

Understanding Applied Wound Management

The development of the Wound Bed Preparation and TIME concepts has led to an increased awareness of the need for systematic approaches to wound management. Applied Wound Management (AWM) seeks to develop this approach by utilising three continuums, Healing, Infection and Exudate to facilitate a systematic assessment of wounds healing by secondary intention. This approach not only supports clinical decision making, but, in conjunction with AWM software, also facilitates clinical audit by producing data that reveals the true extent of wounds healing by secondary intention in the UK.

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KEY WORDS

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Systematic approach
Healing
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Exudate

Wound management is a constantly evolving speciality with regular developments in terms of products and knowledge. The most recent advances have seen the introduction of Wound Bed Preparation (WBP; Schultz et al, 2003; Jones, 2004) and the TIME (Dowsett and Ayello, 2004) concepts, which clearly promote the adoption of a systematic approach to wound management. The key principles underlying the concepts (debridement, wound bioburden control, and exudate management), have been recognised as good practice for some time (Dealey, 1994; Sibbald et al, 2000). However, WBP seeks to incorporate these issues into a systematic approach leading

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to appropriate dressing selection. As identified by Jones (2004), this could be described as a paradigm shift and for those active in the field there is a need to work within this new paradigm.

In this paper, the authors present an Applied Wound Management (AWM) framework that utilises three different continuums, each relating to a key wound parameter:

- ▶▶ Healing
- ▶▶ Infection
- ▶▶ Exudate.

Healing is represented by the tissues in the wound and is a colour-based continuum. Infection is subdivided into named stages representing varying host responses to bioburden, each identified by clinical cues. Wound exudate is represented by volume and consistency parameters, and each can be graded according to a 'matrix' continuum. This practical application to everyday wound care will enable the practitioner to approach wound assessment logically and systematically. Increased workloads across the NHS require decision-making to be systematic, clear and coherent. The AWM system aids this type of decision-making, reducing the risk of poor practice and litigation.

Within the UK, little is known of the true extent of wound healing by secondary intention. National average healing rates for leg ulcers and pressure

ulcers simply do not yet exist; in fact, it is very difficult even to estimate how many of these wounds exist in the first place. The AWM framework allows the categorisation of most wounds healing by secondary intention and, if applied in a clinical setting, can facilitate clinical audit, producing data which could define the true extent of wounds healing by secondary intention in the UK.

Using AWM

The Wound Healing Continuum

The Wound Healing Continuum (WHC) is an aid to understanding the type of tissue present in, and the progress of, the wound (Gray et al, 2004). The key is to determine which type of tissue is of primary importance (Figure 1). As the continuum is followed from left to right, i.e. from black to pink, it correlates with the colours seen in a healing wound (Krasner, 1995). Not all wounds will naturally progress in this fashion, but even where wounds deteriorate or oscillate between healing and stasis, the WHC will be capable of recording their status. Not all wounds will exhibit black tissue during their lifetime. ▶▶



Figure 1. The Wound Healing Continuum.

Using the WHC

When using the WHC, first identify the colour that is furthest to the left of the continuum; for example, if the wound contains yellow slough and red granulation tissue, it would be defined as a 'yellow/red wound'. In this instance, the management plan should focus on removal of the yellow sloughy tissue and promotion of the red granulation tissue. As this objective is achieved, so the wound can progress along the continuum towards the right and to 'pink /healing' status.

The Wound Infection Continuum

The wound infection continuum (WIC) is an aid to understanding the level of bacteria present in the wound (i.e. the bioburden), and the level of host response (Kingsley, 2001; White et al, 2003). There are four stages that also progress from left to right with the most severe, 'spreading wound infection' on the far left. The continuum moves to the right through the stages of 'local infection' and 'critical colonisation' to 'colonisation' (Figure 2). Spreading infection (e.g. rapidly increasing cellulitis) can be a life-threatening condition. The principal visible clinical cue is a rapidly advancing redness

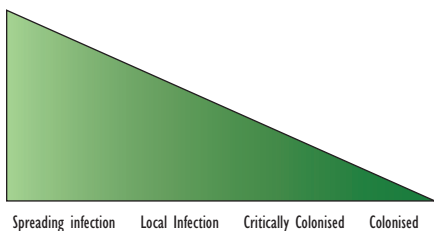


Figure 2. The Wound Infection Continuum.

