FEATURE ARTICLE

CE 1.5 Contact Hours

Development and Implementation of a Nurse-Led Home Phototherapy Program for Challenging Chronic Skin Conditions

Sarah W. Matthews, Karen J. Sherman, and Andy J. Chien

ABSTRACT: Chronic skin conditions pose complex treatment challenges, and treatment adherence issues are a common problem. Home phototherapy is a well-documented, effective treatment for chronic skin conditions such as psoriasis and atopic dermatitis. Nonetheless, its effectiveness is dependent on patient self-management at home, and lack of adherence to complex prescribed treatment protocols occurs frequently. Additional problems that can occur include clinical teams failing to address patient concerns or treatment challenges with home phototherapy or failing to increase or modify therapy when treatments are not meeting therapeutic goals. This phenomenon is referred to as clinical inertia. The aims of this article are to (a) describe the development and implementation of a nurse-led home phototherapy program designed to both prevent clinical inertia and support patients' success in learning self-management for their chronic skin conditions at home and (b) outline the study protocol designed to evaluate the health outcomes and clinical resource utilization from the home phototherapy program.

Key words: Home Phototherapy, Psoriasis, Dermatitis, Nursing, Nurse-Led

Sarah W. Matthews, DNP, APRN, FNP-BC, *School of Nursing, University of Washington, Seattle, WA; and Dermatology, Kaiser Permanente Washington, Bellevue, WA.*

Karen J. Sherman, PhD, *Kaiser Permanente Washington Health Research Institute, Seattle, WA.*

Andy J. Chien, MD, PhD, *Kaiser Permanente Washington, Bellevue, WA; and Division of Dermatology, School of Medicine, University of Washington, Seattle, WA.*

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Correspondence concerning this article should be addressed to Sarah W. Matthews, DNP, APRN, FNP-BC, School of Nursing, University of Washington, Health Science Building T514B, 1959 NE Pacific St., Box 357263, Seattle, WA 98195. E-mail: Sarahm09@uw.edu

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Over 75% of estimated healthcare-related costs in the United States are because of chronic disease, and lack of adherence to treatment remains one of the biggest challenges influencing this trend (Milani & Lavie, 2015). However, patient nonadherence is not the only cause of these high costs. Clinical inertia is also a factor. It occurs when clinical teams fail to address patient concerns or challenges with treatments or fail to increase or modify therapy when treatment goals are not met (Milani & Lavie, 2015); O'Connor et al., 2005). Clinical inertia is a phenomenon that is well documented in the management of chronic diseases such as diabetes and hypertension (Milman et al., 2018; Okemah et al., 2018). The causes are multifactorial and complex. They involve patient, clinician, and health system factors (O'Connor et al., 2005).

Chronic skin conditions also pose complex treatment challenges, and treatment nonadherence is common. Feldman et al. (2007) found the average overall nonadherence to topical treatments for psoriasis was 45%, and Thorneloe et al. (2018) found nonadherence to conventional systemic treatments (i.e., methotrexate) for psoriasis was 29.2% and that to biologic therapy (i.e., adalimumab) was 16.4%. Home phototherapy is a well-documented, effective treatment for chronic skin conditions such as psoriasis and atopic dermatitis (also called eczema; Koek et al., 2006; Nolan et al., 2010). Nonetheless, its effectiveness exquisitely depends on how well patients self-manage at home, and lack of adherence to prescribed treatment protocols is common (Cline et al, 2019; Kalia et al., 2014). Clinical inertia is also a problem in the management of skin diseases in the home, if clinical teams do not intervene when less-than-optimal treatment regimens are used (Halioua et al., 2019).

The aims of this article are to (a) describe the development and implementation of a nurse-led home phototherapy program designed to both prevent clinical inertia and support patients' success in learning self-management for their chronic skin conditions at home and (b) outline the study protocol designed to evaluate the health outcomes and clinical resource utilization from the home phototherapy program.

BACKGROUND

Psoriasis and dermatitis are common chronic inflammatory skin conditions. In the United States, the prevalence of psoriasis is approximately 2%–3% and the prevalence of atopic dermatitis is 2%–5% (Johnson et al., 2019; Rachakaonda et al., 2014). Psoriasis and dermatitis are associated with significant morbidity (Johnson et al., 2019; Kurd & Gelfand, 2009; Rachakaonda et al., 2014), healthcare utilization (Johnson et al., 2019), and healthcare costs (Brezinski et al., 2015). Both conditions require long-term adherence to treatment regimens to achieve and maintain control of symptoms. Sunlight (i.e., ultraviolet light) has been used to treat skin diseases for thousands of years (Totonchy & Chiu, 2014). The mechanisms of action of ultraviolet include immunosuppression through the reduction of Langerhans cells, alterations in the expression of cytokines that suppress helper T cells, inhibition of proliferation of keratinocytes, and induction of T-cell apoptosis (Wong et al., 2013). Evidence has shown that phototherapy (i.e., the use of electronically derived ultraviolet) is a safe and effective treatment option for patients experiencing moderate-to-severe psoriasis and dermatitis (Johnson et al., 2019; Menter et al., 2011; Richards & Honigsmann, 2014), but it requires knowledge and skills to be utilized effectively (Cline et al., 2019; Matthews et al., 2018).

Clinic-based phototherapy is administered by nursing staff, and narrowband phototherapy (311–313 nm) is the most utilized type (Totonchy & Chiu, 2014). It has been shown to be very effective, with 70%–81% of patients with moderate-to-severe psoriasis achieving marked improvement (i.e., 75%–90% reduction of baseline Psoriasis Area and Severity Index [PASI]) in 20.6–29.7 treatments depending on the frequency and dosing regimens (Chauhan et al., 2010; Kleinpenning et al., 2009). PASI is the measure most frequently used to determine improvement during clinical trials and is scored based on the average redness, thickness, and scale of psoriasis lesions (each graded on a 0–4 scale), weighted by the area of involvement (Feldman et al., 1996).

