Using the venous leg ulcer aetiology-specific T.I.M.E. clinical decision support tool to promote consistent holistic wound management and eliminate variation in practice

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The T.I.M.E. clinical decision support tool (CDST; Moore et al, 2019; World Union of Wound Healing Societies, 2020) is based on the well-established T.I.M.E. wound bed preparation framework (Schultz et al, 2003). The tool has been further developed to help support clinicians to assess different wound types – namely venous leg ulcers (VLUs), pressure ulcers/injuries, diabetic foot ulcers and dehisced surgical wounds. In this article, a team of non-wound care specialist staff (homecare and nursing home nurses) used the VLU aetiology-specific T.I.M.E. CDST to help guide wound bed preparation, dressing selection and ongoing management of four patients with VLUs in a homecare setting in The Netherlands.

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Wound care is an ever-growing concern for healthcare systems across the world. Inconsistencies in wound care practices have been highlighted (Guest et al, 2015), and suboptimal wound assessment contributes to a delay in healing and misused resources, while exposing patients to unnecessary risk (Johnson, 2015). Failure to recognise deterioration and/or seek timely advice can lead to poor treatment choices and likelihood of delayed healing (Dowsett and Hall, 2019).

In The Netherlands, a general practitioner usually delegates wound care to the homecare nurse. In the country, there are hundreds of private homecare organisations, but only the largest have dedicated wound care nurses (Lenselink, 2020). The following disciplines are able to refer to the wound care specialist: hospital specialists (such as vascular specialists and dermatologists), the general practitioner, district nurses and specialist doctors in nursing homes.

Tools that incorporate evidence-based wound management and provide a structured approach to wound care can assist accurate and comprehensive wound assessment, and could be beneficial to promote consistent holistic wound management and eliminate variation in practice (World Union of Wound Healing Societies [WUWHS], 2020).

T.I.M.E. clinical decision support tool

The T.I.M.E clinical decision support tool (CDST) was developed with input from an international group of experts to provide support to health care professionals making clinical decisions, while reducing variation in practice and helping to improve wound outcomes (*Box 1;* Moore et al, 2019). Holistic wound care and the involvement of a multidisciplinary team are central features of the T.I.M.E. CDST. The T.I.M.E. CDST uses an 'ABCD and E' approach to facilitate clinical decision-making:

- **A** Assessment of the patient, wellbeing and wound
- **B** Bringing in a multidisciplinary team and informal carers to promote holistic patient care
- **C** Controlling and treating the underlying causes and barriers to wound healing
- **D** Deciding on the most appropriate wound treatment to implement and the desired wound management outcome
- **E** Evaluation and reassessment of how the wound is progressing and if the wound management goals have been achieved.

Box 1. Timeline of the T.I.M.E. clinical decision support tool.

- T.I.M.E. concept developed to provide a structured approach to wound bed preparation – Tissue (non-viable or deficient), Infection/Inflammation, Moisture balance and Edges of wound non-advancing (Schultz et al, 2003).
- A survey of delegates at the 2018 European Wound Management Association conference identified that although T.I.M.E. is universally the most widely used assessment tool, 40% of respondents reported that they did not use any formal framework to guide wound bed preparation in practice (Ousey et al, 2018).
- The T.I.M.E. clinical decision support tool (CDST) evolved from the T.I.M.E. wound bed preparation concept with the aim to help guide an holistic patient–wound approach. The tool addresses the elements of holistic assessment and management and the importance of patient involvement to help eliminate variation in practice. The tool was developed and endorsed by an international group of experts (Moore et al, 2019; WUWHS, 2020).
- The aetiology-specific T.I.M.E. CDSTs for venous leg ulcers, pressure ulcers/injuries, diabetic foot ulcer and dehisced surgical wounds were developed in conjunction with input from tissue viability nurses from the United Kingdom and wound, ostomy and continence nurses in the United States of America.

In 2019, a multi-centre clinical evaluation of the T.I.M.E. CDST was conducted at four different centres: two in Australia (Swanson et al, 2019; Carville et al, 2019) and one in Canada (Woo, 2019) and Denmark (Jelnes et al, 2019). The wound care specialist at each centre asked non-specialists to use and evaluate the tool on five different patients over a 4-week period and report how the T.I.M.E. CDST influenced practice. The tool provided a structured wound management approach supporting non-specialists and encouraging consistency of care and better patient outcomes and experiences of care (Blackburn et al, 2019).

