Abstract

Aim

Evaluate the Wound Care Pathway (WCP) at the Gold Coast University Hospital (GCUH) compared to recommended Australian standards and other wound assessment tools (WATs).

Data Sources

The electronic databases CINAHL and Medline were used to find all articles that described or compared wound assessment or management tools and their development or use. No date limit was set, articles were restricted to English language.

Study Selection

To be included articles need to address development, comparison or use of WATs. Articles are excluded if they address risk assessment tools, tool validation, have a pediatric population, or are not accessible in full text. The reference lists of the successful articles were scanned and any further articles that were found to match the inclusion criteria were acquired through the Monash library or other free online wound care resource. WATs referenced within these articles were downloaded.

Results

The GCUH WCP addressed more of the Australian standard's recommendations than the other tools, but less than half of the total recommendations. The review indicates that such a comprehensive tool as outlined by the Australian Wound Management Association (AWMA) would be very effective, but not practical, and would not be used by Nurses.

Conclusion

A comprehensive WAT and the knowledge to use it to guide optimal wound care would improve patient outcomes. However, the complexity of the tool, as well as the cost to design and implement it, would be prohibitive. Increasing clinician's knowledge of comprehensive wound care may ensure existing tools are used more effectively.

Introduction

Since 1970 we have known that a standardized method for measuring wound healing is needed[1]. Regular assessment, documenting progress and assessing the effectiveness of treatment maximizes healing rates[2]. The GCUH uses a wound assessment tool, the WCP, which was internally created and never validated. This tool is often not filled out completely or correctly. The WCP will be compared to other WATs and recommendations for assessment and documentation in the AWMA standards as well as existing research into tool development and use to determine areas for improvement.

For chronic wounds, those wounds which do not heal in a timely manner, the benefits of using a standardized assessment tool can be significant[3]. There are many factors, systemic, regional, local and environmental, that can impair wound healing and increase the risk of an acute wound becoming a chronic wound[4]. The systematic assessment and collection of data minimises this risk[5]. Where assessments are not performed correctly there is the risk of delayed healing and the potential for serious complications associated with living with a wound for a prolonged period of time[5]. Not only are there risks associated with reduced skin barrier function, such as infection, but there is often pain, social isolation, and poorer quality of life[6, 7]. Delayed wound healing requires additional nursing and medical resources, higher costs of consumables in wound care, and potentially higher costs of hospital lengths of stay to treat complications[5]. The ever-expanding market of dressing products only adds to worsen the situation when you combine a poor assessment with an inappropriate and expensive dressing selection[1]. Conversely, where skilled clinicians use a standardized framework which clearly guides Nurses from assessment through to implementing and monitoring wound care plans that correctly address the factors impacting on wound healing, healing times are reduced, patient suffering is reduced and the overall economic burden is reduced[3, 5, 6]. By addressing the systemic causes of wounds and impaired healing, such as referrals to vascular or dermatological specialists, there is also the potential for reducing the risk of future wounds occurring or reducing their duration[8, 9].

The Gold Coast University Hospital is a 750 bed facility covering surgical, medical, maternity, emergency, ICU, cancer services and many medical and surgical specialty outpatient clinics. There is need for a single, effective WAT to cover all wound types. To date, no single tool has been found in the literature to be applicable to all wound types[10] and also comprehensively cover all wound assessment needs[5]. Improving the WCP to become that tool, or to improve its application at the bedside, will improve outcomes for patients with wounds at the GCUH.

Aim

To determine what is needed in a WAT this review will collate recommendations from AWMA and other research articles investigating the development or use of wound care assessment and management tools. The GCUH WCP will then be compared to these recommendations. Ultimately there will be recommendations to improve the WCP and it's use.

Methods

A search of the electronic databases CINAHL and Medline using the medical subject headings (MeSH) and keywords *wounds and injuries, foot ulcer, heel ulcer, leg ulcer, pressure ulcer, skin ulcer, venous ulcer, wound assessment, wound management, wound*, ulcer** and *clinical assessment tools, wound assessment tool, wound assessment tools.* This returned 416 English language articles from 1988-2015. A review of titles and abstracts eliminated those articles not having a wound focus, not discussing a tool, discussing a risk assessment tool, discussing a classification or staging strategy, pediatric, or validating a tool. The remaining articles were downloaded in full (or excluded if not accessible). Of these, only articles that compared, developed, used or commented on wound assessment and management tool development or use were included in this review. While reviewing the full text articles, references were scanned to locate further relevant articles. In total, 28 articles were identified as focusing on wound assessment tools and their use or development, which could be acquired in full text format. Table 3 is a summary of key findings and implications for practice.

Within these articles were references to the WATs themselves. 11 tools were acquired for the purpose of comparison (see Table 2). The recommendations by AWMA were also summarized to a list of 40 items (see Table 1). A spreadsheet was created to compare the contents of each tool to the recommendations by AWMA. The recommendations were grouped into four categories: initial assessment, ongoing assessment, optional assessment and care planning. Numbers of items addressed in each category were charted (see Figure 1).

Results

AWMA has created a set of standards for wound management[11] in which they include recommendations for assessment, planning and documentation. Their recommendations are summarized in Table 1. No single tool encompasses all recommendations from the AWMA standards, however the GCUH WCP covered more items than the comparison tools (see Figure 1). This was still less than half of AWMA's total recommendations. While there is general consensus

among the review articles that comprehensive wound assessment is needed, and that an appropriate tool can help, such a comprehensive tool as outlined by AWMA would not be practical, and would not be used by Nurses. This is reflected in the current use of the GCUH WCP where many items on the tool are not completed, nurses often using the WCP only as a means to record what dressing was applied to the wound.