Narrowband phototherapy is most effective when administered 3 times a week (Hallaji et al., 2010). However, three weekly clinic-based phototherapy sessions for several months can be burdensome for patients who need to travel long distances or miss work for treatments. Alternative systemic treatments include conventional medications such as methotrexate, cyclosporine, and acitretin and the newer systemic biologics (i.e., adalimumab, etanercept, ustekinumab, and secukinumab). Increasingly, these systemic medications are used because of their efficacy and ease of administration (Koek et al., 2010); however, significant side effects may occur (i.e., renal and hepatic toxicity, hyperlipidemia, hypertension, infections, malignancy, heart failure). In addition, biologic systemic therapies also have substantial costs ($30k-$100k per year; Ahn et al., 2013; Koek et al., 2006; Vano-Galvan et al., 2012). As the cost of pharmaceuticals has increased, interest in expanding the use of home-based phototherapy as a more accessible, safe, and less expensive alternative has grown (Anderson & Feldman, 2015; Hearn et al., 2008; Koek et al., 2009).

Benefits and Challenges of Home Phototherapy

Home phototherapy has many benefits. Treatment at home leads to reduced patient burden (i.e., no travel, parking costs, or missed work) and greater patient satisfaction compared with clinic-based treatments (Koek et al., 2006). In addition, the only significant treatment cost for patients is the one-time expense of the home unit that ranges from approximately $700 to $3,000, and such home units are increasingly covered by insurance providers (Daavlin, 2019; Yentzer et al., 2013).

Home phototherapy also has challenges. Effective home phototherapy requires patients to learn and follow prescribed self-managed protocols that necessitate ongoing adjustments based on multiple factors (i.e., time since last treatment, response to treatment, side effects, photosensitizing medications). In addition, prescribed topical (and sometimes systemic) treatments may add to the complexity of the overall regimen and require high patient motivation, knowledge, and skills. Although the best approach to support patients' use of home phototherapy has not been widely studied, there is growing evidence that health outcomes are highly linked to adherence (Cline et al., 2019; Evers, A., Kleipenning, M., Smits, T., Boezeman, J., van de Kerkhof, P., Kraaimaat, F., Gerritsen, M., 2010). Unfortunately, adherence and, ultimately, the health outcomes achieved

in clinical trials of home phototherapy can decrease significantly in the real-world environment when frequent monitoring and patient support end (Yarbrough et al., 2009).

Results From Previous Internal Organizational Research

In 2014, an internal grant supported the implementation of a pilot project at the authors' large integrated healthcare organization in the United States, in which 10 patients with psoriasis on maintenance clinic-based phototherapy successfully transitioned from clinic to home treatments. The pilot study was one of a few that have described in detail the nursing support required for patients to learn to self-manage their home phototherapy treatments. Weekly phone contacts between patients and the phototherapy nurses over 4–8 weeks (depending on the patients' needs) helped patients develop the knowledge and skills necessary to maximize their ability to self-manage treatments. The nurses emphasized the importance and rationale of consistent completion of treatments as prescribed and appropriate modifications within the parameters of the treatment protocols. The frequent nurse contacts strengthened treatment adherence and allowed the nurses to provide timely assistance with managing personalized treatment issues when they arose. As patients' confidence and independence increased, patients needed progressively less supervision by the nurses.

All 10 patients successfully transitioned to home phototherapy (i.e., they maintained good control of their psoriasis and managed flares appropriately), but some experienced more treatment issues than others, and close timely follow-up was key to keeping their progress moving forward. Findings from this pilot study highlighted the need to protocolize timely nurse-supported patient education and treatment adjustments, to optimize patients' adherence to treatment protocols and their ability to learn self-management, in addition to preventing clinical inertia. The study also underscored the full extent of nursing resources needed to support patients' optimal use of home phototherapy over time.

Home Phototherapy Program Implementation

On the basis of the success of this pilot study, the organization implemented a home-based phototherapy program in 2017 using a team of phototherapy-trained nurses and one dermatologist. The design of the home phototherapy program (i.e., frequency and mode of contacts between the patients, nurses, and providers) and the treatment protocols (Table 1) were developed using published evidence (Anderson & Feldman, 2015; Cameron et al., 2002; Koek et al., 2009; Nolan et al., 2010; Rajpara et al., 2010) and lessons learned during the pilot study. Within a year of the beginning of the program, the nurses determined that the prescribed dosing protocol (based on percentages of previous millijoule-based doses administered) was complex as it required patients to calculate doses and necessitated a great deal of patient support by the nurses (i.e., frequent phone calls and emails, often weekly for 4–8 weeks). Hence, the home phototherapy nurses worked with the dermatologist on the home phototherapy team to design a simpler, time-based home phototherapy dosing protocol that would support patients' comprehension of appropriate dose titration and allow them to become independent more quickly. The nurses felt they could decrease the number of nurse–patient contacts with the simpler dosing protocol but recognized that meeting treatment goals required more than dose changes, patient education, and knowledge uptake. To avoid clinical inertia, the team defined the optimal timing for nurses to assess patient progress, address side effects that could stall progress, and adjust dosing within the protocol parameters to maximize individual results, all while avoiding overuse of nursing resources. Figure 1 (home phototherapy program process) illustrates all elements of the current simplified program implemented across all regions of the organization. More recently, implementation of an organization-wide online home phototherapy registry now supports patient monitoring with easily accessible patient-specific information and reminders for the nurses to instigate timely follow-up phone calls and provider clinic visits as appropriate.

Because of the multifaceted efforts to implement a highly effective nurse-led home phototherapy program that could continue to be scaled up across regions and states and ultimately help to inform the care of patients outside the agency, the organization decided to partner with a local university to study the program's health outcomes and use of clinical resources.

