Overcoming Challenges in Wound Management:

A Toolbox Approach for Primary Care

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Abstract

Introduction: Primary care providers and other clinical staff commonly manage wounds in the outpatient setting. They often face time constraints and lack formal education in wound care, particularly when dealing with patients with multiple comorbidities. Poorly managed wounds and associated comorbidities have a wide-reaching impact on patient outcomes and quality of life (QoL). Fostering the clinical expertise of team members can help standardize wound services, and most interventions improve wound management self-efficacy in primary care settings. Repetitive expert coaching to teach wound management shows improved provider confidence, time to healing, and patient QoL. **Methods:** An evidence-based wound management toolbox was designed and implemented with associated education through four 15-minute repetitive coaching sessions to evaluate the self-efficacy of project participants at a local primary care clinic primarily serving persons at risk or experiencing homelessness. The toolbox included wound management assessment and documentation, evidence-based algorithms, patient education, supply information, and referral pathways. A pre-intervention and post-intervention survey was used to evaluate the self-efficacy of participants. **Findings:** Ten clinic personnel participated, comprising six with wound care roles and four with non-wound care roles. The intervention significantly increased self-efficacy scores, from 56.50 to 124.50 out of a possible 180 points, with those in wound care roles experiencing the most notable improvements. The results highlight the value of a comprehensive, toolbox-based approach to wound management in addressing the educational and practical needs of primary care providers and staff.

Keywords: wound management, self-efficacy, primary care, education toolbox

Wound Care Management in Primary Care

Primary care is the entry point into the health care system for most patients. With the increase in individuals with multiple comorbidities and an aging population, primary care is commonly the first place for a wound to be seen or possibly prevented. Improving provider and staff knowledge to provide cost-effective, evidence-based wound care requires a thorough understanding of the problem and possible solutions for practice change. A doctoral project sought to improve self-efficacy in wound management at a community-based primary care clinic, which primarily serves individuals experiencing homelessness, by developing and implementing an evidence-based wound toolbox and associated education.

Problem Statement

Wounds place a burden on society and the healthcare system. Approximately 2.5% of the US population, or about 8.2 million individuals, have chronic wounds (Sen, 2021). Wounds disrupt the skin's structural and functional integrity. Chronic wounds are defined as a wound that stalls or fails to proceed through the wound-healing phases in a timely manner (Frykberg & Banks, 2015).

Payment for wound care services is complex. Insurance coverage often determines what a provider can order and prescribe. The Centers for Medicare & Medicaid Services (CMS, 2020) provide coverage guidance and acknowledge that extensive literature on wound care exists with varying clinical opinions. Therefore, CMS does not have defined limitations except for documenting medical necessity. Medicare projected costs incurred in 2014 were somewhere between $28 and $96 billion, with outpatient costs higher than inpatient costs. Diabetic foot disease costs are one-third of the $237 billion spent on diabetes, with similar mortality rates as cancer and a fraction of research funding. In Arizona, many unhoused individuals are covered

under Medicaid, known as the Arizona Health Care Cost Containment System, which does not provide any guidance for wound management (AHCCCS, 2023).

National oversight and standardized guidelines are lacking in the United States. Centers for excellence exist for most life-threatening conditions, such as the National Cancer Institute (Mahmoudi & Gould, 2020). However, no center of excellence provides national oversight for wound care management and practice guidelines. Clinics treating the unhoused often see complex wounds but do not incorporate comprehensive wound care services (Frasier et al., 2023; Goto et al., 2023). Typically, in the United States, any wound care improvements in this population are through various grassroots efforts.

Compared to other countries, access to resources, educational materials, and evidence-based information is frequently held behind paywalls and membership requirements (AAWC, 2022; Alliance of Wound Care Stakeholders [AWCS], 2023; UpToDate, 2023). This contributes to insufficient clinician knowledge and practice confidence resulting from a lack of consistent and well-structured wound care education at academic institutions (Neilsen & Coleman, 2022; Sen, 2021). For example, it is reported that medical students typically receive about nine hours of wound care training (Patel et al., 2008). These challenges underscore the urgent need for improved wound management strategies.

Purpose and Rationale

Due to high wound care costs, inadequate provider and staff knowledge, and ineffective policies and procedures for adequate wound healing, there is a need to address the management of wounds in the primary care setting. A literature review was conducted for articles within the last five years. However, limited available research made it necessary to expand the search from

five to 10 years. The purpose of this project is to improve provider and clinic staff wound management self-efficacy through the implementation of a wound management toolbox.

Background and Significance

At the core of the problem, wounds are not considered an actual "disease," resulting in a system lacking robustness and reproducibility of research and outcomes (Mahmoudi & Gould, 2020). Without national guidelines and limited research funding, wound care has not received the attention needed, despite becoming a growing problem.

Population: Primary Care Providers

Providers and other clinical staff commonly manage wounds in the outpatient setting. Providers order wound care and often face time constraints as these patients have multiple comorbidities. Also, they rarely receive adequate formal education in wound care (Beatty, 2022). Nurses and medical assistants often perform dressing changes which may result in a lower level of assessment and care as nurses often utilize lower-quality evidence to shape their practice and lack product-specific knowledge (Welsh, 2018).

The message is confusing because various websites and organizations often conflict with different messages for treatment. For example, wound care began with plain gauze coverings for infected and non-infected wounds, followed by wet-to-dry dressings (Laurano et al., 2022). Over time, studies and experience showed that wet-to-dry dressings provide greater drawbacks than benefits and are no longer recommended. Yet surprisingly, the National Institutes of Health (NIH) MedlinePlus, a medical encyclopedia, provides patient education for wet-to-dry dressing changes, which was recently updated and reviewed for use (U.S. National Library of Medicine, 2021). This is one example of the inconsistency in education and conveys a confusing message to providers and patients, making navigating wounds in primary care challenging.

Potential Interventions: TIME-H, Five Strategies

While there are limited studies on wound care, some interventions for wound management have shown promise. For providers, wound diagnosis is primarily clinical, with assessment and documentation of the wound (Alam et al., 2021). The TIME framework is one method to guide treatment, including tissue debridement, infection control, moisture balance, and optimal wound edges. However, disease and patient-specific interventions required consideration of additional therapies, including compression, circulation, biopsies, nutrition, and even palliative management. It is even recommended to consider a TIME-H framework, which considers healing time (Guarro et al., 2021).

Another approach is to incorporate five strategies to guide clinicians in choosing the best dressing for the patient (Giaquinto-Cilliers et al., 2022). The first strategy requires the provider to consider the complexity of wounds by identifying local and systemic factors. Next, "heal-ability" addresses the cause, blood supply, comorbidities, nutrition, and medications that may prevent healing. The third strategy is to assess and prepare the wound bed using the TIME framework. Fourth is using tools to create a treatment plan based on a wound bed preparation (WBP) framework. Finally, the provider chooses the dressing modified according to wound healing and does not require frequent changing.

Comparison/Current Practice

Due to insufficient research and available evidence, wound care lags behind other practice areas. The reliance on outdated systems and tools has resulted in poor wound categorization and measurement data from limited stakeholder integration (Mahmoudi & Gould, 2020). In addition, a confusing and crowded wound care supply market adds to the problem. Various disciplines, organizations, and individual states and countries have specific scopes and

procedures regarding wound care (Association for the Advancement of Wound Care [AAWC], 2022; & UpToDate, 2023). The lack of central guidance has led to a lack of standard protocols and inadequate national wound-healing reporting, with limited and fragmented data available.

Research and clinical data help improve the quality of patient care. The CMS has recognized The U.S. Wound Registry (USWR) as a Qualified Clinical Data Registry (Fife et al., 2018). The USWR collects wound data from electronic health records (EHR) to gather real-world evidence for healing wounds. The data shows that most wounds do not heal, contradicting provider-reported high healing rates.

Randomized controlled trials are difficult to conduct in wound patients because, on average, they have six severe comorbid conditions and a minimum of 10 medications, resulting in exclusion (Fife et al., 2019). CMS then creates non-coverage policies due to a lack of inclusion in studies. Providers often turn to the Agency for Healthcare Research and Quality (AHRQ, n.d.) for evidence for improving health care and creating national initiatives. However, the only current wound-related topic is pressure ulcers with associated tools and research. Also, with many of the conferences sponsored by the suppliers of products and the vast number of products available, it can make it challenging for any provider or clinic to determine the best approach to wound care that is cost-effective and optimizes patient outcomes (AAWC, 2022).

Desired Outcomes and Future State

The desired outcome is to implement best practice principles of wound healing and knowledge translation in the clinical setting using cost-effective treatments that improve patient outcomes in a high-risk population. Optimally, Quality of Life (QoL) improves with improved healing times that prevent hospitalizations, infections, and chronic wounds (Giaquinto-Cilliers et al., 2022). The economic and social impact improves with improved wound healing time.

Promising advances are moving wound care into a new era of wound treatments. The advancement of traditional dressings, such as foams, hydrogels, hydrocolloids, and hydro conductive dressings, are being tested by bioactive wound dressings, including bioactive macromers, antimicrobial peptides (AMPs), natural antiseptics, and synthetic antiseptics (Laurano et al., 2022). Most published guidelines and consensus support wound treatment with standard wound care principles for four weeks when developing clinical programs (Frykberg & Banks, 2015). Then, assess if the patient will benefit from advanced therapies. Despite all the advances, adhering to basic wound care principles often leads to satisfactory outcomes.

In summary, wound care requires complex provider decision-making, which impacts patient outcomes. The complexity of wound care will continue to increase as costs rise, the population ages, comorbidities become more prevalent, and bacterial resistance increases (Mahmoudi & Gould, 2020). Similar to the AHRQ (n.d.) toolkits, which provide selected practical tools that are adaptable to the needs of an individual hospital, an evidence-based toolkit can help support wound care clinical decision-making in an outpatient setting.

Internal Data

A local federally qualified health center (FQHC) primary care clinic that serves persons at risk or experiencing homelessness has requested an intervention to improve wound care. Internal data assisted in understanding the problem. Based on conversations with stakeholders and staff, the clinic needs directionality in managing wounds within a complex population. Providers need to be able to consider multiple factors, as most patients at this clinic have Medicaid or are uninsured, have low health literacy, and often live in unsanitary conditions when deciding on wound care. FQHCs do not bill separately for wound care supplies but the clinic receives a set sum to cover all expenses for the visit. Also, the clinic relies on donations to treat

the uninsured. The agency has two medical respite centers for referral for those who cannot be treated adequately in the outpatient clinical setting or for those needing transitional care following hospital admissions. Outreach teams, called "street medicine," treat those who do not want to enter the health care system, frequently face mobility challenges, transportation issues, and unsanitary conditions.

Clinic staff expressed a desire to standardize high-quality and affordable wound care delivery. Within the clinic, no current standards or policies for wound care existed. Concerns were brought up regarding the lack of consistency with treatment regimens and documentation. There had been some effort to improve the wound care knowledge gap through several lunch meetings. However, few remembered what was taught during those training sessions. The proper use of supplies and supply costs due to limited resources was a significant concern to the office manager who purchases supplies. The lack of standardization of workflow from people to processes showed a gap that needed to be addressed.

PICOT Question

A review of the literature led to the clinically relevant PICOT question: "At a primary care clinic, how effective is the use of a wound education toolbox compared to no toolbox in addressing provider wound care self-efficacy over several months?" and led to the following exhaustive search.

