Wound healing...
Is it really that difficult?

Julie Hewish
Senior Tissue Viability Nurse
Community Tissue Viability.
Questions...

- What is a wound? Give me a definition.
- What is the definition of wound healing?
- When does an acute wound become a chronic wound?
- Are chronic wounds the same as Hard to heal wounds?
- Are wound types treated differently i.e. A pressure ulcer differently to a leg ulcer?
- Do we assume the wound will heal unless convinced otherwise?
- Isn't it about the dressings? If we had MORE choice, we’d heal the wounds quicker!
A wound may be defined as the interruption of continuity in a tissue, usually following trauma. Skin is predominantly affected although any tissue, whether nerve, bone or organ, may be wounded.
Wound healing - definitions

- the process of returning to health; the restoration of structure and function of injured or diseased tissues.
- **Wound healing**, is an intricate process in which the skin (or another organ-tissue) repairs itself after injury.
- Wound healing can be defined as the physiological process by which the body replaces and restores the function of damaged tissue. (Flanagan 1997)
Chronic wounds or Hard to Heal – are they the same?
Chronic wounds - definition

Typically they have a duration of more than 4 weeks and are characterised by the failure to progress through the normal stages of wound healing (Menke, 2007)
Hard to Heal definition -

One that fails to heal with standard therapy in an orderly and timely manner...

(Troxler, Vowden & Vowden, 2006)
Its all about timing...

- Hard to heal definition can be applied to both acute and chronic wounds and is independent of the wound type and aetiology
- Many wounds are challenging to manage
- Delayed healing occurs in a variety of wound types
- Although common, delayed healing is frequently not recognised early enough
The human costs...
Wounds...the patients view

- ‘Pain was terrible...God almighty, the pain was terrific...it was unrelenting.’
  ‘I couldn’t walk about...I packed up driving...I was on crutches...I couldn’t take the kids swimming...I didn’t go out.’

- ‘You get the feeling that other people [wonder] what the hell is that dog doing down there, when the dog goes past everyone else, you know.’
The patients view

• ‘...and when they used to come twice a week to do my legs, sometimes three, if I did want to go out, I couldn’t go out ‘cos they held me in. You don’t know what time they are going to call so my life was round the district nurse.’

• ‘I am very conscious of it, if its there I think to myself I can smell myself, somebody else can.’
The patients view

- ‘But what made me angry, really, all the time was, nobody ever seemed to be really doing anything. Just one dressing off, put another one on... There you go, see you in two to three days’ time...’


- ‘My friends say, come on... But I say when you are in pain all the time, it’s miserable. I feel better sat at home quietly...’
Glass half empty....

Treat all wounds as potentially hard to heal...
Facts... chronic wounds:

- Affect 1 – 2% of the population (Anderson, 2006)
- Costs the UK £1 Billion per year
- As nurses we spend 40 – 50% of our time supporting Pts with chronic wounds
- They have a detrimental impact on a Pts QoL
- Lost working days
- Social isolation
- Depression/ anxiety
- Increased stress leads to further non healing
# General differences between acute & chronic wounds

<table>
<thead>
<tr>
<th>Acute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short duration</td>
<td>Not healed by 6 weeks</td>
</tr>
<tr>
<td>No underlying pathology</td>
<td>Underlying pathology</td>
</tr>
<tr>
<td>Normal inflammatory stage</td>
<td>Prolonged inflammatory stage</td>
</tr>
<tr>
<td>Usually heals without complication</td>
<td>A variety of complications may arise</td>
</tr>
<tr>
<td>Acute wound fluid supports proliferation</td>
<td>CWF does not support proliferation</td>
</tr>
<tr>
<td>Wound fluid doesn’t damage peri-wound skin</td>
<td>CWF damaging to peri-wound skin</td>
</tr>
<tr>
<td>Neutrophil, elastase and MMP levels normal</td>
<td>Neutrophil, elastase and MMPs levels high</td>
</tr>
<tr>
<td>Fibrinectin intact</td>
<td>Fibrinectin degraded</td>
</tr>
<tr>
<td>Normal remodelling of ECM</td>
<td>Defective remodelling of ECM</td>
</tr>
<tr>
<td>Normal growth factor levels</td>
<td>Lower levels of GFs</td>
</tr>
<tr>
<td>Normal levels of inflammatory cytokines</td>
<td>Increased levels of pro-inflammatory cytokines</td>
</tr>
</tbody>
</table>
How do wounds heal?