Development of aetiology-specific T.I.M.E. CDSTs

The T.I.M.E. CDST has since evolved into aetiology-specific tools, which retain the principles of the original T.I.M.E. CDST tool by using an 'ABCD and E' approach, but with the addition of specific management prompts for four different wound aetiologies – venous leg ulcers (VLUs), pressure ulcers/injuries, diabetic foot ulcers and dehisced surgical wounds. There are two versions of the VLU aetiology-specific T.I.M.E. CDST: one that includes Smith + Nephew products *[Figure 1]*, and one that does not specify a particular product and can be adapted to local formularies *[Figure 2]*.

Aim: Evaluating the VLU aetiology-specific T.I.M.E. CDST

Enabling non-wound care specialist staff to conduct wound care and treatment planning may promote consistent holistic wound management, as well as alleviate the burden on specialist staff in managing these patients.

Setting: Evean,The Netherlands

This article focuses on the experiences of staff at Evean, a provider of specialist nursing care and homecare, geriatric rehabilitation care, occupational therapy, physiotherapy, remedial therapy, home support, daytime activities and assisted living based in The Netherlands. There are 18000 patients in the care of Evean. Evean is one organisation in the country that has dedicated wound care specialist nurses.

Non-wound care specialists

All the staff at Evean are familiar with the concept of wound bed preparation. The non-wound care specialists involved in the evaluation were homecare and nursing home nurses. Nurses were randomly invited to participate in the evaluation of the VLU T.I.M.E. CDST and were enthusiastic to participate.

For the purpose of this evaluation, the wound care specialist (HP) gave a 60-minute face-to-face introduction explaining how to use the tool and how to complete the data collection forms.

Protocol

Following a confirmed diagnosis from the general practitioner, the VLU aetiology-specific T.I.M.E. CDST *[Figure 1]* was used by the non-specialists to guide wound bed preparation, dressing selection and referrals to other specialist disciplines using the ABCD and E approach. Where products listed in the tool were not available, the clinician used an equivalent product according to local protocol.

The non-specialists treated the patients' wound care independently, but compression therapy was prescribed and managed by the specialist. The wound care specialist (HP) was available to answer questions or discuss clinical decisions if this was requested by the non-specialists.

Each patient was monitored and reviewed for 4 weeks using the VLU T.I.M.E. CDST. Parameters of wound healing were recorded each week, such as wound size, condition of the wound bed, how the wound was progressing and the degree to which the wound management goals had been achieved.

Case 1: 92-year-old woman

Assess patient, wellbeing and wound

A 92-year-old woman sustained a break in the skin over the left shin bone after a fall. Based on local protocols, as there was a history of chronic venous insufficiency and the wound was on the lower leg, the general practitioner diagnosed the wound as a VLU.

