



# POSITION DOCUMENT



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## **Pain** at wound dressing changes

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Understanding wound pain and trauma:  
an international perspective

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The theory of pain

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Pain at wound dressing changes: a guide  
to management

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# Pain at wound dressing changes

*CJ Moffatt*

In producing a position document, The European Wound Management Association (EWMA) aims to provide clear advice on the clinical management of a specific topic area, drawing together the current literature presented by international experts in the subject, and highlighting future questions for research and practice. In that EWMA understands the importance of sharing information and best practice throughout Europe, this first position document will be available in English, French, German, Italian and Spanish rather than rely on publication in English alone. As such, we hope that this document will stimulate international discussion and lead to collaboration and tangible benefits to patients, clinicians and industry.

The history for this position document arose from a growing acknowledgement that pain is a frequent symptom in patients with a wide range of wounds. Research in the last 10 years has focused on healing as the major outcome of treatment, with little attention paid to other patient-centred outcomes, such as pain. However, with the development of quality of life assessment in patients with chronic wounds, pain has been identified as a major issue. The vision for this document, therefore, was to provide clear clinical advice on the assessment and management of pain at dressing changes in chronic wounds. In reviewing the evidence, we have confirmed that this is a poorly understood area of practice and that the evidence base required to make recommendations is sadly lacking.

To start the process for this document, a multinational survey of health professionals involved in wound management was undertaken, the results of which are given in the first article of this document. While this survey has found some similarities in the understanding of pain and trauma between practitioners in different countries, it has also highlighted significant differences in practice, many of which are related to the system of care delivery, including access and knowledge of products.

Current understanding of wound pain is primarily drawn from the literature relating to other conditions and on the physiology of acute and chronic pain. The lack of clear understanding of pain in patients with wounds, prompted a review of the theory of pain, which is expertly presented in the article by Wulf and Baron. It is vital that nurses acknowledge these complex underlying pain mechanisms in order to make sense of their patients' pain experiences.

Patients with chronic wounds are often subjected to painful dressing changes. This view is supported by the multinational survey, which revealed that dressing removal was considered by practitioners to be the time of greatest perceived pain. In an attempt to redress this, the final article aims to provide practical guidance on managing procedural pain, in particular at dressing removal, drawing on the limited research evidence available.

Producing this position document has highlighted the complexity of the problem, and confirmed that pain may be as important a topic as wound healing, yet there are few studies that have been undertaken in this area. The focus of future research must define the type and nature of pain in these patients, while new research study designs need to be employed to examine alternative outcomes to wound healing, which take account of symptom control and provide demonstrable benefits to patients. The last decade has focused on healing, the next decade must focus on the patient, with pain management a priority.

# Understanding wound pain and trauma: an international perspective

*CJ Moffatt<sup>1</sup> PJ Franks<sup>2</sup> H Hollinworth<sup>3</sup>*

**A recent study in the UK sought to identify practitioners' views on pain and trauma, and their relationship with wound care products. This important study involved a large sample of nurses from two national wound care organisations, and was the first serious attempt to understand this issue on a wider scale. Findings from this research prompted a broader investigation into the similarities and differences in Europe and North America. This article discusses the results of an international collaboration that sought to explore these issues further.**

## INTRODUCTION

There is an increasing acknowledgement that pain is a major issue for patients suffering from many different wound types<sup>1</sup>. The last decade has focused on healing as the principal outcome of wound management<sup>2</sup>, an emphasis which arose out of the acknowledgement that patients were being treated ineffectively, resulting in delayed healing and prolonged care<sup>3</sup>. This approach has been pivotal in our understanding of evidence based care, with its emphasis on clinical and cost effectiveness<sup>4</sup>. However, the use of complete healing as the outcome of successful treatment has been at the expense of other important patient centred outcomes, such as pain and other quality of life issues<sup>5</sup>. In addition, the emphasis on complete healing fails to recognise the small but important group of patients who have to live with a chronic wound, despite best practice<sup>6,7</sup>. The reliance on complete healing as the only outcome also fails to recognise improvements in patients' health status as a legitimate and important outcome of care<sup>8</sup>. More research is required to examine other aspects of wound management that may be relevant to patients with wounds. Greater attention perhaps should be paid to wound product evaluations and surveys where characteristics such as pain, maceration, trauma and comfort are observed<sup>9,10</sup>. Although the rigour of such studies may be criticised and considered soft data, further interpretation of this information may give a clearer understanding of factors other than healing, which although difficult to define, have a major impact on the patient. This paper presents the results of an international collaborative survey which explores practitioners' understanding of pain and trauma at wound dressing changes.

## International perspective

An international perspective may be valuable in highlighting the role that differences in wound care delivery systems have on practitioner performance, patient experience and access to wound care products. In some countries wound management as a speciality is well developed, while in others the profile is very low<sup>11</sup>. Issues such as reimbursement, allowing access to appropriate wound care products, may be vital in understanding this problem. The wound care industry itself may play a role, with companies selecting their markets according to wider global economic forces. This leads to limited access and knowledge of suitable products<sup>12,13</sup>. These factors compound the low profile of wound care as a health issue internationally.

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## KEY FINDINGS

1. Dressing removal is considered to be the time of most pain.
2. Dried out dressings and adherent products are most likely to cause pain and trauma at dressing changes.
3. Products designed to be non-traumatic are most frequently used to prevent tissue trauma.
4. Gauze is most likely to cause pain. New products such as hydrogels, hydrofibres, alginates and soft silicone dressings are least likely to cause pain.
5. Awareness of product range and ability to select dressings is highly variable between countries.
6. Use of valid pain assessment tools is considered a low priority in assessment, with greater reliance on body language and non-verbal cues.

Table 1 | Countries which took part in the international survey

Country		Number of respondents
France	F	1672
Canada	CAN	413
Finland	FIN	404
UK	UK	373
USA	USA	315
Switzerland	CH	183
Sweden	S	162
Spain	E	136
Austria	A	108
Denmark	DK	77
Germany	D	75
<b>Total</b>	<b>11</b>	<b>3918</b>

## METHODS

Eleven countries took part in the international survey. The participating countries are given in Table 1 and included mainly those from western Europe, but did not include countries from eastern Europe. Out of a total of 14,657 questionnaires distributed, there were 3918 respondents (27% response rate).