- Normal healing process is a well orchestrated, complex and interlinked series of four well recognised overlapping phases.
Understanding normal healing

Four phases of wound healing:
1. Vascular response (or coagulation)
2. Inflammation
3. Proliferation
4. Maturation

Not all wounds follow this initial stage as this depends upon the nature of the wounding (i.e. pressure ulcers or C6 stage leg ulcers)

The normal process can be interrupted at any stage and is vulnerable to a variety of intrinsic and extrinsic factors
Extra cellular matrix

- Largest component of normal skin
- Gel like matrix
- Composed of polysaccharides, water and collagen proteins
- Serves as a scaffold for cells
- Regulates cellular functions
- Lubricates cells
- Provides a transport system for nutrients and waste products
Wound healing analogy...
Vascular response

- Trauma
- Bleeding
- Air initiates clotting process supported by platelet aggregation (clumping)
- Coagulation cascade – formation of fibrin mesh which closes wound temporarily – dries to form scab
- Blood and serous fluid helps to cleanse wound surface.
Inflammation 1

- Release of inflammatory mediators (prostaglandin & histamine) from mast cells
- Blood vessels adjacent to injured area become more permeable (vasodilation)
- Presence of heat, erythema, discomfort and functional disturbance.
- Increase in exudate due to increased permeability of capillary walls. This is rich in nutrients, growth factors and enzymes (MMPs)
Inflammation 2

- Neutrophils arrive within a few hours of injury
- Primary role is 1st line defence against infection
- Phagocytic action, killing bacteria and breaking down foreign materials and devitalised tissue
- Produce and release inflammatory mediators which recruit and activate fibroblasts and epithelial cells
- Short life span.
Inflammation 3

- Macrophages and lymphocytes become prominent in the wound bed and help with the clean up by regulating phagocytic activity.
- They also encourage production of enzymes (growth factors) and cytokines.
- Cytokines are used extensively in intercellular communication (Project manager!)
- These cells control the transition from inflammation to proliferation – preparing for repair men!
Proliferation 1 - ECM

- Production of new granulation tissue through collagen production (Scaffolding) and angiogenesis (new blood supply)
- Fibroblasts are key cells in this phase (being responsible for production of collagen) but they also produce the Extra cellular matrix (ECM)
Proliferation 2

- Provisional wound matrix is remodelled and replaced with scar tissue which partially restores structure & function of tissues.
- Migration and proliferation of epithelial cells and fibroblasts from uninjured tissue and stem cells circulate to wound site.
- In normal dermis fibroblasts are slow and sparsely distributed, in provisional wound matrix they are numerous and active migrating in response to cytokines (communication cells) and growth factors released.
Migration of fibroblasts

- Moves by binding to matrix components such as collagen
- While one end remains bound the cell extends a cytoplasmic projection to find another binding site
- When found, the attachment to the original site is broken by protease secreted by the fibroblast
- Cell uses its cytoskeletal network of fibres to pull itself forward.
Fibroblasts
Maturation

- Wound becomes less vascularised
- Collagen fibres are reorganised lying at right angles to the wound margins.
- Collagen is constantly degraded and new collagen synthesised.
- Highest activity occurs between 14 – 21 days.
- Scar tissue is gradually remodelled and becomes comparable to normal tissue after a long period of time.
- Can take 12 – 18 months and full tensile strength not regained (Approx 80%)
MMPs (Matrix metalloproteinases)

- Part of a larger family of Metalloproteinases that play an important role in wound healing.
- They are produced by inflammatory cells (Neutrophils & macrophages) and wound cells (epithelial, fibroblasts and vascular endothelial cells).
- When first synthesised, MMPs are latent. They are activated by other proteases.
- 23 MMPs have been identified. MMP – 1, 2, 8 & 9 are related to wound healing.
Matrix Metalloproteinases (MMPs)

- Essential for the migration of cells through the ECM
- They remove collagen and other ECM components that were denatured during injury
- Important because collagen molecules must interact with each other to form a fibril (Fine fibre)
- Partially degraded matrix will not bind resulting in disorganised, weak ECM
- Degraded collagen must be removed by the controlled action of MMPs
- Hole in the wall image...
MMPs ctd...

