

The TILI score: the new diagnostic tool for identifying wound infection

This article is based on a Made Easy workshop held at the Wounds UK Annual Conference on 8th November 2021, sponsored by Urgo Medical. The aim of the workshop was to discuss the development and evidence for the new Therapeutic Index for Local Infections (TILI) score, a diagnostic tool designed to facilitate identification and decision-making around wound infection for staff of all levels (Dissemond et al, 2020a), and to explore use of the tool in practice through real-life examples. The workshop consisted of presentations by two well-respected experts in wound care: Jeanette Milne and Andrew Sharpe and included a practical session on diagnosing local wound infection.

Wound infection is an important and common complication in wound care and can have a significant impact on patients' quality of life, wound healing and the healthcare system (Edwards-Jones et al, 2021). To begin the workshop, Jeanette directed delegates to the following poll questions: Are you familiar with the Therapeutic Index for Local Infections (TILI) score? Are you using the TILI score in practice? Votes indicated that most delegates were not familiar with the TILI score nor using the tool in practice and, therefore, the workshop provided an opportunity to introduce delegates to this simple tool that can be used to support diagnosis of local wound infection.

DEVELOPMENT AND EVIDENCE FOR THE TILI SCORE

Real-world evidence has shown that an estimated 3.8 million patients with a wound were managed by the NHS in 2017/2018, of which 89% of acute wounds and 49% of chronic wounds healed in the study year (Guest et al, 2020). It was also estimated by Guest et al (2020) that only 45% of chronic wounds healed if there was a definite or suspected infection. This evidence highlights the substantial burden of wounds, but also the importance of awareness and engagement in infection prevention and control.

Early intervention for the treatment of wound infection or suspected infection should be carried out according to evidence-based best practice

within a structured framework to standardise care (Wounds UK, 2021). Jeanette explained that diagnosing infection and documentation of signs and symptoms can be difficult, as various systems and templates to support decision-making and documentation exist and getting engagement to change templates may be challenging. Patients also increasingly receive care from multiple clinicians, and this can affect continuity of care (Haggerty et al, 2013). Continuity of care is a key element linked to improved patient outcomes and a reduced number of complications, including infection (Guest et al, 2020).

A different approach to diagnosis and treatment may be needed with the threat of antimicrobial resistance (AMR) looming. AMR is a global health issue that threatens the effective prevention and treatment of infection and occurs when bacteria, viruses, fungi, and parasites evolve over time and no longer respond to specific antimicrobials, groups of antimicrobials or indeed to any antimicrobial therapy (Fletcher et al, 2020; World Health Organization [WHO], 2020).

Jeanette expressed the importance of taking an approach informed by antimicrobial stewardship (AMS), of acting now to protect the antimicrobials we have (*Box 1*) and of using antimicrobials judiciously to prevent serious or life-threatening infection such as limb amputation, sepsis, or necrotising fasciitis. The importance of acting sooner to prevent patient

JEANETTE MILNE
Chief Matron Community,
Northumbria Healthcare NHS
Foundation Trust

ANDREW SHARPE
Advanced Podiatrist, Salford Care
Organisation

Box 1. Definition of antimicrobial

'Antimicrobial' is an umbrella term that includes antibiotics, antiseptics, disinfectants, and other agents, such as antiviral, antifungal, antibacterial and antiparasitic medicines (Wounds UK, 2021).

Box 2. Covert signs of infection (adapted from IWII, 2016)

- Friable, bright red granulation tissue
- Increased malodour
- New/increased pain or change in sensation
- Epithelial bridging, and pocketing in granulation tissue
- Delayed wound healing beyond expectations
- Wound breakdown and enlargement or new ulcerations of the periwound.

deterioration and hospital admission and to improve healing outcomes was also emphasised.

Accurate clinical diagnosis of local wound infection at the point of care is essential, so that use of antibiotics can be reduced, and appropriate topical treatment administered (Edwards-Jones et al, 2021).