Search Strategy

Limitations, Inclusion, and Exclusion Criteria

A systematic search strategy provided a transparent method to retrieve evidence-based data to answer the PICOT question. Three academic databases, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Cochrane Library, were selected based

on their comprehensive collection of health-related peer-reviewed content and Cochrane's quality comprehensive reviews. After searching key terms, additional exclusions were applied, including peer review articles from the past 10 years, English language, adults, and full-text availability. Grey literature was examined for content relevancy, which was previously utilized for background information. However, grey literature was excluded from the PICOT literature review, including but not limited to conferences, dissertations, books, websites, professional organizations, and continuing education. Also, research sponsored and funded by the product manufacturer was excluded for more rigorous transparency. After narrowing the number of articles, each list was hand searched for relevance to the PICOT question, with results evaluated using a Rapid Critical Appraisal (RCA) checklist (Melnyk & Ellen Fineout-Overholt, 2019). The final yield included the 10 most relevant and high-quality studies related to the PICO question.

Keyword Selection with initial and final yields

Due to differences between databases and search results, each search and its results were independently examined. The CINAHL search keywords included wound care, primary practice, and tools. CINAHL automatically pulls up Boolean searching modifiers resulting in additional terms, including wound healing, wound management, or wound treatment; general practice (GP) or GP or primary care or primary health care; and tools, techniques, or strategies. CINHL initial yields included 162 results. After exclusions, 39 articles were hand then searched, with 20 articles critically appraised with a final yield of six articles.

The subsequent search included the Cochrane Library, which has a designated wound category that is subdivided. The wound category contains 63 Cochrane Reviews related to wounds in the past 10 years. After excluding surgical wounds, pressure ulcers, burns, trauma, and malignant wounds, there were 69 reviews on venous ulcers, diabetic foot ulcers, acute

wounds, skin accesses, infection control, acute wounds, and other ulcers. Due to categorization, there is overlap if the review is applied to multiple categories. These abstracts were hand searched for relevance. The final yield included two reviews based on evidence that practice implementation. This evidence further clarifies the need for quality wound care research.

Lastly, the PubMed search included keywords outpatient, wound care, intervention, and ulcer. There were 139 results after exclusions. Additional filters were available and applied, limiting results to RCTs, systematic reviews, and meta-analyses, yielding 28 results that were then hand-searched, and critically appraised, with a final yield of two studies.

After identifying 10 relevant studies, each reference was entered into an evaluation table for further data analysis (see Appendix A). The level of evidence was determined using Steven and Cutter's hierarchy for interventions (Melnyk & Ellen Fineout-Overholt, 2019). Of the 10 studies, level one evidence included one systematic review (SR) of RCTs. Level two evidence included one non-RCT. There were seven studies with level three evidence, including three longitudinal studies, one being mixed methods, two retrospective cohort studies, with one having a prospective study included, one observational descriptive survey study, and one pre-posttest nonequivalent quasi-experimental design. Level four evidence included two qualitative studies with one being part of a mixed review.

Critical Appraisal and Synthesis of Evidence

Critical appraisal of each article for validity, reliability, and practice usefulness was determined using the RCA checklist (Melnyk & Fineout-Overholt, 2019) and entered into respective quantitative and qualitative tables, with data synthesis then completed (see Appendix A). As depicted in Table A3, the majority of the studies lacked the robust evidence desired when determining evidence-based interventions and were located in the United Kingdom (UK) and

Australia. Demographics included mostly older males and females with various wound etiologies. The sample sizes were relatively small, except studies that only looked at retrospective or prospective data analysis. Significant heterogeneity existed across studies, with variations in measurement tools and intervention design. Three studies also included creating models for implementing wound care in primary care, including the health service pathway model, the cooperative wound clinic (CWC) model, and the complex wound care clinic model. Two utilized the pressure ulcer scale of healing (PUSH) and adapted it to wound care. Most tools and models used had been evaluated for validity and reliability. Three studies also included creating models for implementing wound care in primary care, including the health service pathway model, the cooperative wound clinic (CWC) model, and the complex wound care clinic model (see Table A3). Two utilized the pressure ulcer scale of healing (PUSH) and adapted it to wound care.

Despite the poor generalizability of studies, the data shows that regardless of the intervention or tool used, the self-efficacy of staff and wound healing improved (see Table A3). In addition, the best results occurred when a wound care expert provided education and when treatments occurred in specialized wound clinics, even if the clinic was within a primary care practice. Outcomes were measured by pre-intervention and post-intervention surveys and wound healing. When included, costs and the number of visits declined, with improved healing. Qualitative outcomes showed improved skills and knowledge, Clinical practice guideline (CPG awareness, and motivation.

As evaluated in Table A1, without a control group, there is an inherent bias across most studies. Analysis of provider data gathered from large databases often lacked consistent documentation. As an outlier, the strength of evidence available for the choice of dressing and

topical agents to promote optimal healing was poor and rarely listed as part of the intervention (Norman et al., 2018). The experiences of those with chronic wounds show that wounds impact a person's self-care capacity and QoL with poor healing times (see Table A2). Interestingly, often nurses nor providers felt comfortable in wound care management, with providers usually referring to nursing.

Discussion

Using a wound care resource toolbox with repetitive expert coaching showed improved confidence in providers, time to healing, and patient QoL. Although a gap exists for evidence-based wound care, according to the literature review, education is an effective strategy to improve wound care management in primary care settings. Poorly managed wounds and associated comorbidities have a wide-reaching impact on patient outcomes and QoL. Key stakeholders may not be aware the nature of the issues surrounding poorly managed wound wounds Fostering clinical expertise of team members can help standardize services. Continuing education appears to be important for the retention of knowledge and skills, and motivation. Compression is essential to wound healing and knowing when to refer is necessary.

With the United States lacking a central authority for publication and consensus for evidence-based wound care, the use CPGs from other countries, which are not hidden behind paywalls may be optimal. Also, the ability to have access to a wound care expert appears to be an important consideration, as many providers already feel overburdened with the number of guidelines available for them to commit to use. Wounds, except pressure ulcers, have not gained the resources compared to the seriousness of the problem. Overall, the studies contribute to our understanding of the costs and outcomes of wound management in clinical practice and provide important insights into how to improve care for patients. National healthcare systems seem to be

a key factor in understanding the depth of the problems due to centralized data and decreased profit-centered healthcare. However, the United States is far from legislative action. More research is needed to confirm these findings in larger populations and different settings. Evidence supported that regardless of the intervention, improving clinical staff wound management self-efficacy improved patient outcomes.

Theoretical Framework Application

The literature review has highlighted the need for a standardized approach to wound care that is adaptable to the diverse settings and populations served by healthcare providers and clinical staff. To address this need, in 2002 the AAWC created a task force to improve wound care services (Paine et al., 2006). The AAWC Conceptual Framework of Quality Systems was created as a comprehensive wound care management framework that adapted the Health and Medicine Division (HMD) quality domains to become the pillars of a conceptual framework that illustrates the relationships between quality domains and wound care outcomes: effectiveness, efficiency, equity, patient-centeredness, safety, and timeliness.

WoundReference, a clinical and decision support platform for clinicians, provides an illustration of the AAWC Conceptual Framework of Quality Systems (Appendix B, Figure B1) and highlights how to apply the framework in clinical practice (Song et al., 2022). The patient-centered care pillar emphasizes the importance of involving patients in their own care and addressing their individual needs and preferences. The clinical effectiveness pillar focuses on evidence-based practices and treatments that are tailored to the specific wound type and patient characteristics. The safety pillar prioritizes the prevention of adverse events and complications associated with wound care. The timeliness pillar underscores the need for timely assessment, diagnosis, and treatment to prevent complications and promote healing. The efficiency pillar

emphasizes the importance of cost-effective wound care that maximizes resources and minimizes waste. The equity pillar emphasizes the need for equitable access to high-quality wound care, regardless of patients' socioeconomic status, race, or other demographic factors. This framework provided an operational model to guide the creation of the wound care toolbox, and its application in the study will allow for a comprehensive evaluation of the effectiveness of the wound care management intervention (Paine et al., 2006).

Implementation Framework

Creating a wound care toolbox and associated education for providers and staff required a practical implementation framework that is adaptable to the organization's needs and can be modified based on feedback. This project was designed as a pilot study with multiple repetitive coaching sessions at various intervals as project implementation occurred. The PDSA framework is a proven implementation framework that guided project implementation (Institute for Healthcare Improvement [IHI], 2017). The PDSA consists of four stages: Plan, Do, Study, and Act (see Appendix B, Figure B2).

In the Plan stage, a plan was be developed to test the change and addressed who, what, and where, and included a data collection plan (IHI, 2017). During this stage, questions were asked and predictions made. The planned changed included the development and implementation of a wound care toolbox and associated education for providers and staff. Provider and staff self-efficacy was measured using a pre-post survey design. Products chosen were based on less frequent dressing changes as healing improves when a wound is undisturbed.

The Do, Study, and Act stages further guided implementation (IHI, 2017). In the Do stage, the planned change was executed. During this stage, problems and unexpected observations were documented, and early data analysis was be performed. In the Study stage,

feedback from participants was encouraged. Team member inclusion was valuable and provided additional insights and perspectives. In the Act stage, information gathered was evaluated. Based on the results and insights gathered during the Study stage, the planned change was modified and adapted. Future cycles can be continued by organization for further improvements and monitoring of wound management.

Sustainability was addressed through clinical staff and stakeholder engagement. The feedback and insights provided by these groups can improve the wound care toolbox and education over time, ensuring the program remains effective and efficient. Overall, the PDSA cycle provided a flexible framework for implementing and refining the wound care toolbox and associated education. The regular cycles of testing, analysis, and improvement will ensure that the program remains responsive to the needs of the population served, as well as to the healthcare providers and staff who will use the toolbox.

Methods

After reviewing the gathered evidence, a strategy for implementing changes in practice at the project site was developed, incorporating stakeholder engagement, intervention design, data collection, and measurement of results. It was recommended that the clinic use a wound care toolbox to standardize wound care practices and improve clinic staff wound management self-efficacy. To ensure the success of the project, it was essential to include healthcare team members who assist with wound care management and maintain continued support from key stakeholders Furthermore, it was identified as important to ensure all staff members were informed about the toolkit to promote a seamless workflow from the front office to the back office. For instance, by being more knowledgeable about the wound care process, front office

staff could improve their communication with patients about wound management. This approach also aimed to strengthen collaboration across different disciplines.

Ethical Considerations

Considerations were taken to maintain the integrity and ethical conduct of the project. The project was discussed and approved by the parent organization's chief medical officer (CMO) and discussed with the clinic office manager. The project was reviewed and approved by the Institutional Review Board (IRB) at Arizona State University (ASU) (See Appendix C). Informed consent was obtained from all participants, ensuring they clearly understood the project's purpose, the voluntary nature of participation, and their right to withdraw without penalty. The consent process involved providing participants with a detailed project overview, with completion of the pre-implementation survey providing consent to participate. No personal identifying information was collected at any point during the project. A unique participant ID was generated for each individual using non-personally identifying information to protect participants' privacy and confidentiality. This ID was used to link the pre-intervention and post-intervention surveys. It was emphasized that their participation or decision to withdraw would not impact their employment or status at the clinic. No foreseeable risks were associated with the participation in the education sessions or completion of surveys. The data was shared without any personal identifying information and was intended for use in reports, presentations, or publications related to the project.

Setting and Participants

The wound management project was implemented at a local FQHC primary care clinic, which offered comprehensive outpatient healthcare services to individuals experiencing or at risk of homelessness. The clinic is part of a larger organization that offers outreach services, respite

care, and behavioral health services. Due to the population served, wounds are commonly seen. The recruitment of participants was carried out by the DNP student using a recruitment flyer and sign-up sheet. Participants consisted of clinical and front office staff. To be eligible for inclusion, participants had to be adults aged 18 years or older who were fluent in speaking, reading, and understanding English and interested in participating.