Home Phototherapy Program Study

The aims of this study are to

1) examine the effects of the Home Phototherapy Program (i.e., level of disease clearance achieved, quality of life, burden of treatment [BOT], side effects such as burns, and number of treatments needed to achieve 90% or greater clearance); and
2) describe the clinical resources utilized in the Home Phototherapy Program (i.e., type and frequency of nursing and medical care provided).

This study is currently underway with longitudinal results expected in 1 year. The program is in the data collection phase; therefore, this article does not include evaluation data or results. However, the article does provide a detailed description of the study protocol that is in process to help others interested in formally evaluating their phototherapy programs.

METHODS

Study Design

This study uses an observational cohort. The project was reviewed and approved by the agency's human subjects committee. Participants are identified prospectively at

TABLE 1. Complete Simplified Home Phototherapy Protocol for Psoriasis and Dermatitis

Program Structure **Clinician Contacts With Patients**	**Mode of Contact**	**Role and Responsibilities**
Dermatology provider contacts	Primary in-person clinic visits	• Initial determination of home phototherapy candidacy and referral to home phototherapy • Determines patient's phototype (I–V) and includes in phototherapy prescription • Visit at 3 months to determine if home phototherapy is achieving desired results and, if possible, decreased or discontinued medications • Visit at 6 months to assess long-term effects
Nurse contacts	Telehealth model: primarily phone and some email; rare clinic visits	• Initial home phototherapy patient education (30–60 minutes) and then follow-up phone calls at 4 and 8 weeks after initiation • Additional contacts that are patient driven, as needed • Ensure steady progress of treatments • Address patient issues and concerns • Actively prevent clinical inertia • Utilize registry to manage population of home phototherapy patients
Phototherapy Protocols		
Nurse-Driven		
Protocol Name	Description	Details
Starting dose	• Evidence-based protocols established from studies on burning/tanning typical for Phototypes I–VI	• Phototypes I–V are appropriate candidates for home phototherapy (home units lack adequate power to treat Phototype VI) • Starting dose is 0.7% of phototype's estimated minimal erythema dose • May be adjusted by provider or nurse if the patient is taking photosensitizing medications
Patient-Driven, Nurse-Supported		
Protocol Name	Description	Details
Treatment frequency	Treatments are administered 3 times/week during the clearance phase	• Clearance phase is the period in which phototherapy treatment doses are increased and the condition is continuing to improve • Tapered to once-weekly once condition is controlled • Once skin is clear, call phototherapy nurse to discuss taking a break from treatments vs. staying on maintenance therapy
Dose escalation	Subsequent doses are based on the phototype-driven protocols	• Dose increases of 15%–25% of the previous dose based on the phototype-driven protocols and the patient's degree of erythema (see "Erythema protocol" below) • Dosing plan individualized when appropriate and given to the patient at initiation to minimize need for patients to calculate doses
Dose adjustments based on outcomes	Determined by protocol with adjustments based on three variables	• Time since the last treatment (see "Missed treatment protocol" below) • Photosensitizing medications • Erythema (see "Erythema protocol" below)

(continues)

TABLE 1. Complete Simplified Home Phototherapy Protocol for Psoriasis and Dermatitis, Continued

Program Structure Clinician Contacts With Patients	Mode of Contact	Role and Responsibilities
Missed treatment protocol	Time since the last treatment	If the patient missed treatments, adjust as below: • 8–13 days: stay the same (no increase) • 14–20 days: reduce time by 50% • 21 days or more: contact phototherapy nurse
Erythema protocol (pinkness)	Not pink (no erythema) at all	• Continue to increase dose as directed
	If very light pink (mild erythema)	• Same dose repeated, and then subsequent doses continued at the previous rate of increase
	If medium pink or red (moderate or greater erythema)	• Contact phototherapy nurse
Photosensitizing medications	Many medications are photosensitizing	• Contact phototherapy nurse whenever new medications are started

the time they enroll in the Home Phototherapy Program and followed for 9 months using data from their electronic health records, their home phototherapy treatment logs (required as part of the treatment process), and telephone-administered questionnaires. Our target sample size is 30 patients.

Setting

The organization serves more than 700,000 patients with six dermatology clinics primarily serving Western Washington State; four of them offer clinic-based phototherapy managed by registered and licensed practical nurses specially trained in phototherapy. Some of these same phototherapy nurses are trained to remotely support those patients prescribed home phototherapy.

Clinical Treatment Procedures

The dermatology provider, in collaboration with the patient, determines if the patient is an appropriate home phototherapy candidate and then refers the patient to the home phototherapy program. The home phototherapy orders include the provider's determination of the patient's phototype (based on how easily they burn and/or tan; Gupta & Sharma, 2019). The organization's home phototherapy lead dermatologist designed the treatment protocols to be phototype driven, with separate dosing protocols for Phototypes 1 and 2 (burn most easily), Types 3 and 4 (moderate risk of burning), and Type 5 (least likely to burn) based on published dosing protocols (Anderson & Feldman, 2015; Evers et al., 2010; Koek et al., 2006, 2009). For each protocol, the starting dose and typical dose escalation pattern depend on the phototype. The prescribing dermatology provider (i.e., dermatologist or dermatology-trained nurse practitioner) may also adjust the starting dose based on photosensitizing medications a patient is taking, or the phototherapy nurse may adjust following the photosensitizing medication protocol. In addition, because individuals have unique responses to the dosing, they keep a treatment log to document the date of their home treatment, the dose, their skin conditions' response to treatment (i.e., better, same, worse), and side effects (i.e., erythema, burning sensation, blisters). If specific responses such as burning occur, patients make changes to the typical dosing recommendation by following the prescribed phototherapy protocols (Table 1) or contacting the nurse for further directions. Patients in home phototherapy continue their nonphototherapy personal treatment regimen, and as clinically appropriate, their dermatology provider may make other treatment changes over time.