The wound had been present for 7 days and measured 4cm (length) x 2cm (width) x

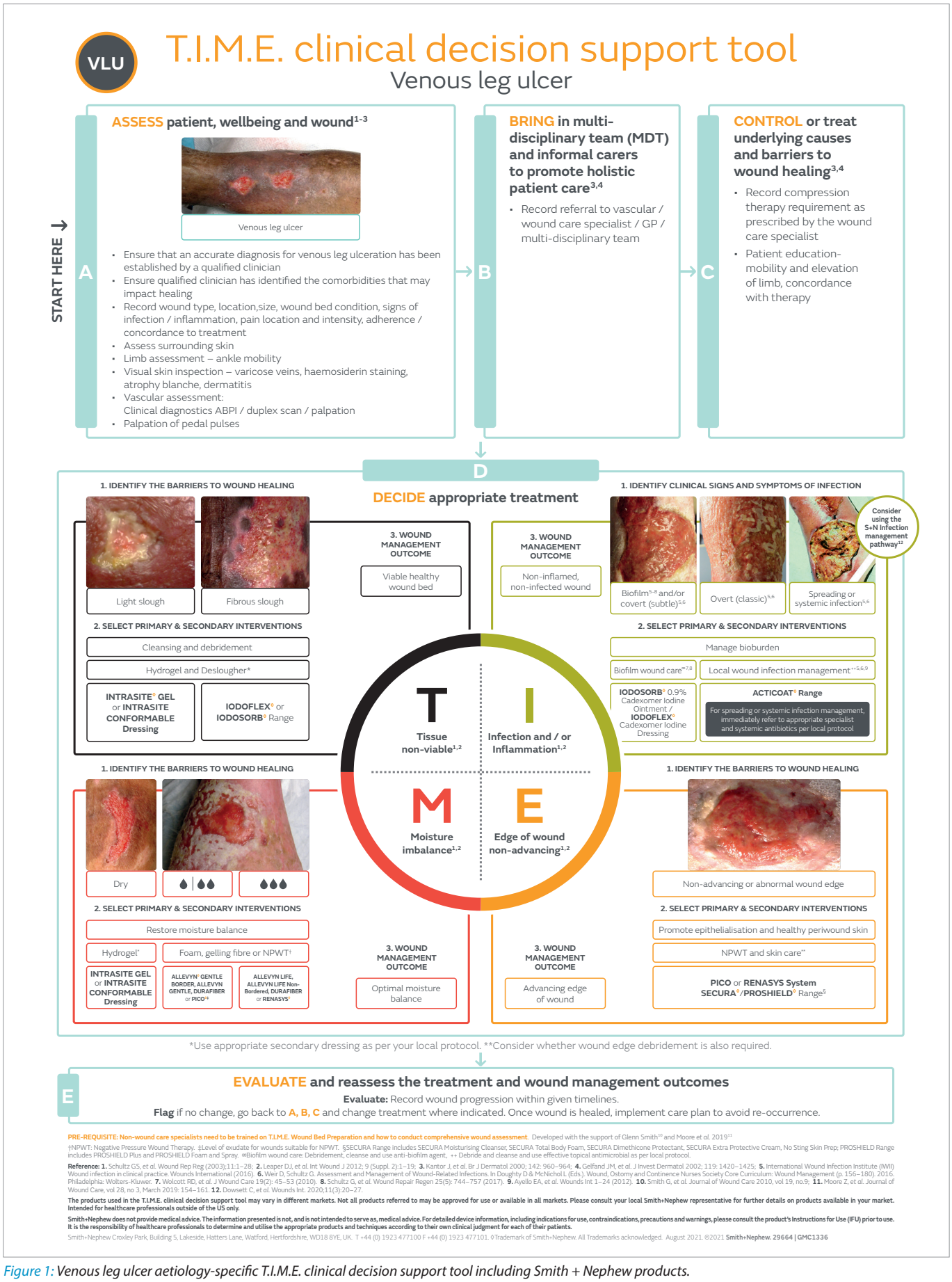


Figure 1: Venous leg ulcer aetiology-specific T.I.M.E. clinical decision support tool including Smith + Nephew products.

T.I.M.E. clinical decision support tool

Venous leg ulcer

START HERE →

A — ASSESS patient, wellbeing and wound[1-3]

Venous leg ulcer

- Ensure that an accurate diagnosis for venous leg ulceration has been established by a qualified clinician
- Ensure qualified clinician has identified the comorbidities that may impact healing
- Reecord wound type, location,size, wound bed condition, signs of infection / inflammation, pain location and intensity, adherence / concordance to treatment
- Assess surrounding skin
- Limb assessment – ankle mobility
- Visual skin inspection – varicose veins, haemosiderin staining, atrophy blanche, dermatitis
- Vascular assessment:
  Clinical diagnostics ABPI / duplex scan / palpation
- Palpation of pedal pulses

B — BRING in multi-disciplinary team (MDT) and informal carers to promote holistic patient care[3,4]

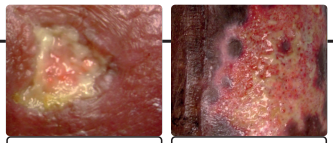
- Record referral to vascular / wound care specialist / GP / multi-disciplinary team

C — CONTROL or treat underlying causes and barriers to wound healing[3,4]

- Record compression therapy requirement as prescribed by the wound care specialist
- Patient education- mobility and elevation of limb, concordance with therapy