Wound Assessment Tools

The ideal tool will lead clinicians from assessment and diagnosis through to setting clear healing objectives and wound care plans. It will be grounded in research and evidence, and fast to use for clinicians of all knowledge levels[12-15]. The recommendations from the AWMA standards adhere to this ideal and can be grouped as initial assessment (patient history and systemic observations), optional assessment (regional observations and investigations relevant to wound location and aetiology), ongoing assessment (wound bed and local area) and care planning (management plan, collaboration, documentation and evaluation)[11]. These recommendations are very broad and AWMA does not provide specifics on how this should be done. These groupings are used to compare the tools.

Initial assessment

The tool needs to be able to link the pathophysiology of what is happening at the cellular level to an appropriate assessment and management plan[3], but the complexity of wound healing means multiple processes of healing are happening at once[2]. The impact of some of these processes can be observed in and around the wound bed, but there are also a large number of risks to healing which are systemic and/or less obvious which also need to be assessed and managed to ensure optimum wound care[5, 16]. These are collected in the initial assessment and include health history, nutritional status, medications, environment, and psychosocial aspects of wounding among other things. This information leads to a diagnosis and appropriate care planning.

"Ulcer" or "Chronic Wound" is not a diagnosis, but rather the manifestation of an underlying disease process[17]. Failure to correctly diagnose a wound type may result in failed management and wasted resources. Interventions based on accurate diagnosis delivers benefits to patients, healthcare systems and society[18]. A diagnosis is needed to ensure the wound is adequately managed and all contributory factors are addressed[17, 19]. The diverse range of wound diagnoses means that what is most important to one type is of no, or lesser, value to another. For example, in the patient with the palliative fungating wound to the breast there is need for accurate ongoing assessment of pain, odour and exudate[20], not necessarily for peripheral circulation or sensation in the feet which would be more relevant to the patient with diabetes and an ulcer on the foot[21]. The risks being identified

are also very different, meaning plans will vary greatly; dressing changes for diabetic foot ulcers are not generally associated with a high risk of life threatening bleeding[20].

Therefore, the initial assessment is important in laying the foundation for creating the overall care plan. Of the 12 tools assessed, the Toronto Symptom Assessment System for Wounds (TSAS-W)[22], ASSESSMENTS by Ayello[23] and the GCUH WCP covered 3 of the 15 recommended assessment items. Others imply the use of history taking through their educational materials, such as Applied Wound Management[24] and the NE1 WAT[25], however there are no prompts or areas to record information on the tools themselves. Given the importance of this information in determining the underlying pathophysiology and direction of the care plan, it would have been anticipated that one of the tools would have achieved a greater than 20% concordance with the AWMA standards.

Adding these items to the GCUH WCP would increase the amount of time taken to complete the document, increasing the cost of care[26] and possibly further reducing Nurse's compliance with filling it in. Arndt and Kelechi state "Busy clinicians value instruments that are easy to use, efficient, reliable, valid, and sensitive to wound changes over time"[10]. Education and support documentation, such as procedures and assessment algorithms, could be used as a way to ensure consistent care[13] and reduce the amount of items needing to be covered on the GCUH WCP itself. But even with all of this support, there is still a heavy reliance on the knowledge of the clinician to be able to find this information and use it effectively[6, 20] as there are no prompts in the record-keeping tool itself.

Optional assessment

Following on from a lack of initial assessment information in the listed tools, which would be used to determine a diagnosis, there is also almost no prompting of the user to pursue further investigations specific to wound type. Only the Wound Healing Scale v.1[27] and the GCUH WCP make reference to neurological or vascular investigations. Again, these relate back to correctly identifying the cause of the wound, risks for impairing wound healing, care planning and collaboration[28, 29].

Unlike the ongoing assessment items and the care plan, both initial assessment items and optional assessment items do not need to be frequently re-assessed. As such this information could be collected separately, reducing the amount of time taken for wound reviews. The GCUH WCP splits

the tool so that initial and optional assessments are on the front page and ongoing assessments and care planning repeat on the subsequent pages.

Ongoing assessment

All of the tools in this review monitored wound healing with ongoing assessments. They generally agree on a small number of items; objective measures like size and depth, and subjective characteristics like exudate and tissue type. They also agree observations need to be made over time[2, 5].

Simple tools include the Barber tool, which is used for measurement only[26], and the Wound Healing Scale (WHS)[27] and the Sessing scale[2] for subjective assessments only. The Barber tool's strength is listed as being simple to use and does not rely on subjective assessments[26]. However, a combination of objective and subjective measures may need to be combined to adequately capture information on what is preventing the chronic wound from healing, or to assess the effectiveness of treatment[3]. Other tools record both and may also incorporate the use of a classification system to encourage uniformity of language such as the Red-Black-Yellow system for describing tissue type[14] or the STAR system for classification of skin tears[30].

PUSH[10], DESIGN-R[31] and BWAT[10] are examples of tools that combine both measurement and subjective assessments and have 3, 7 and 13 assessment items respectively. These simpler tools were meant to tell the clinician, at a glance, whether or not the wound is healing[32]. None of these tools covered initial or optional assessments and only addressed 36%, 36% and 55% of the recommendations from AWMA in the 'ongoing assessments' category, respectively.

Arguably, the greater number of assessment items means the greater the ability to detect variation[31] but also the more time consuming to administer and therefore more costly[26]. Also, not all tools have wound healing as their primary concern. The Toronto Symptom Assessment System for Wounds (TSAS-W) is a 13 point tool focusing on the patient's perspective of what is important to them such as cosmesis and dressing bulk[22], yet it still addressed 66% of the AWMA ongoing assessment recommendations. The ASSESSMENTS tool has no less than 30 items. This tool has less of a focus on wound healing and more of a focus on documenting assessment[23, 33]. The ASSESSMENTS tool was the only one to meet all of the AWMA recommendations for ongoing assessment. The GCUH WCP also covered this are well with 91% of the recommended items recorded.