Procedures

This project was pre- and post-survey design to assess the effectiveness of a wound management toolbox to improve wound management self-efficacy among participants. The intervention consisted of four repetitive coaching sessions, which were completed on two dates. The sessions leveraged the concept of self-efficacy defined by Chang and Crowe (2022), which refers to an individual's belief in their ability to effectively perform specific behaviors or tasks related to EBP.

The pre-intervention phase of the project occurred during the summer and fall of 2023. This phase included obtaining project approval, streamlining the wound care formulary, and developing a comprehensive toolbox. The toolbox contained visual aids for diagnosing common wounds, documentation and EHR improvements, streamlined supplies, patient education material, and referral pathways. The wound management toolbox was prepared by assembling its components into binders for the participants. Assistance from organizational stakeholders, including IT support for EHR and documentation improvements, culminated in obtaining IRB approval.

Subsequently, the process of recruitment and securing informed consent took place. The recruitment strategy involved the use of a script and flyers to attract participants at the clinic. Following this, informed consent was sought. Each participant was presented with the informed

consent document, which was read aloud for clarity, and a copy was provided for their personal reference. Confirmation of consent was achieved through the completion of a pre-survey by the participants. This initial survey was designed to gather demographic data and evaluate the participants' initial levels of self-efficacy and knowledge pertaining to wound management.

Next was the implementation phase, spanning December 2023 to January 2024. The wound management toolbox was introduced in two extended coaching sessions. Due to optimal engagement and additional scheduling constraints, the original four sessions were condensed into two sessions. For simplicity, these sessions will be referred to as session one and session two. The participants were taught wound care competencies using the wound care toolbox as the primary educational resource. Participants were encouraged to actively use the toolbox during the intervention, focusing on applying the knowledge by using the resources provided rather than merely memorizing the information. Participants who opted out of the coaching were still encouraged to use the toolbox in their practice to support organizational adaptation.

Upon completion of the intervention, the same survey without demographic data was administered to evaluate the knowledge gained and measure the improvement in participants' self-efficacy. Like the pre-intervention survey, this post-intervention assessment did not request personal identifying information. Importantly, no patient data or chart audits were collected as part of this intervention. These procedures were designed to prioritize participant confidentiality, informed consent, and the comprehensive evaluation of self-efficacy in wound management through the coaching sessions.

Outcome Measures

The primary outcome measured was wound care management self-efficacy among project participants. The data collection included information gathered from the pre and post-

intervention surveys. The pre and post-intervention survey was based on the validated and reliable Self-Efficacy (SE-EBP) Scale (Chang & Crowe, 2011). The SE-EBP scale is a 28-question tool that assesses confidence levels in engaging in evidence-based practice. The scale is rated on an 11-point response scale ranging from 0 (no confidence at all) to 10 (extremely confident). The scale underwent rigorous psychometric testing. The SE-EBP scale has established validity through content validity, which was established using the known groups method and an expert panel of nurse researchers and tool development researchers. Construct validity was examined using exploratory factor analysis (EFA), which identified three factors corresponding to specific steps of EBP. The scale also demonstrated high internal consistency with a Cronbach's alpha coefficient of 0.97 for the overall scale and alpha coefficients ranging from 0.91 to 0.96 for the subscales.

The SE-EBP tool captures confidence in various steps of the EBP process and can be a valuable tool for assessing and monitoring the effectiveness of EBP interventions (Chang & Crowe, 2011). Healthcare organizations can utilize this scale to identify areas for improvement and tailor educational interventions to enhance self-efficacy in EBP, ultimately promoting evidence-based care and improved patient outcomes. Innes-Walker et al. (2019) implemented evidence-based wound care in wound clinics and tailored the tool to evaluate provider and nurse confidence in evidence-based wound care. The design included pre-post surveys to measure self-efficacy and knowledge. Permission was obtained from the author to use and modify the tool, which was developed based on the original valid and reliable scale (Crowe, 2011).

The scale used by Innes-Walker et al. (2019) was modified from its original form for project. Therefore, it was no longer deemed valid and reliable due to the changes made. The specific content of the tool was determined based on consultation with a wound care expert and

site stakeholders. The pre and post-intervention survey contained the same questions and presurvey gathered demographic data (see Appendix D).

Data Collection and Analysis Plan

Descriptive statistics will be used to describe the sample and outcome variable, self-efficacy in the two domains of confidence and frustration. Crosstabs was used to further explore the data for clinical significance. The pre- and post-intervention survey data was analyzed to assess participant wound care management self-efficacy changes. Collected data was uploaded into Intellectus Statistics™ software for analysis, ensuring appropriate evaluation of project outcomes. Ideally, a paired t-test would be used for statistical significance. However, due to the absence of a validated and reliable tool specifically designed for evaluating wound management self-efficacy, this was not evaluated. However, descriptive statistics will of valuable insights regarding project success as tool was only slightly modified from its original using expert opinion.

Budget

A budget had been designed to ensure the successful execution of the project while optimizing the utilization of resources, with incorporated direct costs, indirect costs, and an associated cost versus revenue saving analysis (see Appendix E). All costs were absorbed by the project coordinator and required no outside funding. The project coordinator paid for the equipment and supplies utilized in the development of wound care toolbox items, educational materials, and pre-post surveys. The organization absorbed all organizational personnel wages and salaries as part of employee compensation and were not included in budget estimates. The DNP coordinator oversaw project development, implementation, and evaluation without direct compensation. Training sessions were conducted at the site location conference room and

incurred no additional costs as facilities were available for use. Necessary modifications to the existing EHR system were made using organizational equipment and personnel.

Results

Intellectus Statistics™ (2023) software was used to store, manage, and analyze the data. Descriptive analysis was used for demographic characteristics of participant characteristics and pre and post intervention survey evaluation (Appendix F).

Demographics

Clinic personnel (*N*=10) participated in the intervention and included providers, RN, MAs, front office staff, behavior health, and patient navigators participated in the intervention (see table F1). The most common age of the sample was 60% between the ages of 30-39, with the majority, 90% female, and 60% Hispanic. Of all professions, six had experience with wound care and are directly involved in patient wound care at the clinic and included one registered nurse, three medical assistants, and two providers. The four remaining professions hold non-wound care roles in the clinic, including front office staff, patient navigators, and behavioral specialists. The majority of participants (*n*=5) (50%) have been in their profession for greater than 10 years. Among those individuals who have non-wound care roles, all four individuals had no prior wound care experience. Of the six with wound care roles, three had 2-5 years of wound care experience, and collectively all six individuals spent between 6-30% of their time on wound care.

Formal wound care training was assessed, revealing that all non-wound care staff lacked formal training (Figure F1). Only MAs, RNs, and providers (*n*=6) had received any formal wound care training. A majority had undergone 1-2 hours of training (66.7%), including one

provider (16.7%), two MAs (33.3%), and one RN (16.7%). One provider had no prior formal wound care training, and one MA received 5-10 hours of training.

Outcomes

The intervention led to significant improvements in self-efficacy, with the domains of confidence and frustration contributing to the self-efficacy outcome. (see Table F2). Pre-intervention, the average self-efficacy score was 56.50 (*SD* = 44.15), with scores ranging from 0 to 110 points. Post-intervention, the average score increased to 124.50 (*SD* = 33.10), with a range from 64 to 180 points. In the domain of confidence, the average score before the intervention was 42.60 (*SD* = 34.29), with scores ranging from 0 to 91 points. Post-intervention, this increased to an average of 87.80 (*SD* = 26.69), with scores ranging from 38 to 125 points. In the domain of frustration, the average score pre-intervention was 13.90 (*SD* = 11.50), ranging from 0 to 32 points. Post-intervention, this increased to an average of 22.60 (*SD* = 11.45), with scores ranging from 0 to 40 points.

To better understand improvements, self-efficacy among wound care staff (*n*=6) and non-wound care staff (*n*=4) was analyzed separately (see Figure F2). Pre-intervention, the average self-efficacy score for wound care staff was 87.50 (*SD* = 21.88), with a range from 65 to 110 points. Post-intervention, this score increased to an average of 124.50 (*SD* = 33.10), ranging from 64 to 180 points.

The substantial rise in average self-efficacy scores post-intervention indicates marked improvements. Clinically, these findings suggest enhanced staff confidence and reduced frustration in wound care management, potentially leading to more effective patient care and satisfaction. The intervention equipped participants with essential knowledge and tools for improved wound care practices, fostering competency and confidence. It is anticipated that

streamlining supplies and integrating evidence-based practices will contribute to improved resource allocation and patient access to necessary supplies.

Discussion

Summary of findings

This study aimed to assess the efficacy of an educational intervention on the self-efficacy of clinic personnel in managing wound care, utilizing a comprehensive wound management toolbox. The results demonstrated a significant improvement in self-efficacy following the intervention, particularly among participants with direct wound care responsibilities. This improvement underscores the vital role of direct patient care experience in shaping self-efficacy perceptions and highlights the importance of education in building healthcare providers' competency and confidence.

Notably, participants with direct wound care responsibilities demonstrated a higher baseline level of self-efficacy compared to their counterparts in non-wound care roles. This distinction underscores the influence of direct patient care experience on self-efficacy perceptions. A key finding was the variation in formal wound care training among participants. This lack of comprehensive training likely contributed to the initial levels of self-efficacy reported. The intervention's success highlights the critical role of formal education in building competency and confidence among healthcare providers. Moreover, the study's findings advocate for the integration of standardized wound care training programs within clinic settings, emphasizing the need for ongoing professional development in this critical area of patient care.

A pivotal strategy for the project's success was the inclusion of non-wound care team members, including front office personnel, patient navigators, and behavioral health professionals. This multidisciplinary approach aligns with the findings of Goto et al. (2023), who

noted the contribution of interdisciplinary care systems to the success of wound care programs. Despite scheduling conflicts that prevented the office manager and referral coordinator from participating in coaching sessions, their contributions were indispensable. The referral coordinator, overseeing all referrals and ordering durable medical equipment (DME), offered insights that streamlined interactions between clinical team members. Moreover, patient navigators are crucial in liaising with patients for community care coordination, transportation needs, and access to services based on specific patient needs. The inclusion of behavioral health specialists, who are directly involved in patients' mental health and substance abuse-related needs, benefits from understanding challenges faced by this population that influence wound development and may complicate treatment plans.

One of the goals was to streamline supplies to improve costs and simplify provider supply ordering. All wound supplies were inventoried, and provider feedback guided the supply formulary during the intervention. The wound care binder included a specific product formulary guide based on the manufacturer's recommendation for product use. Also, a wound care representative provided samples for providers that had longer wear times to evaluate for inclusion in the product formulary.

Another aspect of streamlining supplies was to change the DME ordering of supplies, which had not previously been done at the clinic. The clinic previously absorbed the cost of supplies, even for patients insured under Medicaid. Education was provided for ordering wound care supplies for Medicaid patients as a DME as consumable medical supplies (Arizona Health Care Cost Containment System, 2023). Also, education was provided for uninsured patients with complex wounds regarding the referral process to a local wound clinic serving this population.

The process of DME ordering faced several challenges during the project, but the issues were resolved post-implementation. During project implementation, it was attempted to order supplies for clinic drop shipment due to the patient's homeless status. However, the company was notified that only two items were available. Multiple attempts were made to contact the company for the supply formulary without success, which staff had verbalized was a common issue. After the project was completed, the organization changed DME suppliers and established a contract with a second supplier specializing in wound care supplies. Binder contents were updated to reflect this information.