RISK FACTORS AND SIGNS AND SYMPTOMS OF WOUND INFECTION

Jeanette then further discussed the risk factors and signs and symptoms of wound infection. In immunocompromised individuals and those with chronic wounds, subtle signs may exist such as purulent discharge, erythema and swelling, local warmth, increasing malodour and new or increasing pain, or covert signs of infection (*Box 2*), and these must be identified to detect the presence of infection (IWII, 2016).

It is important to note that early 'soft signs' of deterioration and sepsis should also be recognised, and appropriate action taken to prevent a patient from serious illness. Soft signs are early indicators that a patient may be becoming unwell and subtle changes may be obvious to families/carers such as in a person's behaviour, manner or appearance. Types of soft signs can be related to a person's physical presentation (e.g. shortness of breath, reduced urine, unsteadiness when walking), mental state (e.g. feeling more anxious/agitated, more withdrawn than normal) or behaviour (e.g. altered sleep patterns, increased tiredness/restlessness).

Clinicians should demonstrate good practice

by asking patients to express how they are feeling and by encouraging families/carers to share any soft signs that they may have spotted. A note of soft signs should be made in the patients record for future reference and any concerns escalated.

Selecting therapeutic treatments must be based on the individual patient, their wound/wound bed, and the severity of infection, and should be augmented with use of the National Early Warning Score (NEWS)2 in the acute perspective or Community National Early Warning Score (CNEWS) in the community. The Midwifery Early Warning Score (MEWS) or Paediatric Early Warning Score (PEWS) may also be used depending on the patient group.

A holistic assessment of patient presenting factors, local wound factors and environmental and past medical history alongside soft signs and scoring will help clinicians to decide the most appropriate treatment choices. Treating infection appropriately (and as early as possible) can prevent severity of infection, improve patient quality of life and overall outcomes, as well as reduce resource use and costs to healthcare systems (Wounds UK, 2021).

The second edition of 'Wound Infection in Clinical Practice' (IWII, 2016) was launched as an update of the first edition published in 2008 by the World Union of Wound Healing Societies (WUWHS, 2008). The IWII (2016) consensus presents clinical signs and symptoms within the wound infection continuum describing the gradual increase in the number and virulence of microorganisms, together with the response they

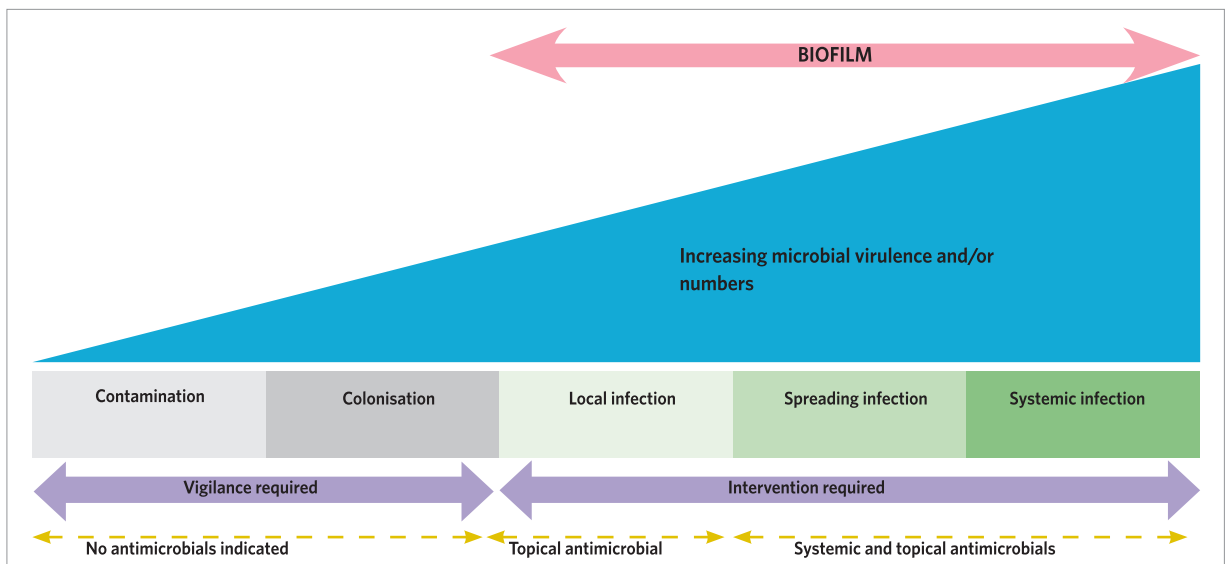
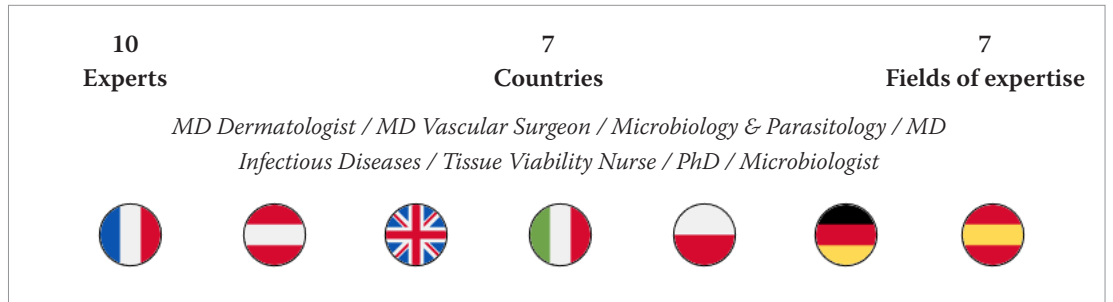