Care planning

This area focuses on ensuring that all risks that have been identified are addressed, and that documentation is comprehensive and clearly able to identify the progress of the wound. Collaboration is also in this section and is very important is the management of the complex, chronic wound[28]. There are important components of wound tools that are not so obvious, such as guiding the clinician to set goals and plan care. A literature review by Greatrex-White and Moxey[5] identified that these less obvious but important aspects of a wound assessment tools were not well represented. This review concurs with only AWM, WHS v.1 and GCUH WCP addressing goal setting. No tool addresses more than 43% of AWMA recommendations in this area.

Discussion

In comparison with the other WATs the GCUH WCP appears to be very good. However, it is substantially lacking assessment items that are crucial to the initial assessment of the wound and determination of the underlying pathophysiology and risk factors[3, 11]. Adding areas to the form to include this data may make the form less appealing to Nurses and only exacerbate the problem of WCPs not being completed correctly. Education on complex wound assessment may improve knowledge of systemic factors and pathophysiology and their impact on wound healing. It may also provide instruction on correct use of the WCP. A study by Timmins[16] showed that Nurses baseline wound management knowledge is poor and general nursing experience alone does not correlate with being knowledgeable in the area of wound management[34]. There is a lack of wound care education in undergraduate programs[15] that may be encouraging new Nurses to learn 'on the job', potentially perpetuating poor practices based on ritual[16] and personal preference. If undergraduate training was provided within educational institutions and then supported in the workplace by a standardized wound assessment tool, it could help new Nurses develop experience and confidence and improve the overall standard of care given[5].

Unfortunately, while training has been shown to increase assessment and management skills in the short term, French[35] showed that after 6 months the improvements are negligible. Possibly because what was learnt was the ability to improve documentation but not the understanding of wound healing to actually improve wound care[36]. Even with large amounts of wound care training available there is still the gap between theory and practice that a more comprehensive wound assessment tool may help to bridge[16], but a tool by itself can not identify all the complex factors impairing wound healing. Nor can it explain to the clinician why the wound is not healing and

make recommendations to correct it[3]. So some form of education is needed to improve clinical judgment.

A second area where the WCP was shown to rate poorly against the AWMA recommendations was in care planning. A key argument by Fletcher[3] is that the point of the assessment is to create clear goals and objectives to facilitate wound healing. While the WCP does ask the clinician to state the wound healing goal, there is no support to make the link between the data collected and what those goals should be. It may seem obvious to wound care professionals, but others may need algorithms to follow[13] or some form of documentation with clear guidelines[5, 8]. While, in theory, this should allow clinicians to determine healing trajectory and plan for care[37], Cooper argues that the range and inter dependency of systemic factors in any one individual is too complex for care to be standardized in this way[1], and perhaps the current state of evidence to support creation of these algorithms is insufficient[37].

Implications for research

The author recommends further research into the development of a wound care education package as an adjunct to the WCP. The package would mirror the key elements that have been identified here as being important for a WAT; explaining the path from the initial assessment and pathophysiology of what is happening at the cellular level through to an appropriate assessment and management plan[3] including collaboration and dressing selection. Evaluation of the education package would need to consider its efficacy in improving completion of the WCP, improvements in diagnosis and collaboration, and evaluate the cost to implement it. Flexible approaches such as interactive web-based programs that utilize problem-based learning[6], self-directed or social learning, ongoing support seminars[32] and competency assessment[13] should all be considered.

Implications for practice

The modern care environment is one where nurses find they have more responsibilities and less time/funding for self education[6, 15]. High staff turnover rates are also listed as a barrier to ensuring consistent use of a WAT[32]. Having a training package that standardizes wound assessment knowledge to guide optimal wound care would improve patient outcomes and save on expenses associated with sub-optimal wound care. Correct completion of the WCP showing evidence based decision making processes which are clear, consistent, and coherent will reduce the risk of poor practice and, subsequently, the risk of litigation[24].

Limitations

Limitations include: searches were limited to only English language documents and to only those articles and wound assessment tools where the full text or tool could be accessed, only one person reviewed the articles and tools.

Conclusion

The GCUH WCP performs better against the AWMA recommendations for wound assessment and documentation than other WATs identified in this study, but still covers less than half of all recommendations. The main deficits are in initial assessment and care planning. The diversity in these areas may be too great to add to the WCP, however a training package may provide the clinician with the knowledge needed to bridge the gap and ensure better documentation and wound healing outcomes.

Tables and Figures

Table 1: Recommendations for inclusion in a wound tool, modified from AWMA standards

