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Wound Cleansing in Chronic Wound Management
Evidence, Measurement, and Clinical Practice

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Abstract

Wound cleansing is widely regarded as a foundational component of chronic wound management; however, the empirical evidence supporting commonly recommended cleansing techniques remains limited. Much of the guidance informing current practice is derived from acute wound models, laboratory studies, and expert consensus rather than from comparative studies conducted in chronic wound populations.

The aim of this thesis was to examine the evidence base for wound cleansing practices in chronic wounds and to investigate nurses' knowledge, attitudes, and practice related to wound cleansing.

The thesis comprises four studies. Study I systematically reviewed evidence comparing irrigation and swabbing techniques in chronic wounds. Study II developed and psychometrically evaluated a questionnaire measuring nurses' knowledge, attitudes, and practices related to wound cleansing. Study III applied the instrument in an international cross-sectional survey. Study IV conducted confirmatory factor analysis to evaluate the internal structure of the attitudes subscale.

The review identified extremely limited chronic wound-specific evidence for commonly recommended cleansing techniques. The developed instrument demonstrated acceptable psychometric properties. Survey findings showed variation in clinician knowledge and practice, with higher knowledge associated with formal wound care education. Confirmatory analysis supported the multidimensional structure of nurses' attitudes.

These findings highlight the need for stronger empirical evidence and structured education to support evidence-informed cleansing practices.

Keywords: chronic wounds; wound cleansing; wound irrigation; biofilm; nursing practice; knowledge-attitude-practice; questionnaire development; psychometric validation.

To my grandfather (*Dr. Tibor Rajhathy*)

Who left too early but still managed to publish more papers than I could count.

A Hungarian-rooted scientist who sowed the seeds of curiosity in both plants and people.

Your achievements were my call to action; this thesis my reply.

This work is also dedicated to Christian Lachapelle

Whose leadership was instrumental in shaping a lasting commitment to ethical, evidence-informed practice.

He set the foundation for this path, challenging early assumptions and helped shape how I think, the standards I hold, and the decisions I make in practice. Through his mentorship, a clear and unwavering commitment to accountability – to the patient, the nurse, and the health system - was established.

His emphasis on partnerships grounded in quality rather than commercial interest reinforced the importance of independent, critical evaluation and a sustained commitment to remaining free from conflicts of interest.

And finally, to the field of statistics

For turning simple questions into existential crises...

and for teaching me that evidence-based practice begins with questioning everything, including the evidence itself...

and for reminding me that 'statistically significant' is rarely the same as 'clinically meaningful.'

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List of papers

This thesis is based on the following studies, referred to in the text by their Roman numerals.

- I. Rajhathy, Erin Marie, Vander Meer, Juliann, Valenzano, Teresa, Laing, Leanna Evelyn, Woo, Kevin Y., Beeckman, Dimitri, Falk-Brynhildsen, Karin, 2023. "Wound irrigation versus swabbing technique for cleansing noninfected chronic wounds: a systematic review of effectiveness in bleeding, pain, infection, exudate, and necrotic tissue". *Journal of Tissue Viability*, 32:1, 136-143.
- II. Rajhathy, Erin Marie, Falk-Brynhildsen, Karin, Woo, Kevin Y, Beeckman, Dimitri, 2025. "Knowledge, attitudes, and practices (KAP) of nurses towards wound cleansing: design and evaluation of measurement properties of a questionnaire". *Journal of Tissue Viability*, 35:1, 100967.
- III. Rajhathy, Erin Marie, Woo, Kevin Y, Falk-Brynhildsen, Karin, 2026. "Knowledge, attitudes, and practices of health care professionals towards chronic wound cleansing: international cross-sectional survey." Manuscript submitted for publication.
- IV. Rajhathy, Erin Marie, Falk-Brynhildsen, Karin, Woo, Kevin Y, Beeckman, Dimitri. "Confirmatory evaluation of the internal structure of the Wound Cleansing KAP attitudes subscale." Manuscript in preparation.

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Abbreviations

CFA	Confirmatory factor analysis
CFI	Comparative fit index
CINAHL	Cumulative Index to Nursing and Allied Health Literature
COSMIN	Consensus-Based Standards for the Selection of Health Measurement Instruments
EPS	Extracellular polymeric substance
KAP	Knowledge-Attitudes-Practice
PCA	Principal components analysis
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSI	Pounds per square inch
RCT	Randomized controlled trial
RMSEA	Root mean square error of approximation
SRMR	Standardized root mean square residual
TLI	Tucker-Lewis index
USD	United States dollars
WLSMV	Weighted least squares mean- and variance-adjusted

Prologue

This research began long before the first study was designed. It began with questions that emerged through clinical practice, grounded in the care of patients living with chronic wounds.

Early in my career, I worked in the medical supply sector supporting wound care recommendations for the Ontario (Canada) public homecare sector. My role then was to make product-related recommendations intended to support the public health system, with decisions grounded in what was considered most clinically appropriate for patients and safe and feasible for nurses to implement in practice. At the time, this approach aligned with the principle that evidence-based care represents not only best practice for patients and nurses but ultimately the most cost-effective approach for the health system.

I initially accepted the information provided by manufacturers and industry experts as an accurate representation of the available evidence. Only later, during my master's studies, did I begin to understand how clinical knowledge is generated, evaluated, and translated into practice. With that understanding came a realization that many commonly accepted wound care practices were supported by surprisingly limited empirical evidence.

Following my transition into the public health sector, I assumed responsibility for overseeing wound care practice across large community care programs. This role provided a unique opportunity to observe routine wound care delivered by hundreds of nurses across diverse clinical environments. While these nurses demonstrated strong commitment to patient care, it became clear that foundational practices, such as wound cleansing, were performed with substantial variability. Technique, pressure, duration, and solution handling differed considerably between nurses and settings.

These observations raised a simple but important question: if wound cleansing is considered a core component of wound management, what evidence actually supports how it is performed?

In seeking answers, I reviewed the literature underpinning widely recommended cleansing practices, particularly irrigation. What appeared to be well-established clinical guidance was supported primarily by extrapolation from acute wound models, laboratory studies, or theoretical reasoning, rather than by studies conducted in chronic wound populations. At the same time, chronic wounds were increasingly recognized as complex biological environments characterized by persistent microbial communities, including biofilm; yet, relatively little attention had been directed toward examining the everyday clinical practices used to manage these wounds.

These experiences occurred against the backdrop of rising global prevalence of diabetes, increasing numbers of complex chronic wounds, and continued concern regarding preventable complications, such as infection and amputation. In Canada, wound care represents a substantial and growing area of health system expenditure, with tens of millions of dollars spent annually on products within a single provincial home care system, excluding the additional costs associated with nursing care, hospitalizations, and long-term outcomes.

These collective experiences shaped the questions that ultimately led to this thesis. If wound cleansing is performed routinely by nurses across health systems worldwide, yet the empirical evidence supporting its execution remains limited, then understanding both the evidence base and how nurses conceptualize and perform this practice is essential.

This is not only a question of technical procedure, but of how care is delivered at the patient-nurse interface, where foundational practices are enacted in real time. Practices that are evidence-informed, consistently understood, and feasible for nurses to implement are more likely to support optimal patient outcomes and contribute to more effective and sustainable use of health system resources.

This research program was therefore developed to examine the evidence underpinning wound cleansing practices and to better understand how nurses' knowledge, attitudes, and practices influence how wound cleansing is performed in care.

Erin Rajhathy

1 Introduction

Chronic wounds represent a persistent and growing challenge for both patients and the health systems responsible for their care. Across publicly funded systems, demographic shifts, including population ageing and increasing prevalence of chronic disease, have contributed to a sustained rise in the incidence and complexity of chronic wounds. Care delivery has correspondingly shifted toward community-based settings, where management is characterized by repeated encounters with generalist clinicians, most commonly nurses.

Despite their routine nature, chronic wounds impose a disproportionate burden on patients and health systems. Individuals living with chronic wounds frequently experience prolonged pain, reduced mobility, social isolation, and diminished quality of life over extended care trajectories. At the system level, chronic wound management is resource-intensive, involving repeated clinical visits, sustained product utilization, and escalating costs associated with complications and delayed healing.

Within this landscape, wound cleansing occupies a central yet paradoxical role. It is one of the most frequently performed interventions in chronic wound care and is widely considered essential to wound bed preparation. However, the empirical evidence supporting commonly recommended cleansing techniques remains limited, particularly in chronic wound populations. Much of the guidance informing clinical practice is derived from acute wound models, laboratory studies, or expert consensus rather than from direct evaluation in biologically representative chronic wound environments.

This misalignment between the routine application of wound cleansing and the limited clarity surrounding its evidence base raises fundamental questions. Specifically, how is wound cleansing conceptualized and performed in practice, and to what extent are these practices aligned with available evidence?

Addressing these questions requires not only evaluation of the existing evidence base, but also an understanding of how clinicians, particularly nurses (who deliver the majority of routine wound care) interpret,

adapt, and implement wound cleansing within real-world care environments. This thesis was therefore designed to examine both the empirical foundation of wound cleansing and the knowledge, attitudes, and practices that shape its execution in clinical care.

2 Background

2.1 Epidemiology and Burden of Chronic Wounds

Chronic wounds represent a substantial and growing burden on health systems globally, with significant implications for service delivery, resource allocation, and patient outcomes.¹⁻³

In many developed, publicly funded health systems, the management of chronic wounds is increasingly shifting from acute care to community-based settings, including homecare, primary care, and long-term care facilities (nursing homes).⁴ Within these settings, wound-related services account for a considerable proportion of health care utilization.^{2,5,6} Day-to-day management is delivered through repeated encounters with generalist clinicians.⁶ Wound care consumes an estimated 40% to 80% of community nursing encounters internationally.^{5,7,8}

As a result, routine wound care, including foundational interventions, such as wound cleansing, is delivered primarily at the patient-clinician interface, where clinical decisions are enacted repeatedly over prolonged care trajectories. Nurses represent the primary professional group responsible for executing these interventions,^{7,8} although, wound care may be delivered by a broader range of clinicians depending on context and system structure.⁹

Beyond health system utilization, chronic wounds impose a substantial humanistic burden. Individuals frequently experience prolonged pain, impaired mobility, social isolation, and diminished quality of life.^{2,6,8,9} Psychological sequelae, including anxiety and depression, are common and further increase care complexity, resulting in additional health system utilization.^{6,8,9,11}

Economic consequences are similarly substantial, with costs arising from both direct care and broader societal impacts, including loss of productivity, early retirement, informal caregiving, and long-term disability.^{2,9,10} As populations age and multimorbidity increases, the absolute and relative burden of chronic wounds is expected to steadily rise,^{6,10,12} disproportionately affecting vulnerable populations.

Despite this burden, global prevalence of chronic wounds remains poorly defined and likely underestimated due to inconsistencies in definition, classification, and measurement across health systems.² These challenges are addressed in the following section.

2.2 Definitions and Classification of Chronic Wounds

To date, no universally accepted definition of a chronic wound exists. Chronic wounds are commonly described as wounds that fail to progress through the normal phases of healing within an expected time frame.^{7,9} Although duration is frequently used as a practical descriptor, defining chronic wounds solely based on time does not adequately capture their underlying complexity.