- MMPs “Chew back” the denatured matrix to reach intact functional matrix
- It must be carefully controlled by tissue inhibitors of metalloproteinases (TIMPS) to prevent MMPs from degrading intact functional matrix
- This controlled action of proteases on ECM plays a key role in regulating angiogenesis and other aspects of normal wound healing.
# MMPs in normal wound healing

<table>
<thead>
<tr>
<th>Role of MMPs</th>
<th>Main phase of healing</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Removal of damaged ECM and bacteria</td>
<td>Inflammation</td>
</tr>
<tr>
<td>• Degradation of capillary basement membrane for angiogenesis (temporary breakdown of the ECM)</td>
<td>Proliferation</td>
</tr>
<tr>
<td>• Migration of epidermal cells</td>
<td></td>
</tr>
<tr>
<td>• Contraction of scar ECM</td>
<td>Maturation/ remodelling</td>
</tr>
<tr>
<td>• Remodelling of scar ECM</td>
<td></td>
</tr>
</tbody>
</table>
Why do MMPs cause problems?

- MMPs present in a wound bed at too high a level for too long a time begin to degrade proteins such as growth factors and ECM proteins essential for healing. This ultimately impairs healing.

- Evidence has found that MMPs in general are highly elevated in wounds with delayed healing compared to acute healing wounds.
How do we know that MMPs are causing healing problems?

- Ability to heal is affected by a wide range of intrinsic and extrinsic factors. However,
- Regardless of underlying cause of the delay, H2H wounds generally share similar characteristics, including:
  - Elevated inflammatory markers
  - High levels of proteases
  - Diminished growth factor activity
  - Reduced call numbers in the wound

Hostile wound environment, wounds are stuck in the inflammatory phase of healing
How do we as nurses know?

- Wounds are failing to progress
- Wounds appear ‘inflammatory’
- Cycles of local wound bed infection
- Less than 40% wound area reduction in 4 – 6 weeks is a significant indicator
- A protease testing kit has been developed.
Vicious circle of delayed wound healing

1. Cells produce excess proteases
2. Increased inflammatory response
3. Damaged tissue
4. Bacterial proteases and toxins
5. Delayed wound healing
How can we improve healing rates?
Putting the patient at the centre of wound care...

- Holistic approach
- Identifying reasons for non concordance
- Quality of life/wellbeing
- Joint care planning
- Outcome driven
- Timely referral
- Social model
- Audit
So how do we do this?

Holistic approach
Holistic assessment

3 Groups

- Patient related factors – Intrinsic
- Patient related factors – Extrinsic
- Wound related factors

What are these?
Patient related factors - Extrinsic

- Non concordance
- Social isolation
- Financial/ employment issues
- Environmental
- Nurse/ pt relationship
- Is a carer for others
- Cultural/ religious beliefs
- Previous experiences
- Lifestyle choices
Wound related factors

- Long wound duration
- Large wound (> 100cm²)
- Full thickness wound (Exposed tendon or bone)
- Underlying osteomyelitis
- Failure to progress by 40% at 6 weeks
- Presence of devitalised tissue
- Presence of local infection
- Presence of systemic infection
- High exudate levels
- Wounds over a moveable joint
- Wounds that are in close proximity to an ‘orifice’ (ie anus, stoma)
- Inflammatory/ excoriated or macerated peri wound skin
- Presence of oedema
- History of previous damage to same site
- Malignancy
Wound bed assessment- tissue type

- Assessing the tissue in the wound bed informs the phase of healing a wound may be in and aids diagnosis. Part of your management plan should be based on wound bed status.

Is the wound bed......
Necrotic
sloughy
granulating
epithelialising
Assess for Infection

- Wound infection is a problem because it delays healing
- Defining the term infection is important
- The presence of bacteria does not necessarily constitute infection
- Wound swabs will not diagnose infection
- Identification of clinical signs of infection is essential for diagnosis
- Not all clinical signs are associated with a wound infection
- Follow your local guidelines
Local infection

Look for:

- Erythema
- Increase in exudate
- Wound bed dark/dull/bleeding easily (raspberry jam)
- Bridging
- Discolouration of slough and/or dressings (bright green/blue)
- Odour

