Consensus guidance for the use of debridement techniques in the UK

In Autumn 2010, a multidisciplinary group of clinicians met in Manchester to discuss the issue of debridement in wound management. There are various debridement techniques available in the UK, but facilities and skills vary. This paper, resulting from the meeting, briefly outlines the differing techniques used, the levels of skill required to use them and the wound types for which they are appropriate. It is important that clinicians practising debridement are aware of the variations in method, and the limitations of their own skills and competency so that, if appropriate, the patient can be referred to receive timely and appropriate intervention.

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The role of debridement within wound management is well recognised, but there is a lack of standardised guidance on debridement practice in the UK. There is a great disparity in the techniques used and the facilities available. An informal survey of tissue viability nurse specialists (TVNS) carried out by Fairbairn et al (2002) highlighted these issues in the area of sharp debridement. Although many of the TVNS questioned responded that they carried out sharp debridement regularly, their definitions of sharp debridement, the site and extent to which they debrided wounds, their experience and training all varied widely (Fairbairn et al, 2002).

All authors were members of the consensus meeting panel; * Chair of the panel. Full author details in *Box 1*

Flanagan (1999) commented that there was little time for reflection on practice and many clinicians performed ritualistic practice. This is even more evident in today's pressurised work place. In terms of debridement, this can mean that practitioners may operate within their own range of competency (which for many will be autolytic debridement), but this may not be the most appropriate method for an individual patient or their wound. There is a skill in choosing the right debridement method at the right time. Upskilling practitioners in the most recent advances in debridement tools and techniques will help to ensure that the appropriate and optimum treatment options are implemented, thus improving patient care and clinical outcomes.

Agreement was reached at this meeting that more guidance in wound debridement was needed, and that a document outlining debridement strategies would assist practitioners to address clinical need.

A multidisciplinary group of clinicians (*Box 1*) held a consensus meeting in the autumn of this year to discuss the issues surrounding the use of wound debridement in the UK.

Agreement was reached at this meeting that more guidance in wound debridement was needed, and that a document outlining debridement strategies would assist practitioners to address clinical need. It is important that practitioners are knowledgeable about the different types of debridement available and the level of skills and training required to use them in clinical practice. It was also agreed that clinicians should be able to recognise the indications and contraindications of the various methods, and the limitations of their own skills and competency, so that timely and appropriate referral can be made in order that the patient receives the most appropriate treatment for their wound and general health status.

As with any area of practice, healthcare practitioners are responsible for ensuring that they are competent before undertaking a task such as sharp debridement.

This document briefly outlines the differing techniques used in the UK, explains the level of skill required, and the patients and wound types on which they can be used.

Wound debridement

The importance of debridement in wound management is well known, and its role in the preparation of the wound bed to promote healing is recognised (Falanga, 2001; Gray et al, 2006; Wolcott et al, 2009). Debridement occurs naturally in wounds and studies indicate that if the process is accelerated, healing will be achieved more quickly (Steed et al, 1996).

Debridement is considered to be a beneficial component of wound management because:

- The presence of devitalised tissue within the wound may mask or mimic signs of infection (O'Brien, 2002)
- Necrotic tissue may serve as a source of nutrients for bacteria, particularly anaerobes such as Bacteroides species and *Clostridium perfringens* (Leaper, 2002)
- Devitalised tissue acts as a physical barrier to healing (Kubo et al, 2001) and could prevent the effectiveness of topical preparations such as antimicrobial agents, pain relief and steroids, and may impede normal matrix formation, angiogenesis, granulation tissue formation and epidermal resurfacing (Weir et al, 2007)
- The presence of necrotic or devitalised tissue contributes to the stimulus to produce inflammatory cytokines which can promote a septic response (Leaper, 2002), and can also lead to the overproduction of matrix metalloproteases (MMPs) (Weir et al, 2007)
- The presence of necrotic tissue within the wound which may impair healing and lead to an exaggerated inflammatory response, may prevent the clinician from gaining an accurate picture of the extent of tissue destruction, thus inhibiting the clinician's ability to assess the wound correctly (Vowden and Vowden, 1999a; Leaper, 2002; Weir et al, 2007). This may be of particular significance in pressure and diabetic foot ulcers, where the extent of the wound may be underestimated due to the presence of necrotic tissue.