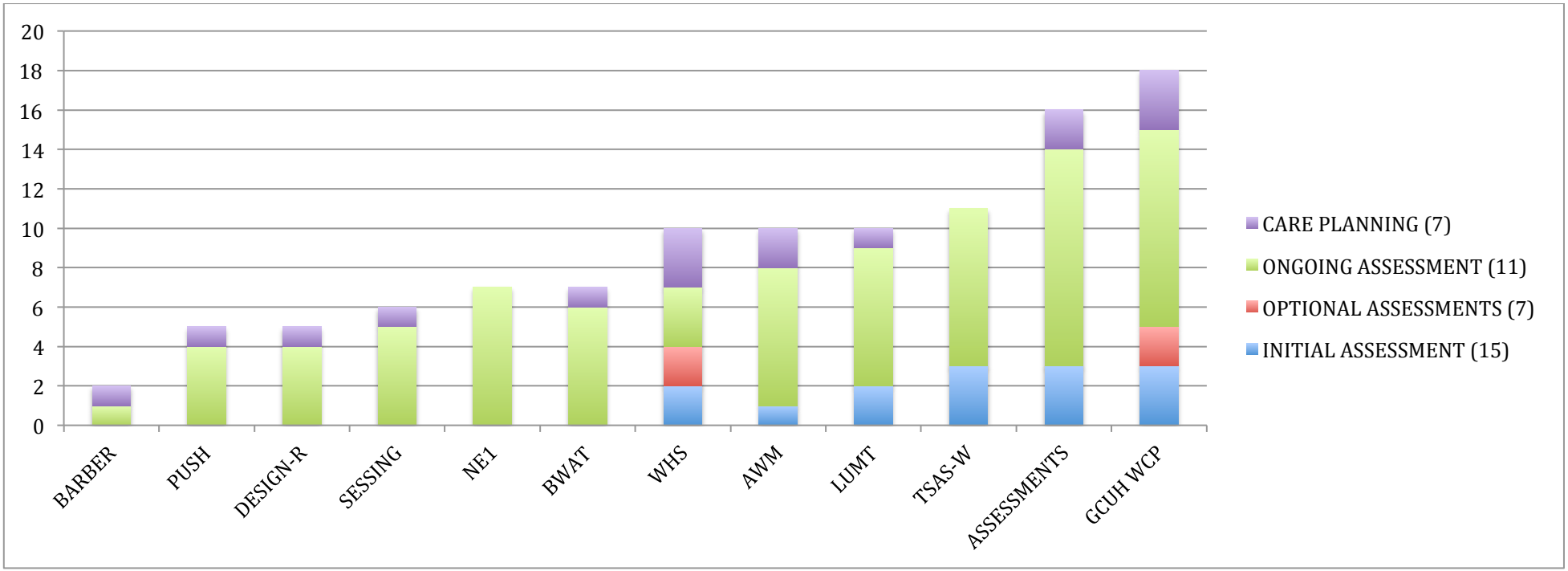
Initial Assessment	**Ongoing Assessment**	**Optional Assessment when indicated**	**Care Planning**
Reason for Presentation	Wound type/Aetiology	Risk assessments (falls, skin integrity)	Short and long term goals
Health History	Duration	Vascular assessment	Management Plan to optimize wound healing potential
Age	Location	Sensory assessment	Individual and carer preference, ability and willingness to participate
Previous wound history and outcome	Dimensions	Nutritional assessment	Evidence of inter-professional communication and care
Medication history	Wound bed characteristics (tissue type and foreign bodies)	Psychological assessment	Comprehensive and chronological documentation
Psychosocial implications resulting from wounding	Wound edges appearance	Medical imaging	Effectiveness
Nutritional status	Peri-wound appearance	Pathology	Increase awareness of healthy lifestyle choices
Sensitivities and allergies	Exudate		Promote activity and mobility activities
Relevant diagnostics and investigations	Odour		
Pain assessment	Inflammation/Infection		
Vital signs	Wound Pain		
Individual's perceptions of wound healing goals			

Table 2: Wound Assessment Tools for Comparison

Tool	Author	Year *(based on earliest publication found)*	Benefits	Limitations
Applied Wound Management (AWM)	Gray et al .	2009	Comprehensive training and support documentation	Investment in time to teach theory[5].
Bates-Jenson Wound Assessment Tool	Bates-Jenson, B	2001	Results in a 'score' which can track progress No cost Several reliability and validity studies[10]	Does not look beyond the wound itself to consider the impact of other factors.
Pressure Ulcer Scale for Healing (PUSH)	National Pressure Ulcer Advisory Panel	1998	Graph of 'score' for visualization of progress No cost Quick	Created for pressure injuries specifically, has been validated to other wounds but has questionable reliability[10] Not for comprehensive assessment and planning[37]
Leg Ulcer Measurement Tool (LUMT)	Woodbury et al	2004	Sensitive to wound changes when measured monthly[38]	Only one study has attempted to validate it[38]
NE1 Wound Assessment Tool	Nancy Estocado	2011	Visual aid in the classification of pressure injuries	Cost to use Focus on pressure injuries only Focus on the wound only, does not look at other assessment needs or care planning
Toronto Symptom Assessment System for Wounds	Vincent Maidaat al	2009	One of the few tools which are patient centered	Based on tools made for palliative care, focuses on symptom control rather than wound healing Requires validation testing[22]
Wound ASSESSMENTS Chart	Ayello	1992	Very detailed Encourages collaboration	Reports on validity testing not found
Gold Coast University Hospital Wound Care Pathway	Franks et al (not published)	2012	Tool which best matched the AWMA recommendations	Not being completed correctly

Tool	Author	Year *(based on earliest publication found)*	Benefits	Limitations
Barber Tool	Barber, S	2008	Simple Graphical indication of change Does not rely on subjective measures	Only considers wound size
Sessing Scale	Ferrell, B	1997	Easy to learn and use	According to Greatrex-White[5] this tool met the least of their criteria for a good WAT Specifically for pressure injuries
Design-R	Masui, Y et al	2011	Has weighting of elements to reflect their individual impact on healing	Specifically for pressure injuries

Figure 1: Comparison of Gold Coast University Hospital Wound Care Pathway to other tools vs the AWMA standards



PUSH – Pressure Ulcer Score for Healing, BWAT – Bates-Jensen Wound Assessment Tool, WHS – Wound Healing System v.1, AWM – Applied Wound Management, TSAS-W – Toronto Symptom Assessment System for Wounds, LUMT – Leg Ulcer Measurement Tool, GCUH WCP – Gold Coast University Hospital Wound Care Pathway. The number in brackets in the legend indicates the maximum number of elements in that section. For example, out of a possible 12 points for "Ongoing Assessment" the PUSH tool included 4.