Once referred to the home phototherapy program, the phototherapy nurse provides the patient with the initial phototherapy education and training via phone or, more rarely, in the clinic. Follow-up phone consultations with the nurses occur at least monthly for 2 months, and clinic visits with the dermatology provider are at 3, 6, and 9 months after starting phototherapy and then yearly (Figure 1). Home phototherapy participants have digital photos taken using standardized dermatology digital cameras by nursing staff at four points during their treatment: at their visit with their dermatology provider when they are first referred to home phototherapy (enrollment) and then again at their 3-, 6-, and 9-month visits with the provider after the start of home phototherapy. The nursing staff download the photos into the patient's electronic medical record per usual care. Disease severity is assessed using the patient's digital photos obtained during provider visits, de-identified, and later scored by the dermatology nurse practitioner. Quality of life and BOT are evaluated with questionnaires collected by a research specialist during structured phone interviews (see below). If at any time the provider is concerned that there is a delay in the patient's progress toward clearance because of home phototherapy challenges (i.e., misunderstanding the treatment protocols, lifestyle issues, inconsistent use of complementary medications),

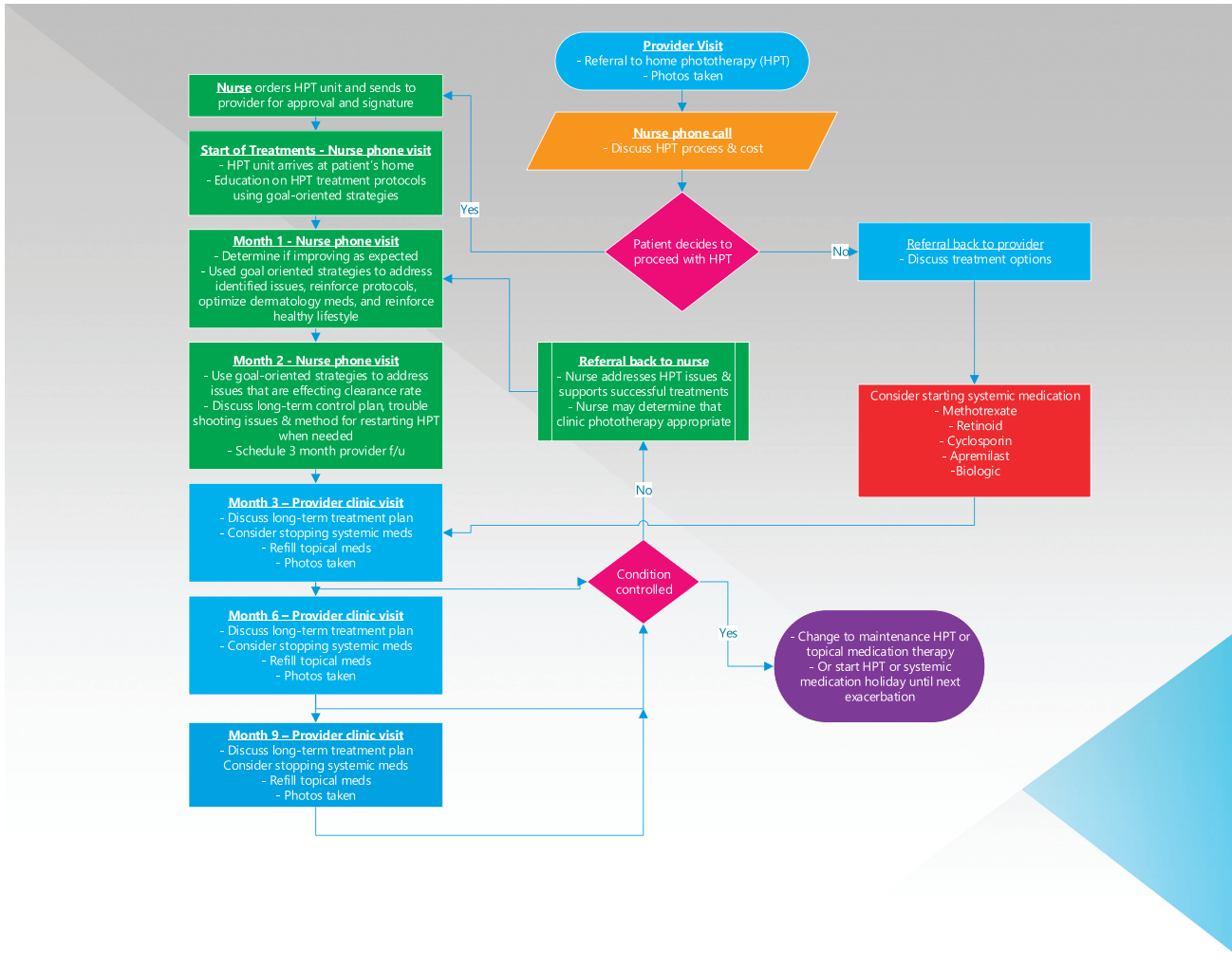

FIGURE 1. Home Phototherapy Program process.

the provider refers the patient to the nurse for further assessment and support.

Study Procedures

Study Eligibility Criteria

Inclusion criteria for this study include (a) age of 18 years or older; (b) diagnosis of psoriasis or dermatitis, also called eczema (i.e., atopic and other types of chronic dermatitis); and (c) referral for home phototherapy. Exclusion criteria are as follows: (a) home phototherapy patients with psoriasis or dermatitis exclusively on their scalp (excluded because the scalp is difficult to score using digital photographs because of hair obscuring the view of the scalp) and (b) other skin conditions such as vitiligo (a much slower response rate) and mycosis fungoides (much smaller numbers affected).

