conditions such as psoriasis, lichen planus; and other topics such as Mongolian spots, atopic dermatitis, and keloid scarring (see Appendix A). This information will help providers properly identify and diagnose dermatological conditions in non-Caucasian individuals.

Potential Barriers

The main barrier that impacted the creation of this project was the lack of resources and images currently available regarding this topic, which made it difficult to create a thorough module for each condition. Most articles did not describe how the dermatologic condition presented in non-Caucasians and lacked descriptive photos of non-Caucasian skin types. In order to attempt to alleviate this issue, continuous research was conducted through the use of a variety of mediums in order to find the most information possible.

Conclusion

This project will help future and current healthcare professionals better identify dermatologic conditions in the non-Caucasian patient population. This project is needed due to the healthcare disparities that non-Caucasian patients are currently faced with, which this project hopes to diminish. The organizations that were primarily influenced by this project are Bethel University's PA program, Athletic Training program, Undergraduate Nursing program, Post-Baccalaureate Nursing program, and Nurse-Midwifery program. Healthcare providers influence patients' everyday lives, and the goal of this module is to positively influence as many

individuals as possible. The module being created through this project will enhance healthcare knowledge on how dermatological conditions present in the non-Caucasian population in order to achieve an efficient and correct diagnosis (see Appendix A). Chapter 4 will cover a summary of the results of the project, limitations that occurred throughout the creation of the project, and further research goals to expand the project in the future.

Chapter 4: Discussion

Introduction

The Dermatological Conditions in the Non-Caucasian population module was created as a supplemental educational piece for healthcare professionals due to the lack of resources available regarding the presentation of skin conditions on non-Caucasian skin types (see Appendix A). Additional educational materials are needed to educate future healthcare professionals on the importance of identifying skin conditions in all individuals (Narayan, 2017). The goal of this module was to diminish healthcare disparities, improve provider education on how dermatological conditions present in the non-Caucasian population, and provide an easily accessible resource on this topic, which includes pictures and descriptions of how various dermatological conditions present in the non-Caucasian population (Ebede & Papier, 2006). This project was necessary because all patients deserve to be treated equally, and all healthcare professionals need to be provided with the resources that can help them do so.

This module was created through the use of scholarly articles to supplement the education of the participating EPBU on dermatological conditions in the non-Caucasian population (see Appendix A). This module was completed on Thinkific and sent to each of the participating EPBU (see Appendix C). The module outline and link was sent to the instructors of each participating EPBU (see Appendix D). The instructors provided the link to the students, who completed the module and pre/post-quiz, which was used to assess the knowledge gained by the course instructor (see Appendix B). In addition, each student completed a final survey of their thoughts on the module layout, how they benefited from the module, and suggestions for future improvements (see Appendix B).

Summary of Results

The module was completed and sent to each of the participating EPBU. The participating EPBU then sent their feedback on the module to the creators of the project. Overall, the feedback from the participants was that the module was well put together, beneficial in raising awareness to this issue and increasing the knowledge of the participants on this topic, and was organized in a way that was engaging and highly informative. The participants reported that the pictures were helpful for identifying and diagnosing the dermatological conditions. The creators hoped that by having current pictures for each condition all located in an easily accessible module that it would help offset the lack of an adequate amount of descriptive images previously available on this topic (Ebede & Papier, 2006; Narayan, 2017). The feedback from the participants also included that this topic was extremely beneficial in supplementing the education they received on dermatological conditions. Participants stated their prior dermatologic training for non-Caucasian patients was lacking. The creators found there was a lack of education on this topic and a significant issue in numerous educational programs (Ebede & Papier, 2006). Overall, the participants believed that each of the chosen conditions were highly prevalent and important to learn about due to the negative impacts the conditions can have on non-Caucasian individuals.

Some of the participant feedback also included suggestions on how to improve the module, which included increasing the font size of the headings, modifying the quizzes by making the answers of the pre-quiz not visible, and adding additional topics to the module. The creators of the module reviewed all of the feedback and decided to increase the font size of the headings to make them more visible for the participants. The module generator that was used was created using the free version, which made the answers to the pre-quiz visible and not able

to be changed. The creators plan to expand the number of topics in this module, but due to the lack of available resources, this is not possible at this time.