Be aware that patients with diabetes may not present with all of the above – be cautious
# The Assessment and Management of Bacterial Loading in Wounds Tool (AMBL)

<table>
<thead>
<tr>
<th>LOCAL SIGNS &amp; SYMPTOMS</th>
<th>Wound Bed Contamination</th>
<th>Wound Bed Colonisation</th>
<th>Local Wound Bed Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wound bed</strong></td>
<td>Patient’s immune system is maintaining bacteria at safe levels</td>
<td>Multiplying bacteria has the ability to tip patient and wound defences</td>
<td>Healing is compromised</td>
</tr>
<tr>
<td></td>
<td>Healing / patient not compromised</td>
<td>Healing compromised</td>
<td>Healing and patient compromised</td>
</tr>
<tr>
<td><strong>Exudate Levels</strong></td>
<td>Normal exudate for patient/wound type</td>
<td>Increased exudate (sometimes mild odour)</td>
<td>Malodorous / Copious / purulent exudate</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>No change</td>
<td>Increased / changed pain</td>
<td>Acute / changed pain</td>
</tr>
<tr>
<td><strong>Erythema</strong></td>
<td>Erythema not usually present ¹</td>
<td>Erythema not usually present ¹</td>
<td>Abnormal/changed odour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYSTEMIC SIGNS &amp; SYMPTOMS</th>
<th>None</th>
<th>None</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systemic antifungal</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>High Risk patient?</strong></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Wound Swabs for M, C &amp; S</strong></td>
<td>No ²</td>
<td>No ²</td>
<td>No ²</td>
</tr>
<tr>
<td><strong>Topical Antimicrobial dressing</strong></td>
<td>Standard formulary dressing</td>
<td>¹ Line Honey-impregnated dressing</td>
<td>¹ Line Honey-impregnated dressing</td>
</tr>
<tr>
<td><strong>Other actions</strong></td>
<td>Debride sloughy/necrotic tissue ³</td>
<td>Consider referral to Tissue Viability</td>
<td>Refer to Tissue viability if support needed</td>
</tr>
<tr>
<td></td>
<td>Treat / optimise co-existing morbidities</td>
<td>Treat / optimise co-existing morbidities</td>
<td>Treat / optimise co-existing morbidities</td>
</tr>
<tr>
<td></td>
<td>Assess wound for colonisation/ wound bed infection at every dressing change</td>
<td>Assess wound for infection at every dressing change</td>
<td>Debride sloughy/necrotic tissue ³</td>
</tr>
</tbody>
</table>

¹ Some wounds (if chronic or < 72 hours old or) may have an erythematous border due to the inflammatory processes of wound healing: the erythematous border should be < 1 cm

² Wound swabbing is only indicated where systemic antibiotic therapy is required to treat systemic infection and soft tissue infection such as Cellulitis

³ Do not attempt to debride lower limb wounds until vascular integrity has been explored in line with a holistic patient assessment. A lower limb assessment (Palpate Pedial Pulses, capillary refill, skin assessment etc) plus a Doppler (where appropriate) should be clearly documented.

⁴ Note that high risk patients (including those with diabetes or compromised immune / circulatory systems) may not display the signs & symptoms of colonization or infection described below and may present with more subtle signs.
Anatomical location

- Wounds on certain anatomical sites such as moveable joints or weight bearing loads (heels) can be problematic.

- Fixation of dressings can be difficult and not offloading pressure ulcers can lead to a deterioration in wound condition.
Assess the exudate level...

- Identify the cause (including MMPs)
- How is it affecting the Peri wound skin?
- Assess level – low, medium, high...What does this mean?
Pain

‘Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of tissue damage’

(International Association for the Study of Pain, 2006)
Can be seen as the 5\textsuperscript{th} vital sign for detecting problems.

- Infection
- Inflammation
- Injury /Iatrogenic
- Ischaemia

A pain assessment should form part of your holistic approach
So much to remember to do...!
Tools for assessing or measuring wound healing

**Assessing**
- Risk tools
- AMBL tool
- Wound assessment tools
- QoL tools
- Anxiety/Depression scores
- Pain tools
- MMP testing

**Measuring**
- Treatment pathways
- Wound measurement in cm²
- Wound progression charts
- Photography
- Audit
Wound healing pathway & risk assessment tool

Guidance for assessing hard to heal wounds
Please tick any box that relates to the patient you are assessing. The greater the number ticked, the more at risk the wound is of being Hard to Heal.