Volume	Viscosity		
	High 5	Medium 3	Low 1
High 5			
Medium 3			
Low 1			

Figure 3. Exudate Continuum.

(greater than 2cm around the wound margin), which may be accompanied by other signs and symptoms, notably pain, and often includes very high exudate levels, malodour, and, in the surrounding tissues, heat, swelling, and blistering. Local infection is characterised by less than 2cm of redness around the wound margin, sometimes with symptoms similar to spreading infection being present but to a lesser degree (Kingsley, 2003).

Critical colonisation, a term first coined by Davis in 1998, is now an accepted state (Kingsley, 2003; Cooper, 2005; Jorgensen, 2005) characterised by delayed healing, with malodour, raised exudate levels and slough often being present. However, the wound will not present as if locally infected, so there will be an absence of surrounding cellulitis (Cutting, 2003; Kingsley, 2003; Scanlon, 2005).

It is important to understand that bacterial colonisation, which is a state of host manageable bioburden, is normal in a wound healing by secondary intention and does not hinder progression towards closure at expected rates (Bowler, 2002; 2003). Therefore, the term 'colonisation' on the infection continuum describes a wound that is free of untoward or unexpected symptoms for a healing wound (e.g. tenacious slough, excessive wetness, malodour, dull granulation, etc) and is actively improving. A clearly visible reduction in the wound size over a two-week period would suggest an acceptable level of colonisation (Flanagan, 2003).

Using the WIC

The WIC is a simple sliding scale that can be used as an aid to clinical decision-making regarding the level of bacterial colonisation of a wound (Cutting, 2003; Scanlon, 2005). A wound may never move from the furthest point to the right on the continuum, 'colonisation', during the entire treatment period up to healing. However, where a patient is identified as having a wound which has a spreading or localized infection, or a critical colonisation, consideration

should be given to addressing these states when developing a wound management plan.

The Wound Exudate Continuum

The Wound Exudate Continuum (WEC) (Figure 3) is an aid to estimating both the volume and viscosity of wound exudate. Traditionally, wound exudate has been considered in terms of its volume with only little thought given to its viscosity. However, the viscosity of the exudate can be an important indicator of the wound's status (Vowden and Vowden, 2004). The gradings for both parameters are:

- ▶▶ High
- ▶▶ Medium
- ▶▶ Low.

This allows wound exudate to be categorised by a score, e.g. a low volume and of medium viscosity would be a 'Low/Med' category and would score 4, placing it in the low exudate portion of the continuum. Any score falling in the green zone should be seen as advantageous to wound healing. Any score in the amber zone would only cause concern if the previous recording had been green, but not if the previous recording had been red: in this case, an amber reading would demonstrate a step in the direction of healing. A score in the red zone should be investigated further as this may indicate local or spreading infection.

Using the WEC

To use the Wound Exudate Continuum (WEC), the exudate in the wound and on the dressing should be assessed. The number of dressing changes required over a 48-hour period should also be considered. Any wound assessed as having both high viscosity and a high volume of wound exudate would score a full ten points and be regarded as a cause for serious concern. Such a wound may indicate a spreading infection, sinus or fistula formation or some other cause for concern. Any wound scoring 6 points would be regarded as requiring regular review. It might be that this finding is entirely consistent with the treatment applied, e.g. the liquefying of wound slough. In this case, the wound may have

previously been scored in the red zone and, as such, a score of 6 would indicate an improvement. If a wound had previously scored between 2–4 points, but was then graded in the amber zone (i.e. scoring 6 points), this could be an early sign of critical colonisation, or, of the development of a wound infection and should be acted upon accordingly.

