

Antimicrobial stewardship in diabetes-related foot ulcers; development and evaluation of a pathway implementing guideline recommendations using microbial-binding dressings for infection prevention, early intervention and treatment

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Background

Antimicrobial resistance (AMR) is a growing concern in diabetes-related foot ulcers (DRFU) with prevalence of multi-drug-resistant organisms as high as 63%.¹

Topical antimicrobial dressings are not recommended for treatment of diabetes-related foot infections (DRFI),² however a recent survey found 41.8% of healthcare professionals managing hard to heal wounds used antimicrobials prophylactically, while 37.2% did not follow antimicrobial stewardship (AMS) guidance, indicating a gap in best-practice.³

Early diagnosis and treatment are essential to minimise delayed healing and complications, improving outcomes. This should be balanced with a reduction of inappropriate use of antimicrobials to minimise AMR.

Widely supported by clinical evidence, microbial-binding dressings (MBD), with a Dialkylcarbamoyl chloride (DACC) coating, physically binds bacteria and fungi, and are a validated option for infection prevention and control (IPC) in DRFI to manage bioburden before antibiotics are indicated.⁴⁻⁸ Figure 1 highlights the differential mode of action of MBDs compared to antimicrobials such as antibiotics, antiseptics.

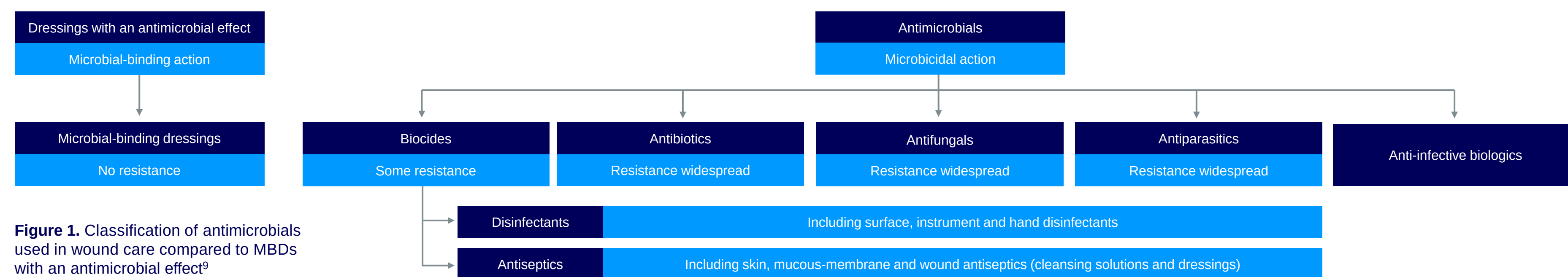


Figure 1. Classification of antimicrobials used in wound care compared to MBDs with an antimicrobial effect⁹

	CLINICAL EVIDENCE	14 evidence-based statements on: - Challenges of wound infection and AMR - Benefits of MBD for IPC - Early IPC in future AMS strategies
	CLINICAL GUIDELINES	Evidence-based guidance on: - Assessing and managing surgical and hard-to-heal wounds - AMS-aligned early IPC and treatment with MBDs
	CLINICAL PATHWAYS	Four pathways covering: - Closed surgical incisions - Diabetes-related foot ulcers - Hard-to-heal wounds - Venous leg ulcers

Objectives

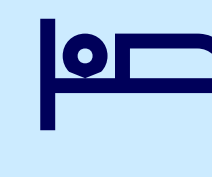
To translate evidence-based recommendations⁹ on the role of MBDs in AMS in wound care into practical simplified guidance on early intervention with MBDs and to evaluate its impact to prevent, control and treat wound infection, supporting more appropriate use of antimicrobials in DRFU.

Methods

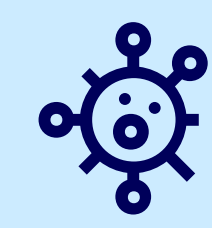
An evidence-based clinical pathway was developed, incorporating the use of MBDs combined with current best-practice for DRFU. This pathway was evaluated clinically to support implementation of recent guideline recommendations and practical application of MBDs in the management of DRFUs, key aspects of the guideline are summarised in Figure 2 below. The evidence-based AMS for DRFU pathway, published as part of the guidance, is shown in Figure 3. Two clinical centres in the UK and Portugal evaluated the pathway to manage complex DRFU with the cases presented.