The questionnaire used for this survey was adapted from that originally used in the UK<sup>14</sup>. This aimed to identify practitioners' primary considerations in their approach to pain and tissue trauma at dressing changes, and the strategies used in the treatment and selection of products for their patients. The questionnaire consisted of structured questions with multiple choice options.

Whilst the survey had been designed to ask comparable questions of all nationalities, there were some slight variations in the questions asked, particularly in relation to the types of products available. One additional question was added, following the UK study, which examined practitioners' views on the importance of wound dressing characteristics and performance. Although some questions asked for one response, some practitioners chose to give more than one answer to the same question. To overcome this, the results were ranked according to the frequency of the response to each question, rather than the absolute percentages. Thus, the most important or highest ranked response for each country was 1 (first), with larger values indicating lower importance (second, etc.). This allowed for all countries to have equal rating for their responses, irrespective of the response frequency.

The questionnaires were translated into the appropriate languages for each country. A variety of distribution methods were used, ranging from mailing members of wound care societies to circulating to participants attending wound conferences. Because of this, the samples may not be representative of the nursing population within each country.

## RESULTS

Data from the completed questionnaires were computed and analysed by a statistical agency. Information was then aggregated by the current authors.

### Questionnaire responses

#### Main considerations at dressing changes

Practitioners from seven of the eleven countries ranked preventing trauma as the most important factor (mean rank= 1.7) to consider when changing a dressing (Figure 1). Pain prevention was the next most highly ranked (mean rank= 2.3) and only one country (Switzerland) rated prevention of infection as the most important priority.

**Perception of pain and different wound types**

Nine of eleven countries ranked leg ulceration as the most painful wound (mean rank= 1.2), with no country ranking it below second rank (Figure 2). Superficial burns were ranked second (mean rank= 2.9), with Spain ranking superficial burns and leg ulceration as equally painful. Other wounds such as infected wounds, pressure ulcers, cuts and abrasions, paediatric wounds, cavity and fungating wounds were considered less painful. However, this may reflect the practitioners' lack of assessment and experience, rather than a true estimate of the pain perceived by these patients<sup>15,16</sup>.

**When patients experience pain**

Practitioners consistently rated dressing removal to be the time of greatest pain (mean rank= 1.4). This was closely followed by wound cleansing (mean rank= 1.6), which was the most important factor in four countries. This result raises issues about the methods used to cleanse wounds. A range of factors may contribute to this, such as the use of antiseptics and other more aggressive mechanical methods of cleansing. This may indicate the very real differences in wound care practices in different countries.

**Pain assessment**

In eight of eleven countries talking to the patient was the most important factor in identifying pain (mean rank= 1.5). In France this was ranked third, while facial expression was ranked highest. In the USA, facial and body language were the most important factors, while in Finland body language alone was considered the most important. These variations may reflect cultural differences between countries, with some populations being more vocal than others. Little attention seemed to be placed on pain assessment before and after dressing changes, suggesting a more global assessment of pain, rather than one relating to the procedure. There was also little evidence that practitioners were using their previous experience of treating similar patients when rating the significance of wound pain<sup>17</sup>.

**Factors contributing to pain**

The results from this question indicated that practitioners were aware that dried out dressings (mean rank= 1.9) and products which adhered to the wound (mean rank= 2.0) were the most important factors leading to wound pain at dressing changes (Figure 3). However, the response concerning the use of gauze packing was consistently rated very low (mean rank= 6.5) with only the UK ranking this third and Denmark fourth. These results are surprising given that gauze is likely to be the most adherent product in wound care, and no longer recommended as best practice<sup>12</sup>. These results may be further confounded by the fact that in some countries practitioners rarely use gauze.

**Factors contributing to trauma**

A similar picture was seen in relation to trauma at dressing changes, with adherent products (mean rank= 1.5) and drying of dressings (mean rank= 2.2), being the most important factors. The problems of

Figure 1 | **Main considerations at dressing changes**

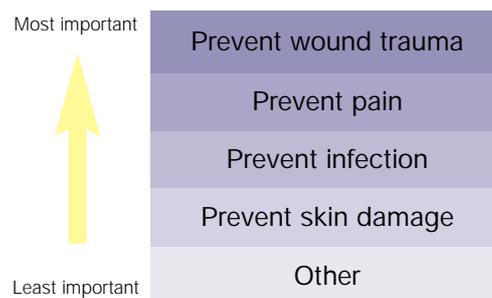


Figure 2 | **Experience of pain at dressing changes**

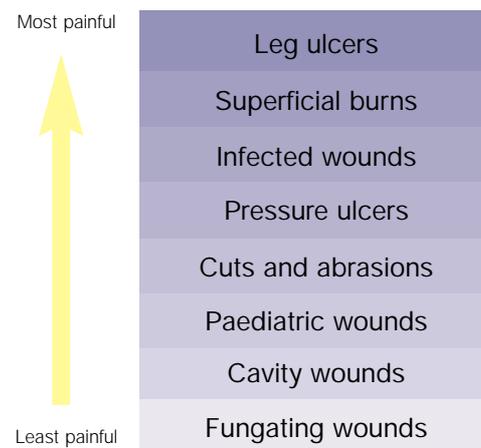


Figure 3 | **Factors contributing to pain at dressing changes**



using gauze were again not considered a priority issue in relation to trauma, despite the evidence that gauze has a major damaging effect on wounds<sup>18</sup>. Gauze has historically been used in wet to dry dressings for debridement – a practice that still pervades in many countries despite recommendations to the contrary<sup>12</sup>.

### **Strategies to manage pain**

The most common strategies used were to soak old dressings (mean rank= 2.3), select non-traumatic dressings (mean rank= 2.6), and to choose dressings which offer pain free removal (mean rank= 2.8). This is surprising given that soaking of dry dressings is not recommended and current wound management is based on the principles of moist wound healing. Only two countries rated giving analgesia before dressing changes as the most important factor (France and UK), compared with Spain, Austria and Germany who ranked this seventh of eight options. Involving patients in strategies to avoid pain was not considered important (mean rank= 7.5). Supporting the surrounding skin during dressing removal was not considered a priority, despite evidence that many of the adhesive wound care products lead to skin stripping and potential skin trauma and pain<sup>13,19</sup>.