Table 3: Review Articles Summary

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Arndt JV, Kelechi TJ. *An Overview of Instruments for Wound and Skin Assessment and Healing*. J Wound Ostomy Continence Nurs 2014; 41 (1): 17-23.	Tool must be systematic and measure progress Tool needs to be easy to use, efficient, reliable, valid, sensitive to wound changes, enhance communication, define a common language and standardise assessment No recommendations for any specific tool	Narative review	5.a	If a tool is too complex nurses will not use it, but it needs to be complex enough to be sensitive to wound changes and enhance communication.
Ayello, E.A., *Keeping pressure ulcers in check.* Nursing, 1996. **26**(10): p. 62-63.	Quick way to document pressure injury assessments Assessment items based on recommendations from Agency for Healthcare Policy and Research	Letter	5.c	Base assessment items on existing guidelines.
Barber, S., *A clinically relevant wound assessment method to monitor healing progression.* Ostomy/Wound Management, 2008. **54**(3): p. 42-49.	Periodic assessment and documentation important to assess effectiveness and maximise healing Graphical representation of progress subjective criteria not consistent or standardised, time consuming=costly Quick to assess wound progress/evaluate plan	Case studies	4.d	Graphical feedback useful for quick evaluation of wound healing
Elements of a wound assessment. Advances in Skin & Wound Care, 2004. **17**(9): p. 461-461.	Provides the support structure for clinical decision making All wound types "enhances" a wound assessment	Letter	5.c	Implies that the tool is only one part of the wound assessment and more is needed.
Cook, L., *Wound assessment: exploring competency and current practice.* British Journal of Community Nursing, 2011: p. S34-40.	Assessment vital for optimum wound care Nurses need skills to plan, implement and evaluate care Expensive, accurate assessment would mean cost-effective treatment WATs not routinely used WATs are just aide memoirs but if they cover link from pathophysiology to goal setting and care evaluation, should result in improved outcomes Access to education becoming difficult, need to explore flexible options that cater for different learning styles More training required to standardise wound assessment	Survey of convenience sample to determine practices and opinions on wound assessment, use of WATs and dressing selection.	3.e	Education required to improve WAT use and nurse competence in wound care planning and evaluation.

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Cooper, D.M., *Human wound assessment: status report and implications for clinicians.* AACN Clinical Issues in Critical Care Nursing, 1990. **1**(3): p. 553-565.	Lack of clinically useable, valid and reliable instruments to evaluate healing. Splits tools into predictive, classifying and measuring Discusses limitations of measurement styles Encourages greater use of recording observations but no structure for this	Narrative review	5.a	Early look at how tools started to be developed. Focus on objective measurement but recognises the need for subjective assessment as well.
Dowsett, C., *Malignant fungating wounds: assessment and management.* British Journal of Community Nursing, 2002. **7**(8): p. 394.	Recommends a comprehensive list of items requiring assessment but no single WAT or structure for documentation Need for multidisciplinary care Need for diagnosis Psychosocial implications of wounding Patient focus - patient priorities and flexible planning with patient and family	Expert Opinion	5.c	Clear focus on patient centred care and patient/family involvement. Importance of multidisciplinary care and a diagnosis.
Eagle, M., *Wound assessment: the patient and the wound.* Wound Essentials, 2009. **4**: p. 14-24.	Elements required for a systematic assessment which can support appropriate treatment plans. Includes documentation and collaboration	Expert Opinion	5.c	Very similar to AWMA recommendations but with a lot more specific details. Still no tool.
Ferrell, B.A., *The Sessing Scale for measurement of pressure ulcer healing.* Advances In Wound Care: The Journal For Prevention And Healing, 1997. **10**(5): p. 78-80.	Need for descriptive wound characteristics Tool must be inexpensive and practical enough to be used regularly. Simple to learn and apply Safe for patients Valid, reliable and sensitive to change	Initial design was qualitative questioning of CNC, then distributed to "several acute care units" for feedback. One longitudinal study of 84 patients for validation.	3.c	Tool too vague for use now, but principles of subjective reporting still important.
Fletcher, J., *Wound assessment and the TIME framework.* British Journal of Nursing, 2007. **16**(8): p. 462-4.	Need to link pathophysiology to plan Clear and objective goals Tool can not substitute for clinical judgement assess combination of measures to understand healing/treetment needs structured assessment is critical=good outcomes, especially for chronic wounds Proactive not reactive, remove barriers to healing TIME framework, data collection strategy, not a tool	Expert Opinion	5.c	Clear links required between reasons for not healing (pathophysiology) and the plan (to remove the barriers to healing). Details are not in the tool but part of the clinician's knowledge.