Contemporary perspectives increasingly conceptualize chronic wounds as wounds associated with underlying pathology. Conditions such as diabetes, vascular disease, and impaired perfusion disrupt the cellular and physiological processes required for healing, contributing to persistent inflammation and impaired tissue repair.^{3,11}

However, variation in terminology and classification complicates this conceptualization. Terms such as “chronic,” “hard-to-heal,” and “complex” are often used interchangeably, reflecting differences in clinical context, classification approaches, and care settings.³ These inconsistencies contribute to challenges in comparing findings across studies and in interpreting prevalence and outcomes at the health system level.

Although chronic wounds are characterized by impaired healing, their physiological state is not fixed. Clinical interventions, such as correction of underlying pathology and debridement, may modify the wound environment and reinitiate acute inflammatory processes, creating conditions more conducive to healing.

For the purposes of this thesis, chronic wounds are defined as wounds associated with underlying pathological processes that impair normal healing, including, but not limited to, diabetic foot ulcers, pressure injuries, and vascular ulcers.

The following section outlines key biological differences between acute and chronic wounds, highlighting the mechanisms underlying this altered healing environment.

2.3 Biological Differences Between Acute and Chronic Wounds

Chronic wounds differ biologically from acute wounds in ways that directly influence both disease progression and clinical management. Acute wounds typically progress through orderly phases of healing supported by coordinated immune responses, cellular signalling, and angiogenesis (Figure 1). In contrast, chronic wounds fail to progress through these phases in a timely or coordinated manner, often due to underlying chronic conditions, such as impaired perfusion, metabolic dysfunction, or repeated tissue insult.^{9,12}

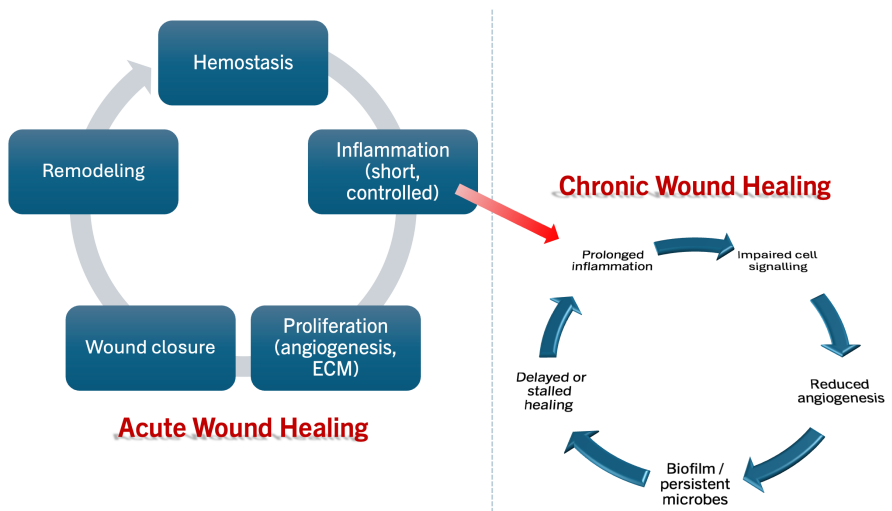


Figure 1. Biological differences between acute and chronic wounds.

Persistent inflammation, dysregulated cellular activity, and impaired tissue repair are defining features of chronic wounds.¹² This includes prolonged inflammatory signalling, imbalances in protease activity, reduced growth factor availability, and impaired function of key cell types involved in repair.¹² These disruptions alter the wound

environment at both cellular and systemic levels, resulting in delayed healing, increased susceptibility to complications, and variable responses to treatment. This altered healing trajectory is associated with prolonged patient burden, including persistent symptoms and reduced quality of life, while also increasing the complexity of clinical decision-making for nurses and contributing to sustained resource demands within health systems.

Importantly, these biological differences limit the applicability of evidence derived from acute wound models to chronic wound contexts, as interventions effective in acute healing may not address the underlying pathophysiology present in chronic wounds.

Microbial persistence represents another important feature of chronic wound biology and is explored in the following section.

2.4 Biofilm and Microbial Complexity

Biofilm has emerged as a key feature of chronic wound environments and is reported in approximately 60% to 70% of chronic wounds in human tissue models.^{13,14} While prevalence estimates vary depending on detection methods, biofilm is consistently associated with delayed healing, recurrent infection, and treatment complexity.¹⁵⁻¹⁹ Biofilm is therefore increasingly described as a biologically plausible contributor to wound chronicity rather than a singular causal mechanism.^{9,12}

Biofilms are polymicrobial communities embedded within a shared extracellular polymeric substance (EPS). Microbial interactions within this matrix are both cooperative and competitive, potentiating tolerance to host immune responses and systemic and topical antimicrobial agents.¹³ This organization differs from microbial contamination in acute wounds, where microorganisms are more commonly planktonic and transient.

Biofilm formation is often described as a temporal process (Figure 2). Human skin is naturally colonized with diverse microbiota; therefore, any disruption of skin integrity is considered contaminated at the time of injury.²⁰ As a result, microbial attachment to the wound surface may occur within hours. Early attachment begins as a reversible process and

progresses toward more stable adhesion (irreversible attachment) as EPS production increases. Within approximately 24 to 48 hours, bacterial aggregates may become embedded within this matrix and form microcolonies. These microcolonies subsequently mature into structured biofilm communities through interspecies communication and quorum signalling.^{13,21}

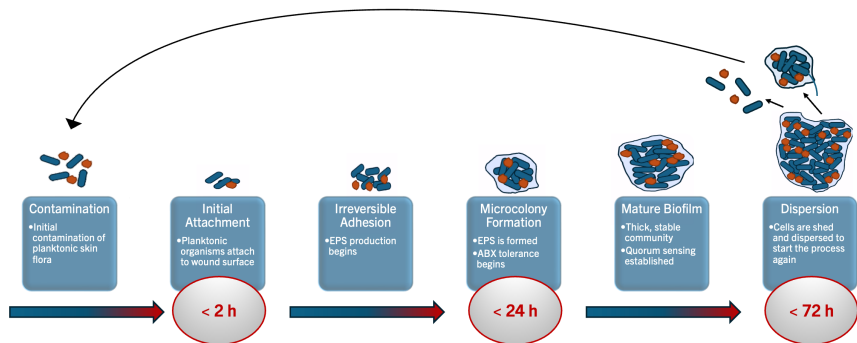


Figure 2. Conceptual illustration of stages of biofilm development in chronic wounds, including contamination, initial attachment, irreversible adhesion, microcolony formation, maturation, and dispersion.

During early phases of attachment, microbial aggregates remain more susceptible to mechanical disruption as EPS remains relatively sparse. As biofilm architecture develops, diffusion barriers increase and microbial tolerance to both mechanical and chemical interventions rises. These temporal dynamics highlight the importance of early surface disruption in wound management.

Collectively, these biological characteristics reinforce the importance of mechanical disruption within wound management. However, while the role of biofilm provides strong biological plausibility for interventions such as wound cleansing, the extent to which specific cleansing techniques effectively disrupt biofilm in human chronic wounds remains insufficiently established. This creates a critical disconnect between biological rationale and empirical validation, particularly for routine interventions that are widely implemented in practice.

2.5 Current Evidence for Wound Cleansing

2.5.1 Role and purpose of wound cleansing

Wound cleansing is consistently identified in clinical guidelines and best practice documents as a foundational component of wound management, representing the first deliberate clinical intervention applied to the wound bed. Its purpose extends beyond removal of visible debris. Cleansing contributes to the reduction of surface bioburden, disruption of adherent microorganisms, preparation of the wound bed for subsequent therapies, and protection of the periwound skin.²⁰

Accordingly, wound cleansing should not be regarded as a purely cosmetic procedure but as a biologically consequential intervention that may influence microbial dynamics and the conditions under which healing progresses.

Across international and national guidance, irrigation is the most frequently recommended approach for routine cleansing and is widely positioned as standard practice.^{20,22-24} These recommendations reflect broad professional consensus regarding the role of cleansing in wound bed preparation and reduction of surface contaminants. However, the routine inclusion of cleansing in care does not necessarily indicate the presence of strong empirical evidence guiding how it should be performed. Rather, its role has been established through a combination of biological rationale, clinical consensus, and long-standing practice norms.

2.5.2 Irrigation as the predominant cleansing method

Irrigation refers to the delivery of a cleansing solution to the wound surface under controlled pressure in order to remove debris, dilute contaminants, and mechanically disrupt loosely adherent material (Figure 3a).

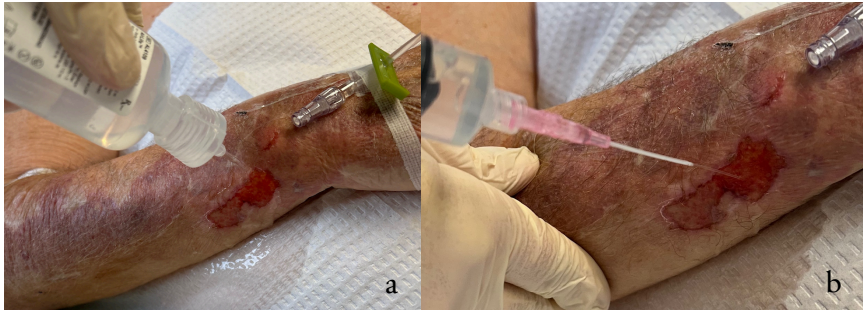


Figure 3. (a) irrigation using squeeze bottle with pressurized tip; (b) irrigation use a syringe and intravenous catheter. Photographs by Erin Rajhathy

Although widely described as the preferred cleansing method, irrigation is not a singular procedure but a multi-component intervention involving interacting variables, such as applied pressure, solution volume, contact time, and consistency of technique (Figure 4). Measures to prevent contamination of both solution and wound environment are also required.

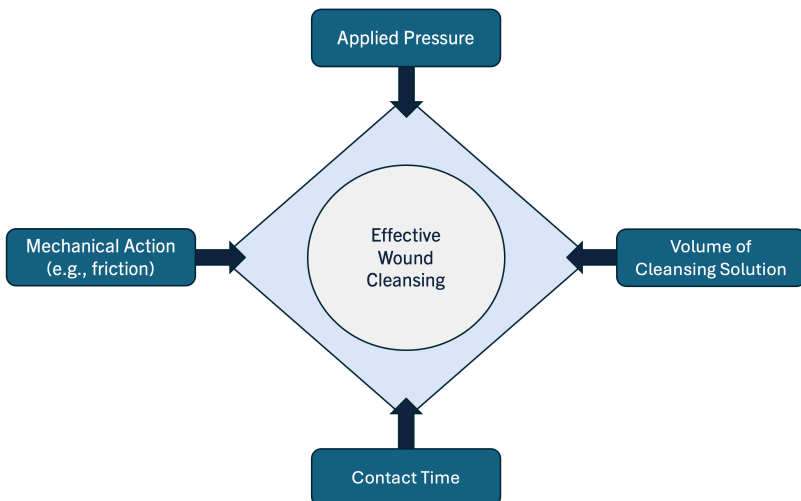


Figure 4. Cleansing mechanics framework.

In clinical practice, these techniques are often acquired informally through observation, workplace orientation, or local procedural norms rather than through structured engagement with the underlying evidence base.^{6,25} As a result, variation in how irrigation is performed is common. This variability is rarely standardized or consistently reported in empirical studies, despite its potential influence on clinical outcomes.