Figure 1. IWII wound infection continuum (IWII, 2016)

Figure 2. Panel of wound experts involved in the development of the Therapeutic Index for Local Infection (TILI) score



invoke within the host (Figure 1).

Bacteria can be found in all wounds but at the contamination/colonised stage no action is required other than vigilance. When there is a localised, spreading or systemic infection it is important to: identify signs and symptoms, act quickly and initiate early intervention, increase the frequency of dressing changes and reduce the number of microbes in the wound. Biofilms play a major role in delaying chronic wounds from healing and it may be necessary to consider an early antibiofilm intervention strategy. The importance of acting quickly with patients who may have multiple comorbidities was emphasised as this can potentially affect wound healing.

The basic principles representing the four cornerstones of treatment that should be applied to all wounds where infection is suspected, or has become an issue, are:

- 1. Pathophysiology** — look at what is causing the wound and address underlying comorbidities
- 2. Wound bed preparation** — remove the barriers to enable healing
- 3. Cleansing (wound, periwound and limb)** — cleanse regularly and within the patient's tolerance
- 4. Infection management/antibiofilm strategies** — identify infection, ascertain the type of infection and decide on the appropriate action to take.

INTRODUCING THE TILI SCORE

A panel of wound experts from different countries (Figure 2) proposed an easy-to-use clinical score for the early detection of local wound infection as a basis for an antimicrobial treatment decision. The TILI score can be used by staff of all levels, including those not

specialised in wound care (Dissemond et al, 2020a) and focuses on nine clinical criteria for local wound infection (Table 1; Figure 3):

- ▶ Six of the criteria are indirect indicators
- ▶ Three of the criteria are direct indicators.

If at least five of these six indirect indicator criteria, or at least one direct indicator criteria, is met, this indicates that antiseptic wound therapy could be initiated.

It should be noted that there are also specific health conditions for the individual clinical situation, such as the presence of wound pathogens (i.e. methicillin-resistant *Staphylococcus aureus* [MRSA]), a septic surgical wound or the presence of free pus, or cases of post-surgical wound infection, which would determine that the wound has a direct indication and requires treatment with an antimicrobial dressing.