D — DECIDE appropriate treatment

1. IDENTIFY THE BARRIERS TO WOUND HEALING



Light slough | Fibrous slough

2. SELECT PRIMARY & SECONDARY INTERVENTIONS

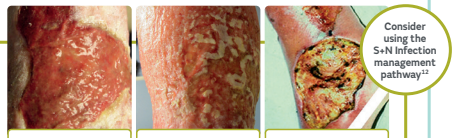
Cleansing and debridement
Refer to specialist for sharp debridement as needed

Surfactant, sharp / surgical or mechanical, autolytic or enzymatic, biological / larval

3. WOUND MANAGEMENT OUTCOME

Viable healthy wound bed

1. IDENTIFY CLINICAL SIGNS AND SYMPTOMS OF INFECTION



Biofilm[5-8] and/or covert (subtle)[5,6] | Overt (classic)[5,6] | Spreading or systemic infection[5,6]

Consider using the S+N Infection management pathway[12]

2. SELECT PRIMARY & SECONDARY INTERVENTIONS

Manage bioburden

Biofilm wound care[*7,8] | Local wound infection management[**5,6,9]

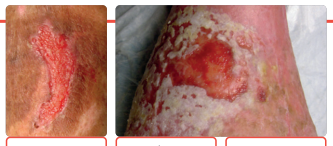
Debride, cleanse and use anti-biofilm agent

Antimicrobial
Topical antiseptic, and/or antibiotic therapy
For spreading or systemic infection management, immediately refer to appropriate specialist and systemic antibiotics per local protocol*

3. WOUND MANAGEMENT OUTCOME

Non-inflamed, non-infected wound

1. IDENTIFY THE BARRIERS TO WOUND HEALING



Dry | ◆ | ◆◆ | ◆◆◆

2. SELECT PRIMARY & SECONDARY INTERVENTIONS

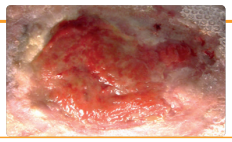
Restore moisture balance

Hydrogel* | Foam, gelling fibre or NPWT†

3. WOUND MANAGEMENT OUTCOME

Optimal moisture balance

1. IDENTIFY THE BARRIERS TO WOUND HEALING



Non-advancing or abnormal wound edge

2. SELECT PRIMARY & SECONDARY INTERVENTIONS

Promote epithelialisation and healthy periwound skin

NPWT and skin care**

3. WOUND MANAGEMENT OUTCOME

Advancing edge of wound

T — Tissue non-viable[1,2]

I — Infection and / or Inflammation[1,2]

M — Moisture imbalance[1,2]

E — Edge of wound non-advancing[1,2]

*Use appropriate secondary dressing as per your local protocol. **Consider whether wound edge debridement is also required.

E — EVALUATE and reassess the treatment and wound management outcomes

Evaluate: Record wound progression within given timelines.

Flag if no change, go back to **A, B, C** and change treatment where indicated. Once wound is healed, implement care plan to avoid re-occurrence.

PRE-REQUISITE: Non-wound care specialists need to be trained on T.I.M.E. Wound Bed Preparation and how to conduct comprehensive wound assessment. Developed with the support of Glenn Smith[10] and Moore *et al.* 2019[11]

†NPWT: Negative Pressure Wound Therapy. ‡Level of exudate for wounds suitable for NPWT. ∞Biofilm wound care: Debridement, cleanse and use anti-biofilm agent, ++ Debride and cleanse and use effective topical antimicrobial as per local protocol. ∞ Signs/symptoms of infection among people with diabetes may be subtle or absent, especially for those with ischaemia and sensory neuropathy. Refer to specialist, according to local protocol, for comprehensive evaluation.

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Figure 2: Venous leg ulcer aetiology-specific T.I.M.E. clinical decision support tool (generic version).

Case 1: 92-year-old woman.

Figure 3: Wound at baseline before cleaning

Figure 4: 100% viable tissue at 4-week review

Case 2: 75-year-old man.

Figure 5: Wound at baseline after cleaning

Figure 6: 75% viable tissue at 4-week review after cleaning

0.1cm (depth) with substantial erythema of the surrounding skin, which was warm to touch, indicating the presence of infection *[Figure 3]*. The wound was affecting the patient's mobility and happiness.