BOX 1

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It is, therefore, important that necrotic tissue is removed as quickly and efficiently as possible to reduce bioburden and prevent infection (Ayello et al, 2004), promote wound closure and to assist with wound assessment (Reid and Morison, 1994).

Wound debridement should be an integral element of good wound care, as outlined in the *Best Practice Statement: Optimising Wound Care* (2008).

It is helpful to have a structured approach to the assessment, diagnosis and management of any type of wound. *Figure 1* presents the key stages of assessing and managing a patient with a wound, placing the patient and their needs at the centre of all decisions. The circular nature of the diagram shows that the patient must remain in the centre of the pathway, undergoing continual review of their treatment and wound progress. On review, treatment objectives may change according to the findings and, if so, the patient will require reassessment and the setting of new objectives, etc, continuing around the pathway until the desired outcomes are achieved. The patient may leave and re-enter the pathway at any point, for example, the patient may need specialist referral and leave once a diagnosis has been established, re-entering the pathway at the implementation of treatment.

Managers and service providers can also use the pathway, enabling their organisation to embrace workforce planning and allocate resources in a logical and structured way.

By using this pathway, the delivery of routine or ritualistic debridement can be avoided and optimal debridement that is tailored to the individual and their wound can be delivered.

As part of patient assessment, the practitioner should consider the risk that the devitalised tissue presents to the patient and if there is a need to ensure rapid debridement. Equally, attention should be paid to the patient's overall condition which may rule out surgical debridement but indicate one of the other rapid methods. In the case of a patient who is in the end stages of life and has a wound with devitalised tissue which is malodorous, there may be a strong argument to use a rapid