Although irrigation is widely positioned standard practice, alternative techniques, such as swabbing with gauze, have historically been used and remain in practice in some clinical contexts. Swabbing involves direct mechanical contact (friction) with the wound surface to remove debris and exudate (Figure 5) and is considered mechanical debridement. The shift toward irrigation has largely been driven by theoretical advantages, including improved removal of debris and reduced trauma to newly formed tissue.²⁶ However, direct comparative evidence between irrigation and swabbing in chronic wound populations remains limited. Existing studies have predominantly focused on acute wounds, limiting their applicability to chronic wound environments.



Figure 5. Swabbing technique using gauze. Photograph by Erin Rajhathy.

Consequently, while irrigation is widely accepted as standard practice, the extent to which it provides superior or clinically equivalent outcomes compared to alternative techniques remains insufficiently established.

2.5.3 Irrigation pressure and procedural variability

The empirical foundation underpinning many wound cleansing recommendations is derived primarily from acute wound models, animal studies, and in vitro experiments.²⁶⁻³² While these studies provide important mechanistic and safety insights, their applicability to chronic wounds remains limited due to fundamental differences in wound biology.

For example, one frequently cited study involving acute wounds contaminated for less than 24 hours reported that irrigation pressures of approximately 13 psi were required to effectively dislodge bacteria from the wound surface.²⁶ Historical guidance from the Agency for Health Care Policy and Research (1994) suggested a pressure range of 10 - 15 psi to remove bacteria while minimizing tissue damage,³³ while contemporary consensus-based recommendations propose a range of 8 - 15 psi.²⁰ Notably, these recommendations are not derived from studies conducted in human chronic wound populations.

Recent work has further demonstrated the practical variability involved in generating irrigation pressure in clinical settings. Using Bernoulli's equation, Lee et al. (2022) showed that pressure at the wound surface is influenced by multiple procedural variables, including syringe size, needle diameter, flow rate, and the distance between the delivery device and the wound bed. Even under controlled conditions, maintaining pressures within the recommended ranges proved difficult, with small changes in techniques resulting in substantial variation.³⁴

When irrigation is evaluated empirically, outcomes are typically measured using distal endpoints, such as wound closure or infection rates.²⁷ Microbiological measures of surface bioburden are infrequently included, and studies rarely control for confounding variables that

influence healing trajectories, including comorbidities, nutritional status, dressing selection, and concurrent therapies.

Together, these limitations highlight both the methodological challenges of evaluating wound cleansing and the likelihood that observed differences in outcomes may reflect variability in how the intervention is performed rather than the intervention itself.

2.6 Knowledge Translation and Practice Formation in Wound Care

2.6.1 Knowledge development in chronic wound care

In areas of clinical practice where direct empirical evidence is limited, knowledge is often generated, stabilized, and transmitted through mechanisms other than experimental research⁶ (Figure 5). Chronic wound care represents one such domain, where the pace of clinical innovation and product development has outpaced the generation of robust chronic wound-specific evidence supporting many widely adopted practices.⁶



Figure 6. Pathways of knowledge transmission influencing wound care practice, including formal education, workplace learning, industry education, and clinical guidance.

Over recent decades, the wound care sector has undergone rapid commercial expansion characterized by the proliferation of advanced dressings, topical agents, cleansing solutions, and technologies marketed to address complex wound pathophysiology, including biofilm and infection.³⁵ Market analyses estimate that advanced wound dressings account for a substantial proportion of total wound care expenditure, with the global market exceeding 35 billion USD in 2023.³⁶ North America accounts for a large share of this market, reflecting high rates of product adoption in developed health systems.³⁷ While these figures represent commercial estimates, they illustrate the scale of financial investment directed toward product-based solutions within contemporary wound care systems.³⁸

In publicly funded health systems, decisions regarding product adoption and formulary inclusion occur at the intersection of government, clinicians, and industry. Although formal evaluation processes exist, education and training related to these products are frequently delivered through industry-sponsored conferences, workshops, and expert-led sessions. As a result, knowledge about emerging interventions often enters clinical practice through educational pathways closely aligned with commercial activity rather than through independent synthesis of primary evidence.

Clinical guidance in wound care is therefore commonly informed by expert interpretation of indirect evidence, including laboratory studies, animal models, acute wound research, and limited human data. While these sources provide important mechanistic insights, their applicability to chronic wound populations remains uncertain due to fundamental biological differences between acute and chronic wounds.

Structural challenges further limit the generation of high-quality clinical evidence in chronic wound care, including heterogeneity in wound etiology, ethical and practical constraints related to study design, and difficulty in controlling for confounding variables that influence healing trajectories.³⁹ Under these conditions, consensus-based guidance and expert opinion function as pragmatic mechanisms for informing clinical decision-making.

2.6.2 Foundational education in chronic wound care

Education plays a central role in shaping clinical practice; however, preparation for managing chronic wounds remains variable across health professional programs, including nursing.^{6,40} Despite the high frequency with which wound care is performed across care settings, chronic wound management is often addressed inconsistently and with limited depth within formal curricula.

Explicit competency expectations are rarely defined, and core principles relevant to wound cleansing, such as wound biology, cleansing mechanics, microbial control, and distinctions between empirical evidence and consensus guidance, are often embedded within broader content rather than taught as discrete, assessable competencies.^{6,40-42}

As a result, clinicians may enter practice without a well-developed conceptual framework for evaluating routine wound care interventions. This gap is further reflected in the reported misalignment between perceived and actual preparedness. Generalist nurses, who provide the majority of routine wound care, often report confidence in their education despite measurable limitations in wound-specific knowledge.^{2,40}

2.6.3 Workplace learning and informal knowledge transmission

In the absence of consistent foundational preparation, nurses commonly acquire wound care knowledge through workplace-based learning, including orientation processes, peer-to-peer instruction, and local practice norms.^{6,25} These informal pathways play a central role in shaping how routine wound care practices are interpreted and performed.

While experiential learning is an inevitable and essential component of clinical development, reliance on observation and local routines may limit opportunities for critical appraisal. Practices that are repeatedly observed within clinical environments can become normalized, regardless of the strength of the evidence supporting them.⁴³ As a result, variability in practice may emerge not only from differences in evidence interpretation but also from differences in how

knowledge is transmitted and reinforced within specific clinical contexts.

2.6.4 Continuing education and industry involvement

Continuing professional education in wound care demonstrates similar variability. Conferences, workshops, and employer-led training remain common sources of ongoing education; however, these formats often emphasize practical application and product familiarity over critical engagement with evidence quality and uncertainty.⁶

Industry involvement in wound care education is particularly prominent. Training on new products and technologies is frequently delivered by manufacturers or affiliated experts. While such initiatives may improve awareness of available interventions,³⁹ they do not consistently emphasize comparative effectiveness, biological relevance in chronic wound contexts, or the limitations of the underlying evidence base.

Even within postgraduate studies or specialty wound care programs, educational content is often anchored in consensus-based guidance rather than systematic appraisal of primary evidence.⁶ Although consensus documents play an important role in guiding practice where evidence is limited, reliance on them as de facto evidence may obscure unresolved uncertainties and reinforce practices that have not been rigorously evaluated in chronic wound populations.

Collectively, these mechanisms of knowledge development and transmission shape how nurses acquire knowledge, form beliefs, and implement wound care practices. In contexts where empirical evidence is limited, clinical practice is influenced not only by formal guidelines but also by educational pathways, workplace norms, and industry-mediated knowledge. These dynamics contribute to variability in the interpretation and execution of foundational interventions, such as wound cleansing.

2.7 Practice Variability and the Need for Systematic Measurement

2.7.1 Variability in wound cleansing practice

Clinical practice reflects the interaction between professional knowledge, workplace experience, and local organizational context. In chronic wound care, where foundational education and empirical evidence remain inconsistent, variation in clinical practice is frequently observed.^{6,25}

Variability in wound cleansing is evident even when broadly similar techniques, such as irrigation, are employed. Differences may occur in applied pressure, solution volume, duration of cleansing, use of mechanical friction, adherence to aseptic principles, and handling of cleansing solutions.²⁰

This variability complicates interpretation of clinical outcomes, as differences in healing trajectories may reflect variation in how an intervention is performed rather than the intervention itself.

2.7.2 Transmission of practice norms

Variation in practice is shaped not only by differences in knowledge but also by how clinical practices are learned and reinforced. Wound management interventions, including cleansing techniques, are frequently transmitted through informal learning processes, including peer observation, workplace routines, and local training practices.²⁵ Contemporary nursing research further demonstrates that clinical learning is often co-constructed through peer interaction, where experiences are shared, discussed, and enacted within real-world care environments.⁴⁴

Through repeated exposure and reinforcement, locally accepted practices may become normalized as routine care. Peer-based learning models, while beneficial for skill development, are inherently shaped by local context and are adaptable to specific clinical environments.⁴⁴ As a result, practice patterns may reflect locally reinforced norms rather than standardized, evidence-based approaches. This effect may be further amplified in settings where learners and supervisors possess

varying levels of competence, introducing inconsistency in how practices are interpreted and performed.⁴⁴

Despite the frequency with which wound cleansing is performed, formal mechanisms to assess nurse competency in this procedure remain limited. Cleansing technique is seldom observed, audited, or evaluated using standardized criteria. In the absence of structured evaluation and consistent evidence integration, peer-based learning may inadvertently perpetuate existing practice variation. As a result, variation in execution may persist without clear understanding of its implications for clinical outcomes, and the procedural characteristics of wound cleansing in routine clinical practice remain poorly documented.

2.7.3 Need for systematic measurement

In practice environments characterized by heterogeneous clinical behaviours, systematic measurement is necessary to support meaningful knowledge development. Without structured approaches to assessing what clinicians understand, believe, and do in routine care, it is difficult to interpret variation or evaluate the effectiveness of clinical interventions.

This limitation is particularly evident in wound cleansing research, where interventions are often described using broad procedural terms, such as “irrigation” or “standard care,” without detailed characterization of how they are implemented in practice. The absence of systematic measurement constrains both the interpretation of existing evidence and the development of targeted educational or clinical strategies.

Measurement approaches that capture clinician knowledge, attitudes, and reported practices provide a means of addressing this gap. By characterizing how nurses conceptualize and perform routine interventions, such approaches can clarify the relationship between clinical guidance, professional interpretation, and everyday practice.

Within this context, variability in wound cleansing should be understood not solely as inconsistency or deviation from best practice,

but as a reflection of how clinicians interpret and operationalize care in the absence of standardized, empirically validated procedures. Systematic measurement of knowledge, attitudes, and practices is therefore essential to understanding and addressing variation in wound cleansing across clinical settings.

3 Conceptual Framework

Understanding how nurses conceptualize and perform wound cleansing requires an explicit framework capable of capturing clinical decision-making in low-evidence practice environments. Clinical practice is shaped by multiple interacting influences, including educational preparation, professional role, practice setting, exposure to guidelines, industry-mediated knowledge, and experiential learning.^{6,39} In domains, such as chronic wound cleansing, where practices are routinely performed but supported by fragmented or indirect evidence, these contextual factors play a central role in shaping how interventions are interpreted and implemented.

As outlined in preceding sections, wound cleansing can be understood as a practice-dense but evidence-light intervention. Under such conditions, practice norms are often stabilized through consensus-based guidance, local routines, and experiential learning rather than direct empirical validation. In these contexts, systematic measurement becomes necessary to characterize how clinicians understand and enact care. Without structured approaches, it is difficult to distinguish between practices informed by evidence, those transmitted through professional norms, and those adapted through contextual experience.