Bring in multidisciplinary team and informal carer to promote holistic patient care

The non-specialist was concerned about wound infection and sought advice from the wound care specialist. The importance of a high-protein diet was stressed, but a referral to a dietitian was not indicated at this stage. In view of the fall, the patient was referred to an occupational therapist for a review of safety at home. Following final review, the patient was referred to a hosiery bandage technician to apply a multi-layer short stretch compression therapy system.

Control or treat underlying barriers to wound healing

An ankle brachial pressure index (ABPI) of 1.13 was recorded and the presence of significant peripheral arterial disease (PAD) was excluded. This allowed the safe use of 2-layer short stretch cohesive bandages providing 40mmHg of compression therapy, which was well tolerated.

Decide appropriate treatment

Using the VLU T.I.M.E. CDST, the main barrier to healing that needed to be addressed was overt (classic) infection.

T=The wound bed comprised 90% viable tissue and 10% slough. The patient required paracetamol during dressing change and rated the wound pain during dressing change as 4 out of 10 on the visual analogue score (VAS; 0=no pain; 10=unbearable pain)

I=The wound showed signs of overt (classic) infection, with substantial erythema of the surrounding skin, which was warm to touch.

M=The wound was moderately exuding

E=The wound edges were intact throughout the 4-week period.

The wound was initially cleaned with a pre-soaked debridement cloth. The wound was treated for 1 week with a topical antimicrobial dressing until the signs of overt infection had resolved. A gelling foam dressing was then used under compression therapy until the wound achieved full closure.

Evaluate

By week 4, there was 100% viable tissue present *[Figure 4]*. The VLU T.I.M.E CDST allowed a careful and thorough holistic approach to the management of this wound, which progressed quickly to healing. The clinician, a homecare nurse, of over 15 years' experience but with no specialist training in wound care, reported that the process was educational and the tool eased decision-making and appropriate treatment.

Case 2: 75-year-old man

Assess patient, wellbeing and wound

A 75-year-old male patient presented to the community team with an ulcer on his right leg. He had a 20-year history of arterial disease and type 2 diabetes. The patient was discharged from hospital following revascularisation of the femoral artery. The wound had been present for 10 days and measured 2.5cm (length) x 1.75cm (width) x 0.1cm (depth) *[Figure 5]*. The patient scored their wound pain as 4 out of 10 on the VAS (0=no pain; 10=unbearable pain), but it did not affect the patient's quality of life or his ability to conduct his activities of daily living.

Before the operation, the patient's ABPI was 0.4, which was indicative of severe PAD. Surgery had been successful and the patient now had good pulsation of the arteries and warm feet. The leg was oedematous and the wound was therefore treated as a VLU as the patient's limb had now been revascularised. However, guidance from the surgical team was to wait to commence compression therapy until an ABPI had been repeated 6 weeks' post-surgery.

Wound care had previously comprised cleansing with a pre-soaked debridement wipe as per local protocol. The wound was dressed with IODOSORB 0.9% ointment, a superabsorbent dressing and a hydrophilic bandage over the dressing.

Bring in the multidisciplinary team throughout care

Throughout the evaluation period, the clinician contacted the wound care specialist for support and advice on the photographs they had taken of the wound.

Control or treat underlying causes and barriers to wound healing

The patient was advised to mobilise as much as possible. The patient continued to receive treatment for diabetes and ongoing arterial disease management throughout the evaluation.

Decide appropriate treatment

Using the VLU aetiology-specific T.I.M.E. CDST, the main barriers to healing that needed to be addressed were non-viable tissue and overt (classic) infection.

T=The wound bed comprised 60% light slough

Case 3: 81-year-old woman.

Figure 7: 75% light slough at baseline before cleaning

Figure 8: 100% viable tissue at 4-week review

and 40% viable tissue

I=There were signs of overt (classic) infection, namely a thin fibrin layer on the wound, and red erythema surrounding the wound

M=Exudate levels were moderate

E=Edges were intact throughout the 4-week period.

The wound was cleansed with a pre-soaked debridement cloth as per local protocol. The wound was dressed with a low-adherent, impregnated gauze dressing, and a secondary superabsorbent dressing was applied on top. Dressing change was planned as per local protocol.