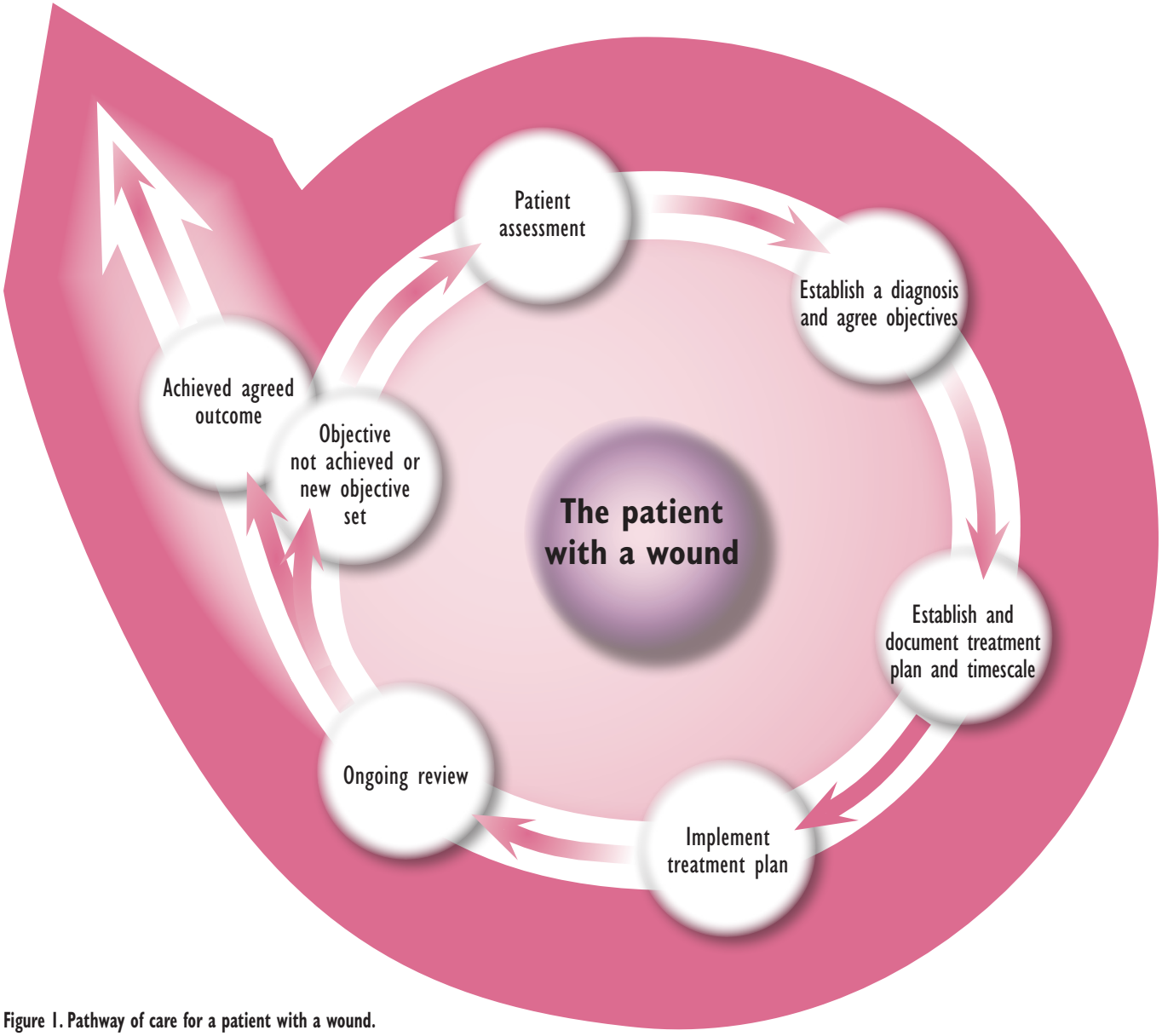

Figure 1. Pathway of care for a patient with a wound.

method to improve the patient's quality of life. Moistening a wound and autolytic debridement may not always be in the interest of the patient. For example, in *Figure 2*, the best action would be to debride the slough at the line of demarcation but not to debride the eschar, and allow the digit to mummify and autoamputate (Vowden and Vowden, 1999b). The decision whether or not to debride should be based upon the steps in *Figure 1*.

Methods of debridement should not be considered to be the realm of the specialist or the generalist, but for all clinicians providing that they have the knowledge base and appropriate clinical skills. It is important that the method of debridement selected is the most effective for the patient and not limited by the skills of the practitioner. If the practitioner lacks the required skills they should seek support from within their own team, or consider further training if the situation is likely to occur frequently.

Before beginning debridement, the practitioner should consider:

1. What he/she hopes to achieve (prevention of infection, removal of non-viable tissue that will delay the healing process, symptom control).
2. How quickly he/she wishes to achieve this. This will be dependent on factors such as the amount of non-viable tissue to be removed, and its anatomical location.
3. How best to debride, and if he/she can perform the procedure or if referral is needed.

Figure 2. Dry necrotic great toe which has mummified following the decision not to attempt autolytic debridement.

By asking these questions, the decision to debride or not, and the method to be used may become clearer.

Access to and availability of skills, clinicians, appropriate products and resources, frequency of care needed and cost-effectiveness will all influence choice.

This article will now focus upon the most commonly used methods of debridement in the UK, namely:

- Autolytic
- Larval
- Mechanical
- Hydrosurgical
- Ultrasound
- Sharp
- Surgical.

Autolytic debridement

Autolytic debridement describes the use of the body's own enzymes and moisture to rehydrate, soften and liquefy hard eschar and slough.

Autolysis of devitalised tissue usually requires a moist, vascular wound environment (Raymundo and Wells, 2000). The use of occlusive and semi-occlusive dressings such as hydrogels, hydrocolloids and films help to keep wound fluid in contact with the necrotic tissue, thus maintaining a moist wound healing environment.