The Knowledge-Attitude-Practice (KAP) framework provides a structured approach for examining these dynamics. Originally developed as a survey-based framework to assess health-related knowledge, beliefs, and behaviours at the population level, the KAP framework has been widely applied in public health and clinical research as a descriptive tool for characterizing practice patterns.^{45,46} In this thesis, the KAP framework is explicitly positioned as a descriptive and exploratory model rather than a theory of behavioural prediction or change. It was selected because the primary aim of this research is to characterize how clinicians, particularly nurses, understand and perform wound cleansing within a low-evidence domain rather than to test causal relationships or intervention pathways.

The framework conceptualizes clinical behaviour across three inter-related domains (knowledge, attitudes, and practices). Knowledge

refers to clinicians’ understanding of the principles underlying a clinical intervention. Attitudes represent beliefs regarding its importance, effectiveness, and relevance, as well as confidence in one’s own practice. Practice reflects the behaviours clinicians’ report performing during routine care. Within the context of wound cleansing, knowledge encompasses applied understanding of procedural elements, such as pressure, duration, technique, and solution handling. Attitudes capture beliefs about the role and value of cleansing, while practice reflects how these principles are operationalized in clinical settings (Figure 6).



Figure 7. The Knowledge-Attitude-Practice (KAP) framework in wound cleansing re-search.

Importantly, the KAP framework does not assume direct causal relationships between knowledge, attitudes, and practice.^{45,46} Rather, it enables examination of alignment and divergence across these domains. This is particularly relevant in practice-dense, low-evidence contexts, where variability in care may arise not solely from knowledge deficits but from difference in interpretation, belief, and contextual application.

Within this thesis, the KAP framework serves as the conceptual foundation for systematic measurement of nurses’ knowledge, attitudes, and reported practices related to wound cleansing. As a research tool, it enables structured characterization of practice in a domain where procedural detail is often poorly defined. As an educational tool, it provides a means of identifying gaps and inconsistencies in nurses’ understanding that may inform curriculum

development and targeted learning interventions. As a clinical and implementation-oriented tool, it offers a framework for examining how knowledge and beliefs are translated into practice across settings, thereby supporting future efforts to standardize care and evaluate implementation strategies.

The doctoral research program was therefore structured as a sequential series of studies aligned with this framework. Initial work focused on clarifying the existing evidence base for wound cleansing. This was followed by the development and psychometric evaluation of a measurement instrument grounded in the KAP framework. The instrument was subsequently applied to characterize clinicians' knowledge, attitudes, and practices across clinical contexts. This sequence reflects the recognition that, in heterogenous and low-evidence domains, empirical investigation of clinical practice requires prior conceptual clarification and systematic measurement.

4 Knowledge Gaps

Wound cleansing occupies a central place in chronic wound management and is widely positioned as a foundational component of wound bed preparation. Despite its routine use, comparatively little attention has been directed toward to how cleansing is operationalized in everyday clinical practice. While recommendations regarding technique exist, they are often described at a high level, with limited insight into how procedural elements, such as pressure, duration, friction, and solution handling, are interpreted and applied by clinicians in practice.

Historically, changes in cleansing practice have preceded the generation of robust clinical evidence.³⁵ The transition from swabbing to irrigation, for example, was largely informed by expert consensus and extrapolation from acute wound research, laboratory studies, and animal models, rather than direct evaluation in chronic wound populations. As a result, commonly recommended approaches have been incorporated into practice without detailed understanding of how they are enacted in routine care.

This limitation is particularly evident in relation to irrigation. Although recommended pressure ranges and techniques are described in guidance,^{20,22} empirical examination of how these parameters are achieved and maintained in clinical settings remains limited. More broadly, foundational procedural elements of wound cleansing are infrequently studied in ways that reflect real-world practice, constraining understanding of how technique may influence outcomes.³⁴

At the same time, investment within wound care has largely focused on the development and evaluation of advanced products, particularly those targeting microbial burden and biofilm. In contrast, clinician-driven practices, such as mechanical cleansing techniques and solution handling, have received comparatively less attention. This imbalance reflects a broader focus on technological innovation relative to the study of foundational care practices.

Within this context, clinical practice is shaped not only by available evidence but by how knowledge is developed, interpreted, and transmitted. As outlined in previous sections, wound care knowledge is acquired through a combination of formal education, continuing professional development, workplace learning, and industry-mediated education. These pathways influence how clinicians conceptualize and perform routine interventions, particularly in domains where empirical evidence is limited or indirect.

Observed variability in wound cleansing practice reflects these dynamics. Differences in technique, pressure, duration, and solution handling have been reported, even where broadly similar approaches are recommended. However, the extent to which this variability is associated with differences in clinician knowledge, beliefs, and confidence remains unclear.

Within this context, a critical gap lies not solely in the quantity of available evidence, but in the absence of structured approaches characterizing how clinicians understand and perform wound cleansing. Without systematic measurement, it is difficult to determine how practices are conceptualized, how they are enacted in routine care, and how variation in practice should be interpreted.

Addressing this gap requires approaches that move beyond examination of the evidence base alone to include systematic characterization of clinician knowledge, attitudes, and practices. Such approaches are necessary to understand how clinical guidance is interpreted and operationalized within real-world settings, and to support the development of targeted educational, clinical, and implementation strategies.

This gap provided the rationale for the present research program. The initial study examined the existing evidence base for wound cleansing practices. Subsequent studies focused on the development and psychometric evaluation of a measurement instrument grounded in the KAP framework, followed by its application to characterize nurses' knowledge, attitudes, and practices in relation to wound cleansing across clinical contexts.

5 Aim and Research Questions

The overall aim of this thesis was to examine wound cleansing in chronic wound management and to develop a structured understanding of how these practices are conceptualized, learned, and implemented in clinical practice, within a practice-dense, low-evidence context.

Specific objectives:

1. To systematically evaluate the empirical evidence informing commonly recommended wound cleansing techniques.
2. To develop and psychometrically evaluate a measurement instrument assessing nurses' knowledge, attitudes, and practices related to wound cleansing.
3. To characterize knowledge, attitudes, and practices related to wound cleansing across an international sample of clinicians.
4. To conduct confirmatory evaluation of the internal structure of the attitudes domain within the developed instrument.

6 Methods

This thesis comprises four sequential studies. An overview of the studies' design, participants, data collection, and analyses is presented in Table 1. Detailed methodological descriptions for each study are presented in the appended papers. The methods described below provide an overview of the research program and highlight key methodological considerations relevant to the thesis as a whole.

Table 1. Overview of the studies included in this thesis.

Study	Design	Sample	Main Focus
I	Systematic review	Published literature	Synthesize evidence Define gap
II	Instrument development	Canadian nurses (<i>n</i> = 130)	Item quality analysis Content and construct validity Reliability
III	Cross-sectional survey	International clinicians (<i>n</i> = 438)	Characterize practice Examine variation
IV	Secondary psychometric analysis	Nurses (<i>n</i> = 278)	Confirmatory evaluation of internal structure

6.1 Scientific Approach

This research program was conducted within a pragmatic, post-positivist orientation integrating quantitative measurement with applied clinical inquiry. The objective was not only to examine existing evidence but to generate structured measurement of clinician knowledge, attitudes, and practices related to wound cleansing.

Within this approach, empirical observation, operationalized through the measurement of self-reported data, was used to describe patterns

and progressively refine understanding of a clinical phenomenon that is routinely performed but incompletely characterized. Quantitative methods were employed to synthesize evidence, develop and evaluate a measurement instrument, and examine clinician-reported behaviour across clinical contexts.

The research was conceptually informed by the KAP framework, applied as a descriptive model for examining clinician behaviour in a low-evidence clinical domain. Consistent with this positioning, the framework was used to characterize existing knowledge, beliefs, and practices without assuming causal relationships between domains. This approach aligns with a post-positivist lens, in which measurement is used to iteratively develop understanding in contexts where definitive evidence is limited.

6.2 Research Design and Program Structure

This thesis employed a sequential multi-study design comprising four interconnected studies addressing complementary aspects of wound cleansing in chronic wound management (Figure 8). The research program was structured to progress from evaluation of the evidence base to development and application of a measurement framework capable of characterizing clinical practice.

The four studies included:

- I. a systematic review of wound cleansing techniques,⁴⁷
- II. development and initial psychometric evaluation of a KAP questionnaire,⁴⁸
- III. an international cross-sectional survey applying the instrument,⁴⁹ and
- IV. confirmatory psychometric evaluation of the attitudes subscale using confirmatory factor analysis (CFA).⁵⁰

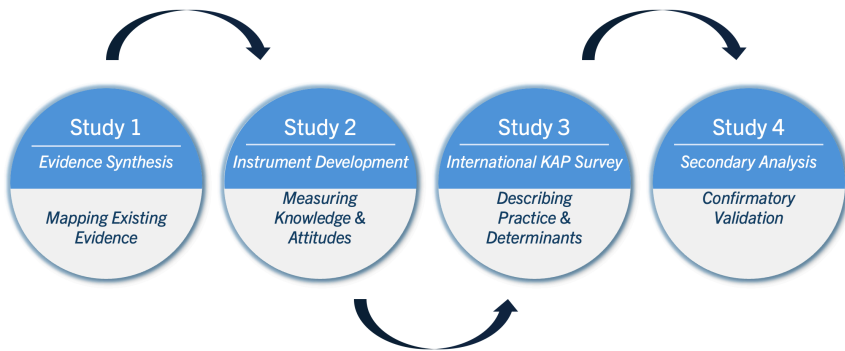


Figure 8. Study program aligned with the KAP framework.

This staged design reflects a programmatic approach in which each phase addresses limitations identified in the preceding stage. The systematic review established the scope and limitations of the existing evidence base. Instrument development was then undertaken to enable structured measurement of clinician knowledge and practice. The international survey applied this instrument to characterize clinician perspectives and reported behaviours across contexts. Finally, confirmatory analysis evaluated the internal structure of the attitudes domain in an independent sample.

Together, these studies form three interconnected layers of investigation (Figure 9).

- an evidence layer (Study I)
- a measurement layer (Study II and IV), and
- a practice layer (Study III)

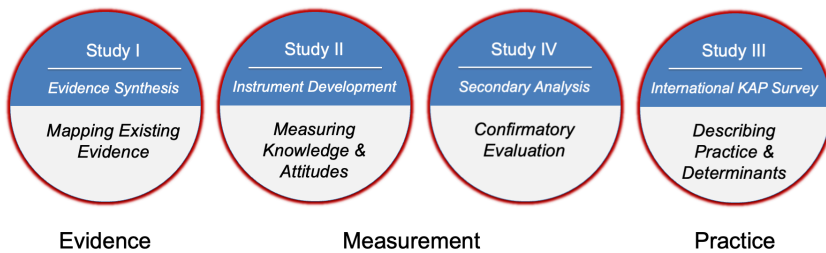


Figure 9. Interconnected studies, representing evidence, measurement, and practice layers.

This structure enables wound cleansing to be examined not only as a clinical intervention but as a measurable practice shaped by knowledge, beliefs, and contextual influences.