Evaluate

After 1 week, the signs and symptoms of infection had resolved, and the wound bed comprised 75% viable tissue and 25% light slough. By week 4, the wound moisture level had reduced to low. The non-specialist clinician sought the expertise of the wound care specialist when they were unsure of the next steps in treatment. The wound was starting to reduce in size and the surrounding skin was less inflamed *[Figure 6]*. The wound care specialist asserted the need to start compression therapy for this patient once the ABPI had been repeated 6 weeks after surgery.

Case 3: 81-year-old woman

Assess patient, wellbeing and wound

An 81-year-old woman with type 2 diabetes and polymyalgia rheumatica presented with a VLU that had been present for 3 months. The wound had originally occurred after trauma and was located on the lower left leg. The wound was not impacting on the patient's quality of life or stopping her from conducting her activities of daily living.

The patient had varicose veins and an ABPI of 1.03, and the presence of significant PAD was excluded. The wound measured 1.5cm (length) x 0.5cm (width) x 0.1cm (depth) *[Figure 7]*. The presenting wound had been slow to heal despite compression therapy being prescribed. An iodine dressing and antibiotics had previously been prescribed, but the patient was reluctant to have a third course of antibiotics.

The patient scored pain from the wound as 5 out of 10 on the VAS (0=no pain; 10=unbearable pain). The patient received 1000mg paracetamol 3 times a day and 5mg Prednisolone daily for rheumatism.

Bring in the multidisciplinary team throughout care

Referral to members of the multidisciplinary team was not required for this patient during the evaluation period.

Control or treat underlying causes and barriers to wound healing

2-layer short stretch cohesive bandages providing 40mmHg of pressure were used to promote healing of the ulcer.

Decide appropriate treatment

Using the VLU aetiology-specific T.I.M.E. CDST, the main barriers to healing that needed to be addressed were non-viable tissue and moisture imbalance.

T= The wound bed comprised 75% light slough and 25% viable tissue

I= At initial assessment and throughout the evaluation, there were no signs of overt infection or biofilm.

M=Exudate levels were moderate

E= Edges were intact throughout the 4-week period.

The wound was cleansed with a pre-soaked debridement cloth as per local protocol. A bordered hydrocolloid dressing with a change indicator was used to manage the moderate exudate levels. 2-layer short stretch cohesive bandages were applied to provide 40mmHg of compression therapy. The dressing and compression system were planned to be changed twice a week.

Evaluate

After 1 week, the wound was no longer painful (0 on the VAS) and the wound bed comprised 100% viable tissue. At week 2, the patient had minimal pain during dressing change (2 on the VAS). For the remainder of the evaluation period, the patient experienced no further wound pain. The patient became more mobile. By week 4, the level of exudate had reduced to low. By the final evaluation at week 4, the wound had reduced in size to 0.5cm (length) x 0.3cm (width) x 0.1cm (depth) *[Figure 8]*.

The VLU T.I.M.E. CDST helped to direct dressing selection for the key barriers to healing, namely the management of non-viable tissue and moisture imbalance. The nurse who used the VLU T.I.M.E. CDST found that it helped their decision making and guided them to the appropriate treatment that involved managing the underlying causes of the VLU.

Case 4: 90-year-old man

Assess patient, wellbeing and wound

The patient was a 90-year-old man with diabetes, chronic obstructive pulmonary disease,

Case 4: 90-year-old man.

Figure 9: Wound at baseline after cleaning

Figure 10: Wound at 4-week review after cleaning

Box 2. Differential diagnoses of VLUs.

- Haematological abnormalities, e.g. sickle cell anaemia, thrombocytosis, paraproteinaemia, coagulation abnormalities
- Malignancies
- Pyoderma gangrenosum
- Lipoid necrobiosis
- Infections, e.g. Erysipelas, Buruli ulcer
- Burns
- Underlying phlebological syndromes, e.g. Klinefelter syndrome, Klippel-Trenaunay, post thrombotic syndrome
- Causes in arterial disease, pressure ulcers, Martorell's ulcer, microangiopathy, e.g. Diabetes mellitus, vasculitis

hypertension, early Alzheimer's Disease, and a history of varicose veins and haemostaining. The initial injury to his lower right leg had been caused while the patient removed his own compression stockings. The patient continued to wear his compression stocking, but the injured skin did not heal within 4 weeks so was diagnosed as a VLU by the general practitioner based on local guidelines and the presence of venous insufficiency.