### **Strategies to prevent trauma**

The most important strategy to avoid wound damage was the use of non-traumatic dressings (mean rank= 1.0), and was the only question in which there was complete agreement between all countries. Soaking (mean rank= 2.0) and avoiding adhesive products (mean rank= 2.8) were seen to be less important in preventing wound trauma. The questionnaire offered fewer strategies to participants in relation to trauma compared with the pain question above, which may have influenced the overall profile of priorities between the two questions.

### **Importance of dressing characteristics**

Pain free removal was the most highly desired characteristic of a dressing (mean rank= 1.8), with five countries considering this the most important factor. In Spain this was ranked only fourth, the most important being use of non-allergenic products. Non-adherence to the wound was the second most important priority (mean rank= 2.0), with four countries rating this the most important. Promotion of speedy granulation was considered the most important dressing characteristic in Canada and USA. While comfort was rated second priority in Canada, it was the eleventh priority in Germany. The importance of research back-up appeared to be of little importance to the clinicians from all countries who completed the questionnaire (mean rank= 9.2).

### **Dressings that cause pain**

There was complete agreement that gauze was the product which most often caused pain at dressing changes (mean rank= 1.0), followed by knitted viscose (3.1), film dressings (3.2), paraffin tulle (3.5) and low adherent dressings (4.8). Foam dressings and hydrocolloids were ranked equally (mean rank= 6.5). Hydrogels (mean rank= 9.5), hydrofibre (9.2), alginates (7.3) and soft silicones (7.2) were assessed as the products least likely to cause pain at dressing changes.

### **Dressings that cause trauma**

A similar pattern was seen for trauma, with ten of eleven countries identifying gauze as the most significant product causing trauma (mean rank= 1.1). Film dressings (2.8) and knitted viscose (3.0) were also identified as dressings which can cause trauma. Dressings least likely to cause trauma were hydrofibre (9.8), hydrogels (8.5), alginates (8.1) and soft silicones (7.2).

### **Restrictions on choice**

The survey highlighted that financial (mean rank= 1.8) and reimbursement (mean rank= 3.2) issues were the most important factors influencing the practitioner's choice of dressings. For Spain and France the most important factor was medical staff restricting appropriate choice of dressings. In Switzerland, lack of knowledge was cited as the most important factor. Regional wound management policy (7.5), wound standards (7.5), and the involvement of a senior nurse or wound team (8.1) facilitated greater access and choice of appropriate dressings.

### **Awareness of products**

Germany had the highest proportion of practitioners who stated that they were aware of products specifically designed to prevent pain and trauma at dressing changes (83%), followed by Finland and Switzerland (73%). This was in stark contrast with Denmark (19%), France (39%) and the USA (46%). However, these results must be tempered by the given list of products cited by the practitioners, many of which were not designed specifically to prevent pain and trauma. They also serve to highlight the complexity of understanding these results in the context of individual healthcare settings. Levels of wound care education and the availability and promotion of such products are just two examples of the varying factors between the different countries.

### **Ability to choose the dressing all the time**

Practitioners in the UK had the greatest freedom to select appropriate dressings for all patients (62%), with Austria (52%) and Sweden (51%). Only 25% of Canadian practitioners stated that they could always select the dressing, with similar low results in Germany (29%) and Switzerland (30%). These results in part reflect the reimbursement systems in the different countries. The main dressing types are available on the Drug Tariff in the UK, though with limited range, whereas in other European countries these are governed by different reimbursement rules limiting access to different products. In addition, in many areas of the UK practice is based on guidelines recommending evidence based treatments. These results may be further compounded by the nurse sample selected in each country, and may be a consequence of seniority and specialisation in the field of wound care.

## **DISCUSSION**

It is only in the last decade that we have begun to appreciate the role of pain in the life experience of patients with wounds. Much of this research has focused on pain in the context of quality of life<sup>1,20</sup>. It has been established that patients with wounds such as leg ulceration experience significantly greater bodily pain than the normal population, which is not merely a consequence of an elderly population, but rather a feature of the wound and associated underlying abnormal pain mechanisms<sup>8,21</sup>. Health related quality of life studies have consistently shown that pain improves significantly with effective treatment which promotes healing<sup>22,23</sup>. However, research has also shown that practitioners are often complacent or unwilling to accept the degree of suffering of patients from wound-related pain<sup>15</sup>. Patients may remember procedural pain over decades, often developing elaborate coping strategies to prevent practitioners from inflicting further pain during a dressing procedure<sup>24</sup>.

This survey has highlighted that while many practitioners are aware of issues relating to wound pain and trauma, there are considerable international variations in practice. This area requires a coordinated approach to standardise recommendations for good practice based on best available evidence. The survey has stimulated many research questions. A key component in improving practice is access to appropriate products. Wound associations and industry must seek to develop markets in countries where these types of

wound dressings are unavailable. Even in western Europe reimbursement issues prevent usage of modern wound care products on a wide basis illustrating the low priority of the wound care market. The survey has also highlighted the variation in knowledge, with many practitioners unaware of the products specifically designed for prevention of wound pain and trauma. At present there is little consensus on the correct assessment of pain, while a recent systematic review found little robust evidence to guide decision making in wound pain and trauma<sup>25</sup>.

## Limitations

The survey has a number of limitations, not least the different sampling frames in different countries, and the varying levels of expertise in different countries. It cannot be considered as representative of practitioner views within the countries; it is likely that the opinions expressed in the survey are from more specialised nurses, rather than the general nursing population. In addition, this survey relies on the attitudes of professionals with no attempt made to correlate these findings with that of the patient experience in the corresponding countries. Some of the questions used may have been open to different forms of interpretation and the meaning may have changed during the translation. Finally, the questionnaire has not been validated under strict research conditions.

## CONCLUSIONS

These results are a first attempt to examine from an international perspective wound pain and trauma at dressing changes. Despite the limitations outlined above, this multinational survey is an important attempt to stimulate research and discussion in this area, and to bring together the international wound care community in considering these issues.