Overall, the creators of the module were pleased with the feedback that was received from each of the participants. The intention of this module was to decrease the racial discrepancies that are seen in present-day healthcare and to increase awareness of this topic to a variety of future healthcare professionals. Based on the feedback from the participants, this goal was reached and will have a lasting impact on generations of healthcare professionals in the future. The feedback that was received will also be used to continue to expand and make improvements to this module moving forward.

Limitations

Throughout the creation of this module, a limitation was identified such as a significant lack of resources on how dermatological conditions present in the non-Caucasian population, which resulted in the inability to expand on the number of conditions included in the module. One example of this limitation was when the participating EPBU requested certain dermatological conditions to be included in the module, which was unable to be fulfilled due to the lack of resources on the requested conditions. This limitation became evident when the creators attempted to add additional conditions and expand the module to meet the requests of each organization. Regardless of the limitation, this module is still essential as a supplemental resource for various healthcare organizations in order to decrease the disparities seen in present-day healthcare.

Further Research

This project could have been completed in various different ways, such as using photograph examples from firsthand patient experiences. This could be made possible through

future experiences as a practicing PA and from the help of PA colleagues. Another example of how this project could be presented differently would be by creating a handbook resource of the conditions instead of a module. This module could be expanded to a larger audience in the future and reach different populations of healthcare professionals. For example, the creators of the module can expand who has access to the module through providing the module link to current practicing healthcare professionals and other educational programs outside of Bethel University. Continued efforts necessary for the future of the module are to add additional dermatological conditions through additional research, expanding to various healthcare professionals, and updating the module as more resources become available.

Conclusion

The primary goal of this research project is to educate healthcare professionals on how to correctly diagnose dermatological conditions in the non-Caucasian population and to reach as many organizations as possible. This module is a supplemental educational material that includes clinical presentations of dermatological conditions in the non-Caucasian population, descriptions of how to diagnose dermatological conditions in the non-Caucasian population, and a section on treatment specifically for non-Caucasian individuals (see Appendix A). This module will benefit both the healthcare professionals who complete it and the patients they will be able to better treat through the education gained from the module. This module is currently easily accessible to the participating EPBU, and the researchers plan to expand on this project by providing access to additional healthcare providers and organizations in the future.

The researchers learned that there is a significant lack of resources regarding the diagnosis of dermatological conditions in the non-Caucasian population. Extensive research on the topic of how to identify dermatological conditions in the non-Caucasian population further

confirmed the limitations of resources currently available to the public. The need for an easily accessible and modifiable resource became evident throughout the implementation of this research project. This educational module can easily be updated in the future by including additional conditions through continued research and firsthand patient experiences.

The opportunity to create a module to educate other healthcare professionals has been fulfilling and beneficial. This module was created to properly recognize and diagnose dermatological conditions in the non-Caucasian population, in addition to diminishing racial discrimination seen in present day healthcare (Ebede & Papier, 2006). Educating healthcare professionals on how to diagnose dermatologicals conditions in the non-Cacasian population will be beneficial in any healthcare setting. This module was necessary because of the current lack of educational materials available on this topic. This module has considerable potential to benefit numerous healthcare professions, educational programs, and patients, which will have a positive impact in the future of diminishing the current discrimination that is seen throughout healthcare as a whole.

