ZnTech by Skinnovate

#29

SBHSE — School of Biological and Health Systems Engineering

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Problem Statement

Skin tears are painful wounds affecting millions of elderly patients, particularly in long-term care facilities, where rates can reach over 20% [1]. Our project aims to address this issue by developing a comfortable, passive protective compression sleeve that helps prevent skin tears, enhances patient comfort, and reduces related healthcare complications.

Mission Statement

"To empower elderly patients with fragile skin through innovative, comfortable, and easy-to-use passive protection solutions, preventing skin tears and enhancing quality of life in all care settings."

Manufacturing Design

Selected a weave-based design to ensure uniform compression, durability, and consistent microcurrent delivery. Other manufacturing plans include 3D printing zinc-nylon electrodes onto the polyester fibers of the arm sleeve, or alternatively, weaving zinc-nylon threads in a pattern within the polyester fabric.

Technical Model
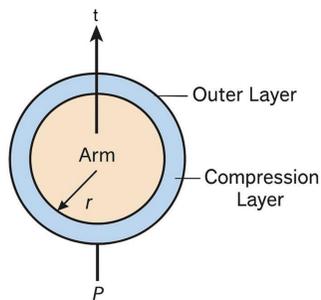
Compression Layer Model

Figure 3. Compression-layer model illustrating the relationship between sleeve strain, arm size, and fabric modulus used to maintain therapeutic pressures (15–25 mmHg) for safe, consistent use in elderly patients.

Skin Generated Microcurrent Diagram

Figure 1. Leveraging a Zinc-Oxygen battery, our device delivers skin-generated microcurrents to promote active healing. Benefits include collagen stimulation, enhanced blood flow, wound care support, and antimicrobial protection for vulnerable skin.

Figure 2. Our fabric combines zinc fibers for bioelectric stimulation with cotton and polyester for comfort, breathability, and durability, forming the core of our skin tear prevention sleeve.

Next Steps

- Verification of device feasibility
- Pre-clinical testing
- IRB approval
- Establish FDA pathway
- Device manufacturing protocol

Timeline of Key Decisions

Design Input

Design must be comfortable, safe, and avoids allergic reactions and skin sensitivities.

Technical Specifications

Compression Level	8-12 mmHg (gentle, consistent)
Sleeve Fit	+/- 5% of arm circumference
Moisture Vapor Transmission Rate (MVTR)	>1000 g/m²/24 hrs (prevents maceration/supports skin health)
Wash Durability	>40 wash cycles
Compatibility	ISO 10993 compliant

QR Codes

HoQ   Gantt Chart

Acknowledgements

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References:
[1] K. LeBlanc, K. Y. Woo, E. VanDenKerkhof, and M. G. Woodbury, "Skin tear prevalence and incidence in the long-term care population: a prospective study," J Wound Care, vol. 29, no. Sup7, pp. S16–S22, July 2020, doi: 10.12968/jowc.2020.29.Sup7.S16.

Timeline: Decided product will prevent skin tears (Class I) → Decided to focus on forearm, due to pressure on skin causing incidence of tears → Elemental Zinc chosen as active ingredient with polyester/nylon as the thread of base → Goal of 2 µA current through device promoting collagen synthesis → Focused on elderly patients in long term care → Models support theory that electric field accelerates skin healing by electrotaxis → Weave in or print zinc fibers directly into textile