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# The theory of pain

*H Wulf<sup>1</sup> R Baron<sup>2</sup>*

## INTRODUCTION

**Pain is an unpleasant sensation associated with actual or potential tissue injury. Pain that occurs after tissue injury has a protective role, alerting the body to damage and inducing rest to allow tissue regeneration. In chronic persistent pain (> 7 weeks) this physiological function may be compromised, counteracting regeneration. Chronic pain as such often becomes a disease of its own. The pathophysiology of pain involves an alteration of pain transmission pathways. Thus knowledge of the normal physiology of these pathways is an essential prerequisite for understanding the mechanisms of acute and chronic pain.**

## MECHANISMS OF PAIN

### Pain transmission: nociception

Nociception involves the relay of pain signals from the nociceptors (pain-sensing nerves) in the peripheral tissues to the central structures in the brain. Acute or nociceptive pain is an inflammatory response to painful or noxious stimuli (tissue damage) and is usually time-limited. In contrast, persistent injury or abnormal function of the peripheral or central nervous system (neuropathic pain) is a major factor in the development of chronic pain. Since chronic pain can share some basic mechanisms with nociceptive pain, studies using physiological stimulation of intact nociceptors have contributed almost as much as those of experimental nerve injury to our understanding of chronic, especially neuropathic, pain. As an aid to understanding the pathophysiology of chronic pain some of the relevant physiology of normal nociception<sup>1</sup> will be described.

### Normal physiology

Pain sensations are normally elicited by activity in unmyelinated (C-) and thinly myelinated (Aδ-) primary afferent neurons that synapse with neurons in the dorsal horn of the spinal cord. Sensory information is then relayed to the thalamus and brainstem. Since our current knowledge about the contribution of nociceptive Aδ-fibres to chronic pain is limited, the following sections will concentrate on C-fibres.

To date, four subtypes of C-fibres have been identified in human skin<sup>2</sup> (Table 1). Most C-fibres are polymodal, while some only become active under inflammatory conditions and are referred to as 'silent' or 'sleeping' nociceptors. Histamine-sensitive fibres, which have large innervation territories, are thought to be responsible for the itch sensation<sup>3</sup>.

### Peripheral sensitisation

### Hyperalgesia

Normally, C-nociceptors are silent in the absence of stimulation and respond best to stimuli that are potentially noxious. Following acute tissue injury, or in the presence of an ongoing inflammatory state nociceptors become physiologically sensitised, releasing a complex mix of pain and inflammatory mediators (Figure 1). This peripheral sensitisation decreases the firing threshold and increases the responsiveness of Aδ- and C-fibres.

Increasing sensitivity of neurons to a repeated stimulus can lead to a small stimulus being perceived as painful (hyperalgesia). Cutaneous application of algescic chemicals (such as capsaicin or mustard oil) produces a transient burning pain due to active and sensitised polymodal C-fibres<sup>4</sup>, together with an increased pain response to thermal and mechanical

Table 1 | **C-nociceptors**

Type	% of total	Stimuli
CMH	50%	mechanical, chemical, heat and cold – 'polymodal nociceptors'
CM	16%	mechanical only
CH	7%	heat only (some show sensitivity to histamine)
CMiHi	27%	chemical (some only sensitive to heat and mechanical stimuli after chemical stimulation – 'silent' or 'sleeping' nociceptors) some show sensitivity to histamine

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Figure 1 | **Peripheral nerve sensitisation**

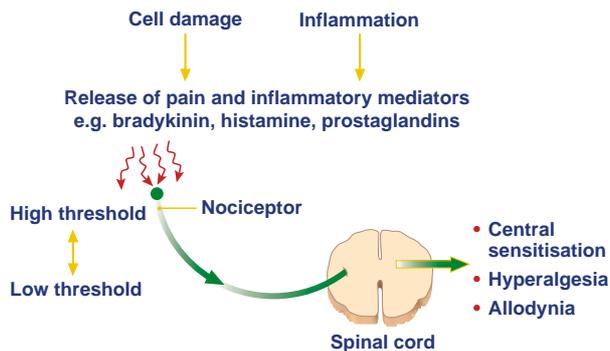
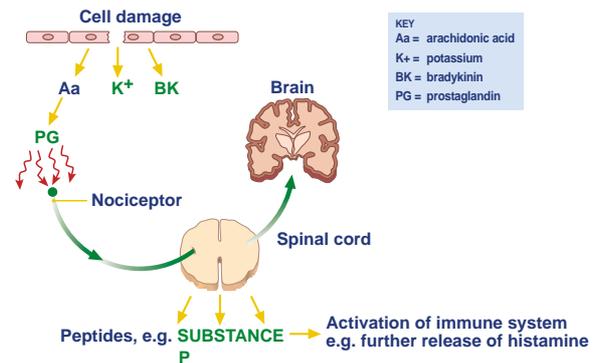


Figure 2 | **Pain mediators**



stimulation. This phenomenon is present exclusively in the primary zone where the C-nociceptors are directly activated by the algogenic substance and is known as *primary hyperalgesia*. This can be accompanied by a secondary increase in sensitivity to mechanical stimulation in the surrounding skin where the C-nociceptors have not been activated (uninjured tissue). This form of *secondary hyperalgesia* depends on mechanisms within the central nervous system (CNS).

## Central sensitisation

### Wind up and summation

Sustained or repetitive C-nociceptor activity produces alterations in the response of the CNS to inputs from the periphery. When identical noxious stimuli are repeatedly applied to the skin at a certain rate, either from tissue damage or externally, there is a progressive build-up in the response of spinal cord dorsal horn neurons (known as 'wind up')<sup>5,6</sup>. This allows the size of the dorsal horn neuron's receptive field to grow<sup>7</sup>. This physical process, called central sensitisation, occurs with any tissue damage and is a normal response of the undamaged nervous system.

The application of slowly repeated noxious stimuli in normal human subjects is also associated with a progressive increase in the intensity of perceived pain, provided that the stimuli are presented no more than three seconds apart<sup>8</sup>. This perceptual phenomenon, called temporal summation of pain, is the subjective correlate of wind-up and is exaggerated in some patients with chronic pain.