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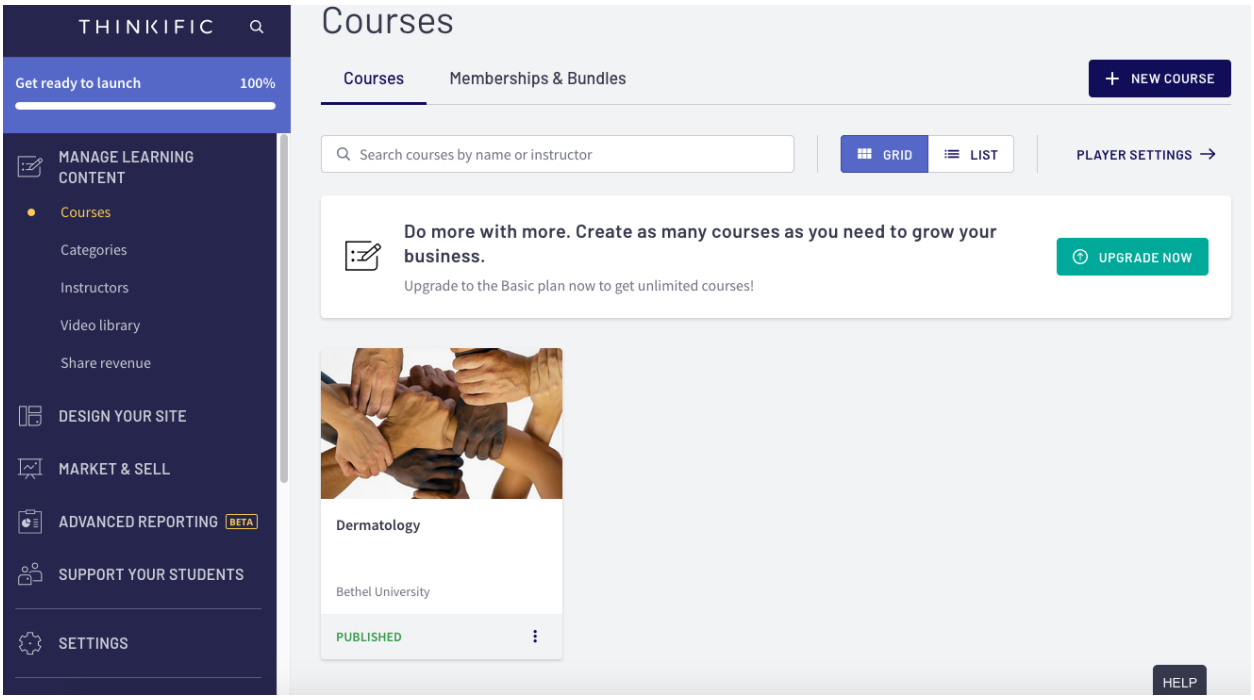
APPENDIX A