Measures and Data Collection Timelines

The series of standardized digital photographs taken by nursing staff at the patients' medical visits at baseline and at 3, 6, and 9 months are utilized to score psoriasis severity using the PASI (Feldman et al., 1996) and dermatitis severity using the Eczema Area and Severity Index (Chopra et al., 2017). When psoriasis or dermatitis is present only on the hands and/or feet, the Hand/Foot Physician Global Assessment tool (Leonardi et al., 2011) is utilized. A questionnaire covering the Dermatology Life Quality Index (Finlay & Khan, 1994) is administered at baseline and at 3, 6, and 9 months. Questionnaires, administered at 3, 6, and 9 months, cover BOT (Koek et al., 2006), acute response to treatment, and select side effects for home phototherapy (not done at baseline because they will not have experienced home phototherapy yet). Data on clinical resources (i.e., the number of contacts with the nurses and providers; contact mode of phone, email, or clinic visit; and content and time required for patient education) are extracted from the electronic health record. The nurses and providers document treatment adherence information in their phone and clinic visit chart notes for extraction at the end of the study.

Planned Analysis

Table 2 summarizes the study measures. The plans for analyzing the evaluation data for this in-process study are described below.

Study Aim 1: Examine the effects of the Home Phototherapy Program (i.e., level of disease clearance achieved, quality of life, BOT, side effects such as burns, and number of treatments needed to achieve 90% or greater clearance)

Level of clearance (PASI, Eczema Area and Severity Index, and Hand/Foot Physician Global Assessment measures), quality of life (Dermatology Life Quality Index measure), BOT (BOT measure), and acute side effects will be analyzed as treatment outcomes. Analyses will begin with descriptive statistics to assess response distributions and missing data patterns as well as reliability assessment of the measures within the project sample. Univariate and bivariate graphical analyses will be used to provide a description of the sample. Differences in proportions of patients meeting clearance criteria for successful treatment will be examined at 3, 6, and 9 months. Analysis of covariance will be used to assess quality of life over time, using the baseline score as a covariate. BOT will also be examined over time but only at the 3-, 6-, and 9-month measures because, at baseline, the participant would not be able to speak to home phototherapy's BOT yet. Nursing and/or provider documentation of appropriate adherence to phototherapy protocols and the treatment log will be analyzed to evaluate adherence (using standardized tools).

Study Aim 2: Describe the clinical resources utilized in the Home Phototherapy Program (i.e., type and frequency of nursing and medical care provided)

Resource utilization will be analyzed using the number of contacts with the nurses and providers, patient-driven contacts, the mode of contact (i.e., phone, email, clinic visits), and the time required for the nurse to provide education at enrollment (i.e., discuss unit type, house requirements, cost, time commitment) as well as the time required for the nurse education call after the unit arrives in the home (i.e., treatment protocols, side effects, when to call the nurse) and the time needed for the 1- and 2-month follow-up calls (i.e., optimizing treatments, managing side effects, when to go to maintenance, taking breaks from phototherapy when condition is controlled). The expectation is that all the educational sessions will be phone visits, but other types of visits will be noted if they occur. To facilitate data collection, we created standardized tools to prompt nurses to include the information we needed in the electronic health record notes. Descriptive statistics will be used to characterize the clinical resources utilized to support home phototherapy treatments.

DISCUSSION

This article describes an ongoing study of a nurse-led home phototherapy program in an integrated healthcare system. To our knowledge, this is the first such evaluation effort that has been implemented in the United States. For that reason, the information gained will be important for guiding the development of similar programs in other healthcare systems.

In Europe, adherence to home phototherapy is supported by nurses via nurse home visits (Cameron et al., 2002; Koek et al., 2006). Patients rent home phototherapy units (which are not available in the United States), and the service includes nursing care throughout the course of treatment. This approach allows the nurse to closely monitor the patient's progress and modify the treatments in a timely way, therefore preventing clinical inertia. The home phototherapy model in the United States is very different. Patients purchase the phototherapy units, and the expectation is that they will independently self-manage at home with varying levels of support from their dermatologist and the rest of the clinical team. Minimal evidence exists about the optimal support for patients in the U.S. model. Consequently, U.S. dermatologists and nurses lack the information needed to design and implement an evidence-based nurse-led program that can provide care using a telehealth model (i.e., care is provided by phone and email) and optimize health outcomes, patient and staff satisfaction, and resource utilization.

Unlike Europe, home phototherapy is not commonly prescribed in the United States because of clinician apprehension about a patient's ability to self-manage, concerns about potential side effects in the home environment, unclear dosing regimens, clinician loss of control, liability, and lack of availability (Koek et al., 2006). Koek et al. (2010) conducted a randomized trial in the United Kingdom of home phototherapy delivered by trained phototherapy nurses during home visits and found it to be cost effective. Few studies have fully described the clinical resources necessary to offer home phototherapy services (Anderson & Feldman, 2015; Cameron et al., 2002; Koek et al., 2010), but many providers assume extensive resources are needed, because patients must be taught to use the phototherapy equipment safely and effectively on their own and be monitored and supported over time to facilitate optimal results. The current study is examining these concerns about clinical resources and patient health outcomes, which will help guide decisions about expanding the use of home phototherapy in the agency and other healthcare systems. Important questions will also be addressed about the ultimate impact of home phototherapy on patient outcomes and clinical resources. Compared with the original, complex, home phototherapy protocol, does the protocol currently implemented at the agency support earlier patient independence while achieving a high level of disease control and improved quality of life? What is the effect on the patient's perception of the burden of their disease treatment? Are fewer planned nursing contacts effective, or do they decrease patient adherence and, ultimately, health benefits? What are the necessary elements of clinical resources that optimize cost-effectiveness and support broader implementation of the program?