### Allodynia

Large diameter, low threshold mechanoreceptive primary afferents (Aβ-fibres) are normally sensitive to innocuous tactile stimuli and do not increase their discharge frequency with more intense stimuli. However, when central sensitisation is produced by C-fibre activity, these large diameter Aβ-fibres become capable of activating CNS pain signalling neurons<sup>9</sup>, resulting in increased perception of pain.

Central sensitisation can be produced in normal subjects using selective C-fibre activation by capsaicin. As a consequence of ongoing discharge in C-nociceptors at the site of capsaicin application (primary zone), an area of enhanced cutaneous sensitivity develops and spreads beyond the boundaries of the region directly activated by capsaicin. In this outer (secondary) zone, normally innocuous tactile stimuli, such as gently brushing the skin, become capable of producing pain (allodynia). Both neural peptides such as substance P<sup>10</sup> and excitatory amino acids acting at the NMDA receptor<sup>11</sup> contribute to this central sensitisation (Figure 2).

## KEY POINTS

1. The pathophysiology of pain involves an alteration of pain transmission pathways.
2. Tissue damage and inflammation sensitises nerve endings that transmit pain signals.
3. Increased sensitivity of neurons to a repeated stimulus can cause benign sensations to become painful.
4. Injury to the peripheral nerves is often associated with abnormal sensory function, causing a marked increase in patients' response to pain.
5. An understanding of how the nervous system responds and adapts to pain is vital if we are to make sense of patients' pain experiences.

## Glossary

<b>A<math>\beta</math>-fibre</b>	Termed 'A-beta' these fibres mainly sense touch and pressure
<b>A<math>\delta</math>-fibre</b>	Termed 'A-delta' these fibres rapidly transmit sharp acute pain
<b>Afferent</b>	In the case of the nervous system, a nerve that is conducting signals away from the periphery towards the central nervous system
<b>Allodynia</b>	Increased sensitivity – such that stimulation, which would normally not be perceived as painful, becomes painful
<b>C-fibre</b>	These slow-conducting fibres transmit dull aching pain
<b>Deafferentation</b>	A loss of sensory input into the CNS
<b>Hyperalgesia</b>	Increased sensitivity to painful or noxious (i.e. potentially harmful) stimulation
<b>Lamina</b>	Afferent nerve fibres enter the spinal cord via the dorsal horn, and terminate in the different layers (or laminae) of the grey matter (chiefly layers II-V)
<b>Myelin</b>	The fatty sheath that covers the nerve axon and assists in the rapid transmission of signals – hence unmyelinated C-fibres conduct more slowly than myelinated A $\delta$ -fibres
<b>NMDA</b>	The N-methyl-D-aspartate (NMDA) receptors in the dorsal horn of the spinal cord are an important part of the pain transmission pathway, and are implicated in the development of central sensitisation. Blocking the pathway at this point is possible with NMDA antagonist drugs such as ketamine
<b>Nociceptor</b>	A nerve that responds to noxious or painful stimuli

In summary, it is clear that activation of C-fibres in the skin produces a change in the CNS. In addition to enhanced responses to signals transmitted via the nociceptors from the site of the injury or assault, gentle moving tactile stimuli which activate A $\beta$ -fibres in the wider surrounding area become capable of evoking pain. Under physiological conditions this change is reversible, however, if there is significant tissue injury or there is nerve damage, then it can develop into chronic pain.

## MECHANISMS OF PAIN AFTER NERVE DAMAGE

Injury of peripheral nerves is often associated with pain despite a loss of sensory function. Melzack and Wall<sup>12</sup> suggested that damage to fibres which inhibit pain transmission at the spinal cord, is the reason for ongoing pain ('Gate Control theory'). Thus, fibres which normally 'close the gate' are unable to function and signals can be transmitted up to the brain without modulation, where they are experienced as pain.

### Peripheral mechanisms

#### Ectopic discharge

When a peripheral nerve is cut or damaged, the nerve endings regenerate and form a neuroma. Such neuromas may develop spontaneous activity (ectopic discharge) with increased sensitivity to chemical, thermal and mechanical stimuli<sup>13</sup>. The increased frequency of signals sent to the spinal cord also causes a region near the spinal dorsal root ganglion (distant from the site of injury) to begin to generate spontaneous impulses<sup>14</sup>. This may result in pain occurring in response to non-noxious stimuli (allodynia).

Microelectrode recordings from transected nerves in human amputees with phantom limb pain have demonstrated spontaneous afferent activity<sup>15</sup>. Tapping the neuroma was associated with increased pain and afferent discharge in small and large afferent fibres. Interestingly, this phenomenon was found in several cases of more than 20 years duration, which indicates that abnormal primary afferent hyperactivity in humans can be persistent.

### CNS mechanisms

#### Spinal cord hyperexcitability

Partial peripheral nerve injury is associated with the development of an increase in the general excitability of spinal cord neurons similar to that normally observed after prolonged C-nociceptor stimulation (central sensitisation)<sup>16</sup>. This neuropathic central sensitisation is probably due to activity in pathologically sensitised C-fibres, which sensitise spinal cord dorsal horn neurons by releasing glutamate and the neuropeptide substance P<sup>17</sup>.

Once central sensitisation is established, activity in C-nociceptors can maintain the central processes that cause allodynia. In chronic neuropathic pain, selective block of A $\beta$ -fibres eliminates allodynia<sup>18</sup>, but ongoing burning pain persists indicating that it is mediated by C-nociceptors. Conversely, gradual heating of the skin (which selectively activates C-fibres) produces a graded increase in the intensity of both ongoing pain and allodynia. This

suggests that C-nociceptor input from the periphery can dynamically maintain central sensitisation, which results in A $\beta$ -mediated allodynia. One can see how different nerves, activated in response to different activities, such as cleansing a wound or removing a suture, interact in this hypersensitive environment to cause the patient to experience pain that, to the observer, seems out of all proportion to the stimulus.

## Reorganisation in the CNS

Under normal physiological conditions, primary afferent neurons terminate in specific laminae in the dorsal horn. However, damage to the peripheral nerves can result in 'deafferentation' with sprouting of the surviving afferent axons and the development of aberrant connections in the spinal cord. Under these circumstances, surviving dorsal root axons can make functional contact with spinal cord neurons that have been deprived of their normal input<sup>19,20</sup>. After such reorganisation, large diameter primary afferents, including those which respond best to innocuous moving stimuli (A $\beta$ -fibres), provide a major direct input to spinal neurons that normally have direct input from unmyelinated primary afferents (C-fibres). This 're-wiring' of the connections within the CNS may cause a marked increase in responses to light tactile stimulation<sup>21</sup>.