6.3 Study Program Overview

Study I: Systematic Review

The first study synthesized the existing evidence comparing irrigation and swabbing techniques for cleansing noninfected chronic wounds. A systematic review was conducted in accordance with PRISMA guidelines.⁵¹ Searches were performed in MEDLINE, CINAHL, Embase, and the Cochrane Database of Systematic Reviews.

Eligibility criteria focused on adult populations with chronic wounds, including pressure injuries, venous and arterial ulcers, and diabetic foot ulcers. To ensure conceptual clarity, chronic wounds were defined based on underlying pathology rather than duration alone. Studies comparing irrigation and swabbing using normal saline were included, while advanced technologies and alternative cleansing agents were excluded to isolate fundamental cleansing techniques.

Quality appraisal was conducted using the Cochrane Risk of Bias tool.⁵² Due to substantial heterogeneity and the limited number of eligible studies, findings were synthesized narratively. Only one randomized controlled trial (RCT) met inclusion criteria, with limited representation of chronic wound populations, restricting

generalizability. This finding informed subsequent phases of the research program by demonstrating the need for alternative approaches to studying clinical practice.

Study II: Instrument Development and Psychometric Evaluation

The second study involved development and initial psychometric evaluation of a questionnaire assessing nurses' knowledge, attitudes, and practices related to wound cleansing. Instrument development followed COSMIN methodology and included literature-informed construct definition, item generation, expert Delphi review for content validity, and cognitive interviews to assess clarity and response processes.⁵³

The instrument was developed in English and tested in a Canadian nursing sample to ensure linguistic consistency and alignment with the intended target population. Restricting initial testing to a single professional and linguistic group reduced construct-irrelevant variance and supported evaluation of item performance prior to international application.^{53,54}

Psychometric testing included assessment of item difficulty, discrimination, construct validity through known-groups comparison, internal consistency, and test-retest reliability. Exploratory principal components analysis was conducted to examine the structure of the attitudes subscale.^{54,55} As the instrument included both knowledge and self-reported practice items, results reflect measurement of nurse-reported behaviour rather than direct observation of clinical performance, which was considered in the interpretation of findings.

Study III: International Cross-Sectional Survey

The third study applied the developed KAP questionnaire in an international cross-sectional survey of health care professionals involved in chronic wound management. Data were collected using an online survey distributed through professional associations, networks, and social media over a six-week period.

A network-based, nonprobability sampling strategy was used to maximize international reach. This approach enabled inclusion of

participants from 50 countries, providing a broad overview of clinician knowledge, attitudes, and practices across diverse settings. However, as the sampling frame could not be defined and participation was voluntary, the representativeness of the sample cannot be assumed.

Analyses focused on descriptive characterization of responses and exploration of differences across professional groups, education levels, and practice settings. Country-level comparisons were not conducted due to small sample sizes within individual countries. Findings therefore reflect aggregated patterns rather than country-specific conclusions.

Study IV: Confirmatory Psychometric Evaluation

The fourth study conducted a secondary psychometric evaluation of the attitudes subscale using CFA. Analyses were performed using data from the international survey and restricted to nurses to preserve construct relevance and reduce heterogeneity related to differences in professional scope and training.

The specified three-factor structure identified during exploratory analysis was tested without modification. CFA was conducted using WLSMV estimation, appropriate for ordinal data. Model fit was evaluated using multiple indices, including CFI, TLI, RMSEA, and SRMR.⁵⁵

Restriction to a nursing subsample supported interpretability of latent constructs by minimizing variability unrelated to the measurement model. Sensitivity analysis examined the robustness of the model without engaging in data-driven re-specification. This approach ensured that confirmatory analysis remained aligned with the theoretical structure established during instrument development.

6.4 Participants and Sampling

Nurses were selected as the primary population of interest across multiple components of the research program due to their central role in delivering routine wound care. In most health care systems, nurses perform the majority of wound cleansing procedures across care settings.

The sampling strategy varied across studies according to methodological requirements. Instrument development and initial psychometric testing were conducted in a Canadian nursing sample to ensure linguistic consistency and alignment with the intended population. The international survey expanded the sampling frame to include a broader range of health care professionals and contexts, enabling examination of practice across settings.

The use of network-based sampling facilitated international participation but may introduce selection bias, as clinicians with greater interest or engagement in wound care may be more likely to participate. Additionally, variation in health system structure, education, and professional roles across countries limits direct comparability between contexts.

6.5 Statistical Analysis

Statistical analyses were conducted using SPSS® 30.0 (IBM Corp., Armonk, NY, USA) and R using the *lavaan* package (version 0.6-21). Methods were selected based on the level of measurement and distributional properties of the data.

Psychometric analyses followed established recommendations, including evaluation of item performance, construct validity, and reliability. Known-groups comparisons were used to assess construct validity of knowledge scores, while exploratory and confirmatory factor analyses were used to evaluate the internal structure of the attitudes domain.

For the international survey, descriptive statistics were used to characterize responses, and inferential analyses were conducted to explore differences across groups and associations between clinician characteristics and knowledge scores. Given the exploratory nature of the analyses and the sampling approach, findings were interpreted descriptively rather than as population-level estimates.

6.6 Missing Data Handling

Data completeness was assessed prior to analysis. Survey design required completion of items to progress, resulting in exclusion of

incomplete responses. As a result, analyses were conducted on complete-case datasets.

6.7 Ethical Considerations

Ethical considerations were addressed in accordance with international research ethics standards, including the Declaration of Helsinki⁵⁶ and the Council for International Organizations of Medical Sciences International Ethical Guidelines.⁵⁷

The research involved questionnaire-based studies with health care professionals and did not include patient participants or the collection of personal health information. Participation was voluntary and anonymous, and informed consent was provided through study information presented prior to survey access.

The research protocol was reviewed by the Swedish Ethical Review Authority, which determined that the project did not fall within scope of the Swedish Ethical Review Act and issued an advisory statement indicating no ethical objections (Dnr 2023-04397-01).

The psychometric testing conducted in Canada (Study II) involved an anonymous questionnaire administered to nurses and posed no more than minimal risk. Under the Canadian Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2), anonymous survey research involving health professionals may fall below the threshold requiring formal research ethics board review.⁵⁸

The international survey was distributed through professional networks without recruitment through specific institutions. As no identifiable research sites were involved, additional local ethics review could not reasonably be obtained. Ethical oversight was therefore maintained through the sponsoring institution, with appropriate safeguards including voluntary participation, anonymity, and secure handling of data.

The secondary analysis conducted in Study IV used de-identified data and did not involve new data collection or participant contact.

7 Results

This chapter presents the principal findings from the four studies included in this thesis. The studies were designed as an integrated research program progressing from evaluation of the existing evidence base to development, validation, and application of a measurement approach to characterize wound cleansing practice.

Across the program, findings converge to demonstrate that wound cleansing is a routinely performed clinical intervention that is poorly specified empirically but can be systematically characterized through structured measurement of clinician knowledge, attitudes, and practice.

Four interrelated findings emerged:

- The empirical evidence base informing basic wound cleansing techniques in chronic wounds is minimal and does not adequately represent chronic wound populations.
- A novel questionnaire was developed to measure nurses' knowledge, attitudes, and practices related to wound cleansing, providing a structured method for examining clinician self-reported practices in this domain.
- Application of this instrument in an international sample demonstrated patterned differences in knowledge and reported practices associated with professional background and education.
- Confirmatory analysis supported the internal structure of the attitudes domain, strengthening the measurement properties of the instrument.

Together, these findings establish wound cleansing not only as a clinical intervention but as a measurable practice shaped by clinician knowledge, beliefs, and contextual influences.

7.1 Study I: Evidence Base for Wound Cleansing Techniques

The first study evaluated the empirical evidence comparing irrigation and swabbing techniques for cleansing noninfected chronic wounds.

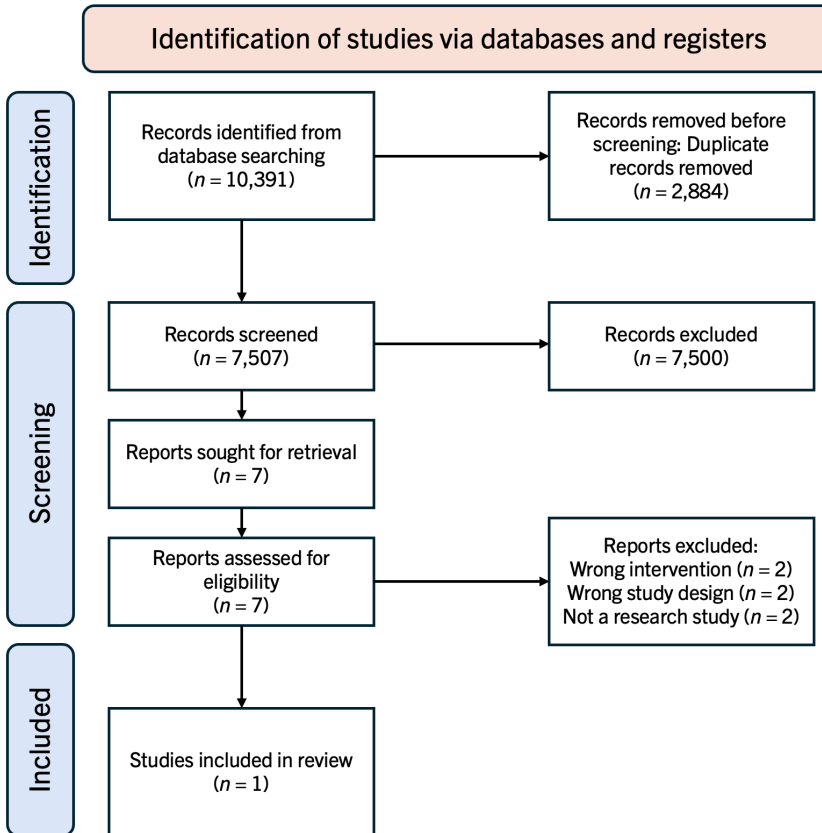


Figure 10. PRISMA flow diagram of study selection.

Only one RCT met the eligibility criteria (Figure 10). Although the study included 256 participants, only a small subset represented chronic wound cases, limiting applicability to the population of interest.

The study compared pressurized irrigation with swabbing using normal saline and reported lower pain and slightly lower infection

rates in the irrigation group. However, key outcomes relevant to chronic wound management, including necrotic tissue, exudate, and bleeding, were not assessed.

Key study characteristics are summarized in Table 2 of Study I.

Despite low risk of bias (Figure 11) within the included trial, the limited representation of chronic wounds and absence of comprehensive outcome measurement restrict interpretation of these findings.

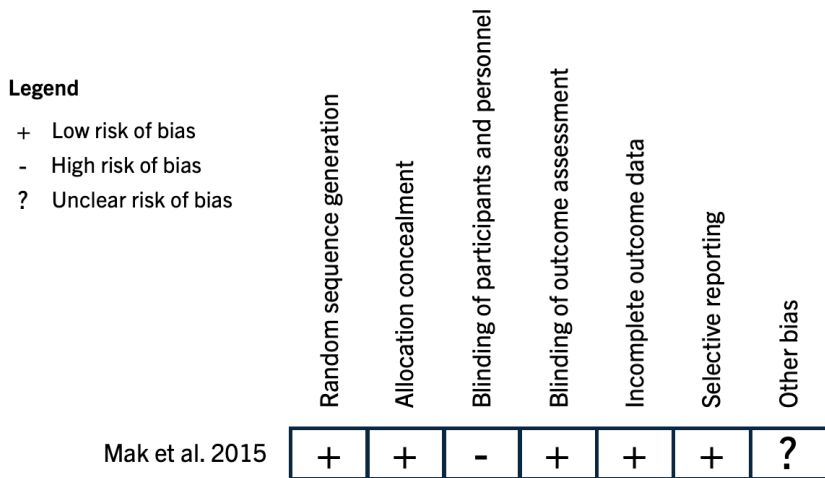


Figure 11. Risk of bias assessment of the included RCT.