During autolysis, phagocytic cells and proteolytic enzymes soften and liquefy necrotic tissue, so it can be digested by macrophages (Ayello et al, 2004). This is beneficial as the enzymes are selective to necrotic tissue (Dolynchuk, 2001). There is relatively little pain associated with this form of debridement and it is a versatile, easy technique requiring little or no technical skill (Dolynchuk, 2001). However, autolysis can be a slow process so it is contraindicated in the presence of infection, where rapid intervention is indicated. It can also be associated with an anaerobic odour (Dolynchuk, 2001) and may lead to maceration of the periwound skin if the moisture balance is not correct.

Autolytic debridement is used in clinical practice to soften and rehydrate eschar before using other

methods of debridement (Vowden and Vowden, 1999a).

Limitations of this method of debridement are that it is not always a safe method, e.g. the slowness of the process may raise the potential for infection, pain and maceration of the periwound skin. It should also not be used on ischaemic feet.

Autolysis should be used for pre-debridement, e.g. before larval therapy, maintenance debridement, when there is a small volume of tissue and a manageable amount of slough, or if there is a risk of injury if other methods such as sharp debridement are used, e.g. not knowing when to stop sharp debridement. It would be suitable for a simple, uncomplicated wound or a traumatic wound with a scab. Autolytic debridement can be achieved using hydrogels, hydrofibre and hydrocolloids. They may be used in conjunction with antimicrobial agents if there is a risk of, or infection present. However, antimicrobial agents are not the answer to problems related to debridement. Further information on the use of antiseptic and antimicrobial agents can be found in documents by the European Wound Management Association (EWMA, 2006), the World Union of Wound Healing Societies (WUWHS, 2008) and the *Best Practice Statement on the use of topical antiseptic/antimicrobial agents in wound management* (2010).

Key points for autolytic debridement include:

- Most commonly used method of debridement in the UK
- Can be used by both generalist and specialist practitioners
- Use should be based on the patient's assessment, not the practitioner's level of skill
- Appropriate dressings required because of the risk of maceration and/or infection
- Longest treatment time of all methods of debridement
- Softens devitalised tissue and encourages autolysis
- Costs associated with dressings and repeat visits need to be considered.

Larval therapy

Larval therapy is the use of larvae of the green bottle fly to remove necrotic and devitalised tissue from the wound. It is effective, rapid and highly selective and can therefore be regarded as 'micro-debridement' (Vowden and Vowden, 1999a).

There are three mechanisms of action by which maggots work:

- Debridement
- Antimicrobial
- Facilitate healing.

Maggots feed on necrotic tissue. They secrete enzymes which semi-liquefy the tissue into a form that can be ingested (Sherman, 1998). Maggots have a pair of hooks which they use to attach to the tissue, which disrupt cell membranes to facilitate the penetration of their proteolytic enzymes.

Medical maggots are born in sterile conditions and have traditionally been applied to the wound bed with a closed mesh dressing, to prevent the maggots from leaving the wound. However, nowadays, they are usually applied in closed foam bags. They are removed after 48–72 hours of treatment.

Larval therapy is not suitable for all patients. The condition of the wound must be correct to ensure survival of the maggots. For example, the maggots may be squashed by pressure, i.e. if they are used on the heel of an active patient.

Larval therapy is quicker than autolytic debridement.

Key points for larval therapy include:

- Can be applied by competent practitioners with specialist training
- Bagged method reduces the skill required to deliver larval therapy, and can be left *in situ* for 4–5 days
- Larvae need to be ordered in advance but treatment time is short once in place
- Most effective where the devitalised tissue is not dry; softens and liquefies devitalised tissue
- Costs associated with treatment are higher than autolytic debridement, but treatment times are shorter.

Mechanical (wet to dry)

Mechanical debridement is used to describe the process of using dressings that adhere to wounds. These are usually wet-to-dry dressings such as gauze. The top layer of the wound bed dries and adheres to the dressing which is then removed. This is non-selective as, on removal, the dressing takes with it both healthy and unhealthy tissue. Being a non-selective method of debridement, it may traumatise healthy or healing tissue. It can be time-consuming, as it calls for frequent dressing changes and is also painful for the patient.