## CONCLUSIONS

This brief overview outlines the complex nature of the underlying mechanisms involved in both nociceptive (inflammatory) and neuropathic pain. What patients tell us about their pain can be very revealing, and an understanding of how the nervous system responds and adapts to pain in the short and long term is essential if we are to make sense of patients' experiences. The wide area of discomfort surrounding a wound, or even of a wound that has apparently healed long ago such as an amputation stump, is a natural consequence of the nervous system's ability to change the way it responds to the signals it receives. That there is a physiological basis to such chronic pain may be seen as a welcome finding to the sufferer; for too many carers, both lay and professional alike, there is often a difficulty in believing that which cannot be directly observed.

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# Pain at wound dressing changes: a guide to management

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## INTRODUCTION

Pain is a complex, subjective and perceptual phenomenon which is influenced by physiological, psychological, emotional and social factors. Effective management of pain is fundamental to the quality of care and often hinges on the health professional's ability to understand the impact of these factors on the patient. It is well established that pain is a significant feature of living with a chronic wound and adversely affects a patient's and family caregivers' quality of life<sup>1</sup>. Research is required to provide a better understanding of management strategies for recognising, evaluating and controlling chronic wound-related pain. This paper draws on the authors' clinical experience and the basic science of pain physiology to offer recommendations for good practice when managing pain at wound dressing changes. Because of the complexity and size of the topic, the focus is specifically on managing pain at dressing removal in adult patients with chronic, non-burn wounds.

## SCALE OF THE PROBLEM

Several studies have shown that patients living with a chronic wound are often subjected to dressing changes, which exacerbate their pain<sup>2,3,4</sup>. In a recent multinational survey, practitioners considered dressing removal to be the most painful aspect of the dressing procedure<sup>5</sup>; this is particularly problematic where a dressing has stuck to the wound or removal of a dressing has torn the skin<sup>3,6</sup>. Pain at dressing changes can also be evoked by the debridement of slough and necrotic tissue, the application of antiseptics and the use of wound cleansing procedures<sup>7</sup>. These topics are complex and it is beyond the scope of this article to cover all these issues.

## Professional issues

While many practitioners are aware of issues surrounding wound pain, all too often nurses fail to manage pain effectively at dressing changes<sup>8</sup>. Choniere *et al*<sup>9</sup> found that nurses sometimes did not administer prescribed medication to patients with burns prior to a procedure, even when they rated their pain as moderate or severe. A major review by Kitson<sup>10</sup> concluded that nurses' lack of knowledge undermined appropriate nursing interventions in postoperative pain management, and further research is needed to understand why pain control methods are not fully utilised, specifically in relation to wound dressing activities.

Hollinworth highlighted a lack of understanding by practitioners of the underlying physiology responsible for the perception of pain, such that nurses often failed to acknowledge that simply brushing the skin surrounding a wound could be extraordinarily painful for the patient<sup>11</sup>. In addition, it has been suggested that professionals often define and understand a patient's wound pain based on clinical assumptions. For example, it is frequently accepted that arterial ulcers are more painful than venous ulcers, and that small ulcers are less painful than large ulcers<sup>12</sup>. The relationship, however, between the intensity of pain a patient is experiencing and the type or size of injury is highly variable, and is not an accurate predictor of pain<sup>13</sup>.

It has been reported that social defences such as 'distancing' and 'denial' may be used by nurses to protect them from feeling overwhelmed about inflicting pain on their patients<sup>14</sup>; when used in excess such strategies can result in poor practice.

## PAIN MODELS

One of the first attempts to apply a model for chronic wound pain was presented by Krasner in 1995<sup>15</sup>. This is a useful model as it highlights the difference between background pain, which is associated with the underlying aetiology of the wound, and the pain which is caused by treatment (iatrogenic pain), such as at dressing changes.

It is important for practitioners to understand that the pain arising from wounds is multidimensional in nature. Attempts to provide a structure for the complex experience of pain have generated various models, such as the three distinct dimensions of pain (sensory, affective and cognitive) proposed by Melzack and Casey in 1968<sup>16</sup>.

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## Dimensions of pain

### Sensory dimension

This dimension will give information about how much the wound hurts and what it feels like (i.e. the physical sensations of having a wound). Following initial tissue damage, the inflammatory response sensitises the pain receptors in the skin. This helps the person locate the extent and site of the wound so that it can be protected. In an acute wound this pain subsides with healing; however, in chronic wounds the impact of the prolonged inflammatory response can cause the patient to have an increased sensitivity in the wound (primary hyperalgesia) and surrounding skin (secondary hyperalgesia). If further painful or noxious stimuli are added as a result of repeated manipulation, such as during dressing changes (wind-up), the patient may become locked into a cycle where any sensory stimulus will register as pain (allodynia).

A further complication arises because wounds invariably involve damage to nerves and some patients may experience altered sensations as a result of the changes in how the nerves respond (neuropathic pain). Even the lightest sensation, such as a change in temperature or blowing on the wound, may produce an exaggerated response from the central nervous system, causing the patient to feel excruciating pain (allodynia). Damaged nerves can also fire 'ectopics' causing pain, for example, to shoot down the leg for no apparent reason. This type of pain is often not responsive to analgesia and requires antidepressants and antiepileptic drugs to modify the nerve activity<sup>17</sup>.

Wound healing complications, such as infection and ischaemia, may further contribute to the pain; however, more detailed study is required to fully understand the impact of these and other complications, such as skin maceration, on the overall pain experience.

There may also be pain associated with underlying pathologies. These may or may not be related to the wound itself and include peripheral vascular disease, diabetic neuropathy, arthritis (e.g. rheumatoid), dermatological conditions (e.g. eczema) and malignancy.

### Affective dimension

This dimension refers to the emotional impact of the pain, for example, how the patient feels. Fear, anger, anxiety, sorrow, depression, irritability and fatigue are all common feelings which may exacerbate, or be exacerbated by, the patient's pain response.