Module

Module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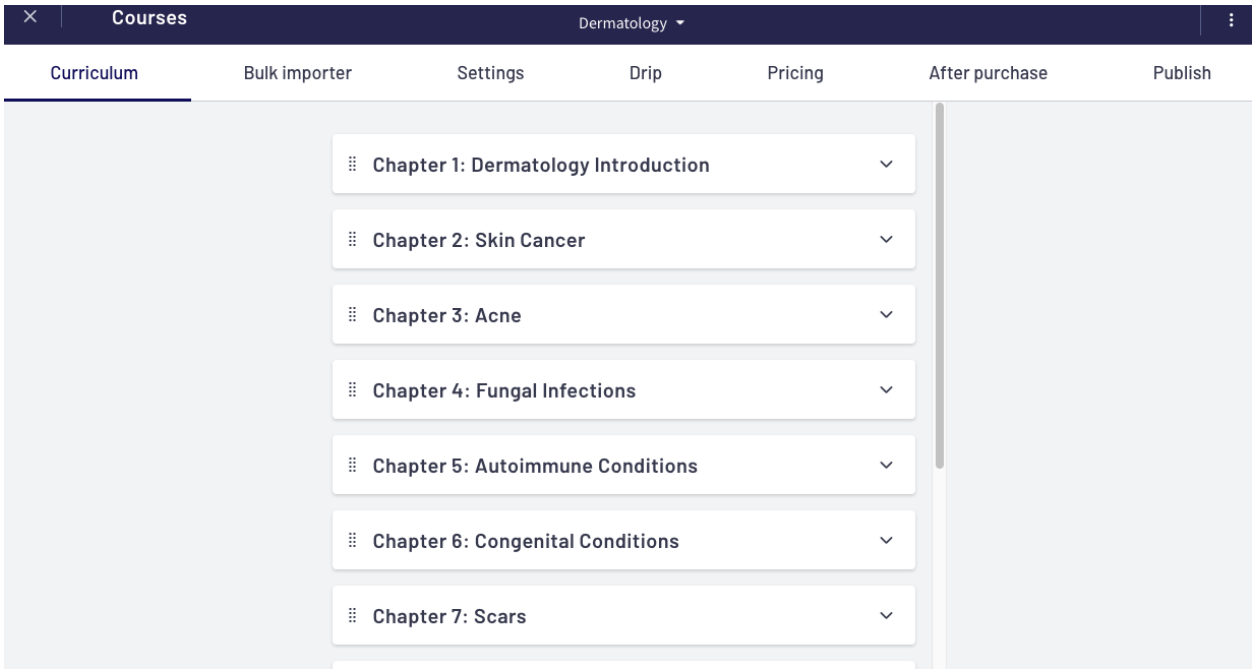
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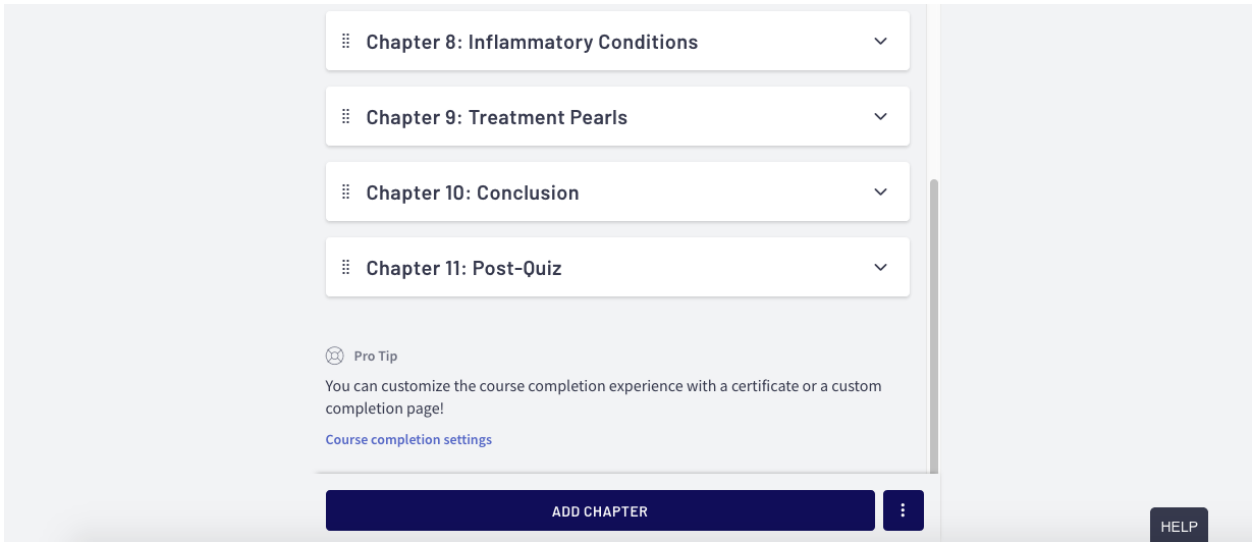
Chapter 3: Acne
Chapter 4: Fungal Infections
Chapter 5: Autoimmune Conditions
Chapter 6: Congenital Conditions
Chapter 7: Scars