Wound type

Most wounds can be categorised into one of six different types:

- ▶▶ Pressure ulcer
- ▶▶ Leg ulcer
- ▶▶ Diabetic foot ulcer
- ▶▶ Surgical wound
- ▶▶ Trauma wound
- ▶▶ Complex wound.

Before embarking on a plan of care for a person with a wound, it is vital that the cause of the wound is identified and treated if required, e.g. all leg ulcers should be assessed using national guidelines. Failure to do so can lead to delayed healing and potentially damaging complications. A paper written to support the AWM framework provides more detailed information (Cooper et al, 2003).

Using AWM in the clinical setting

Following the application of the three continuums, the wound can be defined in terms of:

- ▶▶ Tissue/colour (WHC)
- ▶▶ Bioburden/host response (WIC)
- ▶▶ Exudate volume/consistency (WEC).

It is at this stage that consideration must be given to the cause (aetiology) of the wound. Such an assessment would, for example, in the case of a heel pressure ulcer, necessitate a very different form of management/treatment than if it were a leg ulcer or a diabetic foot ulcer. Each wound would require treatment/management relevant to the underlying pathology, despite recording the same initial results following AWM assessment by the three continuums. To summarise, when using AWM, assess:

- ▶▶ Healing (WHC)
- ▶▶ Bioburden (WIC)
- ▶▶ Exudate (WEC)

- ▶▶ Wound type/aetiology
- ▶▶ Underlying pathology.

Table 1 gives further examples of this type of decision making and two cases studies will now be presented that illustrate the use of the AWM framework:

AWM case studies

Case study 1

An eighty-five year old male was admitted to orthopaedics with a fractured neck of femur. On assessment he also presented with a partial-thickness dermal burn to his left shoulder blade area. The wound measured 12cm x 5cm on initial assessment.

WHC

Figure 4 illustrates the wound presenting with a deep dermal burn of black/yellow tissue, which needs rehydrating to facilitate the debridement of the devitalised tissue.

Figure 5 demonstrates an improvement in the wound bed condition, with debridement of necrotic tissue. However, the wound healing continuum still demonstrates that there is black/yellow/red and pink tissue present. Of primary importance is the black tissue, followed secondly by the yellow. The treatment aim is to focus on the debridement of the black/yellow tissue by rehydration.

WIC

The wound infection continuum gives the reader the opportunity to consider if the wound has altered healing due to the presence of bacteria. In both images there are no signs of local or spreading infection. The wound is progressing and improving, ruling out any form of critical colonisation. However, the wound is a chronic wound which was caused by a burn, therefore the wound will be colonised, but this will not inhibit healing.

WEC

Review of Figures 4 and 5 show that there are low volumes of exudate with low viscosity. This indicates that exudate



Figure 4. Burn at presentation.



Figure 5. Burn at first review.

management is not a problem with this wound and can be categorised as 'low'. However, to facilitate debridement, a degree of moisture should be provided by the dressing. Once black/yellow tissue begins to soften there may be an increase in the levels of exudate, but this does not indicate an infection according to the wound infection continuum.

Summary

In summary, the wound presents as 'black/yellow', therefore requiring debridement. The wound is 'colonised', with 'low' exudate levels and 'low' viscosity. The wound should be managed by application of a dressing which facilitates debridement by providing a moist environment (i.e. autolytic), but is not required to absorb exudate or to have any antimicrobial properties.

Case study 2

A 75-year-old female who was cared for in a long-term care of the elderly

Table 1
Clinical application of Applied Wound Management

Wound continuum	Treatment objectives	Patient assessment	Wound type	Management plan	Treatment
Figure 6 Healing=Black Infection=colonised Exudate=low/low	Debride Maintain Hydrate	A frail individual with a poor overall condition due to CVA. Poor prognosis	Pressure ulcer to heel	Rehydrate and debride necrotic tissue on heel Prevent further damage by utilising a heel protector device	Hydrocolloid: change every 5-7 days, or sheet hydrogel change every 2-3 days, or amorphous hydrogel change every 2 days Heel protector in situ at all times
Figure 7 Healing=Yellow/red Infection=locally infected Exudate=Low/medium	Debride /promote granulation Reduce bacterial load	As above	As above	Debride tissue while promoting granulation Manage local infection/ prevent spreading infection	Alginate/hydrofibre with antimicrobial properties or Cadexomer iodine or honey ointment Absorb exudate Absorbent foam dressing to cover

unit following a cerebral vascular event, presented with a pressure ulcer to her right heel, which occurred due to a deterioration in her physical condition, despite all available preventative strategies being deployed.