Another goal was to improve EHR, which needed thorough documentation improvements and order sets. Due to the timing of holidays and IT coordination challenges, the organization's Medical Director will coordinate the EHR changes. The binder contents included population-specific documentation templates and order sets for providers and follow-up visits based on requirements to justify the DME's ordering of supplies. Providers can refer to the binder for these templates to guide documentation until templates are implemented into the EHR.

The dissemination of project findings and the wound management toolbox binder to the Medical Director signifies the project's success and potential for broader application within the organization. Project findings and wound management toolbox binder were disseminated to the Medical Director within the organization. The organization was interested in the use of the toolbox at other organizational locations to standardize wound care practices. Due to management changes, the organization's Medical Director requested a meeting to discuss the project. Project findings were disseminated during this meeting, and a copy of the binder contents was provided with future recommendations. The wound care needs were discussed at another primary care clinic within the organization.

This project aligned with existing literature emphasizing the importance of self-efficacy in improving care outcomes and the effectiveness of interdisciplinary approaches in managing wound care. The primary care settings serving individuals experiencing homelessness need be equipped to navigate complex wounds. This is particularly important because this demographic often avoids seeking care due to the fear of social stigma (Goto et al., 2023). Integrating community-based care that addresses social determinants of health using a multidisciplinary approach can further facilitate wound healing in this population. Using a multidisciplinary approach in this project will facilitate addressing another barrier that prevents wound healing in this population. Also, expansion into outreach or street medicine programs can deliver wound care directly to individuals, which will help eliminate additional barriers faced by this population (Frasier et al., 2023).

Sustainability

To ensure the sustained success of the project over the long term, a comprehensive approach to sustainability was adopted. Identifying key personnel overseeing and maintaining change is crucial for succession planning and was discussed with stakeholders. Long-term commitment and support were fostered by involving organizational stakeholders in decision-making and seeking their input. The development of the toolbox was guided by sustainability considerations. The PDSA cycle of quality improvement provides a flexible framework for implementing and refining the wound care toolbox and associated education. Future testing, analysis, and improvement cycles will ensure the organization can realize improved patient outcomes, cost savings, and long-term organizational support. There is interest in expanding the project to other locations at the organizational level. A future legacy project can further support future sustainability efforts. Efforts were made to facilitate this endeavor at the organizational

level with the Medical Director and project mentor. The medical director will facilitate collaboration with IT to help integrate the wound care toolbox into existing systems and workflows, particularly within the EHR record. This includes implementing order sets and standing orders to facilitate long-term application.

The sustainability plan included the site champion's role, as she has played a vital role in advocating for change in wound management and engaging organizational stakeholders. However, as the project nears completion, the site champion plans to retire as a provider. To ensure sustainability, the site champion's role was transferred to a designated individual who will continue to champion the project's objectives and ensure its long-term viability. This individual will oversee and maintain the wound care project, provide modifications based on emerging evidence, and act as a resource for consultation.

Challenges and Barriers Encountered

One significant barrier was the requirement for hourly staff to clock out to participate in the project's coaching sessions. Typically, participation in the lunch and learn sessions sponsored by the organization do not necessitate the staff to clock out. To mitigate this issue, pizza was provided as an incentive. However, scheduling conflicts arose, highlighting a decline in interest among staff members who preferred using their lunch breaks to leave the office and socialize. For future initiatives, it would be beneficial to explore with stakeholders the feasibility of allowing participants to stay clocked in during these educational sessions. Combining sessions optimized the situation, and engagement remained high despite initial challenges.

Recommendations for Further Research

Future recommendations recommended chart reviews to better understand wound care practices and identify areas for improvement, such as healing times, follow-up, and wound care

approaches. This will help the team identify areas for continued improvement and develop targeted interventions to improve wound care outcomes, ensuring patients receive high-quality care tailored to their needs. Future considerations would be to consider nurse-only visit documentation templates as a provider only needs to be seen weekly. Due to the nature of the population served, this may provide useful future considerations for getting patient feedback related to the heat endurance of products. To better understand current wound care practices and identify areas for improvement, chart review data on healing times, follow-up practices, and current wound care approaches would be beneficial. This will help the team identify areas for improvement and develop targeted interventions to improve wound care outcomes, ensuring patients receive high-quality care tailored to their needs.

Limitations

While the results are promising, they are subject to limitations, including the study's small sample size, which may affect the generalizability of the findings. Future quality improvement projects should aim to continue to implement improved wound management across a broad range of clinical settings and with larger participant groups. Additionally, exploring the long-term impact of such interventions on patient outcomes and clinic operational efficiency would provide valuable insights into the sustained benefits of enhanced staff self-efficacy in wound care.

Conclusion

This project highlights the significance of implementing a wound management toolbox with an educational intervention to improve the self-efficacy and competency of clinic personnel in wound care management. The positive outcomes of this project not only demonstrate the immediate benefits of such interventions but also underscore the potential for long-term

improvements in patient care and clinic operations. The educational intervention aimed at enhancing clinic personnel's self-efficacy in wound care management yielded significant improvements in confidence and reduced frustration, demonstrating the efficacy of targeted educational programs. By addressing the gap in formal wound care training and incorporating comprehensive strategies like the development of a wound management toolbox, the initiative showed promise in enhancing patient care and clinic efficiency. Despite limitations such as a small sample size, the positive outcomes suggest the potential for broader applicability and underscore the importance of continuing such educational efforts to improve healthcare delivery. This project highlights the critical role of education in empowering healthcare providers and improving patient outcomes in wound care management.

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Appendix A

Evaluation and Synthesis Tables

Table A1
Evaluation Table for Quantitative Studies

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Guest et al. (2017), Diabetic foot ulcer (DFU) management in clinical practice in the UK: Costs and outcomes **Country**: U.K. **Funding**: Funded by Acelity, Gatwick, **Bias**:	Physiologic model implied	**Design:** Retrospective cohort analysis **Purpose:** To follow a cohort of patients with diabetes in clinical practice from the initial presentation of a DFU to evaluate in greater depth how patient management	**N=** 130 patients, **Demographics:** Mean age 67 Male 60% Diabetic 100% **Setting:** Mostly from primary and community settings **Exclusion:** <18 years, non-diabetics, no DFU, DFU before 2102, less than 12 months medical history	**IV1: Patients with DFU** Exposure start at the time of diagnosis of DFU **DV:** Exposure over 12 months and measured DFU variables **DV1:** Risk for amputation **DV2:** time to healing	**Tools:** Doppler ankle brachial pressure index (ABPI) **Validity/ Reliability:** ABPI validity & reliability well established	**Statistical Tests Used:** multivariate binary logistic regression -Mann–Whitney U-test -Kruskal–Wallis test -Logistic regression -Multiple linear regression	**DV1:** Amputation Risk: Males: Odds ratio 3·626 (95% CI: 1·111; 11·837); P=0·03. Age: Odds ratio 0·959 (95% CI: 0·927; 0·991); P=0·01 **DV2:** time to healing 0·3 months among patients prescribed analgesics (P < 0·05)	**Level of Evidence**: Level 3 **Strengths**: random sample, The UK has a central database **Weakness**: Clinical entries are not always precise. Lack of compliance in charts

Key: ABPI Ankle Brachial Pressure Index, **AD** Advanced Directives, **BWAT** Bates-Jenson Wound Assessment Tool, **CPG** Clinical Practice Guideline, **CSA** Clinical Support App, **CSI** Champions for Skin Integrity, **CWC** Cooperative Wound Clinic, **DFU** Diabetic Foot Ulcer, **DV** Dependent Variable, **EB** Evidence Based, **EBP** Evidence-Based Practice, **IV** Independent Variable, **QoL** Quality of Life, **LoC** Level of Confidence, **LOE** Level of Evidence, **M** Mean, **Mdn** Median, **MNA** Mini Nutritional Assessment, **NIHR** National Institute for Health and Care Research, **NMA** Network Meta-Analysis, ***SD*** **S**tandard deviation; **TDF** Theoretical Domain Framework, **GP** General Practice, **GRADE** Grading of Recommendations Assessment Development and Evaluation **PCS** Primary Care Setting, **PHQ-2** Patient Health Questionnaire-2, **PUSH** Pressure Ulcer Scale for Healing , **SF-12** Short Form-12, **SPMSQ** Short Portable Mental Status Questionnaire, **TIME** Tissue Infection/Inflammation Moisture Edge, **VLU** Venous Leg Ulcer, **UAC** Under the Curve, **USA** Unified Severity Adjustment, **WOC** Wound Ostomy and Continence, **WWIC** Welsh Wound Innovation Centre, **WM** Wound Management, **>** greater/more, **<** less/lower, **=** equal

Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
None listed		impacted healing and costs	after diagnosis of DFU, dermatologic tumor, other types of wound **Attrition: N/A**	**DV3:** Cost patient management **DV4**: Infection rates **Definitions:** DFU: patient has diagnosis of diabetes with an ulcer on the foot.		-Kaplan–Meier analyses	0·5months among patients prescribed anti-infectives (P=0·011) **DV3:** Cost of Wound care over 12 months $9,527 73% - Community 13% more for amputations. **DV4**: infection 41% had received only antimicrobial dressing, 34% antibiotic	Lack of DFU specialist involvement. **Feasibility**: DFU in clinical practice will continue to be challenging with rising numbers. **Application**: Real-world clinical practice Management and costs generalizable to the US.
Innes-Waler et al. (2019), Improving patient outcomes by coaching	Cooperative Wound Clinic (CWC) model of care	**Design:** A longitudinal, pre-post design **Purpose:**	**N=** 36 health professionals **N**=81 patients	**IV1:** Use of CWC resource kit and repetitive expert coaching	**Tools:** -Self-Efficacy in Evidence-Based Practice scale	**Statistical Tests Used:** -Descriptive analyses -pre/post comparisons	**Pre-survey %/Post survey %** **DV1: Confidence & Self-Efficacy** "somewhat or very confident":	**Level of Evidence**: Level III **Strengths**:

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
primary health general practitioners and practice nurses in evidence-based wound management at on-site wound clinics. **Country**: Australia **Funding**: Wound Management Innovation CRC (established and supported under the Australian Government's Cooperative Research	Repetitive coaching model	Develop and trial a CWC to increase health professionals' WM expertise and capacity in primary care settings.	**Demographics Health Professionals:** Gender: 94% Female Age in years: 21 to over 60 Occupation: Providers - 23% RN - 58% Other - 19% **Demographics Patients:** Female 54% **Setting:** Primary Practices across three Australian states **Exclusion:** No prevention or open wound **Inclusion:**	**DV1**: health professionals' Confidence in WM **DV2**: Patient Satisfaction & QoL **DV3**: Wound Healing **DV4: e**ffectiveness of CWC model **Definitions:** CWC: Service delivery model that used the principles of the "leg Club" model of care used in home WM.	-Patient Enablement and Satisfaction Survey (PESS) - health-related QoL (SF-12 v2) -Pressure Ulcer Scale for Healing (PUSH) tool **Validity/ Reliability:** PUSH tool Responsive in different types of leg ulcers and diabetic ulcers Validated Self-Efficacy in E.B. Practice scale SF-12 v2/PESS Construction of scales and preliminary tests of	-Self-reported survey data	-wound assessment: 56%/100% -wound Diagnosis: 22%/100% -roles: 78%/89% -psychosocial aspects: 56%/67% -documentation: 67%/89% -implementing: 56%/100% -monitor & evaluate: 67%/100% **DV2: Patient satisfaction/QoL** 24-week patient "Strongly agreed" Received quality: treatments 93% decisions 87% Nurse care 87% Overall satisfied 87% QoL Score Start: N=57 *M* 37.2 (*SD* 13.9)	Confidence levels increased, and wound healing improved. **Weakness**: Limited sites, sample size, & generalizability. Limited follow-up data **Feasibility**: Feasible for primary practice settings. **Application**: Few studies are available on wound care improvement projects in primary care.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Centers Program **Bias**: Participants and clinicians' commitment to this project may have influenced results, possibly indicating bias.			-Clinic size large enough -Clinic support -Clinic to collect data **Attrition: Health Professionals:** Both Pre/post surveys (N=9); 24-week survey (N=18) End of Study Patient surveys; (N=15) QoL pre-data (N=57); QoL post data (N=5); Wound healing (N=23)		reliability and validity		24 weeks: N=5 *M* 47.3 (*SD* 9.7) **DV3 Wound Healing** PUSH - 87% healing by 24 weeks, N=9 **DV3: CWC model** "strongly agreed" -100% resulted in better patient outcomes.	Use of Nurse Practitioners wound experts in primary settings.