CONCLUSION AND NURSING IMPLICATIONS

Translating research to the complex real-world practice environment is not easy (Titler, 2007), and the details on

TABLE 2. Variables, Measures, and Data Sources for Home Phototherapy Study

Evaluation Variable	Evaluation Measure	Data Source	Description
Psoriasis severity (how well the program is working)	• Psoriasis Area & Severity Index (PASI; Feldman et al., 1996) • PASI 75: proportion of patients reaching a 75% improvement of the PASI	Digital photography obtained by nursing staff	Four measures: • Skin area involved (0–6) • Redness (0–4) • Thickness (0–4) • Scale (0–4) Score range (0–72)
Eczema (i.e., dermatitis) severity (how well the program is working)	• Eczema Area & Severity Index (Chopra et al., 2017) • Severity scale: 0–5.9, clear–mild 6.0–22.9, moderate 23.0–72, severe	Digital photography obtained by nursing staff	Four measures: • Skin area involved (0–6) • Redness (0–3) • Thickness (0–3) • Scale (0–3) Score range (0–72)
Psoriasis or dermatitis severity on the hands/feet	• Hand/Foot Physician Global Assessment (hfPGA; Leonardi et al., 2011) • Success as determined by hfPGA required a score of 0 or 1	Digital photography obtained by nursing staff	0 = clear, no signs of plaque psoriasis or dermatitis 1 = almost clear, just perceptible erythema with minimal scaling with or without pustules 2 = mild, light pink erythema with minimal scaling with or without pustules 3 = moderate, dull red, clearly distinguishable erythema with diffuse scaling and some thickening of the skin, with or without fissures and pustule formation 4 = severe, deep, dark red erythema with obvious and diffuse scaling and thickening as well as numerous fissures with or without pustule formation
Quality of life (additional effects on patients)	• Dermatology Life Quality Index (DLQI; Finlay & Khan, 1994)	Participant	Structured phone interviews DLQI : 10-question measure using a Likert scale (each worth 0–3 points) 0–1 = no effect at all on patient's life 2–5 = small effect on patient's life 6–10 = moderate effect on patient's life 11–20 = very large effect on patient's life 21–30 = extremely large effect on patient's life
Burden of treatment	• Burden of Treatment (BOT; Koek et al., 2006)	Participant	Structured phone interviews BOT: four-question measure using a 10-point Likert-scale (each worth 0–3 points) 0 = not a burden 1 = mild burden (scores of 1–3) 2 = moderate burden (scores of 4–7) 3 = very high burden (scores of 8–10)

(continues)

TABLE 2. Variables, Measures, and Data Sources for Home Phototherapy Study, Continued

Evaluation Variable	Evaluation Measure	Data Source	Description
Acute response to treatments	Four short-term side effects • Mild erythema (expected) • Burning sensation (expected) • Severe erythema • Blistering	Participant	Structured phone interviews (based on required patient treatment log) Four measures: • Mild erythema (expected) • Burning sensation (expected) • Severe erythema • Blistering
Other treatments for psoriasis	• Prescriptions	Electronic health record	Pharmacy databases
Important medical conditions: psoriatic arthritis, myocardial infarction, hypertension, diabetes, and obstructive sleep apnea	• ICD codes • Prescriptions	Electronic health record	Record section: • Diagnosis and procedure codes • Pharmacy databases
Sociodemographic data	• Age, gender, race, ethnicity, education	Electronic health record plus questionnaire	From enrollment and demographic files plus a question about education
Adherence	• Nurse and/or provider documentation of appropriate adherence to phototherapy protocol via charting template	Electronic health record; treatment log	Chart review (or electronic capture) Nurse/provider reviews treatment protocols listed in Table 1 and documents using an electronic medical record documentation tool with the question: "Assessment: following home phototherapy protocol appropriately: yes/no"
Clinical resources	• Number of contacts with nurse/provider • Contact mode: phone, email, clinic visits • Time required for nurse to provide education at baseline and at 1 and 2 months (phone visits) • Content/topics covered: help with dosing, side effects, medication issues, others	Electronic health record	Chart review (or electronic capture)

Note. ICD = International Classification of Diseases.

how to implement effective nursing care strategies for specific treatment programs are often missing in the literature. Nurses can play a key role in addressing clinical inertia by developing evidence-based programs that assist patients with complex needs to meet their therapeutic targets. Although there is extensive research showing the effectiveness of home phototherapy, the specific details describing the treatment protocols and clinical support necessary for optimal results are not available. This article provides an in-depth description of a newly developed home phototherapy program and the changes made to simplify treatment protocols to support patient adherence, optimize health outcomes, and streamline clinical resources. It also provides a detailed outline of the clinical evidence-gathering strategies used to evaluate the impact of this modified nurse-led home phototherapy program to offer an example for other nurses interested in doing a similar investigation.

This study will be valuable in multiple ways to the agency and others implementing home phototherapy programs in other healthcare organizations. The clinical outcomes will help nurses and dermatology providers at the agency to evaluate how well the program is working for patients in their practice and whether changes are needed to enhance results. It will inform program modifications to support increased effectiveness and help to determine if home phototherapy should be prescribed only to certain subgroups of patients. The quality of life and BOT outcomes will also assist clinicians to more fully describe the program to prospective patients, so they can decide if this option might work for them. The resource outcomes are critical to understanding how practical and cost-effective

the program is in comparison with other treatments and how it may be modified to be more efficient. When nurses implement evidence-based programs into their clinical practice in a structured way and carefully examine the effects, they have a tremendous opportunity to expand the impact of the care they provide for their individual patients, populations of patients, and the greater healthcare system. ■

REFERENCES

Ahn, C., Gustafson, C., Sandoval, L., Davis, S., & Feldman, S. (2013). Cost effectiveness of biologic therapies for plaque psoriasis. *American Journal of Clinical Dermatology*, *14*, 315–326. 10.1007/s40257-013-0030-z