When considering the criteria for the TILI system, erythema (generally defined as redness) of

Table 1. Indirect and direct indication for antiseptic wound therapy
Indirect indication
Erythema to surrounding skin
Heat
Oedema, induration or swelling
Spontaneous pain or pressure pain
Stalled wound healing
Increased and/or change of colour or smell of exudate
Direct indication
Presence of wound pathogens
Surgical septic wound
Presence of free pus

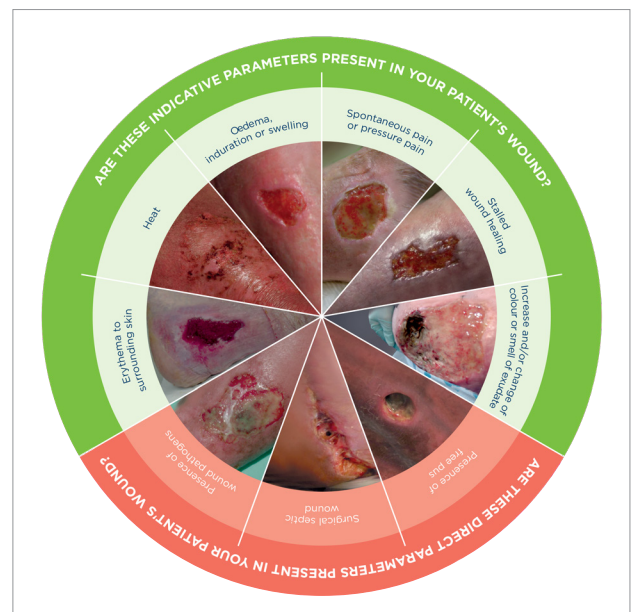


Figure 3. The TILI score — a tool for the detection of local wound infections

the surrounding skin should be observed, as this may present differently depending on the patient's skin tone.

THE TILI SCORE IN PRACTICE

The TILI score has been validated and found to be sensitive, specific and suitable for use in practice: the criterion validity, which measures the validity of the TILI score compared with the current gold standard,

was analysed to confirm that the score correctly classified local infection and confirmed the need for antimicrobial therapy (Dissemond et al, 2020b).

In clinical practice, assessment for the presence of wound infection should be made according to a structured, evidence-based framework such as the TILI score. The pathway (Figure 4) also incorporates the National Early Warning Score (NHSE Patient Safety Alert, 2018), highlighting the importance