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Norman et al., 2018. Dressings and topical agents for treating venous leg ulcers. **Country**: U.K. **Funding**: This review was co-funded by the National Institute for Health and Care Research (NIHR), Manchester Biomedical Research Centre.		**Design:** Cochrane Review: network meta-analysis (NMA) **Purpose:** To assess the effects of (1) dressings and (2) topical agents for healing venous leg ulcers in any care setting and to rank treatments in order of effectiveness, with assessment of uncertainty and evidence quality.	**N**= 7014 participants from 78 studies RCTs **Demographics:** Over 18 years Ages 46-81 Mostly women **Setting:** Wound managed in any setting. **Exclusion:** Quasi-random methods Dressings attached to external devices such as negative pressure wound therapies, skin grafts, growth factors and other biological agents,	**IV1:** 25 Various alternative dressings (20) and topical agents (16) **DV1:** Wound Healing **Definitions:** Venous leg ulcer: pen wounds caused by poor blood flow through the veins of the lower leg RCTs: medical studies where patients are chosen at random to	**Tools:** Grading of Recommendations Assessment, Development and Evaluation (GRADE) **Validity/ Reliability:** Application of GRADE methodology to NMA for determining validity of results, quality of data, and certainty of inferences made. The WOC Level-of-Evidence Rating for Strength of Guideline	**Statistical Tests Used:** meta-regression methods pairwise meta-analyses	**DV1:** No confidence in RCTs Silver dressings – may increase healing compared to nonadherent dressings. Results compared interventions with resulting certainty of evidence using GRADE**:** 6 Low, 3 Very Low, 1 Moderate Due to space, please refer to the review for individual dressing and topical agents results.	**Level of Evidence**: Level 1: Systematic review of RCTs **Strengths**: Quality Cochrane review. Results show that higher-quality studies are needed. **Weakness**: Each study did not have enough participants. Result accuracy is low for each study. High level of bias **Feasibility**:

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Included studies: Most of the included studies were industry funded. **Bias**: Overall high risk of bias among included studies.			larval therapy and treatments such as laser, heat or ultrasound. **Attrition:** NMA included 59 studies and N=5156	receive different treatments	Recommendations 38 research questions			Less reliance on evidence for practice and focus on most widely used intervention currently in clinical practice. **Application**: Limited clinical value for evidence. However radical improvements are needed to the planning, conducting, and reporting of trials related to wound healing treatments.

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Lommi et al., (2022), Nursing outcomes in wound care management: A mixed method study **Country:** Italy **Funding:** The Centre of Excellence for Nursing funded this study Scholarship **Bias:** None listed.	Middle range theory of chronic conditions	**Design:** **S**equential explanatory mixed method: Longitudinal study **Purpose:** To analyze the outcomes of nursing care in managing difficult wounds and the experience lived by patients with chronic ulcers.	**N= 44** **Demographics:** Male/Female 68%/32% Mean age 70 **Setting:** Community Outpatients' Clinics of a local health authority **Exclusion:** None **Inclusion** Adults over 18 y, without cognitive disorders/depression using tools to screen, willing to participate. **Attrition:** none	**IV1:** Educational intervention for patients with chronic ulcers. **DV1:** nutritional status- MNA **DV2:** Severity of Ulcer - BWAT **DV3:** QoL Physical/Mental- SF-12 **Definitions:** Self-care: the process of maintaining health through health promotion and disease	**Tools:** 2-item Patient Health Questionnaire (PHQ-2) -Bates-Jensen Wound Assessment Tool (BWAT) -mini nutritional assessment (MNA) -short form survey-12 health survey (SF-12) -short portable mental status questionnaire (SPMSQ) **Validity/ Reliability:** Authors provide sources for validity and reliability for**:** -10-item	**Statistical Tests Used:** -Descriptive statistics -Hierarchical linear regression -Bonferroni post hoc test	M(*SD*) Bold values are significant ($p < .05$). **DV1:** **Nutritional status** Start 23.64(3.65) 1 month 23.91(3.61) 3 months 23.86(3.36) 6 months 23.73(3.69) **DV2:** **Severity of ulcer** Start **32.93**(8.17) 1 month **27.68**(8.51) 2 month **22.**39(10.32) 6 month **17.89**(10.83) **DV3: QoL** Physical Start 42.12(6.72) 1 month 43.12(7.54) 3 months **5.74**(6.49) 6 months **46.02**(8.55) Mental Start 49.56(6.51)	**Level of Evidence:** Level 3 **Strengths:** Data collected over time Patients lived experiences with wounds **Weakness:** -pandemic caused data collection problems -Prevalence of males (68%) -instruments validated in Italian context **Application:** Tools can be used to help

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				management	SPMSQ to measure cognitive deterioration -PHQ-2 for depression assessment. -The MNA to identify, assess and monitor patients who are at risk of malnutrition. -A13-item BWAT to assess wound progression -A 12-item SF-12; how patients perceive their psychophysical conditions		1month 51.37(6.56) 3 months 50.02(7.22) 6 months **52.93**(6.89) higher levels of physical QoL is associated with younger age, living alone, higher education, absence of comorbidities, presence of a non-severe chronic ulcer, and good nutritional status (R2 between .56 and .70). Scores of physical and mental components of SF-12 showed an association at 3 months as wound healed	standardize practice -new methods of care to improve wound outcomes and patient QoL

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Cho et al., 2020 Development of a Model to Predict Healing of Chronic Wounds Within 12 Weeks **Country**: United States **Funding**: Healogics Inc grant to University of Southern California **Bias**: Design bias based on exclusion of wounds with implausible dimensions &	Unified Severity Adjustment (USA) Model	**Design:** Prospective longitudinal cohort study **Purpose:** To develop quality measures to determine wound severity using intake data from wound care clinics. for predicting chronic wound healing within 12 weeks using data collected at intake.	**N=** 261,398 patients and N=620,365 wounds **Demographics:** All Ages BMI – Sex - **Setting:** Wound care clinics in 46 states, mostly hospital based using standardized treatment protocols **Exclusion:** -radiation wounds -acute wounds -only received initial consultation-implausible wound sizes **Attrition:** NA	**IV1:** demographics, clinical, and wound characteristics at intake **DV1**: wound status at 12 weeks: healed vs not healed for various variables **Definitions:** Chronic wounds: wounds not healed in expected time frame (4-12 weeks) Healed: healed -measure – 0	**Tools:** Under the curve (UAC): how well model predicts outcome. - 1.0 perfect, 0.7-1.0 acceptable < 0.5 not acceptable Akaike information criterion (AIC): assess variable contribution, > increase **Validity/ Reliability:** using a random sampling of 70% of wounds to develop the prediction model and was then validated with the remaining 30% of wounds.	**Statistical Tests Used:** -Logistic regression -Classification tree models – machine learning	**DV1: summary of wound healing:** -59% wound healed at 12 weeks Wound characteristics predict chronic wound healing over demographics or comorbidities. -pressure ulcers and arterial ulcers are least likely to heal -wound dimensions predictor of healing	**Level of Evidence**: Level 3 **Strengths**: -large sample size, generalizability broad range of etiology -use as a quality measure **Weakness**: Does not identify the treatment provided **Feasibility**: quality measures **Application**: when to refer, wound dimensions are influential

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the use of a unified grading scheme.				-flap procedure w/ complete take -successful graft -margins sutured measure - 0				predictor of healing
Young et al., 2019. An initiative to improve the effectiveness of wound healing within GP Practices **Country**: Wales, United Kingdom **Funding**: No external funding **Bias**: None listed	GP Practice complex wound clinics model for diffusion	**Design:** Non-RCT **Purpose:** To improve wound management by implementing complex wound clinics into GP to reduce the number of patients with wounds.	**N= 49** GP wound clinic **N=39** GP clinic **Demographics:** M=66 Male 50% **Setting:** General Practice **Exclusion:** Patients who only were treated once by clinic. **Attrition:** N/A	**IV1:** Implement a complex wound clinic within a GP **IV2:** GP practice with no complex wound clinic DV1: Healing rate DV2: cost DV3: # visits **Definitions:** Complex wound clinic	**Tools:** Practice Nurse-led complex wound clinics in General Practice **Validity/ Reliability:** No established model of practice exists for implementation of a complex wound clinic into GP. The model was developed jointly by the Welsh Wound	**Statistical Tests Used:** Mann Whitney	**DV1:** Healed at 5 months. IV1 67% IV2 33% **DV2: Cost** IV1: M £308.3 (*SD* 284.9) IV2: M £316.9 (*SD* 318.0) **DV3:** #visits IV1: Mdn 6 IV2: Mdn 7	**Level of Evidence**: Level 2 **Strengths**: Clinic with and without intervention. **Weakness**: Generalizability to other clinics, single clinic for replication. **Feasibility**: In GP structure and processes have to be addressed,

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				-one-to-one and web training -resources -referral pathways Compression formulary -documentation streamlined	Innovation Centre (WWIC) and the General Practice.			**Application**: Similar challenges faced in PCS in United States, Expertise needed for healing, costs similar
Parker et al., 2019. Implementation of the Champions for Skin Integrity model to improve leg and foot ulcer care in the primary healthcare setting **Country**:	Champions for Skin Integrity (CSI) model	**Design:** Pre-post, nonequivalent group research design **Purpose:** to facilitate the transfer of EB wound assessment, management, and prevention into the PCS	**N**=109 Registered for workshops (GP 7) **Demographics:** 68% experience > 11 years 93% cared for who had or at risk for ulcers **Setting:** PCS	**IV1:** Implementation of the CSI model in PCS **DV1:** LoC to identify and assess **DV2:** LoC in EB management **DV3:** LoC to prevent **DV4:**	**Tools:** Pre-post surveys, and 3 months Skin Integrity Audit Tool **Validity/ Reliability:** -Skin Integrity Audit tool was previously validated.	**Statistical Tests Used:** Descriptive Statistics Paired t test Chi-square test Fisher's exact probability test	Significant ($p<0.5$) **DV1:** LoC identify and assess ulcers $p<0.05$, except assessment of wound bed P=0.188 **DV2:** LoC in EBP management > than preworkshop, 3 month data not significant for VLU **DV3:**	**Level of Evidence**: III **Strengths**: Positive findings to transfer evidence in PCS **Weakness**: Small sample size for 3 month follow up, confidence was not sustained **Feasibility**:

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Australia **Funding**: Queensland University of Technology, Engagement Innovation Grant **Bias**: Staff who elected to participate may have had prior interest in wound care. Poor survey follow-up return			**Exclusion:** patients: Intellectual or cognitive impairment **Attrition:** Only 109 of the 190 surveyed attended a workshop. 101 Post workshop surveys returned. Only 17 returned 3 month survey.	Change management **DV5:** Skin integrity audit **Definitions:** CSI model – Multi-faceted approach to transfer knowledge through: -"train the trainer" workshop -internal & external network development -CSI resource kit w/ practical tools	-CSI model surveys used in long term care with success		LoC prevention significant at post intervention and 3 months **DV4:** Change management not sustained over 3 months. **DV5:** Post workshop ABPI/Duplex scans P=0.08 Documentation not significant except wound area/volume	**Application**: CSI model shown to increase EBP in treatment and management of wounds in PCS

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Moore et al., 2022. A Clinical Support App for routine wound management: reducing practice variation, improving clinician confidence and increasing formulary compliance. **Country**: United States & United Kingdom **Funding**: None provided by Smith and Nephew		**Design:** Observational Descriptive pre-post survey design: Pilot study **Purpose:** To determine the utility of the CSA during routine wound management, in multiple care settings by wound specialists and non-wound specialists across settings in 2 countries	**N= 123** wound specialists and non-wound specialists **Demographics:** N/A **Setting:** Community, acute, homecare **Exclusion:** **Attrition:** Due to covid 33 non wound specialists left	**IV1:** Pre-CSA survey **IV2:** Post-CSA survey Clinical Support App (CSA) **DV1:** assessment **DV2:** Confidence to manage wound **DV3:** Product selection **Definitions:** CSA functions: -digitized TIME wound assessment tool	**Tools:** WOUND COMPASS CSA TIME wound assessment **Validity/ Reliability:** CSA not validated, pilot study Surveys not validated Quantitative opinion data	**Statistical Tests Used:** Statistical Analysis System (SAS) application analytics	Survey response: 100% very, Sufficiently >50%, Barely <50%, Not at all 0% **DV1:** App improved wound assessment using TIME **DV2:** App increased confidence for providers **DV3:** Improved product selection	**Level of Evidence**: III (possibly IV) **Strengths**: Use of technology promising, large sample of expert opinions **Weakness**: Not an RCT, Due to covid post survey results small **Feasibility**: Cost, no mention how much to use App **Application**:

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Bias: Smith and Nephew developed the CSA				-uses product formulary specified by user -contextual guidance to support the user				Free and low cost apps available.
Edwards et al., 2013 Health service pathways for patients with chronic leg ulcers: identifying effective pathways for facilitation of EB WC **Country**: Australia		**Design:** Observational Retrospective & prospective **Purpose:** To identify effective health service pathways of care which facilitated	**N= 104 patients** **Demographics:** Age M =70 years Male 54% **Setting:** 2 specialized wound clinics **Exclusion:** Unable to speak or read English Cognitive impairment	**IV1:** implementation of health service pathway of care at specialized clinic using EB guidelines **DV1:** Wound healing received ABPI or duplex assessment.	**Tools:** Wound tracings, digital planimetry, & digital photography PUSH tool Kaplan-Meier survival analysis for healing times **Validity/ Reliability:**	**Statistical Tests Used:** Descriptive statistics T-tests, ANOVAs, Mann–Whitney U or Kruskal-Wallis	**Pre/post DV1:** **24 weeks Pre-implementation** area (Mdn) 2.5 cm2 duration (Mdn) 22 weeks PUSH score (M ± *SD*†) 9.8 ± 2.9 edema 79% Venous eczema 17% signs of infection 11%	**Level of Evidence**: Level 3 **Strengths**: Example of health service coordination **Weakness**: Not from United States, had to go to clinic, descriptive design **Feasibility**:

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Citation	Theoretical/ Conceptual Framework	Design/ Method/ Purpose	Sample/Setting	Variables	Measurement/ Instrumentation	Data Analysis	Results/ Findings	Level of Evidence; Application to practice; Generalization
Funding: Australian Research Council's Linkage Projects funding scheme, Smith & Nephew **Bias**: Recall accuracy and response bias		evidence-based management of chronic leg ulcers.	Malignant leg ulcers Ulcers above the knee **Attrition:** 8 did not complete study	**DV2:** Days receiving care **DV3:** # service providers **DV4:** Duration **Definitions:** none	Valid and reliability established.		**pre/post wound clinic admission 24 weeks** received ABPI or duplex assessment. 31%/all received. **DV2:** Days receiving care 2-3xweek/1xweek Dressing changes 3-4xweek/ **DV3:** # service providers 1-8 providers/organizations involved (91%GPs)/M=2 **DV4:** Duration Start 22 weeks not healed/M=12 weeks for healing (95% CI 9.3–14.7)	Similar populations and demographics **Application**: Importance of adopting EBP for wound care, Wounds need expetts

Key: ABPI Ankle Brachial Pressure Index, **AD** Advanced Directives, **BWAT** Bates-Jenson Wound Assessment Tool, **CPG** Clinical Practice Guideline, **CSA** Clinical Support App, **CSI** Champions for Skin Integrity, **CWC** Cooperative Wound Clinic, **DFU** Diabetic Foot Ulcer, **DV** Dependent Variable, **EB** Evidence Based, **EBP** Evidence-Based Practice, **IV** Independent Variable, **QoL** Quality of Life, **LoC** Level of Confidence, **LOE** Level of Evidence, **M** Mean, **Mdn** Median, **MNA** Mini Nutritional Assessment, **NIHR** National Institute for Health and Care Research, **NMA** Network Meta-Analysis, ***SD*** **S**tandard deviation; **TDF** Theoretical Domain Framework, **GP** General Practice, **GRADE** Grading of Recommendations Assessment Development and Evaluation **PCS** Primary Care Setting, **PHQ-2** Patient Health Questionnaire-2, **PUSH** Pressure Ulcer Scale for Healing , **SF-12** Short Form-12, **SPMSQ** Short Portable Mental Status Questionnaire, **TIME** Tissue Infection/Inflammation Moisture Edge, **VLU** Venous Leg Ulcer, **UAC** Under the Curve, **USA** Unified Severity Adjustment, **WOC** Wound Ostomy and Continence, **WWIC** Welsh Wound Innovation Centre, **WM** Wound Management, **>** greater/more, **<** less/lower, **=** equal

Table A2

Evaluation Table for Qualitative Studies

Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
Lommi et al., (2022), Nursing outcomes in wound care management: A mixed method study **Country:** Italy **Funding:** The Centre of Excellence for Nursing funded this study **Bias:** None listed.	Middle range theory of chronic conditions	**Design:** Sequential explanatory mixed method with a quantitative and a qualitative phase. **Method:** Giorgi's descriptive phenomenological method **Purpose:** Explore what patients experienced while living with a chronic wound and its impact on the patient's life	**Sample:** N =14 out of the convenience sample of N=44 **Demographics:** Male, N= 8 Age M=71 10 Living w/ family **Setting:** Community Outpatients' clinics	What were the experiences of patients with chronic ulcers? **Definitions:** Self-care: the process of maintaining health through health promotion and disease management	**Data Collection:** Semi-structured interviews	Inductive analysis	**Themes:** 1- Cared by self -Maintenance -Self-management -Self-monitoring 2-Cared by Health Care Providers -Disease management -Symptom management -Self-management support 3- QoL -Spiritual Wellness -Social wellness -Financial wellness -Autonomy -Physical wellness	**Level of Evidence:** Level 3 **Strengths:** Strong qualitative design Experience of person living with chronic wounds **Weakness:** Small sample size, low level of evidence, limited generalizability **Application:** Identified self-care process and QoL

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
							-Emotional wellness	for patients with wounds
Weller et al., 2020 Understanding factors influencing venous leg ulcer guideline implementation in Australian primary care **Country:** Australia **Funding:** National Health and Medical Research Council, Translating Research	Theoretical Domains Framework (TDF)	**Design:** Qualitative research project **Method:** semi-structured face-to-face and telephone interviews with GPs and nurses **Purpose:** To gain better understanding of nurse and GPs use of VLU CPG and challenges to translate into practice	**Sample:** N=55 total N=35GPs N=20 nurses **Demographics:** Clinical practice: 1-50 years, M= 19 years VLU patients assessed: M= 8//week **Setting:** Primary care setting (PCS) **Attrition:**	**TDF Major Domains:** -Knowledge -Skills -Social Influences -Environmental context & Resources -Beliefs & capabilities -social & professional role & identity -Intentions -memory, attention & decision process **Definitions:** VLU – painful lower limb	**Data Collection:** Theoretical Domains Framework (TDF) questionnaire **Data Dependability:** -applied maximum variation sampling -transcribed audio records -reached data saturation	Contemporary theory-driven conceptual analysis, interrater reliability, transcripts w/ -3 level coding	**Knowledge CPGs**: 11 (2GPs) aware of CPGs but only 5 used. -24/35 reliance on previous knowledge/training **Skills:** #1 referred -competence in performing low -If knew a recommendation, lacked the skill **Social Influences:** -GPs thought nurses knew more -used colleagues, not CPGs	**Level of Evidence:** Level 4 **Strengths:** PCS, addresses barriers **Weakness:** Small sample size, low level of evidence, representation of health professionals limited, no CPGs in United States **Application:** Guide development of interventions to increase uptake of CPGs in PCS

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Citation	Theory/ Conceptual Framework	Design/ Method/ Sampling	Sample/ Setting	Major Themes Studied/ Definitions	Measurement/ Instrumentation	Data Analysis	Findings/ Themes	Level/ Quality of Evidence; Decision for/ Application to practice; Generalization
into Practice grant **Bias:** None				wounds present for > 4 weeks			**Environmental context & Resources:** -busy practice -low motivation to find and review -no ultrasound **Beliefs & capabilities:** -newer educated in culture of EBP **Social, professional identity:** -PCS broad and can't know details **Intentions:** no intent to read **Memory, attention & decision process**: to many to read for PCS	-audit implementation of guidelines

Key: ABPI Ankle Brachial Pressure Index, **AD** Advanced Directives, **BWAT** Bates-Jenson Wound Assessment Tool, **CPG** Clinical Practice Guideline, **CSA** Clinical Support App, **CSI** Champions for Skin Integrity, **CWC** Cooperative Wound Clinic, **DFU** Diabetic Foot Ulcer, **DV** Dependent Variable, **EB** Evidence Based, **EBP** Evidence-Based Practice, **IV** Independent Variable, **QoL** Quality of Life, **LoC** Level of Confidence, **LOE** Level of Evidence, **M** Mean, **Mdn** Median, **MNA** Mini Nutritional Assessment, **NIHR** National Institute for Health and Care Research, **NMA** Network Meta-Analysis, ***SD*** **S**tandard deviation; **TDF** Theoretical Domain Framework, **GP** General Practice, **GRADE** Grading of Recommendations Assessment Development and Evaluation **PCS** Primary Care Setting, **PHQ-2** Patient Health Questionnaire-2, **PUSH** Pressure Ulcer Scale for Healing , **SF-12** Short Form-12, **SPMSQ** Short Portable Mental Status Questionnaire, **TIME** Tissue Infection/Inflammation Moisture Edge, **VLU** Venous Leg Ulcer, **UAC** Under the Curve, **USA** Unified Severity Adjustment, **WOC** Wound Ostomy and Continence, **WWIC** Welsh Wound Innovation Centre, **WM** Wound Management, **>** greater/more, **<** less/lower, **=** equal