7.1.1 Key Finding

The available evidence does not provide sufficient empirical basis to determine the effectiveness of fundamental wound cleansing techniques in chronic wound care, nor does it adequately capture how these techniques are applied in practice.

7.2 Study II: Development and Psychometric Evaluation of the Wound Cleansing KAP Questionnaire

The second study addressed the absence of a standardized approach to measuring nurses' knowledge, attitudes, and practices related to wound cleansing through the development of a KAP-based questionnaire.

The instrument was developed through a structured multi-phase process, including literature-informed item generation, expert consensus via Delphi review, and cognitive interviewing, to ensure clarity and relevance. Content validity was supported through international expert consensus.

The instrument development process is summarized in Figure 12.

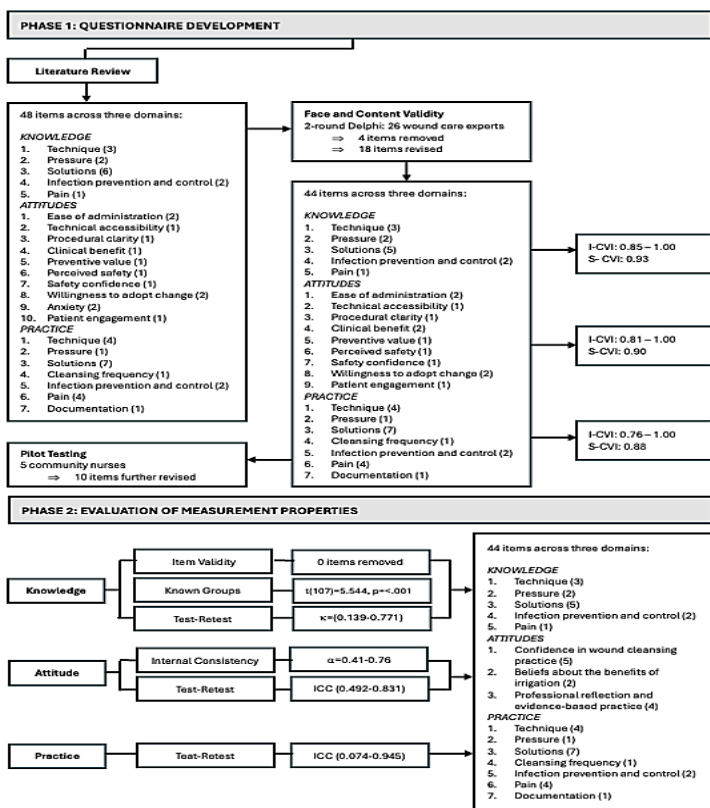


Figure 12. Development process of the Wound Cleansing KAP questionnaire.

Psychometric testing in a Canadian nursing sample demonstrated:

- acceptable item performance, with no evidence of negative discrimination,
- expected variation in item difficulty, including ceiling effects for foundational knowledge items, and
- evidence of construct validity through known-groups comparison, with higher knowledge scores among nurses with formal wound care education.

Exploratory analysis of the attitudes subscale identified a three-component structure, representing:

1. nurse confidence in wound cleansing practice,
2. perceived value of wound cleansing, and
3. professional reflection and evidence-informed practice.

Factor loadings are reported in Study II Table 3.

Reliability varied across components, with stronger performance in the first domain (knowledge) and greater heterogeneity in the third (practice). Test-retest analyses demonstrated variable stability at the item level.

7.2.1 Key Finding

The study produced a novel measurement instrument with evidence supporting key measurement properties, enabling structured assessment of nurses' knowledge, attitudes, and practices in a domain where such measurement was previously unavailable.

7.3 Study III: International Cross-Sectional Survey

The third study applied the developed instrument in an international sample to characterize clinician knowledge, attitudes, and practices related to wound cleansing.

A total of 438 health care professionals from 50 countries contributed data, with nurses representing the majority of respondents.

Completion rates were:

- Knowledge subscale: 78%
- Attitudes subscale: 74%
- Practice subscale: 70%

Knowledge

Mean knowledge scores indicated moderate levels of understanding across participants. Differences were observed across professional and educational groups:

- Nurses demonstrated higher knowledge scores than physicians.
- Within nurses, those with formal wound care education scored higher than those with informal training.

Knowledge did not differ significantly between hospital and community settings.

Attitudes

Attitudes toward wound cleansing were consistently positive across respondents, with broad agreement regarding its importance in wound management and infection prevention.

Practice

Self-reported practices were generally aligned with guideline recommendations; however, variation was observed in key procedural elements, including irrigation technique, pressure application, and frequency of cleansing.

Associations

Regression analysis identified profession and formal wound care education as significant predictors of knowledge scores. Higher knowledge was associated with more consistent adherence to recommended wound cleansing practices.

7.3.1 Key Finding

Clinician knowledge and practice are patterned rather than uniform, with differences associated with education and professional background. Positive attitudes coexist with variability in how wound cleansing is operationalized in clinical practice.

7.4 Study IV: Confirmatory Evaluation of the Attitudes Subscale

The fourth study evaluated the internal structure of the attitudes subscale using CFA in an independent sample.

Analyses were conducted on data from 278 nurses drawn from the international survey dataset to preserve construct relevance.

The hypothesized three-factor structure identified during instrument development demonstrated acceptable to good model fit (Table 2). All items loaded significantly on their respective factors, with stronger and more consistent loadings observed for factors related to clinician confidence and perceived value of wound cleansing. Greater variability was observed within the factor reflecting professional reflection and evidence-informed practice.

Table 2. CFA results for the attitudes subscale.

Index	Value
CFI	0.990
TLI	0.987
RMSEA	0.076
SRMR	0.075

Sensitivity analysis demonstrated that removal of the weakest-loading item resulted in minimal improvement in model fit, supporting retention of the original structure.

7.4.1 Key Finding

Confirmatory analysis supports the structural validity of the attitudes subscale, strengthening the measurement framework and supporting its use in future research.

7.5 Integration of Findings Across Studies

Together, the findings of this research program demonstrate a coherent pattern across the evidence, measurement, and practice domains.

The systematic review established that the empirical foundation for wound cleansing techniques in chronic wounds is limited and does not adequately inform practice. In response to this limitation, a measurement instrument was developed to enable systematic characterization of nurses' knowledge, attitudes, and practices.

Application of this instrument revealed that wound cleansing practice is not uniform but reflects differences in clinician knowledge and educational background, despite generally positive attitudes toward the intervention. Confirmatory analysis further strengthened the measurement framework by supporting the internal structure of the attitudes domain.

7.5.1 Overall Contribution

This research advances understanding of wound cleansing by moving beyond examination of the evidence base alone to provide a structured approach for measuring and characterizing how the intervention is conceptualized and performed in clinical practice.

8 Discussion

8.1 Interpretation of Findings

This thesis examined wound cleansing across four interrelated studies, moving from identification of an evidence gap to the development of an instrument that enables systematic study of clinical practice. Rather than representing discrete lines of inquiry, the studies form a coherent research program that can be understood across three interconnected layers: the evidence layer, the measurement layer, and practice layer. The conceptual progression is summarized in Figure 13.

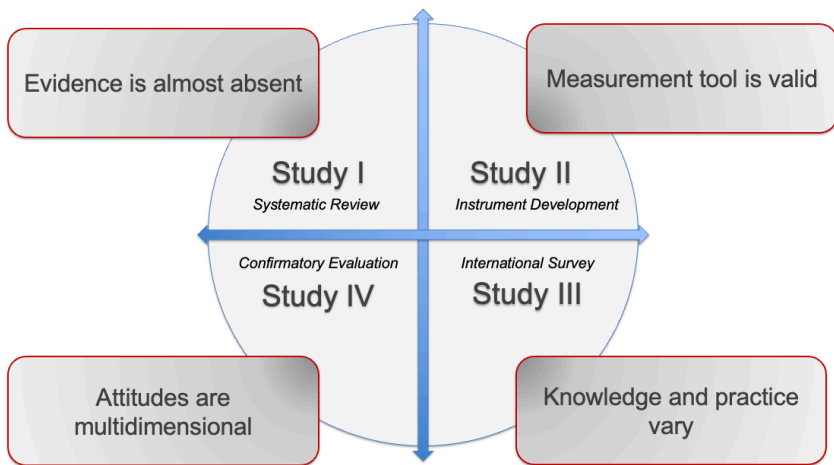


Figure 13. Study design and progression across the research program.

At the evidence layer, the systematic review demonstrated that wound cleansing, despite being a foundational component of chronic wound care, is supported by an extremely limited empirical base. Notably, only a single RCT met eligibility criteria, with minimal representation of chronic wound populations. This finding is not simply indicative of a gap in the literature; it reflects a structural absence of direct experimental evaluation for a practice that is routinely embedded in care.

At the measurement layer, this thesis addressed a critical barrier to advancing the evidence base: the absence of structured tools capable of capturing how nurses understand and perform wound cleansing. The development and psychometric evaluation of the KAP instrument provide a means of operationalizing nurses' knowledge, attitudes, and practices, thereby transforming wound cleansing from an assumed routine into a measurable construct.

At the practice layer, application of the instrument within an international sample demonstrated that wound cleansing is widely performed, generally valued, but variably executed. Differences in knowledge, confidence, and procedural implementation persisted across professional and educational contexts, indicating that clinical practice is neither standardized nor uniformly grounded in evidence.

Altogether, these layers illustrate a progression from absence of evidence to capacity for measurement to characterization of real-world practice. This progression represents a central conceptual contribution of the thesis: wound cleansing is reframed not only as a clinical intervention but as a measurable, interpretable, and modifiable practice within health systems. This conceptual progression is summarized in Figure 14.

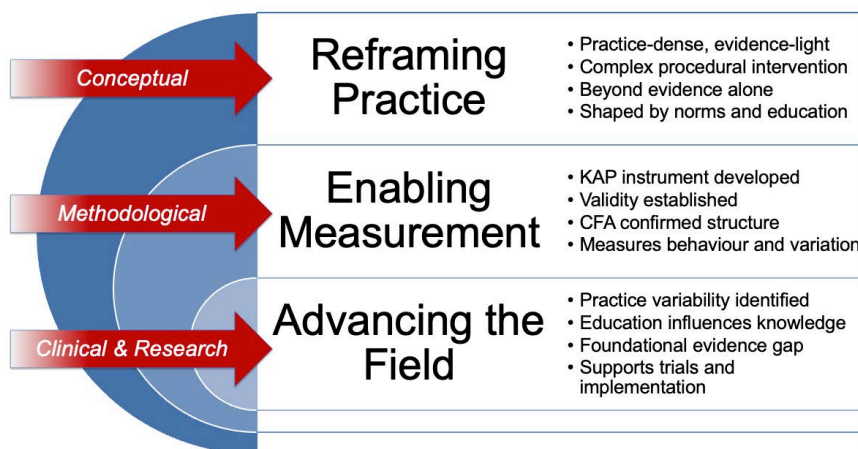


Figure 14. Conceptual progression from evidence gap to practice characterization.