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
French, E.T. and K. Ledwell-Sifner, *A method for consistent documentation of pressure sores.* Rehabilitation Nursing, 1991. **16**(4): p. 204.	Pressure injury focus Consistency and accuracy in assessment=effective management and communication Training does not last, needs a tool/flowsheet to keep it consistent Tool is not the only wound documentation	Expert Opinion	5.c	Training alone is not enough and gets forgotten after a few months. Tool=consistency but is not the only wound documentation.
Gray, D., et al., *Applied wound management*, in *Applied wound management supplement*, D. Gray, Editor 2004, Wounds-UK: Aberdeen. Gray, D., et al., *Applied wound management: clinical tools to facilitate implementation*, in *Applied wound management supplement. Part 2 Implementation*, D. Gray, R. White, and P. Cooper, Editors. 2005, Wounds-UK: Aberdeen. Grey, D., *Applied Wound Management Part 3. Use in Practice.* Wounds UK, 2009. **5**(4).	Based in WBP and TIME Significant educational support Very colourful For any wound type Documentation supports good wound healing and also auditing	Expert Consensus Many mixed articles, some contain case studies supporting tool use (LoE=4.d)	5.b	Very thorough educational support. Tool is simple but has many supporting aids like posters and also an online program (not seen) for use and benchmarking. Tool itself really only looks at ongoing assessment items, assumes other assessment documented elsewhere – no prompting for other assessment in the tool, only in the education.
Greatrex-White, S. and H. Moxey, *Wound assessment tools and nurses' needs: an evaluation study.* International Wound Journal, 2013.	Lists criteria for WATs based on lit review - list much shorter than AWMA No WAT met all their criteria, most did not guide practice Documentation needs to show assessment and review, these are legal documents WAT should show wound progress and be easily understood by people seeing the wound for the first time. Needs to be easy to use and quick Needs to guide practice, especially for inexperiences nurses Wound assessment is a means to an end -> optimal wound management As well as tool nurses need educational support and clear guidelines	Action Evaluation Methodolody Narative review	4.a	Greatrex-White also found that tools do not meet all needed criteria (even less than AWMA's list). Serious lack of guiding practice. Recommends educational support and procedures.

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Hess, C.T., *The art of skin and wound care documentation.* Advances in Skin & Wound Care, 2005. **18**(1): p. 43-55.	algorithms/procedures/formulary for consistent care=efficient and cost effective Education support and competency assessment documentation's importance related to malpractice claims Has recommendation for assessment items, very similar to AWMA but more detailed Quality improvement plans, audits Computerised and consistent, timely documentation Understand responsibility and accountability	Expert Opinion	5.c	Documentation has more far reaching implications that just monitoring healing. Standardise with EBP based procedures as much as possible to eliminate variation or potential for error.
Johnston, D., et al., *The evaluation of a newly developed One Minute Pressure Ulcer Documentation Tool.* World Council of Enterostomal Therapists Journal, 2012. **32**(3): p. 8-12.	Education given prior to tool implementation, plus supporting documents Poor classification of PIs and lack of consistent measuring despite education Nurses liked quick tool but Learning documentation not wound healing	Pre-test/Post-test plus prospective and retrospective chart reviews	2.d	Despite the simplicity of the tool and the education it was still not always completed correctly.
Jones, V., *Wound bed preparation and its implication for practice: An educationalist's viewpoint*, in *Applied Wound Management Supplement*, D. Gray, Editor 2004, Wounds-UK: Aberdeen.	WPB encourage active treatment planning as opposed to just dressing the wound Education challenges include knowledge of wound biology and microbiology. Need to acquire decision making skills based on wound features when faced with a complexity of treatment choices WBP needs a skilled and experienced practitioner Medical model of care	Expert Opinion	5.c	WBP very complex and requires high level of knowledge, skill and experience with the clinician.

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Kennedy, C. and D. Arundel, *District nurses' knowledge and practice of wound assessment: 1.* British Journal Of Nursing (Mark Allen Publishing), 1998. **7**(7): p. 380.	Nurses found to not be using a WAT These assessments can be subjective, variable between practitioners and unreliable or inaccurate. Being experiences does not mean knowing wound care Rely on wound care reps for education Respondents wanted more wound care education but did not want education on assessment Accurate wound assessment and description=good communication and appropriate treatment Poor assessment=patient suffering, costs, inappropriate treatment WAT still needs clinician to have sound knowledge base and observational skills	Observational study Survey	3.e	District Nurses tending to not use a WAT. Using judgement alone could have poor results. WAT also can't stand alone but needs sound clinical judgement backing it.
Kennedy, C. and D. Arundel, *District nurses' knowledge and practice of wound assessment: 2.* British Journal Of Nursing (Mark Allen Publishing), 1998. **7**(8): p. 481-486.	Working party to design WAT, guidelines and education Project needs managerial support and resources Basis needs to be in research and evidence, rituals are time-consuming and less cost-effective WAT is base to defend clinical decisions, ensure continuity of care	Working party to design WAT, narative	5.b	Need for consistent evidence based assessment led to development of WAT. Challenging project, lots of different views, however WAT, procedures and education created: base for clinical decision making and continuity of care
Krasner, D., *Wound Healing Scale, version 1.0: a proposal.* Advances In Wound Care: The Journal For Prevention And Healing, 1997. **10**(5): p. 82-85.	For all wound types Designed to resolve problems of reverse staging Assessment of wounding vs assessment of healing Subjective measures Keep it simple	Expert Opinion	5.c	Indicated improvement or deterioration, simple, no measurement but does have diagnosis and previous wound healing and implies collaboration.
Maida, V., M. Ennis, and C. Kuziemsky, *The Toronto Symptom Assessment System for Wounds: a new clinical and research tool.* Advances in Skin & Wound Care, 2009. **22**(10): p. 468-474.	Patient centred Built from palliative care WAT examples Symptom focus	Pilot study. WAT completed, 'symptom score' generated, care given, compare against new score at 7 days.	3.e	Improve symptom management=improve QoL