Table A3
Synthesis Table

Study (Author, year)	Cho et al., 2020	Edwards et al., 2013	Guest et al., 2017	Innes-Walker et al., 2019	Lommi et al., 2022	Norman et al., 2018	Parker et al., 2019	Moore et al., 2022	Young et al., 2019	Weller et al., 2020
Design/LOE	Prospective longitudinal cohort study	Observational Retrospective & prospective cohort study	RCA	Longitudinal Pre/Post test	Sequential explanatory MM: Longitudinal	Cochrane Review	Pre-Post, nonequivalent group research design	Observational Descriptive pre-post survey design	NON-RCT	Qualitative research project
LOE	III	III	III	III	III	I	III	III	II	IV
Sample *qual/quan*										
# Patients	261,398	104	130	81	44/14	7014	35			
# providers/nurses				33			109	123	88	55
# Wounds	620,365	70					55	443		
Patient Age	*	M 67	M 67	M 71	M 70	46-81			M 66	
Patients Male (%)	58%	54%	60%	46%	68%				66%	
Country of study	U.S.	Australia	UK	Australia	Italy	UK	Australia	US, UK	UK	Australia
Setting										
Primary Care			x	x	x	x	x	x	x	x
Primary Care + WC				x	x	x	x	x	x	
WC – stand alone	x	x				x		x		
Community (Home)			x			x		x		
Acute						x		x		
Type of Wound: lower legs										
All Types				x		x	x	x		
Chronic	x	x	x	x	x		x	x	x	x
DFU		x	x	x	x		x	x		x
VLU		x		x	x		x	x		x
Interventions										
Clinical Education				x	x		x	x	x	
WC Expert		x		x			x		x	
Patient Education				x	x					

Key: ABPI Ankle Brachia Pressure Index, , **CPG** Clinical Practice Guideline, **CSA** Clinical Support App, **CSI** Champions for Skin Integrity, **CWC** Cooperative Wound Clinic, **EBP** Evidence Based Practice, **ED** Education **LOE** Level of Evidence, **M** Mean, **MM** Mixed Methods, **PUSH** Pressure Ulcer Scale for Healing, **QoL** Quality of Life, **RCA** Retrospective Cohort Analysis, **TIME** Tissue Infection/Inflammation Moisture Edge **UK** United Kingdom, **US** United States, **USA** Unified Severity Adjustment **, VLU** Venous Foot Ulcer, **WC** Wound Care, ↑ high/improved/increase/strong evidence, ↓ decrease/low evidence, ↔ Similar/same/needs more research, ***** value not determined

Study (Author, year)	Cho et al., 2020	Edwards et al., 2013	Guest et al., 2017	Innes-Walker et al., 2019	Lommi et al., 2022	Norman et al., 2018	Parker et al., 2019	Moore et al., 2022	Young et al., 2019	Weller et al., 2020
Wound Management		x		x	x	x	x	x	x	x
Data Analysis only	x		x	x		x				
Technology								x		
Screening/Prevention		x	x	x			x			
Model for WC		x		x			x		x	
Survey		x		x	x		x	x		x
Tools Used Usefulness of tool										
Tool/model used	USA Model	Health Service Pathway	Data – lack of consistency	CWC model	BWAT	Data – dressing EBP	CSI Model	CSA	Complex Wound Clinic	Uptake CPGs Surveys
Usefulness	↑	↑	↑	↑	↑	↓	↑	↑	↑	↑
Evidence/Strength	↑/↔	↑/↑	↑/↑	↑/↔	↑/↑	↓/↓	↑/↔	↑/↔	↑/↔	↓/↓
Tool/model used		PUSH	ABPI	PUSH				TIME model		
Usefulness		↑	↑	↑				↑		
Evidence/strength		↑/↑	↑/↑	↑/↑				↑/↑		
Theme: Interviews/surveys										
WC skills/knowledge							↑	↑		↓
Awareness CPG EBP							↑			↓
Motivation EBP				↑			↑	↑		↓
QoL w/ wound				↑	↓					
Self-Care needs					↑					
Outcomes after intervention										
Wound Healing	↑	↑		↑	↑			*	↑	
Pre/post wound %		0/81%		0/87%				*	33%/67%	
Costs		↓						*	↔	
# visits		↓						*	↔	
Provider Self-Efficacy		*		↑			↑	↑	↑	
Patient QoL		↑		↑	↑					

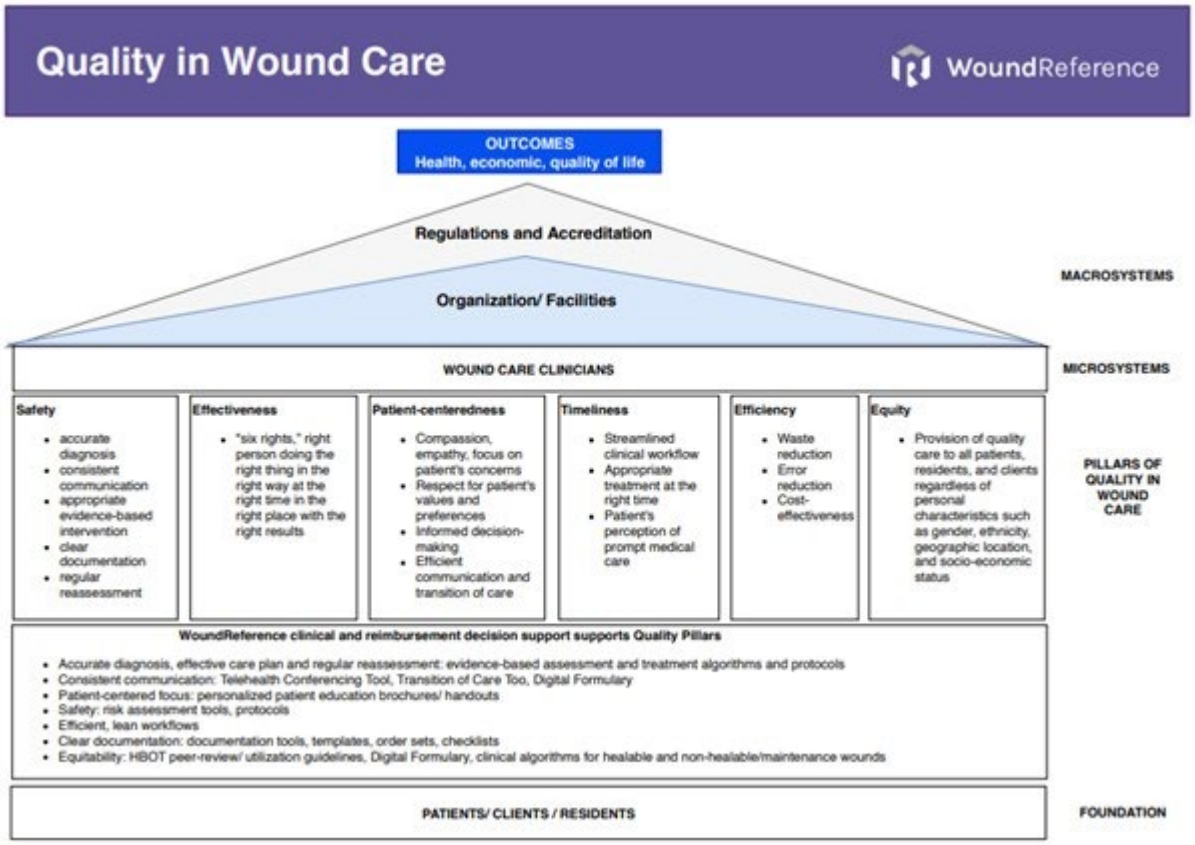
Key: ABPI Ankle Brachia Pressure Index, , **CPG** Clinical Practice Guideline, **CSA** Clinical Support App, **CSI** Champions for Skin Integrity, **CWC** Cooperative Wound Clinic, **EBP** Evidence Based Practice, **ED** Education **LOE** Level of Evidence, **M** Mean, **MM** Mixed Methods, **PUSH** Pressure Ulcer Scale for Healing, **QoL** Quality of Life, **RCA** Retrospective Cohort Analysis, **TIME** Tissue Infection/Inflammation Moisture Edge **UK** United Kingdom, **US** United States, **USA** Unified Severity Adjustment **, VLU** Venous Foot Ulcer, **WC** Wound Care, ↑ high/improved/increase/strong evidence, ↓ decrease/low evidence, ↔ Similar/same/needs more research, ***** value not determined

Appendix B

Models and Frameworks

Figure B1

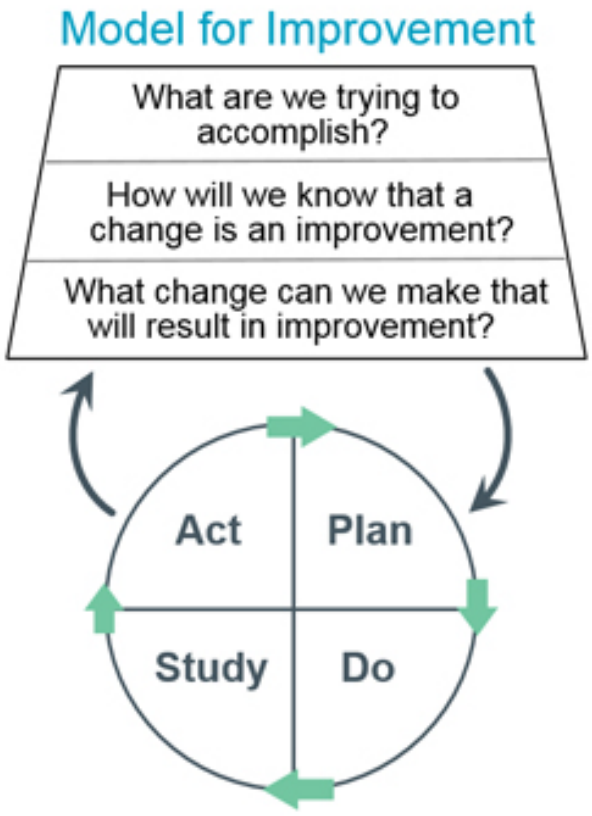
AAWC Conceptual Framework for Quality Wound Care



(Song et al., 2022)

Figure B2

Model for Improvement: Plan-Do-Study-Act (PDSA)



(IHI, 2017)

Appendix C

IRB Approval

EXEMPTION GRANTED

Erin Tharalson
EDSON: DNP
-
Erin.Tharalson@asu.edu

Dear Erin Tharalson:

On 8/23/2023 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Overcoming Wound Care Challenges: A Toolbox Approach in Primary Care
Investigator:	Erin Tharalson
IRB ID:	STUDY00018485
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• recruitment_methods_informed consent_17-08-2023.pdf, Category: Consent Form; • recruitment_methods_recruitment flyer_17-08-2023.pdf, Category: Recruitment Materials; • recruitment_methods_recruitment script_17-18-2023.pdf, Category: Recruitment Materials; • supporting documents_Surveys and Tools_17-08-2023.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • supporting_document_agency letter_17-08-2023.pdf, Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc); • supporting_documents_Education Toolbox_17-08-2023.pdf, Category: Participant materials (specific directions for them); • Wound Management Primary Care_IRB Protocol_17-08-2023.docx, Category: IRB Protocol;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2)(i) Tests, surveys, interviews, or observation (non-identifiable) on 8/23/2023.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

Sincerely,

IRB Administrator

cc: Jennifer Hawkins
Erin Tharalson
Jennifer Hawkins

ASU Knowledge Enterprise Development

APPROVAL: MODIFICATION

Erin Tharalson
EDSON: DNP
-
Erin.Tharalson@asu.edu

Dear Erin Tharalson:

On 10/8/2023 the ASU IRB reviewed the following protocol:

Type of Review:	Modification / Update
Title:	Overcoming Wound Care Challenges: A Toolbox Approach in Primary Care
Investigator:	Erin Tharalson
IRB ID:	STUDY00018485
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Letter_modification_explanation_09-10-2023.pdf, Category: Other; • recruitment_methods_recruitment flyer_09-10-2023.pdf, Category: Recruitment Materials; • supporting documents_Surveys and Tools_05-10-2023.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • Wound Care Self Efficacy_IRB Protocol_09-10-2023.docx, Category: IRB Protocol;

The IRB approved the modification.