Chapter 8: Inflammatory Conditions
Chapter 9: Treatment Pearls
Chapter 10: Conclusion
Chapter 11: Post-Quiz
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Course completion settings
ADD CHAPTER
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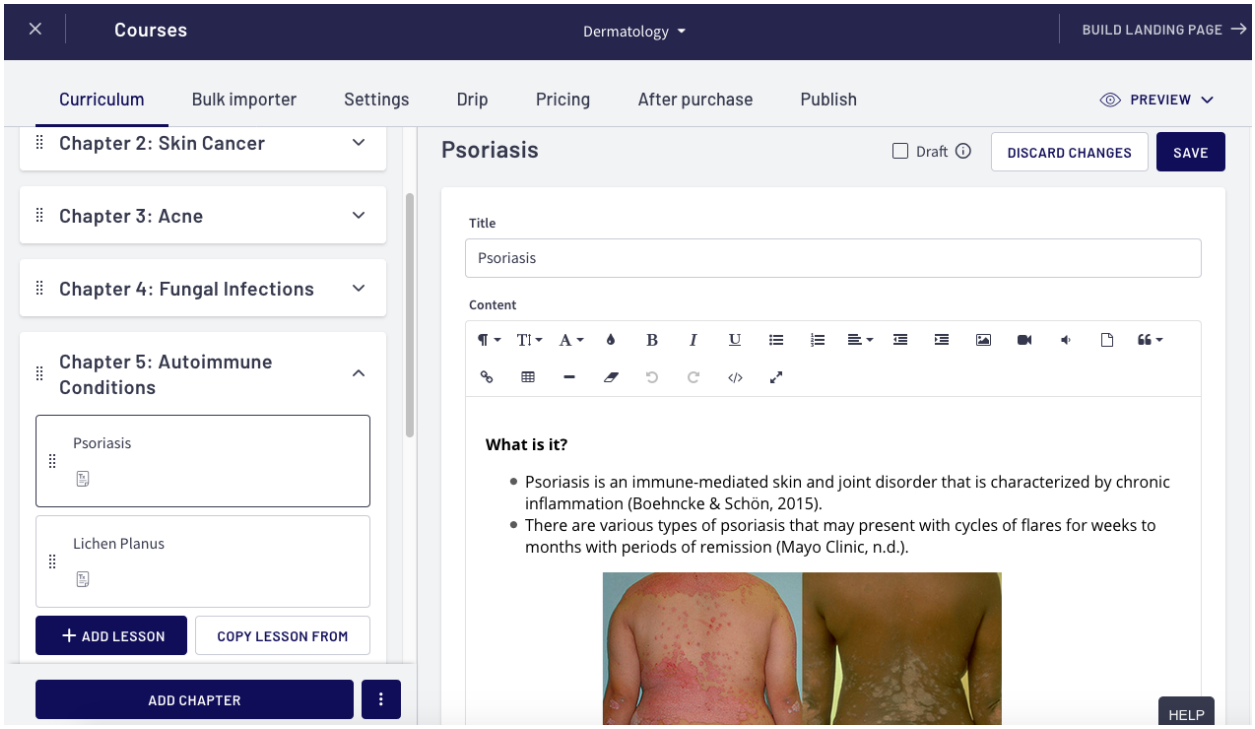
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Chapter 4: Fungal Infections