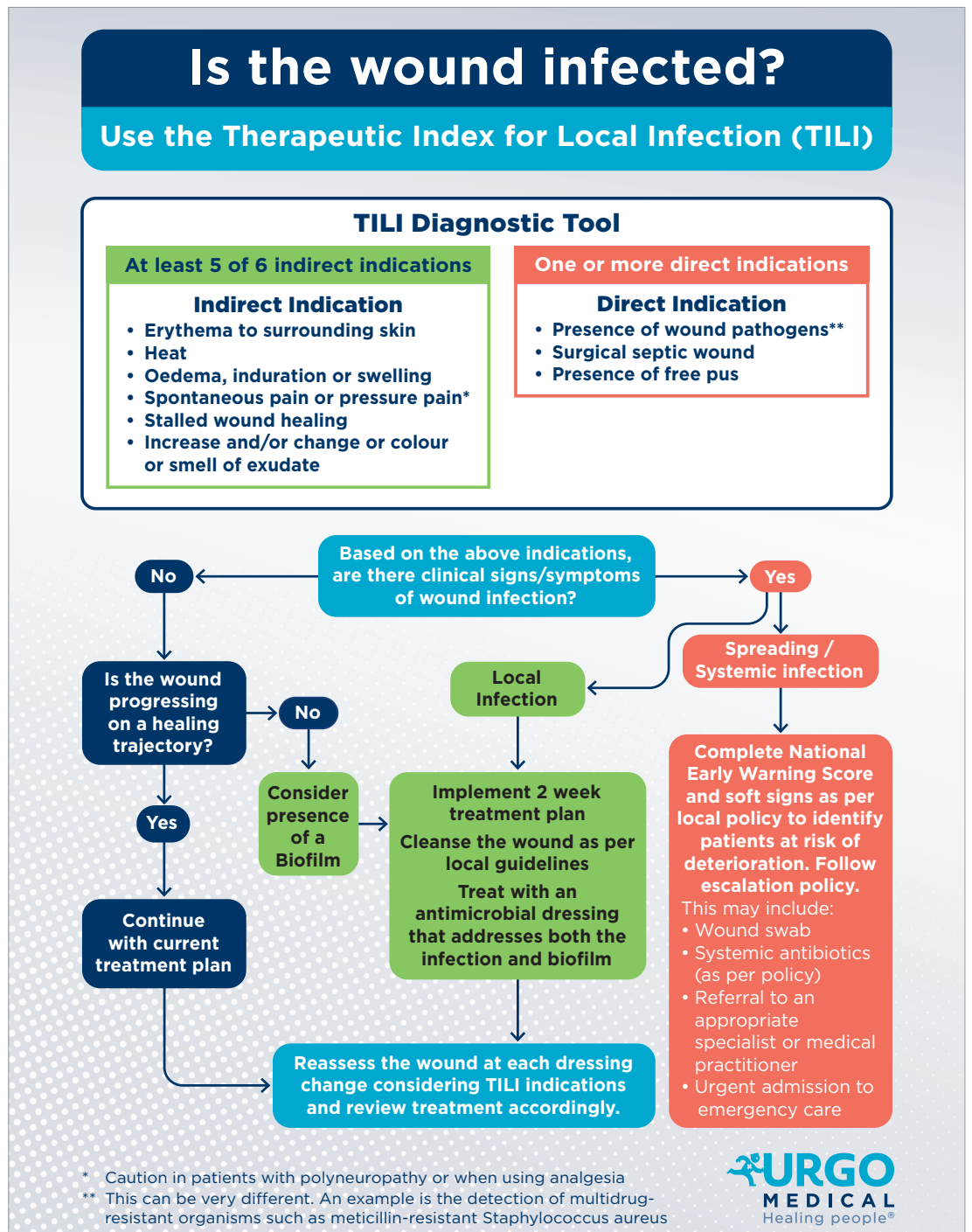


Figure 4. Pathway for use of the TILI score in practice

of early recognition of, and response to, 'soft signs' indicating physical deterioration of the patient and enabling early escalation intervention.

CALCULATE THE SCORE

A case study was presented to the delegates (Figure 5); they were required to calculate the TILI score and discuss what clinical criteria had guided their decision-making.



- Elderly male
- Venous leg ulcer of 48-months' duration
- In compression
- Increased change of colour/smell of exudate
- No wound pain
- No systemic symptoms.

Figure 5. Venous leg ulcer

A score of three was decided for this patient due to the indirect indications of oedema (minimal), stalled wound healing and change of colour/smell of exudate. This score does not indicate that antiseptic wound therapy should be initiated; delegates were encouraged to consider the following:

- » What is the patient's most recent ankle-brachial pressure index (ABPI) assessment?
- » What compression therapy is the patient in?
- » Is the diagnosis right? If so, think about an antibiofilm strategy.

CASE STUDY DISCUSSION

Following this, Andrew Sharpe presented several case studies. The first was a 38-year-old female individual who had good macrovascular blood supply but some microvascular complications. Figure 6 shows the wound 2–3 weeks post-op; delegates were asked

to think about whether an antimicrobial might be indicated at this stage, and to use the TILI score to determine clinical criteria for local wound infection.



- 38-year-old female
- Transmetatarsal amputation 2-3 weeks post-op
- Heat, oedema, induration or swelling, pain, stalled wound healing and increased exudate levels/smell of exudate present.
- No wound pain
- No systemic symptoms.

Figure 6. Transmetatarsal amputation

Most delegates agreed that five of the six indirect indications were met (heat, oedema, induration or swelling, pain, stalled wound healing and increased exudate levels/smell of exudate), which indicates that antiseptic wound therapy could be initiated.

For this patient, and in terms of direct indications, sampling for the presence of wound pathogens was undertaken operatively and, although the wound was moving towards a surgical septic wound, covert signs of infection were not identified, and so the decision was made at this stage to use a topical treatment and to closely monitor the wound. Andrew explained that dressing exudate is a useful component in identifying presence of free pus, another direct indication criteria of the TILI score.

The next case was of an elderly male with underlying peripheral arterial disease who presented with a right medial malleolus ulcer of 4 months' duration (Figure 7). The wound had progressed; however, healing had since become stalled. There was no presence of heat, but the wound was painful.