Ultrasound

There are two types of ultrasound device available in the UK: contact and non-contact. With contact devices the probe used to deliver ultrasound is kept in close contact with the wound bed (Sonoca-185, Söring) and has a built in lavage system which may aid in the reduction of cell debris and bacteria. The Sonoca device has sterile hand pieces.

Using contact ultrasound can have good results; it is immediate, can be used for excisional debridement, is bactericidal at the surface of the wound, and can be used in a variety of settings by trained personnel.

Limitations include lack of or cost of equipment, and trained personnel.

Non-contact, non-thermal low frequency ultrasound (MIST Therapy System, Celleration) delivers ultrasound via an atomised saline solution to the wound bed, without direct contact of the device with the wound or the patient. Benefits are delivered by the effects of streaming and cavitation. It can be used to promote wound healing through cleansing and maintenance debridement through several sessions over time.

Techniques are recommended by individual manufacturers of the device, but training must be undertaken.

Aerosol contamination of the procedures means that clinicians and patients must wear appropriate infection control masks/gowns and the room be decontaminated according to local infection control policy.

When the oscillating ultrasound waves are transmitted through the saline coupling fluid, thousands of micro-sized gas-filled bubbles or cavities are created, which are visible as a mist. As the tip is gently and continuously moved over the wound surface, the bubbles oscillate to create a shearing force against the tissue as the bubbles implode on contact (Tan, 2007).

The gas bubbles test the strength of each cell, and because necrotic tissue has less tensile strength than healthy tissue, the cavitations separate the non-viable proteinaceous material from the wound base (Torke, 2004). In this way, low-frequency ultrasound distinguishes between necrotic and healthy tissue.

Key points for ultrasound therapy include:

- Becoming established in the UK, usually delivered by a competent practitioner with specialist training
- Requires sterilised hand pieces and technology
- Short treatment time, capable of removing most if not all devitalised tissue from the wound
- Appears effective in all tissue types except dry eschar but most suited to superficial slough
- Can be used in all clinical settings but manufacturers' guidelines and infection control policies should be followed (aerosol contamination should be considered)
- Costs associated with sterilising hand pieces and technology required should be considered.

Hydrosurgical debridement

This describes the removal of dead tissue using a high energy water beam. The device used to deliver hydrosurgery delivers a stream of saline via a handpiece at high energy,

turning the saline beam into a cutting implement. If the saline is held parallel to the wound, the cutting mechanism provides a highly controlled tangential excision, whereas if it is held in an oblique position, irrigation and tissue removal is accomplished. The pressure and velocity of the jet can be adapted to regulate debridement; the faster the water, the more effective the cutting technique (Weir et al, 2007).

It is recommended that dry eschar is removed from wounds by sharp debridement before this method is used to remove remaining necrotic debris (Weir et al, 2007).

Key points for hydrosurgical debridement include:

- Established in the UK and usually delivered by a competent practitioner with relevant training
- Can be used in all clinical settings but manufacturers' guidelines and infection control policies should be followed (aerosol contamination should be considered)
- Short treatment time, capable of removing most if not all devitalised tissue from the wound
- Appears effective in all tissue types except dry eschar
- Costs associated with disposable hand pieces and technology required should be considered.

Sharp debridement

Sharp debridement, also known as conservative sharp debridement, refers to the removal of dead or devitalised tissue from healthy tissue using a scalpel, scissors and forceps. It is selective, but does not result in total debridement. While surgeons may debride until the wound bed is bleeding, sharp debridement has a more conservative approach, removing dead tissue to just above the viable tissue level (Fairbairn et al, 2002). This conservative approach is quick and effective, minimises the risk of complications and is considered safe for a wider range of practitioners to undertake in a variety of settings, following training (Preece, 2003). However, some practitioners such as podiatrists may debride to a bleeding wound bed. More than one session may be required. Clinicians must be able to distinguish tissue types and understand the anatomy of the area being debrided (Ayello et al, 2004), since the procedure carries the risk of blood vessels, nerves and tendons being hidden by slough (Tong, 1999).