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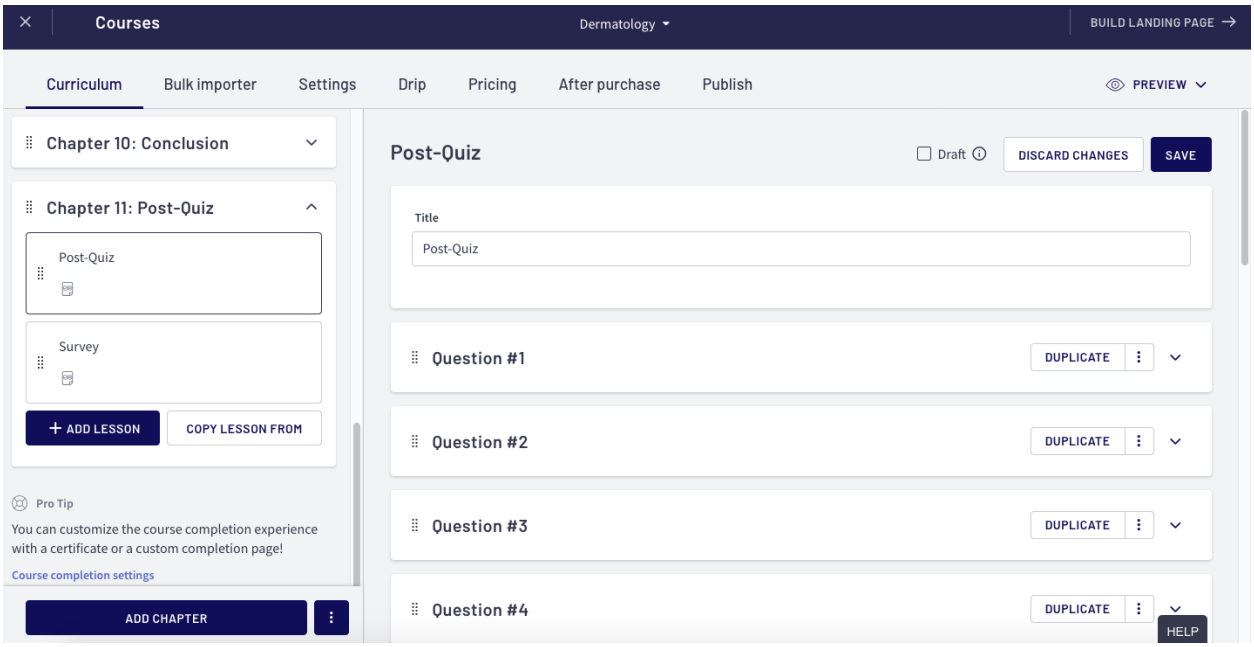
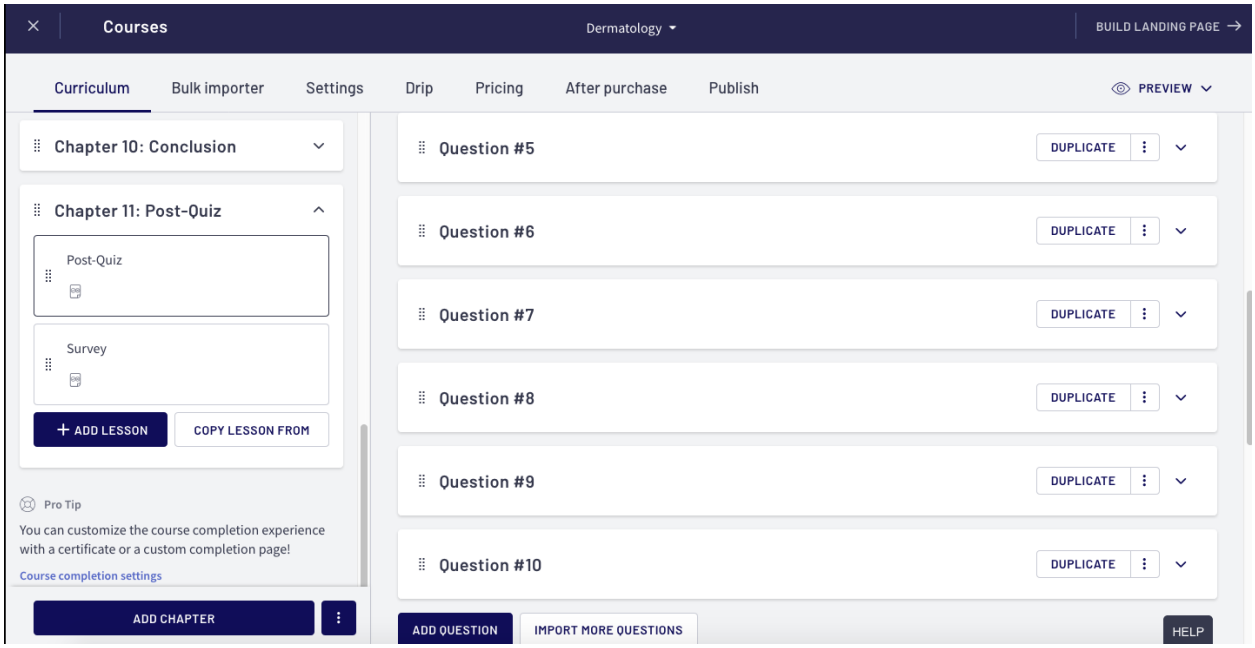
What is it?
Psoriasis is an immune-mediated skin and joint disorder that is characterized by chronic inflammation (Boehncke & Schön, 2015).
There are various types of psoriasis that may present with cycles of flares for weeks to months with periods of remission (Mayo Clinic, n.d.).
HELP