- Elderly male
- Peripheral arterial disease
- Medial malleolus ulcer of 4 months' duration
- No presence of heat
- Wound is painful.
- No systemic symptoms.

Figure 7. Right medial malleolus ulcer

Three of the six indirect indications (erythema to surrounding skin [slight redness], pain and stalled wound healing) and one direct indication (presence of wound pathogens [MRSA]) were met; this indicates that antiseptic wound therapy could be initiated.

GROUP ACTIVITY: IS THE WOUND INFECTED?

Using the case examples on the tables and the TILI score, delegates were asked to decide whether the following wounds (Figures 8–10) were infected. It was noted that picture quality may influence clinical score.

Figure 8 shows a deep tissue injury on the heel where it was clear that one indirect indicator criteria had been met (erythema to surrounding skin); however, as this was a ventilated and sedated patient in intensive care, it was difficult to determine other indicators such as pain or



Figure 8. Case example 1 – Deep tissue injury

whether signs of redness may be due to pressure.

Jeanette explained that this case study was included to show that use of the score in practice cannot replace clinical judgement and all factors need to be considered, including use of the multidisciplinary team. Essentially, clinicians must look at other signs and symptoms that the patient may be becoming unwell.

Figure 9a–c shows the healing trajectory of an elderly female with a venous leg ulcer, caused by a traumatic injury. The patient self-treated the wound at home before seeking medical treatment (Figure 9a). For this patient, five of the six indirect indications (erythema to surrounding skin, heat,

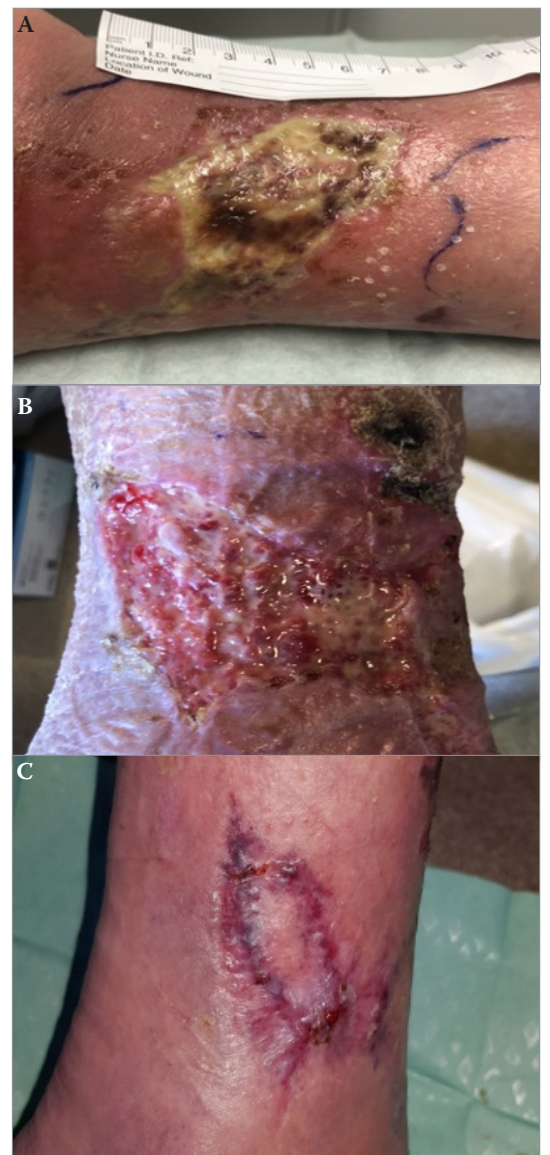


Figure 9. Case example 2 - Venous leg ulcer a) initial presentation b) 2 weeks of treatment c) 6 weeks of treatment

Box 3. Final poll questions and answers**Q1. How easy would you find using the TILI score in everyday practice/patient assessment?****Rotation 1**

Very easy: 39%

Easy: 61%

Not easy: 0%

Rotation 2

Very easy: 7%

Easy: 86%

Not easy: 7%

Q2. How likely would your place of work adopt this TILI score?**Rotation 1**

Very likely: 35%

Likely: 58%

Not likely: 8%

Rotation 2

Very likely: 8%

Likely: 77%

Not likely: 15%

Q3. Is it important to you that this tool is validated?**Rotation 1 and 2**

Yes: 100%

No: 0%

oedema, pain and increased smell of exudate) were met.