WHC

According to the WHC, *Figure 6* is clearly defined as 100% black necrotic tissue. Therefore, the initial management of this wound is to facilitate debridement of this devitalised tissue. *Figure 7* shows that debridement of the black tissue has occurred and that the wound now presents as a yellow/red wound. The colour of importance is now yellow, with debridement of the yellow tissue pivotal to the wound's ongoing progress. The presence of red tissue indicates that the wound is reaching a stage where debridement can stop and stimulation of granulation can occur.

WIC

The initial picture is of a moist black wound. There are no clinical signs of infection, but the wound is malodorous. The odour is due to the presence of anaerobes, but does not indicate that the wound is infected. In fact, the wound is colonised because, as yet,



Figure 6. Heel ulcer at presentation.



Figure 7. Heel ulcer at first review.

no healing delay has occurred. *Figure 7* shows a wound that is critically colonised – categorised as such since it has stayed in this 'dormant' condition for a number of weeks without any sign of improvement. The treatment required is the application of a topical antimicrobial, to reduce the bioburden and to 'kick-start' the healing process. No systemic antibiotics are necessary.

WEC

The wound started off with low levels of viscosity exudate, scoring as 'low' on the continuum, but, as the wound progressed, the levels and the viscosity increased to warrant a 'medium' score. This change in exudate should act as a prompt to the clinician that a change has occurred, and a review of current treatment should be triggered. The wound is 'critically colonised' according to the WIC and, therefore, treatment with an antimicrobial should be commenced. As there is an increased level of exudate, an appropriate absorbent secondary dressing should be considered.

Summary

In summary, the wound started off as a 'black wound' with no infection ▶▶

and minimal exudate. As debridement proceeded, the wound changed to a 'yellow/red wound' that was critically colonised due to non-healing and the presence of bacteria; this led to an increase in the levels of exudate.

Discussion

At the centre of the AWM framework is the WHC. This has attempted to address the shortcomings of previous colour-based assessment tools. It recognises the variance in colour and requires the practitioner to rate the wound according to the colour closest to the left of the continuum. The WIC is aimed at providing a structure and logic to wound bioburden assessment as, with the WHC, the aim is to move the wound status to the right of the continuum. The WEC addresses exudate as an indicator of the wound condition and needs the user to rate both the viscosity and volume of the exudate. Once this assessment has been completed, the exudate rating will fall into one of three categories, giving an indication as to the wound's underlying condition. When all three continuum ratings are taken together, they provide the practitioner with a clear, logical and coherent assessment of the condition of the wound. Only when these three assessments are considered in light of the type of wound, its underlying pathology, and the key principles of its management, can the practitioner design an appropriate treatment/management plan.

Conclusions

The principles of WBP and TIME are now recognised as new paradigms in wound management, and it is up to those active in the field to interpret these concepts in a manner relevant to their own clinical practice. The AWM framework is the authors' response to the need to develop a more systematic and practical approach to wound assessment.

The AWM system can be of benefit to those less familiar with wound healing/management by introducing a systematic approach to decision making. For the specialist practitioner, utilising the framework

facilitates clinical audit and the supporting software can generate relevant clinical data. Whatever the level of knowledge of the practitioner, the AWM system can facilitate systematic clinical decision making and clinical audit of practice. **WUK**

Key Points

- ▶▶ Wound healing/management requires a more systematic approach to ensure high standards.
- ▶▶ AWM can facilitate clinical decision making for those less familiar with wound management.
- ▶▶ AWM supports clinical audit of benefit to the specialist practitioner.

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