Infection **increases** the risk of **hospitalization, amputation, and death** in DRFU patients¹⁰



80% Hospital admissions in DRFU attributable to infection¹¹



Polymicrobial infections reported in **40.5%** DRFU patients¹²



Gram-negative pathogens isolated from DRFU resistant to carbapenems (**41%**), colistin (**49%**) and 3rd and 4th generation cephalosporins (**45%**)¹ ESBL rate for *Escherichia coli* reached up to **66.7%** in DRFU¹²



Evidence review with certainty assessed for certainty using GRADE tool and their importance in the context of IPC and AMS along with key statements scored using a Delphi based approach can be explored further in the full international guideline⁹

Figure 2. Summary of International guideline on AMS and the role of MBDs in wound care⁹

ANTIMICROBIAL STEWARDSHIP PATHWAY: DIABETES-RELATED FOOT ULCERS

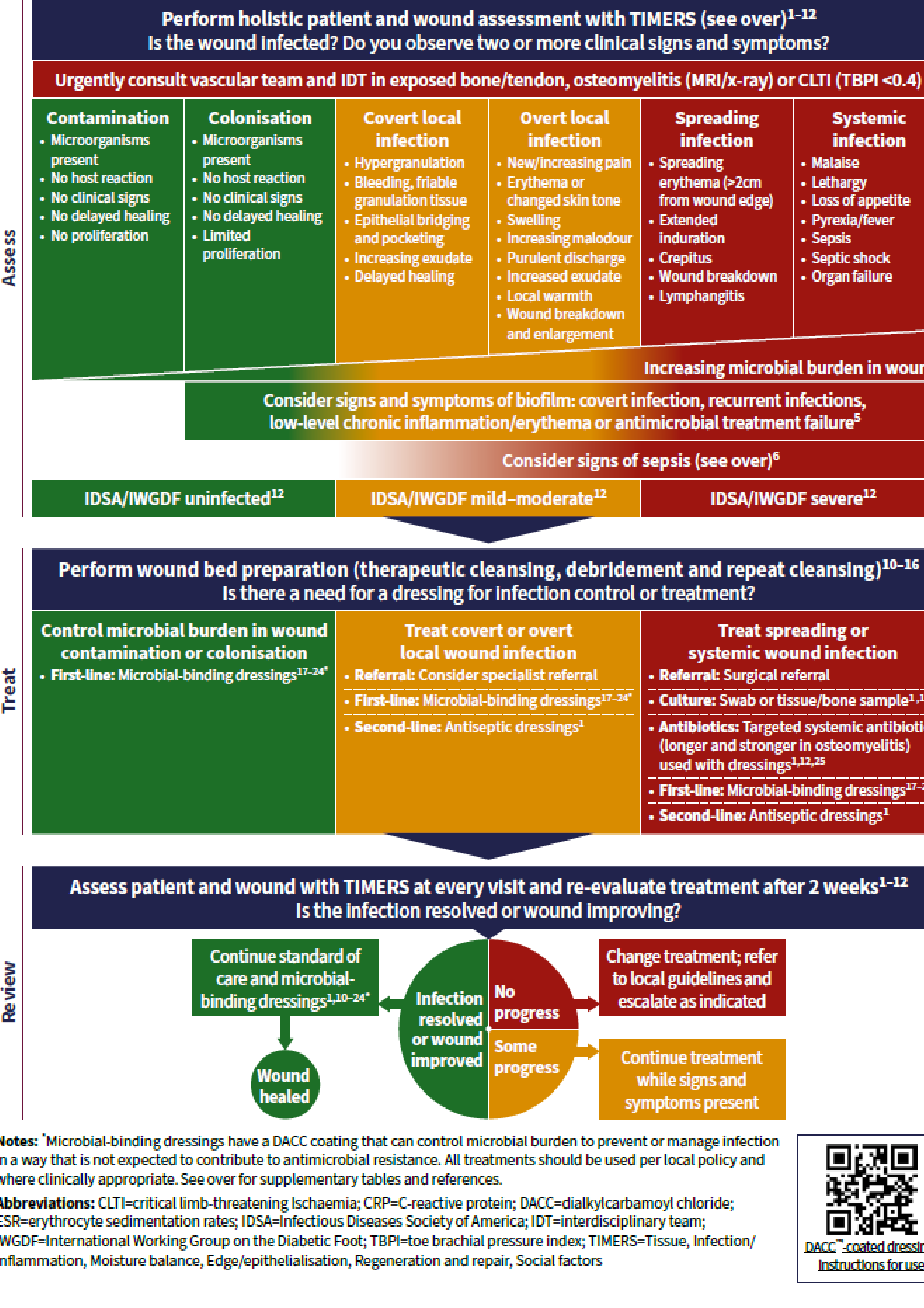


Figure 3. Evidence-based pathway to guide decision making for AMS in DRFU⁹

Conclusions

The AMS-DRFU pathway aids early management of bioburden and infection while reducing inappropriate use of active antimicrobial agents, reserving antibiotics for severe infections, thus minimising the potential for AMR and strengthening AMS across DRFU care.