When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Jennifer Hawkins
Erin Tharalson
Jennifer Hawkins

Appendix D

Pre-Intervention Survey

Overcoming Challenges in Wound Management: A Toolbox Approach for Primary Care

Pre-Intervention Survey
Many thanks for completing the survey for my DNP project. The information you have provided will help me evaluate my quality improvement project. You will receive a post-intervention survey

1. Anonymous ID: Use the first 3 letters of your mother's name and the last 3 digits of your phone number (example: deb439). This same ID will be used for the post-survey after project completion.

2. Gender

- ◯ Male
- ◯ Female
- ◯ Non-binary

3. Age category

- ◯ 18-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60 or older

4. Which race or ethnicity best describes you? (Please choose only one)

- ◯ Hispanic
- ◯ White / Caucasian
- ◯ Asian / Pacific Islander
- ◯ Black or African American
- ◯ American Indian or Alaskan Native
- ◯ Multiple ethnicity / Other

5. Highest level of education:

- ◯ Highschool or equivalent
- ◯ Vocational training
- ◯ Undergraduate degree
- ◯ Graduate degree

6. What best describes your profession or area of specialty:

- ◯ Front Office
- ◯ Medical Assistant
- ◯ Patient Navigator
- ◯ Registered Nurse
- ◯ Provider
- ◯ Volunteer

7. How long have you been working in your area of expertise?

- ◯ Less than 1 year
- ◯ 1 -5 years
- ◯ 6 - 10 years
- ◯ Greater than 10 years

8. How many hours of formal wound training have you received?

- ◯ No formal training in wounds
- ◯ 1 to 2 hours
- ◯ 3 to 4 hours
- ◯ 5 to 10 hours
- ◯ Greater than 10 hours

9. Do you currently provide clinical care for patients with wounds? If so, for how long have you been doing this?

- ◯ 0-1 years
- ◯ 2-5 years
- ◯ 6-10 years
- ◯ Greater than 10 years
- ◯ Do not provide care to patients with wounds

10. If you treat patients with wounds, what percentage of time in a given week do you spend on wound care and management? (Include time to assess the wound, determine appropriate treatment, clean the wound, apply wound dressing, EHR ordering, EHR documentation, and provide patient education.)

- ◯ < 5%
- ◯ Between 5% and 10%
- ◯ Between 10% and 20%
- ◯ Between 20% and 30%
- ◯ Over 30%

11. Please indicate your level of confidence with the following statement:

	Not confident	Little Confidence	Somewhat confident	Confident	Very confident	N/A
Applying the evidence to your clinical practice	◯	◯	◯	◯	◯	◯
Making decisions regarding the wound management	◯	◯	◯	◯	◯	◯
Performing a full assessment of a patient at risk of or with a wound	◯	◯	◯	◯	◯	◯
Documenting a wound management plan	◯	◯	◯	◯	◯	◯
Implemening a wound management plan	◯	◯	◯	◯	◯	◯
Monitoring and evaluating a wound management plan	◯	◯	◯	◯	◯	◯
The different wound treatment options	◯	◯	◯	◯	◯	◯
Managing the wound environment to optimize healing	◯	◯	◯	◯	◯	◯

12. Please indicate your level of confidence with the following statement:

	Not confident	Little Confidence	Somewhat confident	Confident	Very confident	N/A
Preventing and managing wound infection	◯	◯	◯	◯	◯	◯
Minimizing the actual and potential impact of pain	◯	◯	◯	◯	◯	◯
Recognizing peripheral edema	◯	◯	◯	◯	◯	◯
Wound management products, devices, and manufacturer guidelines	◯	◯	◯	◯	◯	◯
Recognizing the need for compression treatment	◯	◯	◯	◯	◯	◯
Measuring and applying compression treatment	◯	◯	◯	◯	◯	◯
Appropriate referral pathways when a higher level of care is needed	◯	◯	◯	◯	◯	◯

13. Please rate your current level of confidence in being able to identify, assess, care for, and prevent the following wound types?

	Not confident	Little Confidence	Somewhat confident	Confident	Very confident	N/A
Venous leg ulcers	◯	◯	◯	◯	◯	◯
Arterial leg ulcers	◯	◯	◯	◯	◯	◯
Diabetic foot ulcers	◯	◯	◯	◯	◯	◯
Burns	◯	◯	◯	◯	◯	◯
Skin tears	◯	◯	◯	◯	◯	◯
Traumatic injuries	◯	◯	◯	◯	◯	◯
Surgical wounds	◯	◯	◯	◯	◯	◯
Dehiscence of surgical wounds	◯	◯	◯	◯	◯	◯
Pressure injuries	◯	◯	◯	◯	◯	◯
Infected wounds	◯	◯	◯	◯	◯	◯

14. Please rate how the following practices are challenging or frustrating for you in addressing wound management currently:

	No challenge	little challenging	challenging	mostly challenging	very challenging	N/A
Adequate time to manage wounds	◯	◯	◯	◯	◯	◯
Dressing choice	◯	◯	◯	◯	◯	◯
Wound assessment	◯	◯	◯	◯	◯	◯
Appropriate wound orders for type of wound	◯	◯	◯	◯	◯	◯
EHR orders and/or documentation	◯	◯	◯	◯	◯	◯
Challenges of population served	◯	◯	◯	◯	◯	◯
Educating the patient	◯	◯	◯	◯	◯	◯
When to refer if a higher level of care is needed	◯	◯	◯	◯	◯	◯

Appendix E

Budget

Phase	Activities/Item		Cost subtotal
Preparation	**Personnel**: DNP project coordinator, clinical staff, administrative support, mentor, site champion, and other stakeholders.	Donated time Salaries & wages per organization (indirect)	0$
	Equipment & Supplies: computer & printer Printer paper – 500 copies Binders – 5 Sheet Protectors – 5 packs	Donated personal computer and printer use (direct)	$100
	Toolbox Development: DNP coordinator, mentor, & compliance	Donated time Salaries & wages per organization (indirect)	0$
	EMR improvements: Organizational IT personnel & Project mentor	Donated time & equipment (indirect)	$0
	Clinic-related: wound care supplies, printed patient education (not evaluated in this project)	Per site budget (direct for clinic)	N/A
Project Delivery	Building and conference room space – site location	Donated space	$0
	Toolkit repetitive coaching session: Participants and coordinator	Donated time	$0
	Refreshments	Direct cost	$50
Evaluation	Review and analysis of results: Intelectus Software, Statistician	Personal computer & ASU Software, donated time	$0
	Misc. expenses: transportation, etc	variable	S100
		Budget for Project Total	$250.00

Potential cost versus revenue savings:

Cost avoidance for patients and improved outcomes and Quality of life

Proactive wound care management reduces the need for expensive interventions, prolonged care, and surgeries.

Enhanced efficiency and productivity for clinical staff and at the systems level

Improved clinical workflow by streamlining wound care supplies, improving EMR documentation, and clinical decision-making algorithms.

Reduced time spent on unnecessary or inefficient practices. Increased time for managing comorbidities and allocating resources to other care areas.

Appendix F

Results

Table F1

Demographic Variables

Variable	*n*	*%*
Age		
18-29	2	20.00
30-39	6	60.00
40-49	1	10.00
60 or older	1	10.00
Gender		
Female	9	90.00
Male	1	10.00
Race/Ethnicity		
Hispanic	6	60.00
Asian/Pacific Islander	1	10.00
White/Caucasian	2	20.00
Black or African American	1	10.00
Profession		
Front Office	1	10.00
Patient Navigator	2	20.00
Behavioral Specialist	1	10.00
Registered Nurse	1	10.00
Provider	2	20.00
Medical Assistant	3	30.00
Years in Profession		
1-5 years	2	20.00
6-10 years	3	30.00
> 10 years	5	50.00
Wound Care Experience		
do not provide patient wound care	4	40.00
0-1 years	1	10.00
2-5 years	3	30.00
6-10 years	1	10.00
> 10 years	1	10.00
% Time Per Week On Wound Care		

0%	4	30.00
6-10%	2	20.00
11-20%	2	20.00
21-30%	2	20.00

Note. Due to rounding errors, percentages may not equal 100%.

Figure F1

Formal Wound Training of Direct Wound Care Staff

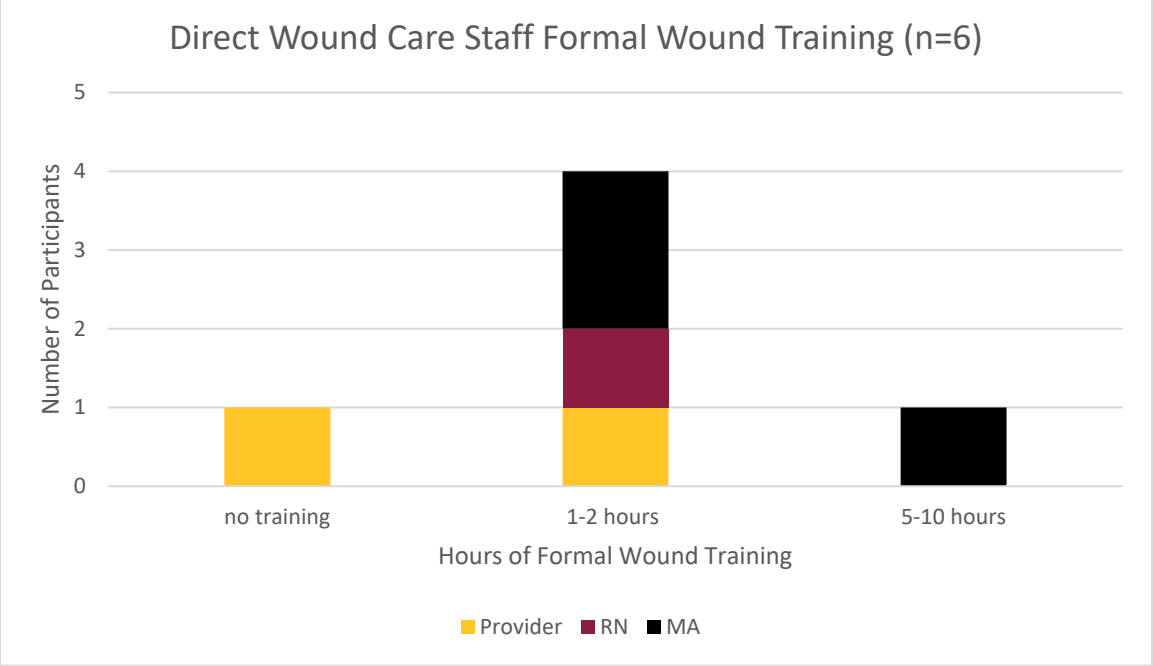


Table F2

Self-Efficacy Outcome Variables; Domains Confidence & Frustration

Variable	*M*	*SD*	*n*	Min	Max
Pre-Self-Efficacy	56.50	44.15	10	0.00	110.00
Post-Self-Efficacy	124.50	33.10	10	64.00	180.00
Pre-Confidence	42.60	34.29	10	0.00	91.00
Post-Confidence	87.80	26.69	10	38.00	125.00
Pre-Frustration	13.90	11.50	10	0.00	32.00
Post-Frustration	22.60	11.45	10	0.00	40.00

Figure F2

Self-Efficacy of Participants, Wound Care Staff, & Non-Wound Care Staff