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Topical Vehicle Design: Educational Intervention Addresses Gap in Dermatology Resident Training

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INTRODUCTION

Over-the-counter (OTC) products are often used as first-line or adjunctive treatments for many dermatologic conditions.[1,2] Topical formulations consist of one or more active ingredients combined with a vehicle, which influences stability, ability to permeate the skin barrier, and optical and physical properties of the product.[3] Topical vehicles (TVs), including ointments, creams, gels, and foams, differ in their pharmacological properties and consequently influence tolerability, patient adherence, and overall treatment success.[3-5] Thus, it is crucial that clinicians, especially dermatologists, are adequately trained on TV formulations. This study sought to quantify TV training in dermatology residency and to evaluate the impact of a targeted educational intervention on residents' overall knowledge and their confidence in recommending and discussing TV formulations and OTC products.

MATERIALS AND METHODS

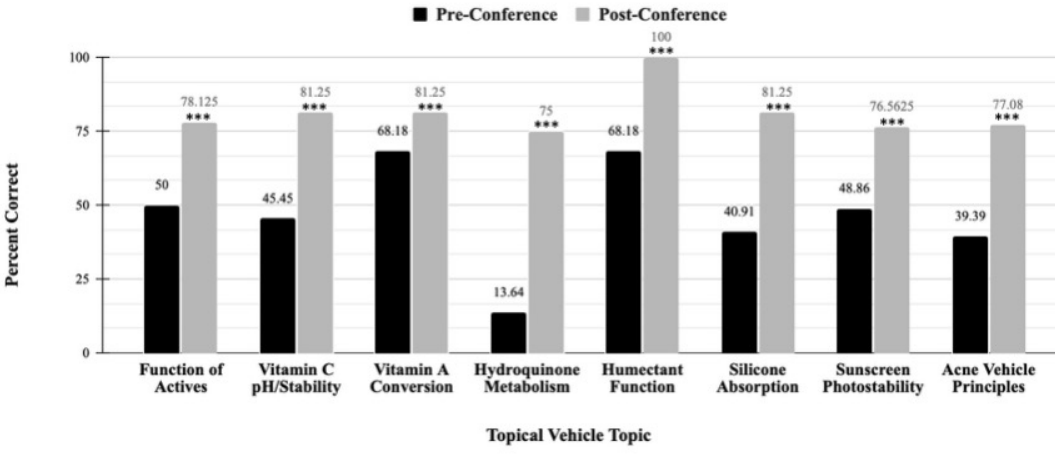
An IRB-approved, anonymous survey (IRB#NCR256476) was distributed to dermatology residents from three training programs in Washington, DC, who attended the inaugural *"Lab-to-Label: Science and Clinical Application in Sunscreen and Cosmeceutical Vehicles"* conference. The educational intervention included didactic lectures, multidisciplinary panel discussions, and hands-on tactile product evaluation. Conference content addressed skin structure and function, TV chemical science, OTC product categories and ingredients, FDA regulations, formulation considerations for acne and sunscreen therapies, and navigation of skincare trends and the influence of social media on patient education.

Participants completed pre- and post-conference surveys assessing prior exposure to TV education, comfort discussing TV formulations, confidence recommending OTC products based on TV type, and formulation knowledge. Objective questions evaluated resident knowledge of actives, vitamin C, vitamin A derivatives, hydroquinone, humectants, silicones, sunscreen, and acne topicals. Pre- and post-intervention objective knowledge scores were compared using a paired-samples t-test in SPSS version 31 (α=.05).

RESULTS

Of the 22 dermatology residents present, 17 participated in the pre- and post-surveys (77% response rate). Most respondents (81.8%) reported no formal training in cosmetic chemistry or TV formulation. Pre-survey responses indicated that only 13.6% felt *"very comfortable"* and 31.8% felt *"somewhat comfortable"*

FIGURE 1. Topical vehicle objective knowledge scores pre- and post-conference. ***$P<.001$ indicates statistically significant difference.



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discussing TVs with patients. After the educational intervention, 81% reported feeling *"much more comfortable"* discussing differences between TV formulations. Similarly, confidence in recommending OTC products based on TV formulations also improved markedly. Pre-intervention, 4.6% felt *"very confident,"* and 36.4% felt *"somewhat confident"* recommending OTC products based on TV formulations. Post-conference, 81.3% reported feeling *"much more confident."* Objective knowledge scores also improved across all categories (Figure 1). A paired-samples t-test demonstrated a statistically significant increase (P<.001) in accuracy from pre-survey to post-survey, with the assumption of normality confirmed using a Shapiro-Wilk test (P=.155).

DISCUSSION

Dermatology residents across three different programs exhibited limited formal training in TV formulation science, highlighting the breadth of this knowledge gap. However, they demonstrated rapid and significant improvement in comfort, confidence, and foundational knowledge following a targeted educational intervention. The "Lab-to-Label" conference resulted in the majority of dermatology residents feeling more comfortable discussing TV formulation differences with patients and more confident recommending OTC products based on TV formulation. Consistent improvement across comfort, confidence, and objective knowledge domains suggests a meaningful benefit to incorporating standardized TV education and educational conferences into dermatology training. Future studies should evaluate long-term retention and examine whether comparable educational interventions could also benefit practicing dermatologists. Limitations of this study include its small regional sample size and the reliance on self-reported measures.

DISCLOSURES

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