8.2 Wound Cleansing as a Practice-Dense, Evidence-Light Intervention

The findings of this thesis position wound cleansing within a broader category of clinical practices that can be described as practice-dense but evidence-light. These are interventions that are routinely performed, embedded in clinical workflows, and widely regarded as essential, yet lack direct empirical validation.

The identification of only a single RCT is particularly significant in this context. Rather than representing an isolated gap, it highlights a broader disconnection between the frequency with which cleansing is performed and the extent to which it has been rigorously evaluated. This disconnect challenges assumptions underlying evidence-based practice, where routine interventions are often presumed to be supported by a cumulative evidence base than is actually available. At the same time, evidence-based care does not rely on randomized trials alone, and not all nursing or procedural practices are equally amenable to conventional trial designs.⁵⁹

Importantly, the absence of RCT evidence should not be interpreted as evidence of ineffectiveness but rather as an indication that foundational practices may evolve and stabilize through mechanisms other than direct experimental validation. In wound care, these mechanisms include extrapolation from indirect evidence, expert consensus, and resulting integration into education and organizational routines.

For patients, this means that a frequently performed intervention, often experienced repeatedly over prolonged periods, may be delivered with variable technique and uncertain effectiveness, potentially influencing pain, healing trajectories, and overall care experience. For nurses, who perform the majority of wound cleansing procedures, this creates a practice environment characterized by responsibility without clear empirical guidance, requiring reliance on training, local norms, and professional judgement. For health systems, the widespread implementation of a high-frequency but poorly specified intervention introduces variability in care delivery, inefficiencies in resource use, and challenges in standardization and evaluation.

This positioning aligns wound cleansing with wider debates in evidence-based practice and implementation science, where it is increasingly recognized that movement from evidence to routine care is shaped not only by evidence quality but also by context, system complexity, and the practical realities of implementation.⁶⁰

8.2.1 Indirect Evidence and External Validity

Many wound cleansing practices are supported by indirect evidence derived from acute wound models, laboratory studies, or animal research. While these sources contribute to mechanistic understanding, their applicability to chronic wound populations remains uncertain due to differences in pathophysiology, microbial burden, and healing trajectories.

The reliance on indirect evidence reflects both historical practice evolution and methodological constraints. In the absence of chronic wound-specific trials, recommendations have been constructed through extrapolation, introducing limitations in external validity that remain insufficiently addressed by the current evidence base.

8.3 Wound Cleansing as a Complex Procedural Intervention

Wound cleansing is frequently conceptualized as a simple or preparatory step in wound care. However, the findings of this thesis support a reconceptualization of cleansing as a complex procedural intervention composed of multiple interacting components, including solution type, irrigation pressure, mechanical friction, duration, and clinician technique, as summarized in Figure 15).

Understanding Wound Cleansing as Practice		
<p><i>Practice-dense, Evidence-light</i></p> <ul style="list-style-type: none"> ➤ Routinely performed ➤ Considered foundational ➤ Limited direct evidence ➤ Stabilized through consensus 	<p><i>Complex Procedural Intervention</i></p> <ul style="list-style-type: none"> ➤ Multiple interacting components ➤ Not standardized ➤ Variable execution 	<p><i>Implications</i></p> <ul style="list-style-type: none"> ➤ Challenges in trial design ➤ "Same intervention" ≠ same procedure ➤ Need for measurement ➤ Practice shaped by: <ul style="list-style-type: none"> ➤ Education, guidelines, and local norms

Figure 15. Wound cleansing as a practice-dense, complex procedural intervention.

This conceptualization has important implications.

From a research perspective, it helps explain why high-quality comparative trials are difficult to design. Variability in procedural components complicates intervention standardization, limits reproducibility, and challenges attribution of outcomes to specific elements of the intervention. Contemporary guidance on complex interventions similarly emphasizes that interventions may consist of interacting components, be highly context-sensitive, and produce effects that are difficult to isolate using overly reductionist designs.⁶¹

From a clinical perspective, this complexity contributes to observed variability in practice. Even where guideline recommendations are followed in principle, differences in execution persist, as demonstrated in the international survey.

Recognizing cleansing as a complex intervention shifts the focus from evaluating isolated components toward understanding how procedural elements interact within real-world clinical contexts. This perspective aligns with broader methodological developments in complex intervention research, in which interventions are understood as dynamic, context-dependent processes rather than discrete, uniform actions.⁶¹

8.4 Biological Context: Biofilm and Mechanical Disruption

Biofilm provides an essential biological context for interpreting wound cleansing practices and should not be minimized within this thesis.

Early microbial attachment represents a stage at which mechanical disruption through cleansing may be biologically plausible; whereas, mature biofilm structures are more resistant to both mechanical and chemical intervention. Despite substantial research and commercial investment in antimicrobial technologies, consistent clinical evidence demonstrating effective biofilm eradication in chronic wounds remains limited.^{13,14} In many cases, it remains difficult to isolate the effect of antimicrobial agents from concurrent variation in cleansing technique, mechanical disruption, and procedural execution. This reinforces the importance of clinician-delivered practices, particularly mechanical cleansing, within the broader context of wound management.

These findings highlight the importance of clinician-driven practices, such as mechanical cleansing, within the broader context of wound management. They also reinforce the need to better understand how foundational interventions are performed, rather than focusing exclusively on product-based solutions.

Maintaining attention to biofilm within this thesis is therefore essential: not as a resolved mechanism, but as a biologically plausible target that underscores the importance of technique and procedural consistency.

8.5 Knowledge Production, Education, and Industry Influence

In low-evidence clinical domains, knowledge is not derived solely from empirical research. It is produced, interpreted, and transmitted through a combination of education, clinical experience, consensus guidance, and industry-mediated information.

The findings of this thesis reflect this dynamic. While clinicians expressed generally positive attitudes toward wound cleansing, variation in knowledge and practice persisted. This suggests that clinical behaviour is shaped not only by awareness of

recommendations, but by how knowledge is interpreted and operationalized within specific contexts.

Industry plays a prominent role in this process. The expansion of advanced wound care products is accompanied by education and training delivered through commercially affiliated channels. While this contributes to dissemination of knowledge, it may also shift attention toward product-based solutions, potentially at the expense of foundational practices, such as cleansing technique. This creates a structural imbalance within wound care, where investment in technological innovation may exceed investment in understanding and standardizing clinician-driven practices.^{35,38}

For nurses, this translates into a learning environment in which knowledge is acquired through multiple pathways, including formal education, workplace learning, and industry-supported training, each of which may emphasize different aspects of care. In such environments, what is routinely taught and reinforced may become normalized in practice even when the supporting evidence remains limited or indirect.

8.5.1 Methodological constraints in existing research

The interpretation of existing wound cleansing studies is further complicated by methodological limitations. Comparative studies frequently employ heterogeneous outcome measures and distal endpoints that may not directly reflect the effects of cleansing interventions.

As a result, it is often difficult to determine whether observed differences in wound healing trajectories can reasonably be attributed to cleansing technique alone. The absence of chronic wound-specific comparative trials, coupled with reliance on distal or inconsistently defined endpoints, constrains efforts to determine the true clinical impact of wound cleansing practices.

In addition, the limited representation of chronic wound cases within available studies further restricts the applicability of findings to the populations in which cleansing is most frequently performed. Even

where randomized designs are employed, the inclusion of mixed wound types or small chronic wound subsamples limits the interpretability of results in this context.

These challenges reflect broader difficulties in generating high-quality outcome data within chronic wound research, where definitional variation, measurement uncertainty, and the influence of multiple confounding variables complicate study design and interpretation.

8.6 Methodological Considerations and Limitations

The methodological design of this research program reflects both pragmatic and conceptual considerations, which have implications for interpretation.

The use of a staged, multi-study design enabled progression from evidence synthesis to instrument development and international application. However, each stage introduces specific limitations.

The systematic review highlights the scarcity of eligible studies, limiting the extent to which definitive conclusions can be drawn regarding the effectiveness of cleansing techniques in chronic wound populations.

The development of the KAP instrument, while grounded in expert consensus and available literature, reflects prevailing conceptualizations within the field. Where direct evidence was available, item content was aligned with that evidence; however, much of this evidence is derived from acute wound or animal models, limiting its direct applicability to chronic wound population. Where such evidence was absent, consensus recommendations informed item development. As such, the instrument may reproduce dominant assumptions rather than fully interrogate them. At the same time, this approach was necessary to establish a structured framework in an area where measurement tools were previously absent.

The international survey provides a broad cross-sectional snapshot across 50 countries, representing a significant strength in terms of scope. However, network-based sampling introduces selection bias, and unequal representation across countries limits comparability. The

sample should therefore not be interpreted as representative of global wound practice but as an international picture of responses drawn from clinicians sufficiently connected to wound care networks to encounter and complete the survey.

The use of English-language administration further introduces potential linguistic and interpretive variability, with implications for measurement equivalence. Even where respondents are sufficiently proficient in English to complete the survey, subtle differences in terminology, procedural interpretation, and professional role boundaries may influence item interpretation. This is particularly relevant in cross-national research, where concepts such as routine cleansing practice, irrigation, or evidence-informed care may not map neatly across settings.

The use of the KAP framework itself warrants careful consideration. While it provides a structured approach to describing clinician knowledge, attitudes, and self-reported practices, it does not establish causal relationships between these domains. As such, observed associations between knowledge, attitudes, and practice should not be interpreted as directional or predictive. Furthermore, KAP-based instruments rely on self-report and may not fully reflect actual clinical behaviour. Self-reported practice may overestimate alignment with recommended practices due to social desirability, recall bias, or the tendency of respondents to report idealized rather than enacted practice.⁶²

Importantly, clinical behaviour is shaped by factors beyond those captured within KAP constructs, including organizational constraints, resource availability, role expectations, documentation systems, and interprofessional dynamics. These contextual influences were not directly measured and likely contribute to observed variability. This limitation is also theoretically important, as it suggests that KAP should be understood in this thesis as a descriptive and structuring framework, not an explanatory model of behaviour.

The CFA supports the internal structure of the attitudes subscale; although, variability in certain domains suggests context sensitivity. This should not necessarily be interpreted as a weakness. In an

international clinical sample, some variation may plausibly reflect the fact that professional reflection and evidence-informed practice are shaped by educational, organizational, and cultural conditions rather than functioning as entirely stable traits across all settings.

The instrument's responsiveness to change over time has not yet been established, representing an important area for future research. Likewise, further work is needed to examine stability across settings, sensitivity to intervention effects, and, ideally, measurement performance across linguistic and cultural adaptations.

Despite these limitations, the instrument is now sufficiently developed to be implemented in real-world clinical and educational contexts, where its utility can be further evaluated. This is an important point: instrument development in applied clinical research is iterative, and practical use is not postponed until every psychometric property is exhausted. Rather, implementation and further evaluation often proceed together, particularly where the alternative is continued absence of any structured method for studying the practice.⁶¹

8.7 Implications for Research, Education, and Practice

The findings of this research program highlight several priorities for future research, education, and clinical practice. These implications can be understood in relation to the three interconnected layers (evidence, measurement, and practice), which together structure how wound cleansing can be more systematically investigated and improved.