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Maklebust, J., *PUSH tool reality check: audience response... proceedings of the National Pressure Ulcer Advisory Panel, Fifth National Conference, "Monitoring Pressure Ulcer Healing: an Alternative to Reverse Staging".* Advances in Wound Care, 1997. **10**(5): p. 102-106.	Nice and quick but should be part of a more comprehensive overall assessment Good to monitor healing Measurement (LxW) challenging-possible math errors, needs instruction, education, demonstration Education to support tool, repeat regularly due to high staff turnover Education at all levels as it's not always the RN performing wound care	Observational study Cross section of opinions at a conference	4.b	Even with a very simple tool there can be concerns about exactly how to use it. Good point about education at all levels.
Matsui, Y., et al., *Development of the DESIGN-R with an observational study: An absolute evaluation tool for monitoring pressure ulcer wound healing.* Wound Repair & Regeneration, 2011. **19**(3): p. 309-315.	Tools for research must be valid and sensitive to change. Need for weighting of items that have a higher impact on healing.	Prospective (n=1067, 6% loss to follow up) and retrospective (n= 3132, 8% loss to follow up) observational studies. Statistical analysis of aspects of wound assessment that had the greatest impact on healing, for weighting.	3.e	Mostly relevant to research focus, not clinical, where accuracy of recording and greater 'degrees' of healing may be required.
Muir C, Watret L. Managing wounds using a structured assessment tool. Journal of Community Nursing 2006; 20 (1): 10.	WBP and TIME as framework for assessing and planning. No WAT. Systematic approach to assessment=sound basis for decision making Requires good understanding of systemic, pathophysiology on wound healing Of value in chronic wounds Focus on referrals	Case study	4.d	Importance of referrals in chronic, non-healing wounds. Very thorough but it all comes down to the knowledge of the clinician, WBP and TIME by themselves are vague prompts.

Article/Title	Key findings	Methods	Level of Evidence*	Implications
Research Question: What is required for an effective wound assessment tool?				
Mullins, M., S.S. Thomason, and M. Legro, *Monitoring pressure ulcer healing in persons with disabilities.* Rehabilitation Nursing, 2005. **30**(3): p. 92-99.	Pressure injury focus Tool must be repeatable Tool must be sensitive to changes over time Validity, reliability and sensitivity needed for tool to be clinically useful PUSH quick and can be used by anyone, not suitable for larger wounds PSST more comprehensive but more time consuming SWHT and SS have multiple concerns No consensus on how to use WATs to make treatment decisions	Literature review	5.a	Importance of reliability, validity and sensitivity in multiple populations. Needs to show changes in wound progress. Needs to have clear links between assessment and treatment choices.
Padmore, J., *The introduction and evaluation of Applied Wound Management in nurse education.*, in *Applied Wound Management: Part 3. Use in practice*, D. Gray, Editor 2009, Wounds-UK: Aberdeen.	Nurses have limited understanding of wound management AWM simple as core element for teaching wound care Free availability of WAT and guides/support materials beneficial for unsupported sites (like nursing homes)	Narrative plus case studies and survey results	4.d	People with varying knowledge levels carry out wound care, training needs to be 'stepped-up' or 'stepped-down' for each. AWM at core then build around it.
Timmins, J., *Can nurses' knowledge of wound care be improved by a systematic approach to wound management?*, in *Applied wound management. Part 3 Use in practice*, D. Gray, Editor 2009, Wounds-UK: Aberdeen.	Training alone did not bridge the gap from theory to practice - needed assessment framework to guide from assessment to dressing selection What is obvious to TVN is not obvious to RN Procedures and guidelines available but not used Documentation did not support reasons for selecting plan - plans continued through ritual not planning If RN's can't do it we need more TVNs.	Pre-Post test 37% loss to follow up	2.d	Combination of education and tool but level of improvement not clearly quantified. In theory could save a lot of money if we get it right.

*JBI Levels of evidence for effectiveness[39]

Level 1 – Experimental Designs
Level 1.a – Systematic review of Randomized Controlled Trials (RCTs)
Level 1.b – Systematic review of RCTs and other study designs
Level 1.c – RCT
Level 1.d – Pseudo-RCTs
Level 2 – Quasi-experimental Designs
Level 2.a – Systematic review of quasi-experimental studies
Level 2.b – Systematic review of quasi-experimental and other lower study designs
Level 2.c – Quasi-experimental prospectively controlled study
Level 2.d – Pre-test – post-test or historic/retrospective control group study
Level 3 – Observational– Analytic Designs
Level 3.a – Systematic review of comparable cohort studies
Level 3.b – Systematic review of comparable cohort and other lower study designs
Level 3.c – Cohort study with control group
Level 3.d – Case–controlled study
Level 3.e – Observational study without a control group
Level 4 – Observational – Descriptive Studies
Level 4.a – Systematic review of descriptive studies
Level 4.b – Cross-sectional study
Level 4.c – Case series
Level 4.d – Case study
Level 5 – Expert Opinion and Bench Research
Level 5.a – Systematic review of expert opinion
Level 5.b – Expert consensus
Level 5.c – Bench research/ single expert opinion