The district nurses obtained an ABPI; the wound was debrided; and an antimicrobial dressing was applied and the patient was put into compression. Follow-up was planned for three times a week at week 1.

Figure 9b shows the wound 2 weeks later. An antimicrobial dressing was no longer required; treatment commenced with a TLC-NOSF advanced wound dressing. The wound had completely healed 6 weeks later (*Figure 9c*), and the patient was put into compression hosiery.

This case demonstrates the importance of holistic assessment, considering the appropriate treatment to address underlying venous disease and early intervention with an antimicrobial dressing to restore microbial balance and achieve a positive patient outcome.

Figure 10 shows a diabetic foot ulcer where one of the three direct indications (presence of free pus) was identified. This patient was at risk of hospital admission for intravenous fluid therapy and osteomyelitis was a concern, as well as local wound infection. Topical and systemic antibiotics were required to treat this wound. Initial swabbing and regular review of the antimicrobial regimen in such instances was highlighted.



Figure 10. Case example 3 - Diabetic foot ulcer

CONCLUSION

At the closing of the Made Easy, it was agreed that it would be valuable for colleagues to share experiences and feedback in the workplace to

support use of the TILI score in day-to-day practice. Final poll questions and answers from both rotations can be found in *Box 3*.

The TILI score is a new evidence-based and validated tool for supporting diagnosis of localised wound infection that can easily be incorporated into everyday practice alongside other existing appropriate treatment pathways (Edwards-Jones, 2021).

The score focuses on early intervention with a selective and time-limited use of local antiseptic wound therapy in patients with infected wounds and, therefore, supports an approach informed by AMS. It may be of benefit for clinicians to re-evaluate their infection practice and to incorporate the TILI score into existing infection pathways. For those interested in the TILI score for their organisation, please contact Urگو Medical at www.urgostartplus.co.uk. **WUK**

REFERENCES

- Dissemond J, Gerber V, Lobmann R et al (2020a) Therapeutic index for local infections score (TILI): a new diagnostic tool. *J Wound Care* 29(12):720-5
- Dissemond J, Strohal R, Mastronicola D et al (2020b) Therapeutic Index for Local Infections score validity: a retrospective European analysis. *J Wound Care* 29(12):726
- Edwards-Jones V, Milne J, Sharpe A (2021) *TILI Score Made Easy*. Wounds UK, London. Available from: www.wounds-uk.com/made-easy
- Fletcher J, Edwards-Jones V, Fumarola S et al (2020) *Best Practice Statement: Antimicrobial stewardship strategies for wound management*. Wounds UK, London. Available at: www.wounds-uk.com
- Guest JF, Fuller GW, Vowden P (2020) Cohort study evaluating the burden of wounds to the UK's National Health Service in 2017/2018: update from 2012/2013. *BMJ Open* 10: e045253
- Haggerty JL, Roberge D, Freeman GK, Beaulieu C (2013) Experienced continuity of care when patients see multiple clinicians: a qualitative metasummary. *Ann Fam Med* 11(3):262-71
- International Wound Infection Institute (2016) *Wound infection in clinical practice*. Wounds International, London. Available at: www.woundsinternational.com
- NHSE Patient Safety Alert (2018) *Resources to support the safe adoption of the revised National Early Warning Score (NEWS2)*. Available at: <https://www.england.nhs.uk/publication/patient-safety-alert-safe-adoption-of-news2/> (accessed 29.11.2021)
- World Union of Wound Healing Societies (2008) *Principles of best practice: Wound infection in clinical practice*. An international consensus, MEP Ltd, London
- Wounds UK (2021) *Best Practice Statement: Use of silver in practice*. Wounds UK, London. Available at: www.wounds-uk.com
- World Health Organization (2020) *Antimicrobial resistance*. Available at: <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance> (accessed 26.11.2021)