Wound treatment had included cleaning with water and gauze and covering with a low-adherent, impregnated gauze dressing and an absorbent bandage. Five months previously, the ABPI of the right and left leg were 1.25 and 1.32 respectively, indicating no presence of PAD and suggesting compression therapy was safe.

The wound on his right lower leg measured 1.5cm (length) x 1.0cm (width) x 0.1cm (depth) *[Figure 9]*. The patient scored their wound pain as 6 out of 10 on the VAS (0=no pain; 10=unbearable pain) and took 500-1000mg paracetamol daily. The patient was dependent on the nurse to change his dressing and apply compression therapy. The discomfort from the wound was limiting the patient's mobility and reducing his ability to carry out his activities of daily living.

Bring in the multidisciplinary team throughout care

A referral to the wound care specialist was made as per local policy because the wound had signs of overt infection and it had not improved within 3 weeks. Throughout the evaluation period, the patient continued to receive treatment and support from other members of the multidisciplinary team for the present comorbidities.

Control or treat underlying causes and barriers to wound healing

The patient was not managing well with compression stockings, so was receiving compression therapy with 2-layer short stretch cohesive bandages applied by the nurse. The patient was encouraged to be as mobile as possible.

Decide appropriate treatment

Using the VLU T.I.M.E. CDST, the main barriers to healing that needed to be addressed were the clinical signs of overt (classic) infection and moisture imbalance.

T=The wound bed was viable and comprised 20% light slough and 80% viable tissue

I=There were signs of overt (classic) infection indicated by a red, inflammed and warm wound area. The wound was painful and there were high levels of exudate

M=Exudate levels were high

E=Edges were intact throughout the 4-week period.

The wound was cleansed with water and gauze. IODODSORB 0.9% ointment was applied to manage infection followed by compression bandaging as per local protocol.

Evaluate

After 4 weeks, the wound had reduced in size to 1.5cm (length) x 0.5cm (width) x 0.2cm (depth) and the signs of infection had resolved *[Figure 10]*. Once the infection had resolved after 2 weeks, the dressing regimen was changed to a low-adherent, impregnated gauze dressing to facilitate moisture balance and clean the wound, as per the VLU T.I.M.E. CDST.

During the 4-week period, compression bandaging was used because the stockings were not comfortable to the patient. However, the patient was not always concordant with treatment and would remove his bandages. Although there had been some initial progress at 4 weeks, the VLU T.I.M.E. CDST indicated that the next step would be to bring in the wound care specialist to assess the patient to support concordance.

Discussion

While there is a desire to simplify and optimise wound care, venous ulcer care is complex and support goes beyond a tool to identify and manage the main barriers to healing; for example, differential diagnoses *[Box 2]*, and how to select the right holistic treatment and compression therapy for the patient and their needs; all of which are critical to healing and require specialist training. All clinical staff need to have an awareness of the signs and symptoms of wound chronicity so that they know when to refer to a wound care specialist if progress stalls.

For this group of clinicians who had a varied level of experience in wound care, using the VLU T.I.M.E. CDST highlighted the need to be in regular contact with the wound care specialist, especially for novice nurses who have not yet developed the competencies required for wound care.

To ensure successful adoption and continuation of practice using the VLU T.I.M.E. CDST, all staff members, including administration, must 'buy-in' to a new approach. It is recommended that any tool is translated into the local language to engage with non-

wound care specialists who are unfamiliar with wound-related terminology.

Conclusion

The VLU aetiology-specific T.I.M.E. CDST is designed to promote consistent holistic wound management and eliminate variation in practice. For the clinicians who used the VLU T.I.M.E. CDST in this case series, it eased decision-making and guidance on appropriate treatment, allowed a systematic approach and aided communication between non-specialist clinicians and wound/other specialists. Tools, such as the T.I.M.E. CDST, can be used as part of a systematic and structured approach to wound management to promote consistent holistic wound management and eliminate variation in practice (WUWHS, 2020).

WINT

Declaration

This case series has been supported by Smith & Nephew.

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