### Cognitive dimension

This aspect of pain is concerned with the attitudes and beliefs people have about their pain, what they believe to be the cause of their pain and the strategies they use to cope with their pain experience. Patients who have been previously subjected to painful dressing changes may remember this pain and become anxious at the prospect of further unrelieved pain<sup>18</sup>.

**Socio-cultural dimension:** Dobson considers a further 'socio-cultural' dimension, which describes the impact of a long-standing painful wound on the patient's family and social network<sup>19</sup>. This may be influenced by cultural, spiritual and social factors.

## PAIN ASSESSMENT

There is no 'prescription' for practice in these complex circumstances, and the above dimensions should not be seen as a 'checklist' from which to categorise the patient. The relative effect of these dimensions can vary between and within individuals over time and circumstances. Rather, it is incumbent on every health professional to be aware of the complexities of the environment in which they work in order to deliver personalised care based on understanding and trust with their patients.

It is therefore important for practitioners to adopt a broad, holistic approach to management. Assessment should begin by talking to the patient about their pain and by observing any responses. In addition, there are a number of validated pain intensity rating scales which should be used to establish the severity of pain. The verbal rating scale

## BOX 1. Recognising neuropathic pain

1. Is the skin or the wound abnormally sensitive to touch?
2. Are there unpleasant sensations when the skin is lightly stroked?
3. Does the pain feel like pricking, tingling, pins or needles?
4. Does the pain come on suddenly in bursts for no apparent reason, e.g. electric shocks, jumping, bursting pain?
4. Has the temperature in the painful area changed? Does hot and burning describe these sensations?

*Adapted from Bennett 2001*

(VRS) has good compliance rates, and is particularly useful for elderly patients as it is considered less complicated to explain than other tools<sup>20</sup>. Even for those patients who have a degree of dementia or confusion, at least one of the available scales can be used with some success<sup>21</sup>. Whatever scale is used, however, it is important that the same one is used each time to provide a comparison of scores. These can be documented to help inform choices about strength of analgesia and dose titration for subsequent dressing changes. As part of a systematic approach to pain management, it is recommended that the issues identified below are incorporated into the pain assessment.

### Existing wound pain

In the burns' literature, the aim is for zero background pain prior to dressing changes<sup>22</sup>. However, further research is needed to establish what is achievable with chronic wound pain, where many patients live constantly with some degree of pain. If the patient complains of pain prior to dressing removal, this should be assessed and the underlying cause identified so that appropriate action can be taken to minimise the pain.

### Neuropathic pain

Effective management of neuropathic pain often involves referral to a pain specialist. Box 1 identifies some signs and symptoms which can be used to recognise whether there is a neuropathic element to the pain experience<sup>23</sup>.

### Socio-cultural issues/anxiety

It is important to establish whether the patient has socio-cultural issues that may impact on dressing changes. For example, a patient may appear to react differently when treated in a clinic, or at home in front of family members or carers. If patients are suffering from dementia or confusion they may not appreciate the need for dressing changes. Therefore, more time is needed for repeated explanations and additional support may be required during the procedure.

The patient may have a history of previous painful dressing changes and may fear the infliction of further pain. What the patient believes is the cause of the pain and what has relieved it in the past should be established. Often patients do not appear anxious, but the use of a simple scale such as the Hospital Anxiety and Depression Scale may be useful in identifying patients at risk. This questionnaire can be completed in five minutes by patients and is regularly used in pain clinics to identify how much anxiety contributes to pain<sup>24</sup>.

## PAIN MANAGEMENT

Analgesics will at best reduce the intensity or duration of the pain, but only a total local anaesthetic block of the region could eliminate all sensation. It is vital therefore that patients are supported by a combination of techniques to help them through the dressing procedure.

### Pharmacological

#### Analgesia

The patient's requirement for analgesia must be assessed accurately prior to the removal of the dressing. If there is underlying wound pain, or pain from other pathologies is poorly controlled, the patient's current analgesic regime should be reviewed and specialist referral made where necessary. We cannot, however, expect the patient to remain untreated while awaiting clinic review by a chronic pain specialist, and the basic principles of good pain management must be applied in the meantime. The World Health Organisation has developed an analgesic ladder as a useful guideline for titrating the strength and dose of analgesia to the level of pain<sup>25</sup>. Senecal has applied this ladder to wound pain and the recommended steps for analgesia are summarised in Box 2<sup>26</sup>.

## BOX 2. Recommended steps for analgesia in wound pain

**Step 1:** Use NSAID ± local anaesthetic.

**Step 2:** Add a mild opioid (use oral medication if possible).

**Step 3:** Replace mild opioid with potent opioid analgesic.

*Adapted from Senecal 1999*

It is recommended that the type of analgesic used should have a short time to peak effect, be easily titrated to changing requirements and cause minimal side effects, although the final choice of drug will be dictated by the patient's history, severity of pain and clinical setting<sup>27</sup>.

A major issue in recommending specific analgesia is the lack of clinical evaluation on the impact of analgesia on wound pain and healing. This should not, however, be a reason for under-medication, as the need for relief of suffering is self-evident when the patient says they find the procedure painful.

Non-steroidal anti-inflammatory drugs (NSAIDs) work peripherally by inhibiting the enzyme cyclo-oxygenase (COX). It is this enzyme which converts arachidonic acid, released from the walls of the damaged cells, into inflammatory prostaglandins. NSAIDs provide good pain relief, but can lead to gastric ulceration, renal failure and a prolonged bleeding time due to impaired coagulation. The effect of NSAIDs on wound healing has yet to be evaluated<sup>28</sup>. However, the impact of prolonged bleeding and reduction in inflammatory response needs to be considered before commencing NSAID therapy.

Recently developed COX-2 specific NSAIDs do not inhibit all prostaglandin synthesis, but are selective for the type that is involved in pain transmission. Even with this improvement, NSAIDs alone would not be sufficient to control severe wound pain.

Mild opioids, such as codeine, given up to an hour before a procedure may ease the pain, and will continue to provide relief for some time after the event. Stronger opioids, such as buprenorphine or morphine may be required where the pain is sufficient to interfere with the patient's ability to tolerate the procedure.