APPENDIX B

Pre and Post Quiz

Pre and Post Quiz





APPENDIX C

Thinkific

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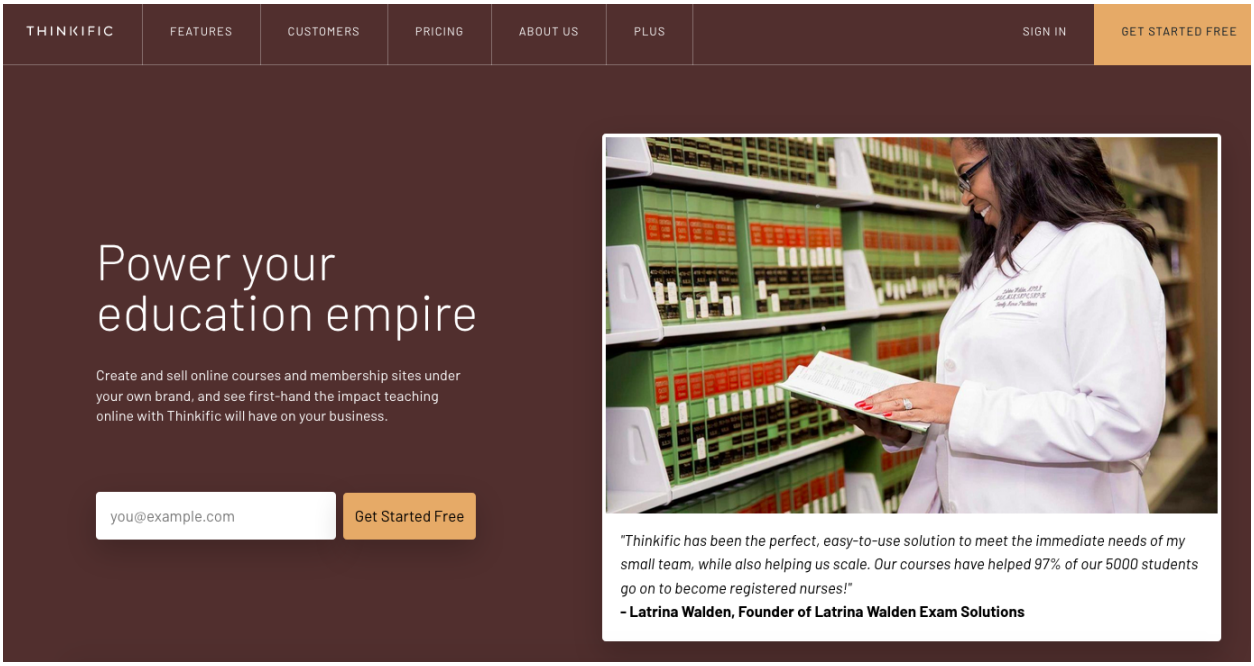
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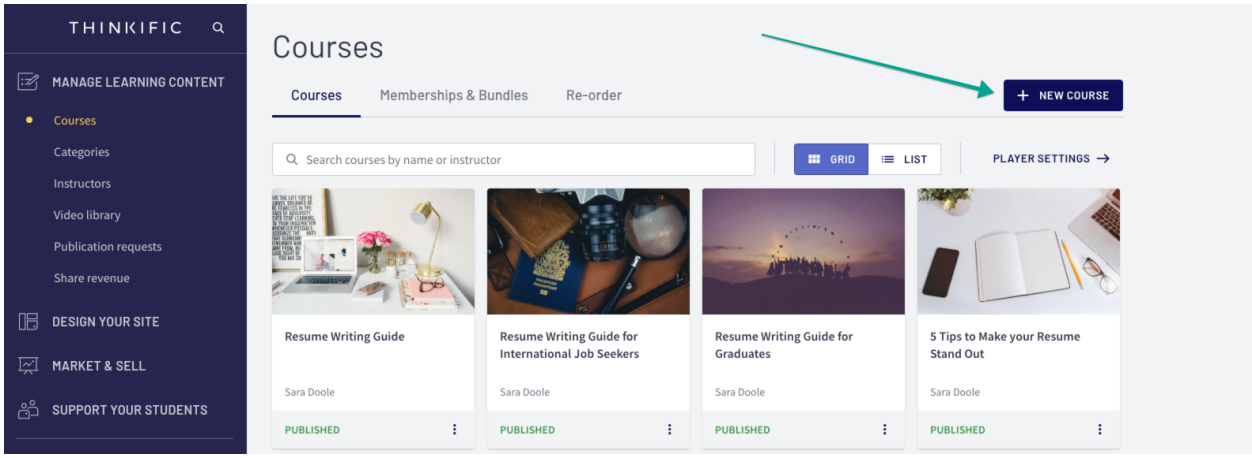
- Latrina Walden, Founder of Latrina Walden Exam Solutions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APPENDIX D