Anderson, K., & Feldman, S. (2015). A guide to prescribing home phototherapy for patients with psoriasis: The appropriate patient, the type of unit, the treatment regimen, and the potential obstacles. *Journal of the American Academy of Dermatology*, *72*(5), 868–878. 10.1016/j.jaad.2015.02.003

Brezinski, E., Dhillon, J. A., & Armstrong, A. W. (2015). Economic burden of psoriasis in the United States: A systematic review. *Journal of the American Medical Association*, *151*(6), 651–658. 10.1001/jamadermatol.2014.3593

Cameron, H., Yule, S., Moseley, H., Dawe, R., & Ferguson, J. (2002). Taking treatment to the patient: Development of a home TL-01 ultraviolet B phototherapy service. *British Journal of Dermatology*, *147*(5), 957–965. 10.1046/j.1365-2133.2002.04860.x

Chauhan, P., Kaur, I., Dogra, S., De, D., & Kanwar, A. (2010). Narrowband ultraviolet B versus psoralen plus ultraviolet A therapy for severe plaque psoriasis: An Indian perspective. *Clinical and Experimental Dermatology*, *36*, 169–173. 10.1111/j.1365-2230.2010.03874.x

Chopra, R., Vakharia, P., Sacotte, R., Patel, N., Immaneni, S., White, T., Kantor, R., Hsu, D. Y., & Silverberg, J. I. (2017). Severity strata for eczema area and severity index (EASI), modified EASI, scoring atopic dermatitis (SCORAD), objective SCORAD, atopic dermatitis severity index and body surface area in adolescents and adults with atopic dermatitis. *The British Journal of Dermatology*, *177*, 1316–1321. 10.1111/bjd.15641

Cline, A., Unrue, E., Collins, A., & Feldman, S. (2019). Adherence to a novel home phototherapy system with integrated features. *Dermatology Online Journal*, *25*(3), 1–8. 30982300

Daavlin. (2019). *The economics of home phototherapy*. https://www.daavlin.com/the-economics-of-home-phototherapy/

Evers, A., Kleipenning, M., Smits, T., Boezeman, J., van de Kerkhof, P., Kraaimaat, F., Gerritsen, M. (2010). Treatment nonadherence and long-term effects of narrowband UV-B therapy in patients with psoriasis. *Archives of Dermatology*, *146*(2), 198–199. 10.1001/archdermatol.2009.382

Feldman, S., Camacho, F., Krejci-Manwaring, J., Carroll, C., & Balkrishnan, R. (2007). Adherence to topical therapy increases around the time of office visits. *Journal of the American Academy of Dermatology*, *57*(1), 81–83. 10.1016/j.jaad.2007.04.005

Feldman, S., Fleischer, A., Reboussin, D., Rapp, S., Exum, M., Clark, A., & Nurre, L. (1996). The self-administered psoriasis area and severity index is valid and reliable. *Journal of Investigative Dermatology*, *106*(1), 183–186. 10.1111/1523-1747.ep12329912

Finlay, A., & Khan, G. (1994). Dermatology life quality index (DLQI)—A simple practical measure for routine clinical use. *Clinical and Experimental Dermatology*, *19*(3), 210–216. 10.1111/j.1365-2230.1994.tb01167.x

Gupta, V., & Sharma, V. (2019). Skin typing: Fitzpatrick grading and others. *Clinics of Dermatology*, *37*, 430–436. 10.1016/j.clindermatol.2019.07.010

Halioua, B., Corgibet, F., Maghia, R., Hello, S., Caillet, G., Nicolas, C., Riboulet, J. L., & Mahé, E. (2019). Therapeutic inertia in the management of moderate-to-severe plaque psoriasis. *Journal of the European Academy of Dermatology and Venereology*, *34*(1), e30–e32. https://doi.org/10.1111/jdv.15882.

Hallaji, Z., Barzegari, M. B., Mansoori, P., Taheri, A., & Mansoori, P. (2010). A comparison of three times vs. five times weekly narrowband ultraviolet B phototherapy for the treatment of chronic plaque psoriasis. *Photodermatology, Photoimmunology & Photomedicine*, *26*(1), 10–15. 10.1111/j.1600-0781.2009.00473.x

Hearn, R., Kerr, A., Rahim, K., Ferguson, J., & Dawe, R. (2008). Incidence of skin cancers in 3867 patients treated with narrow-band ultraviolet B phototherapy. *British Journal of Dermatology*, *159*, 931–935. 10.1111/j.1365-2133.2008.08776.x

Johnson, B., Franco, A., Beck, L., & Prezzano, J. (2019). Treatment-resistant atopic dermatitis: Challenges and solutions. *Clinical, Cosmetic and Investigational Dermatology*, *12*, 1818–1192. 10.2147/CCID.S163814

Kalia, S., Toosi, B., Bansback, N., Astaneh, A., Zhou, Y., Shapiro, J., & Lui, H. (2014). Assessing adherence with phototherapy protocols. *Journal of the American Academy of Dermatology*, *71*(6), 1259–1260. 10.1016/j.jaad.2014.07.046

Kleinpenning, M. S., Boezeman, J., van de Kerkhof, P., Evers, A., & Gerritsen, M. (2009). Narrowband ultraviolet B therapy in psoriasis: Randomized double-blind comparison of high-dose and low-dose irradiation regimens. *British Journal of Dermatology*, *161*, 1351–1356. 10.1111/j.1365-2133.2009.09212.x

Koek, M., Buskens, E., Steegmans, P., van Weelden, H., Bruijnzeel-Koomen, C., & Sigurdsson, V. (2006). UVB phototherapy in an outpatient setting or at home: A pragmatic randomised single-blind trial designed to settle the discussion. The PLUTO studies. *BMC Medical Research Methodology*, *6*, 39. 10.1186/1471-2288-6-39