Wound debridement can play a key role in the promotion of healing, reducing the risk of infection and/or improving patient quality of life.

Sharp debridement is usually undertaken by a doctor with surgical skills, a podiatrist or a competent practitioner with specialist training (Raymundo and Wells, 2000) and can be carried out at the bedside or in a procedure room (Leaper, 2002). It should be performed in an environment that is equipped to deal with any complications that may arise and by a practitioner who is able to deal with them.

It is a quick method of debridement which offers instant results.

Limitations include access to a competent clinician, e.g. if the patient is cared for in a nursing home. It is also not appropriate for certain patient types.

Initial debridement may need follow-up treatments, or may be used in conjunction with other debridement techniques such as autolysis (Edwards, 2000). Repeated minor tissue sparing debridement may be required (Leaper, 2002).

There are variations in technique depending on the site and presentation of non-viable tissue, e.g. in a deep cavity wound.

Sharp debridement in a patient with diabetic foot ulcers is a complex but essential undertaking and should involve a multidisciplinary team approach. Diabetes is associated with small and large blood vessel disease and increased risk of infection and poor healing. There may be underlying neuropathy. Patients therefore need careful assessment and control of their diabetes and infection (Leaper, 2002).

Key points for sharp debridement include:

- Requires a competent practitioner with specialist training
- Requires effective instruments
- May require eschar to be softened beforehand
- Short treatment time, as can be performed in the patient's home, clinic or at the bedside
- Can debulk devitalised tissue in a wound and has a faster treatment time than autolytic debridement
- Costs associated with instruments and staff time need to be considered.

Surgical debridement

Surgical debridement describes the excision or wider resection of necrotic tissue, including the removal of healthy tissue from the wound margins (Fairbairn et al, 2002).

It is an effective method, as it quickly cuts away debris in a selective manner, enabling the clinician performing the procedure to have complete control over which tissue is removed and which is left behind (Preece, 2003). It is best used on large areas, or in cases of contaminated tissue or sepsis where rapid removal is required.

It needs to be undertaken by surgeons or practitioners with surgical training and requires theatre space thus incurring associated costs. Being an invasive procedure, anaesthesia is usually needed which may be contraindicated in some patients, and also brings with it associated risks. It can be a painful and extensive procedure.

Key points for surgical debridement include:

- Performed by a surgeon or competent practitioner with surgical training
- Requires surgical environment
- Quick treatment time
- Technique involves removing non-viable tissue down to and including viable tissue
- Costs associated with theatre time,

instruments and staff need to be considered.

Discussion

Wound debridement can play a key role in the promotion of healing, reducing the risk of infection and/or improving patient quality of life. Given its potentially important role in wound management, it is vital that each and every patient has access to the most appropriate method. There may be a need to use more than one method at different stages in the wound management process.

This paper has considered a number of different debridement methods available in the UK. While there is a lack of empirical evidence to support the efficacy of these methods, as with many aspects of wound management, that should not detract from their potential to improve the lives of patients with wounds.

The link between the presence of devitalised tissue in the wound bed and the risk of infection is clear (Ayello et al, 2004). In the majority of cases, the removal of devitalised tissue will increase the chances of healing and reduce the risk of wound infection. However, it is important that each patient is considered and assessed individually, and that the method(s) of debridement selected are chosen on the basis of patient need, not practitioner skill.

Conclusion

The decision of whether or not to debride a wound should be based upon thorough patient assessment and formulation of a relevant treatment plan. Given the potential benefits of debridement for faster healing and reduced infection rates, both the generalist and specialist alike have a responsibility to ensure that the most effective method of debridement is made available to the patient. This may require referral to a colleague, or continued professional development (CPD) to acquire the necessary skills and competencies for the client base concerned. **WUK**

Key points

- Wound debridement can lead to faster healing, reduced risk of infection and improved quality of life.
- The decision of whether or not to debride should be based on thorough assessment.
- Patients should receive the debridement method which meets their clinical needs.

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