References

1. Cooper DM. Human wound assessment: status report and implications for clinicians. AACN Clin Issues Crit Care Nurs 1990; 1 (3): 553-65.
2. Ferrell BA. The Sessing Scale for measurement of pressure ulcer healing. Adv Wound Care 1997; 10 (5): 78-80.
3. Fletcher J. Wound assessment and the TIME framework. Br J Nurs 2007; 16 (8): 462-4.
4. Harding K, Grey D, Timmons J, Hurd T. Evolution or Revolution? Adapting to complexity in wound management. Int Wound J 2007; 4 Suppl. 2 (2): 1-12.
5. Greatrex-White S, Moxey H. Wound assessment tools and nurses' needs: an evaluation study. Int Wound J 2013.
6. Cook L. Wound assessment: exploring competency and current practice. Br J Community Nurs 2011: S34-40.
7. Moffatt C, Vowden K, Price P, Vowden P. Psychosocial factors and delayed healing. In: European Wound Management Association, ed. Position Document: Hard-to-heal wounds: a holistic approach. London: MEP Ltd; 2008. pp. 10-14.
8. Martin F, Duffy A. Assessing and managing venous leg ulcers in the community: a review. Br J Community Nurs 2011: S6-s14.
9. Muir C, Watret L. Managing wounds using a structured assessment tool. Journal of Community Nursing 2006; 20 (1): 10.
10. Arndt JV, Kelechi TJ. An Overview of Instruments for Wound and Skin Assessment and Healing. J Wound Ostomy Continence Nurs 2014; 41 (1): 17-23.
11. Australian Wound Mangement Association. Standards for Wound Management. 2nd ed; Australian Wound Mangement Association; 2010.
12. Kennedy C, Arundel D. District nurses' knowledge and practice of wound assessment: 2. Br J Nurs 1998; 7 (8): 481-86.
13. Hess CT. The art of skin and wound care documentation. Adv Skin Wound Care 2005 Jan-Feb 2005; 18 (1): 43-55.
14. Gray D, White R, Cooper P, Kingsley A. Using the wound healing continuum to identify treatment objectives. In: Gray D, White R, Cooper P, eds. Applied wound managment supplement. Part 2 Implementation. Aberdeen: Wounds-UK; 2005.
15. Best Practice Statement: Optimising wound care. Wounds UK, Aberdeen; 2008. Available from: <http://www.wounds-uk.com/pdf/content_8950.pdf%3E.
16. Timmins J. Can nurses' knowledge of wound care be improved by a systematic approach to wound management? In: Gray D, ed. Applied wound management. Part 3 Use in practice. Aberdeen: Wounds-UK; 2009.
17. Casey G. Chronic wound healing: Leg ulcers. Kai Tiaki Nursing New Zealand 2011; 17 (11): 24-29.
18. Inernational consensus. Making the case for cost effective wound management. Wounds International 2013.
19. World Union of Wound Healing Societies (WUWHS). Principles of best practice: Diagnostics and wounds. A consensus document. London: MEP Ltd; 2008.
20. Dowsett C. Malignant fungating wounds: assessment and management. Br J Community Nurs 08 2002; 7 (8): 394.
21. Cooper P. A review of different wound types and their principles of management. In: Gray D, ed. Applied wound management supplement. Aberdeen: Wounds-UK; 2004.
22. Maida V, Ennis M, Kuziemsky C. The Toronto Symptom Assessment System for Wounds: a new clinical and research tool. Adv Skin Wound Care 2009; 22 (10): 468-74.
23. Elements of a wound assessment. Adv Skin Wound Care 2004; 17 (9): 461-61.

24. Gray D, White R, Cooper P, Kingsley A. Applied wound management. In: Gray D, ed. Applied wound management supplement. Aberdeen: Wounds-UK; 2004.

25. Medline Industries. NE1 Wound Assessment Tool: Course and Competency. *Medline University*. Available at: https://http://www.medlineuniversity.com/d/course/1010000315/?tabId=152&moduleId=521&GoBackTo=983F77F. Accessed May 8, 2015.

26. Barber S. A clinically relevant wound assessment method to monitor healing progression. Ostomy Wound Manage 2008; 54 (3): 42-49.

27. Krasner D. Wound Healing Scale, version 1.0: a proposal. Adv Wound Care 1997; 10 (5): 82-85.

28. *Optimal Care of Chronic, Non-Healing, Lower Extremity Wounds: A Review of Clinical Evidence and Guidelines*: Canadian Agency for Drugs and Technologies in Health; 2013.

29. Eagle M. Wound assessment: the patient and the wound. Wound Essentials 2009; 4: 14-24.

30. Silver Chain Nursing Association and School of Nursing and Midwifery Curtin University of Technology. *STAR Skin Tear Classification System* 2010.

31. Matsui Y, Furue M, Sanada H, et al. Development of the DESIGN-R with an observational study: An absolute evaluation tool for monitoring pressure ulcer wound healing. Wound Repair Regen 2011; 19 (3): 309-15.

32. Maklebust J. PUSH tool reality check: audience response... proceedings of the National Pressure Ulcer Advisory Panel, Fifth National Conference, "Monitoring Pressure Ulcer Healing: an Alternative to Reverse Staging". Adv Wound Care 09 1997; 10 (5): 102-06.

33. Ayello EA. Keeping pressure ulcers in check. Nursing (Lond) 1996; 26 (10): 62-63.

34. Kennedy C, Arundel D. District nurses' knowledge and practice of wound assessment: 1. Br J Nurs 1998; 7 (7): 380.

35. French ET, Ledwell-Sifner K. A method for consistent documentation of pressure sores. Rehabil Nurs 1991; 16 (4): 204.

36. Johnston D, McGhie S, Magtoto R, Skanes C. The evaluation of a newly developed One Minute Pressure Ulcer Documentation Tool. World Council of Enterostomal Therapists Journal 2012; 32 (3): 8-12.

37. Mullins M, Thomason SS, Legro M. Monitoring pressure ulcer healing in persons with disabilities. Rehabil Nurs 2005; 30 (3): 92-99.

38. Pillen H, Miller M, Thomas J, Puckridge P, Sandison S, Spark JI. Assessment of wound healing: validity, reliability and sensitivity of available instruments. Wound Practice & Research 2009; 17 (4): 208-17.

39. Joanna Briggs Institute Levels of Evidence and Grades of Recommendation Working Party. New JBI Levels of Evidence. Available at: http://joannabriggs.org/assets/docs/approach/JBI-Levels-of-evidence_2014.pdf. Accessed 9 May, 2015.