In addition to oral analgesia, topical application of local anaesthetics can be considered to help relieve pain. A recent meta-analysis of studies using EMLA cream for debridement showed a statistically significant reduction in overall pain scores<sup>29</sup>. The use of morphine topically in wounds, using hydrogel as a carrier, has also shown promising results in palliative care<sup>30</sup>. However, further research is needed to establish the most effective use of these products.

The use of Entonox, a self-administered analgesic gas comprising of oxygen and nitrous oxide, should be considered for painful procedures. Its use is well established in the hospital setting and is favoured for its rapid onset of analgesia<sup>31</sup>. However, Entonox should only be used for the duration of the procedure and is not recommended for prolonged use or for general pain relief at other times.

## Non-pharmacological

### Reducing anxiety

Time invested prior to dressing removal is time well spent. Talking to patients about how much pain they can expect, together with an explanation of whatever measures are in place to minimise their pain will help to reduce the feelings of fear and anxiety. Patients who feel more pain than expected from a procedure, may become less confident about the nurse treating them<sup>32</sup>, and be more anxious about future dressing changes.

Anxiety, like pain, is influenced by physiological and psychological factors. Anxiety generates an autonomic response (e.g. muscle tension, heart rate response), while attention to the pain, past experience and the meaning of the pain all contribute to the interpretation of painful stimuli<sup>32,33</sup>. The impact of these factors on the patient's experience of pain is far from clear and may warrant further study.

Smith *et al* have suggested some simple measures that can be used for reducing anxiety during painful procedures<sup>34</sup>. These have been applied to the context of dressing changes (Box 3). There is great scope to be creative in the approaches taken to manage anxiety through distraction, such as the use of music for example<sup>35</sup>, and at all times, this must be sensitively negotiated with the individual patient.

**BOX 3. Methods to reduce anxiety at dressing removal**

1. Identify what the patient recognises to be triggers of pain and pain reducers.
2. Invite the patient to be involved as much as he or she wants, e.g. remove the dressing themselves.
3. Encourage slow rhythmic breathing during the procedures.
4. Get the patient to pace the procedure according to his or her preference. Offer the patient 'time out'. If the patient is worried about not being able to ask you to stop, negotiate a signal for 'time out', such as clap hands, raise a finger.

**Dressing selection and removal**

It is important that dressings are selected which, on removal, will minimise the degree of sensory stimulus to the sensitised wound area. Dressings such as gauze that stick to the wound and are then pulled off send more sensory information to receptors in the skin than a dressing that has been bathed in moisture and then slides away gently<sup>36</sup>. Soft silicone products have been recommended to help minimise pain and trauma on dressing removal<sup>7,37</sup>. Hydrogels, hydrofibre, alginates and soft silicones were all perceived by practitioners in the recent multinational trauma and pain survey to be least likely to cause pain at dressing changes<sup>5</sup>. A study by Dykes *et al* found that some adhesive dressings cause skin stripping on removal. The soft silicone product used had the least traumatic effects, although this study was carried out in an experimental setting on healthy skin<sup>38</sup>.

When removing a patient's dressing, every attempt should be made to avoid unnecessary manipulation of the wound and to prevent further damage to the delicate healing structures within the wound and surrounding skin. Since many patients may be cared for at home, it is important that family caregivers are able to remove dressings easily without causing undue pain.

**Suggested strategies for the relief of pain at dressing changes**

Avoid any unnecessary stimulus to the wound, such as drafts from open windows, prodding, poking

Handle wounds gently, being aware that any slight touch can cause pain

Select a dressing which:

- is appropriate for the type of wound
- maintains moist wound healing to reduce friction at the wound surface
- minimises pain and trauma on removal
- remains *in situ* for a longer period to reduce the need for frequent dressing changes

Reconsider dressing choice if:

- removal is causing a problem with pain or bleeding/trauma to the wound or surrounding skin
- soaking is required for removal

Read manufacturers' instructions about technique for removal

**Dressing selection and ongoing pain**

It is important to assess the impact of dressing choice on the pain experienced between dressing changes as this will impact on pain at dressing removal. The precise interplay between the dressing and pain felt at the wound surface, however, is not clear.

Dressings remove the visible reminder of the wound by covering it, which allows the person to become involved in daily activities and can reduce attention to the wound pain. Dressings also provide a barrier to mechanical stimuli due to friction and shear forces. Furthermore, it may be that occlusion or absorption alters the composition of wound exudate and the balance of inflammatory mediators, such as prostaglandins, present in the wound.

It has been known for a number of decades that dressings which maintain a moist wound environment can improve healing and are less painful than traditionally used products such as gauze. While the evidence supports the use of modern products over the use of gauze and paraffin tulle in relieving pain<sup>39-41</sup>, robust data showing significant differences in dressing performance between modern products with similar properties, is not currently available. Perhaps more importantly, information is needed to understand the impact of different dressings on the many different wound types and characteristics. For example, a dressing designed to absorb exudate placed on a mildly exuding wound may cause a 'drawing' pain<sup>11</sup> or it may stick to the wound causing friction, which has the effect of constantly rubbing the wound surface.

**CONCLUSION** Wounds will always be painful to some extent, but we can do much to control the impact of this pain on our patients. We can improve their ability to cope with the unpleasantness of necessary dressing procedures by using accurate assessment, good preparation, adequate analgesia, a high standard of clinical technique and the most appropriate cleansing and dressing materials. The direct benefit of pain relief on wound healing rates requires more detailed study, but simply showing respect, empathy and care to our patients is the essence of good health care, and will facilitate a smooth procedure for both clinician and patient.

Practitioners need to be professionally competent, knowledgeable and motivated to act in the best interests of patient care. While further studies must be carried out on specific wound types and the most appropriate approaches to managing them, there is a wealth of knowledge already developed that must be employed.

## KEY POINTS

1. Pain control methods at wound dressing changes are often under-utilised by practitioners.
2. Pain arising from wounds is multidimensional in nature and practitioners should adopt a broad holistic approach to management.
3. It is vital that patients are supported by a combination of techniques to help them through the dressing procedure including good preparation, appropriate choice of dressing materials and adequate analgesia.

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