Proactively incorporating MBDs into DRFU wound care protocols early, before antimicrobials are indicated, supports a positive shift in best-practice, resulting in effective IPC and treatment, allowing wound healing to progress.

DRFU AMS pathway evaluation; CASE 1*

Dr George Smith, Vascular consultant Hull York Medical School

DAY 1
Assessment & appropriate treatment



• **Patient:** 61-year-old male DRFU right foot, lateral
• **Comorbidities:** type 2 diabetes, hypertension and peripheral arterial disease, former smoker
• **Medications:** anticoagulant, antiplatelet and antihypertensives
• **Wound - TIMERS:** Area 84 cm², 1.5 cm depth
• **Tissue:** 15% necrotic, 35% slough and 50% granulation, **Infection:** malodour, friable granulation tissue and delayed healing, **Moisture:** Low serous exudate, **Edge:** Undermining
• **Previous treatments:** polyhexanide cleanser, Silver hydrofiber, debridement of limb-threatening infection
• **Decide appropriate treatment:** **Local infection**, PHMB cleanser, autolytic debridement (patient refused sharp), MBDs (2x weekly) to control bioburden & malodour

DAY 14
Review progress



• **Tissue:** Area 84 cm²: resolution of friability, 15% necrotic, 45% slough and 40% granulation
• **Infection:** Infection stabilised
• **Edge:** undermining improving, attached
Continue with cleansing and MBDs (2x weekly)

DAY 41
Review progress



• **Tissue:** Area 70cm², 5% necrotic, 20% sloughy tissue; 5% epithelial, 70% granulation
• **Infection:** malodour reduced
• **Moisture:** exudate controlled
• **Edge:** attached advancing
Stepped down to cleansing with water and MBD

DAY 78
Review progress



• **Tissue:** Area 66.5cm², 0.8 cm depth, 5% necrotic, 20% sloughy tissue; 5% epithelial, 70% granulation
• **Infection:** no malodour
• **Moisture:** exudate controlled
• **Edge:** advancing

DAY 105
Review progress



• **Tissue:** Area 32cm², 0.5 cm depth, 0% necrotic, 10% sloughy tissue, 40% granulation, 50% epithelial
• **Infection:** infection resolved
• **Moisture:** exudate controlled
• **Edge:** advancing

DAY 131
Review progress



• **Tissue:** Area 19.5 cm², depth of 0.5 cm, 0% necrotic, 5% slough, 35% granulation and 60% epithelial
• **Infection:** signs and symptoms of infection resolved
• **Edge:** advancing

Outcome: excellent healing once necrosis and bioburden/ biofilm addressed

*For both cases, written informed patient consent was obtained to use anonymised clinical data and images

DRFU AMS pathway evaluation; CASE 2*

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DAY 1
Assessment & appropriate treatment



Patient: 53-year-old male, DRFU right foot, plantar
• **Comorbidities:** type 2 diabetes, chronic kidney disease, heart failure, peripheral arterial disease (right ABI 0.5–<0.8), current smoker and obese
• **Medications:** Oral anti-diabetic medications and Insulin, anticoagulant and antihypertensives
• **Wound:** Area 0.5 cm², Depth 1 cm, DRFU Neuroischaemic (WIFI 3), with bony deformity, loss of protective sensation, **TIMERS:** **Tissue:** 100% granulation **Infection:** high bioburden, delayed healing, **Moisture:** moderate serous exudate, **Edge:** unattached, undermining
• **Previous treatments:** saline cleansing, iodine foam and silver dressings
• **Decide appropriate treatment:** **Covert local infection**
Hypochlorous acid solution cleanser, sharp debridement, MBD swab/ contact dressing to reduce bioburden and allow healing to progress

DAY 8
Review progress



• **Tissue:** Area 0.5 cm², Depth 1 cm, 100% granulation tissue
• **Infection:** delayed healing, bioburden reducing
• **Moisture:** moderate serous exudate
• **Edge:** unattached, undermining
Continue treatment strategy

DAY 28
Review progress



• **Tissue:** Area 0.09 cm² increased epithelial tissue
• **Infection:** no clinical signs or symptoms of infection
• **Moisture:** moderate serous exudate
• **Edge:** unattached, undermining
Continue treatment strategy

DAY 51
Review progress



100% re-epithelialised
• **Tissue:** 100% re-epithelialised
• **Infection:** no clinical signs or symptoms of infection
• **Moisture:** dry
• **Edge:** healed

Outcome: wound healed, no antibiotics required

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