Module Outline

Module Outline

Greetings,

Thank you for including the Common Dermatological Conditions in the Non-Caucasian Population online module in your course. The module can be accessed by the following link: [insert link here].

Students will need to make a free account on the Thinkific website in order to gain access to the module materials. The module will begin with an introduction followed by a ten-question pre-quiz. Students will be able to advance through the module at their own pace, and the estimated time of completion is approximately 30 to 40 minutes. The module is concluded with the same post-quiz to encourage student engagement. Individual instructors will be responsible for deciding how they would like their students to report their completion of the module. In order to receive accurate and valid feedback on the scores of the quizzes, the quizzes may need to be proctored to ensure that only the first attempt for both the pre and post quiz is reported by each student.

The module includes definitions, clinical presentations, clinical pearls, and pictures for each dermatological disorder. The module includes fungal conditions such as tinea capitis and tinea versicolor; cancers such as melanoma, basal cell carcinoma, and squamous cell carcinoma; acne conditions such as acne vulgaris and acne keloidalis; autoimmune conditions such as psoriasis, lichen planus; and other topics such as Mongolian spots, atopic dermatitis, and keloid scarring. This information will help healthcare professionals properly identify and diagnose dermatological conditions in non-Caucasian individuals.

Feedback from individuals completing the module will be helpful for future improvements to the content provided in this resource. Students may provide feedback after completion of the module by filling out the following anonymous survey: [insert survey here].

Please feel free to contact us if you have any questions regarding the module. Thank you!

Sincerely,

Mackenzie Mellum, Candace Nysted, & Kassidy Westrom

APPENDIX E

Statements of Approval

Statements of Approval

Kristi Gustafson 4:51 PM (5 minutes ago)
to me

Hi

You and your team have my permission to solicit input and share your findings with faculty in Bethel's Post-Bacc Nursing program.

Permission beyond that is beyond my purview.
Thanks!

Chad Osgood 10:35 AM (24 minutes ago)
to me

On behalf of Bethel University Athletic Training, I, Chad Osgood, give permission to Bethel University Physician Assistant students, Mackenzie Mellum, Candace Nysted, and Kassidy Westrom, to conduct their Master's Research at this organization.

Sincerely,

Chad Osgood

On behalf of Bethel University's Nurse-Midwifery program, I, Renee Clark, give permission to Bethel University Physician Assistant students, Mackenzie Mellum, Candace Nysted, and Kassidy Westrom, to conduct their Master's Research at this organization.

Sincerely,
Renee Clark

Bethel University
Physician Assistant Program
2 Pine Tree Drive
Arden Hills, MN 55112

To Whom It May Concern:

On behalf of the Department of Nursing at Bethel University, I, Sara Nylin, give permission to Bethel University Physician Assistant students, Mackenzie Mellum, Candace Nysted, and Kassidy Westrom, to conduct their Master's Research at this organization. We are thrilled to support them in their research, and we look forward to using their final project in our courses!

Sincerely,

Sara Nylin

Lisa Naser 10:39 AM (2 hours ago)

to Kassidy, me, Mackenzie

Kassidy, Candace, and Mackenzie

As the research coordinator and instructor of clinical medicine, I am thrilled to be able to use your Dermatologic Conditions in the Non-Caucasian Populations in the Clinical Medicine Dermatology Module for future PA cohorts.

Thanks for your hard work in compiling this module.
Lisa

--
Lisa Naser MS PA-C
Associate Professor
Pronouns: she/her/hers
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