8.7.1 Research

At the evidence layer, the most immediate priority is the development of pragmatic clinical trials examining wound cleansing techniques using standard solutions, such as normal saline, in chronic wound population. The identification of only a single eligible RCT underscores the need for direct empirical evaluation of this foundational intervention.

Future studies should account for the procedural complexity of cleansing, including irrigation pressure, technique, duration, and

solution handling, and delivery context, to ensure that interventions are adequately defined and reproducible. Studies should incorporate standardized definitions, transparent procedural descriptions, and clinically meaningful outcomes capable of detecting change attributable to cleansing. Guidance for complex interventions supports this explicit attention to intervention specification, context, and implementation.⁶¹

More concretely, a next phase of research should directly address foundational assumptions underpinning current practice. For example:

- A pragmatic RCT comparing irrigation and swabbing techniques, using standardized protocols for each method (e.g., defined pressure ranges for irrigation and defined technique and force for swabbing), with outcomes including patient-reported pain, amount of necrotic tissue, exudate, bleeding, and clinical signs of infection using a validated assessment tool. Such a study would directly evaluate the widely adopted assumption that irrigation is inherently less harmful or more effective than swabbing, an assumption that has largely been accepted in practice despite limited direct comparative evidence.
- A controlled trial examining different irrigation pressure ranges, with clearly defined delivery methods and pressure verification, to determine whether commonly recommended pressure thresholds meaningfully influence the above-mentioned outcomes or tissue integrity in chronic wounds. This would address the current reliance on recommended pressure ranges that are frequently cited in guidelines but are not supported by chronic wound-specific comparative data.

At the measurement layer, the integration of the KAP instrument into future research represents a critical advancement. The instrument enables systematic assessment of nurses' knowledge, attitudes, and practices, addressing a longstanding barrier to studying wound cleansing as a clinical behaviour. It provides a foundation for evaluating behavioural change, examining practice variation across

settings, and assessing the impact of educational or organizational interventions.

Beyond descriptive application, the instrument may be integrated with behavioural frameworks, such as the Theory of Planned Behaviour, to explore how attitudes, norms, and perceived behavioural control influence clinical practice. While this thesis adopts a descriptive rather than predictive approach, such integration offers a clear pathway for advancing understanding of why practice variation persists despite broadly favourable attitudes.

8.7.2 Education

At the interface between the measurement and practice layers, the findings highlight important implications for education. The association between formal wound care education and higher knowledge scores supports the importance of structured, competency-based training. However, persistent variability in practice indicates that knowledge acquisition alone is insufficient to ensure consistency in clinical execution.

The confirmatory evaluation of the attitudes subscale further suggests that attitudinal domains, particularly those related to professional reflection and engagement with evidence, may be variable and context-dependent. This has direct implications for educational design, as differences in clinician confidence, reasoning, and orientation toward evidence influence how knowledge is interpreted and applied in practice.⁴³

Educational approaches should therefore extend beyond procedural instruction to incorporate critical engagement with evidence, explicit discussion of uncertainty, and practical guidance on how foundational interventions are operationalized in clinical settings. Importantly, education should make visible the distinction between consensus-based recommendations, biologically plausible rationale, and direct empirical evidence, enabling clinicians to appropriately interpret both certainty and uncertainty in practice.

Within this context, the KAP instrument provides a structured means of assessing educational needs and evaluating the impact of training interventions on nurses' behaviour over time. This represents a key applied contribution of the thesis, enabling educational interventions to move beyond knowledge-based outcomes toward structured evaluation of practice and attitudinal change.

8.7.3 Clinical Practice

At the practice layer, the findings highlight the need for greater awareness of variability in wound cleansing practices, even where general alignment with guideline recommendations exists. Recognizing cleansing as a complex procedural intervention creates opportunities to standardize key elements of practice, such as irrigation pressure, solution use, duration, and technique, while maintaining flexibility to account for contextual factors.

More directly, these findings suggest that current guidance may insufficiently specify how cleansing should be performed, focusing on general principles rather than procedural detail. This creates space for variability in execution, even when clinicians are attempting to follow recommendations.

At the same time, the findings demonstrate that clinical practice is shaped not only by formal knowledge, but by how knowledge is transmitted, interpreted, and reinforced within local clinical environments. In the context of limited empirical evidence and variable foundational education, workplace norms and experiential learning play a significant role in shaping routine clinical behaviours.⁴³ This is consistent with broader understanding of workplace learning in professional practice, where enacted care is formed through participation, modelling, and local interpretation rather than formal instruction alone.⁴⁴

In such settings, provisional guidance may become normalized through repeated practice, even in the absence of strong empirical support. Nurses are often required to make decisions based on local norms, experiential knowledge, or product-specific guidance, which

may contribute to variability in how foundational practices are prioritized and executed.

Importantly, the findings also suggest a structural imbalance within wound care: greater emphasis is often placed on advanced products and technologies than on the standardization and evaluation of foundational clinician-delivered practices, such as cleansing technique. This imbalance has implications for both practice and guideline development, as it may result in disproportionate attention to adjunctive interventions while core procedural elements remain underdefined and under-evaluated.³⁵

These findings reinforce the need for clinical guidance to evolve beyond high-level recommendations toward more explicit articulation of procedural elements, where appropriate, while still acknowledging areas of uncertainty.

The KAP instrument offers a means of examining how knowledge, attitudes, and self-reported practices interact within real-world settings, thereby supporting the design of targeted interventions aimed at improving consistency in care delivery.

Improving consistency in foundational practices may have downstream implications for overall wound management, particularly in environments where advanced interventions are implemented on top of variable basic care. Put differently, optimizing higher-order wound care strategies may be limited where the underlying procedural substrate remains inconsistency performed.

8.7.4 Integrated Implication Across Layers

Collectively, these findings illustrate how wound cleansing practice requires coordinated attention across evidence, measurement, and practice domains. Strengthening the empirical evidence base, advancing methods for measuring clinician behaviour, and addressing the contextual realities of clinical practice are interdependent priorities.

By enabling wound cleansing to be systematically measured and studied, this research provides a foundation for future work aimed at

improving the quality, consistency, and effectiveness of chronic wound care. More broadly, the thesis demonstrates that in practice-dense but evidence-light areas of care progress depends not only on generating better trials but also on developing better ways to define, measure, and interpret what clinicians actually do.

9 Conclusion

This thesis examined wound cleansing in chronic wound management across the evidence, measurement, and practice layers, providing a structured account of how a foundational clinical intervention is understood, studied, and enacted in contemporary care. The findings demonstrate that wound cleansing remains a routinely performed yet insufficiently investigated component of chronic wound management, characterized by a marked imbalance between its ubiquity in practice and the limited direct empirical evidence supporting its execution.

At the evidence layer, the research identified a substantial absence of high-quality comparative studies evaluating basic cleansing techniques in chronic wound populations, with only a single eligible RCT identified. This absence reflects not only a gap in the literature, but the broader challenge of generating experimental evidence for complex, clinician-driven procedural interventions.

At the measurement layer, this thesis addressed a critical barrier to advancing the field through the development and psychometric evaluation of a novel instrument designed to assess nurses' knowledge, attitudes, and practices related to wound cleansing. This represents a central contribution of the work, enabling wound cleansing to be operationalized as a measurable construct and providing a foundation for the systematic study of clinician behaviour.

At the practice layer, application of the instrument within an international sample demonstrated that wound cleansing is widely performed and generally valued but variably executed. Differences in clinician knowledge, confidence, and procedural implementation were observed across professional and educational contexts, indicating that practice is neither fully standardized nor consistently grounded in empirical evidence.

Altogether, these findings reframe wound cleansing not simply as a routine task but as a complex, practice-dense intervention that remains under-specified and under-evaluated in both research and clinical guidance. This reframing has important implications. It highlights the need for pragmatic clinical trials that explicitly account for procedural

complexity, supports the integration of structured measurement tools to evaluate clinician behaviour, and underscores the importance of educational and guideline approaches that address both knowledge and the conditions under which practice is enacted.

In clinical domains where empirical evidence remains limited, practice is shaped through the interaction of consensus guidance, education, and local norms. While consensus-based guidance remains necessary, the findings of this thesis suggest that greater attention should be directed toward the specification and evaluation of foundational care practices, rather than disproportionate focus on adjunctive technologies alone.

Strengthening the evidence base for wound cleansing will therefore require not only the generation of new evidence but also the capacity to measure, interpret, and influence how care is delivered in real-world settings. By providing both a conceptual framework and a methodological tool to support this work, this thesis establishes a foundation for future research, education, and practice aimed at improving the quality, consistency, and effectiveness of chronic wound management.

10 Svensk Sammanfattning (Swedish Summary)

Kroniska sår, såsom diabetefotsår, trycksår och venösa bensår, drabbar miljontals människor världen över och utgör en växande utmaning för hälso- och sjukvården. Dessa sår läker ofta långsamt och kan leda till allvarliga komplikationer, däribland infektioner och amputationer. En av de mest rutinmässiga åtgärderna inom sårvård är sårrengöring. Vid förbandsbyten rengör vårdpersonal såret för att avlägsna smuts, mikroorganismer och andra föroreningar. Trots att sårrengöring allmänt betraktas som ett grundläggande moment i sårbehandlingen finns det förvånansvärt lite forskning om hur den bör utföras vid kroniska sår.

Många av de riktlinjer som idag används i klinisk praxis har utvecklats utifrån expertutlåtanden, laboratoriestudier eller forskning om akuta sår, snarare än studier som genomförda på patienter med kroniska sår. Samtidigt har den moderna sårvården präglats av snabba framsteg inom avancerade produkter och tekniker, såsom antimikrobiella förband och behandlingar inriktade på att motverka mikrobiell biofilm. Däremot har grundläggande kliniska åtgärder som utförs vid rutinmässig sårvård, exempelvis sårrengöring, fått betydligt mindre vetenskaplig uppmärksamhet.

Syftet med denna avhandling var därför att undersöka det vetenskapliga underlaget för sårrengöring vid kroniska sår samt att belysa vårdpersonals kunskap, attityder och kliniska arbetssätt i relation till denna åtgärd.

Avhandlingen består av fyra studier. Den första studien var en systematisk litteraturoversikt som undersökte vetenskapliga studier där olika metoder för sårrengöring jämfördes. Resultaten visade att det finns mycket få studier som direkt jämför olika rengöringsmetoder hos patienter med kroniska sår. Den andra studien fokuserade på utvecklade och psykometriskt utvärderade av ett frågeformulär avsett att mäta sjuksköterskors kunskap, attityder och kliniska arbetssätt vid sårrengöring. I den tredje studien användes detta instrument i en internationell enkätstudie bland vårdpersonal som arbetar med sårvård. Resultaten visade att sårrengöring generellt uppfattas som en

viktig del av behandlingen, men att det förekommer variationer i både kunskap och rapporterade arbetssätt. Den fjärde studien genomförde ytterligare statistisk analys för att utvärdera strukturen i attityddelen av frågeformuläret, baserat på data från sjuksköterskor i flera länder.

Sammantaget visar avhandlingens resultat att sårrengöring är en rutinemässig och central del av sårbehandling, men att det vetenskapliga underlaget för hur åtgärden bör utföras vid kroniska sår fortfarande är begränsat. Resultaten belyser behovet av mer klinisk forskning om grundläggande sårvårdsåtgärder samt vikten av strukturerad utbildning för att stödja en mer enhetlig och evidensbaserad klinisk praxis.

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