Koek, M., Buskens, E., van Weelden, H., Steegmans, P., Bruijnzeel-Koomen, C., & Sigurdsson, V. (2009). Home versus outpatient ultraviolet B phototherapy for mild to severe psoriasis: Pragmatic muticentre randomised controlled non-inferiority trial. *British Medical Journal*, *338*, b1542. 10.1136/bmj.b1542

Koek, M. S., vanWeelden, H., Steegmans, P., Bruijnzeel-Koomen, C., & Buskens, E. (2010). Cost effectiveness of home ultraviolet B phototherapy for psoriasis: Economic evaluation of a randomised controlled trial (PLUTO study). *British Medical Journal*, *340*, c1490. 10.1136/bmj.c1490

Kurd, K., & Gelfand, J. (2009). The prevalence of previously diagnosed and undiagnosed psoriasis in US adults: Results from NHANES 2003–2004. *Journal of the American Academy of Dermatology*, *60*(2), 218–224. 10.1016/j.jaad.2008.09.022

Leonardi, C., Langley, R., Papp, K., Tyring, S., Wasel, N., Vender, R., Unnebrink, K., Gupta, S. R., Valdecantos, W. C., & Bagel, J. (2011). Adalimumab for treatment of moderate to severe chronic plaque psoriasis of hands and feet. *Archives of Dermatology*, *147*(4), 429–436. 10.1001/archdermatol.2010.384

Matthews, S., Simmer, M., Williams, L., Fishman, P., & Shors, A. (2018). Transition of psoriasis patients from office-based phototherapy to nurse-supported home phototherapy. *Journal of the Dermatology Nurses' Association*, *10*(1), 29–41.

Menter, A., Korman, K., Elmets, C., Feldman, S., Gelfand, J., Gordon, K., Gottlieb, A., Koo, J. Y. M., Lebwohl, M., Lim, H. W., van Voorhees, A. S., Beutner, K. R., & Bhushan, R. (2011). Guidelines of care for the management of psoriasis and psoriatic arthritis. *Journal of the American Academy of Dermotology*, *65*(1), 137–174. 10.1016/j.jaad.2009.08.026

Milani, R., & Lavie, C. (2015). Health care 2020: Reengineering health care deliver to combat chronic disease. *American Journal of Medicine*, *128*(4), 337–343. 10.1016/j.amjmed.2014.10.047

Milman, T., Joundi, R., Alotaibi, N., & Saposnik, G. (2018). Clinical inertia in the pharmacological management of hypertension: A systematic review and meta-analysis. *Medicine (Baltimore)*, *97*(25), 1–9. 10.1097/MD.0000000000011121

Nolan, B., Yenzter, B., & Feldman, S. (2010). A review of home phototherapy for psoriasis. *Dermatology Online Journal*, *16*(2), 1. 20178697

O'Connor, P., Sperl-Hillen, J., Johnson, P., Rush, W., & Biltz, G. (2005). Clinical inertia and outpatient medical errors. In Henriksen, K., Battles, J., Marks, E., & Lewin, D., *Advances in patient safety: From research to implementation* (pp. 293–308). (Volume 2: Concepts and Methodology). Rockville (MD); Available from: https://www.ncbi.nlm.gov/books/NBK20513/

Okemah, J., Peng, J., & Quinones, M. (2018). Addressing clinical inertia in type 2 diabetes mellitus: A review. *Advanced Therapy*, *35*(11), 1735–1745. 10.1007/s12325-018-0819-5

Psoriasis statistics. (2019). Retrieved June 23, 2019, from https://www.psoriasis.org/content/statistics

Rachakaonda, T., Schupp, C., & Armstrong, A. (2014). Psoriasis prevalence among adults in the United States. *Journal of the American Academy of Dermatology*, *70*(3), 512–516. 10.1016/j.jaad.2013.11.013

Rajpara, A., O'Neill, J., Nolan, B., Yentzer, B., & Feldman, S. (2010). Review of home phototherapy. *Dermatology Online Journal*, *16*(12), 2. 21199628

Richards, E., & Honigsmann, H. (2014). Phototherapy, psoriasis, and the age of biologics. *Photodermatology*, *30*(1), 3–7. 24313462

Thorneloe, R., Griffith, C., Emsley, R., Ashcroft, D., & Cordingley, L. (2018). Intentional and unintentional medication non-adherence in psoriasis: The role of patients' medication beliefs and habit strength. *Journal of Investigative Dermatology*, *138*(4), 785–794.

Titler, M. (2007). Translating research into practice. *American Journal of Nursing*, *107*(6), 26–33. 17563431

Totonchy, M., & Chiu, M. (2014). UV-based therapy. *Dermatologic Clinics*, *32*, 399–413. 10.1016/j.det.2014.03.003

Vano-Galvan, S., Garate, M., Fleta-Asin, B., Hidalgo, A., Fernandez-Guarino, M., Bermejo, T., & Jaen, P. (2012). Analysis of the cost effectiveness of homebased phototherapy with narrow-band UV-B radiation compared with biological drugs for the treatment of moderate to severe psoriasis. *Actas Dermo-sifliograficas*, *103*(2), 127–137. 10.1016/j.ad.2011.05.002

Wong, T., Jsu, I., & Liao, W. (2013). Phototherapy in psoriasis: A review of mechanisms of action. *Journal of Cutaneous Medicine and Surgery*, *17*(1), 6–12. 10.2310/7750.2012.11124

Yarbrough, C., Yentzer, B., Yelverton, C., & Feldman, S. (2009). Continued use of home narrowband ultraviolet B light phototherapy for psoriasis after completion of a clinical trial. *Journal of the American Academy of Dermatology*, *60*(5), 877–879. 10.1016/j.jaad.2008.10.050

Yentzer, B., Gustfson, C., & Feldman, S. (2013). Explicit and implicit copayments for phototherapy: Examining the cost of commuting. *Dermatology Online Journal*, *19*(6). https://escholarship.org/uc/item/8g48g4sc

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