<table>
<thead>
<tr>
<th>General</th>
<th>Tick</th>
<th>Systemic</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication includes steroids, cytotoxic therapy or woundants</td>
<td></td>
<td>Poor perfusion, ischaemia, peripheral vascular disease</td>
<td></td>
</tr>
<tr>
<td>Impaired mental capacity (inability to make informed decisions)</td>
<td></td>
<td>Anemia</td>
<td></td>
</tr>
<tr>
<td>Social isolation</td>
<td></td>
<td>Auto-immune disease – i.e., rheumatoid arthritis, lupus etc.</td>
<td></td>
</tr>
<tr>
<td>A care for others</td>
<td></td>
<td>Diabetes mellitus</td>
<td></td>
</tr>
<tr>
<td>A care for others</td>
<td></td>
<td>End of life status</td>
<td></td>
</tr>
<tr>
<td>Financial/employment issues</td>
<td></td>
<td>Poor nutritional status</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td>Immobility</td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wound specific
- There has been less than 40% reduction of wound surface area after 6 weeks
- Wound of a duration greater than 24 weeks
- Wound larger than 100cm² or a length equal to or greater than 10cm
- A wound deeper than 5mm, undermining or tracking (skin/cavity)
- Heavily exuding wound
- Devitalised tissue (slough necrosis) in wound bed
- Measurement and/or excoriation to wound edges
- Local wound bed infection (Critical colonization)
- Systemic wound infection (Cellulitis)
- Oedema/lymphoedema in affected limb
- Wound malignancy
- Full thickness wound, Exposed tendon, bone exposed
- Wound infection
- Wound contracture

Concomitance – consider:
- Is it related to uncontrolled pain?
- Is it related to a lack of understanding or lack of mental capacity?
- Could it be related to fear anxiety depression
- Is it related to you as a healthcare provider i.e., The day/ time of visits or apps, the competence of staff, nurses, patient relationship, interpersonal skills, lack of empathy

Resource/skill specific – consider:
- Lack of adequate equipment available.
- No or limited access to the dressings required for managing this wound.
- No or limited access to specialists to support you with this wound.
- No or limited access to education and training to enhance wound care knowledge & skills
Referral pathway

Leg ulcer referral pathway

Assessment/re-assessment by trained practitioner (As per RCN guidelines, 2006)
- Patient history
- Physical examination
- Blood pressure
- Uramia/blood glucose
- Examination of the ulcer and surrounding skin
- ABPI
- Pain
- Mobility
- Nutritional status (Including MUST)

Patient with leg ulcer

Diagnosis of aetiology

*ABPI > 1.3 OR unable to Doppler (i.e. due to oedema)
- Refer to tissue viability for advice
- *Referral to vascular service will be required

Venous incompetence
- ABPI 0.8 - 1.3
- Manage with compression bandaging as per local Guidelines

HEALED

Mixed venous and arterial aetiology - ABPI 0.6 - 0.8

Arterial insufficiency - ABPI < 0.6

Other causes:
- Dermatology: Leg ulcer clinic
- Uncertain diagnosis
- Suspected malignancy
- Exudema gangrenosum
- Vasculitis
- Contact dermatitis (Patch testing)
- Referral from community Tissue viability

Podiatry
- Diabetic foot ulcer
- Neuropathic ulcer

If non-healing or slow to heal (<40% reduction in size) after 6 weeks or recurring ulceration:
- Refer to tissue viability team who may then refer on to:
  - Leg ulcer clinic
  - Vascular service

If pain-free, refer to tissue viability for advice on management (may benefit from low compression)
- Routine referral to vascular service if experiencing clasification pain, ulcer not healing or deteriorating

Urgent referral to vascular service

Tissue viability to link with leg ulcer clinic re ‘hard to heal’ wounds

Follow up to be in accordance with specialist advice

Ongoing support from community tissue viability team
Measuring..........
Assess size and depth

- Map/trace and work out surface area in cm²
- If previously mapped work out % reduction over 6 weeks (or % increase if applicable)
- For deeper, cavity wounds assess for tracking/undermining using a probe and a clock face technique
Determining the percentage reduction in wound surface area

• Re trace the wound as previously explained.

• Work out the surface area in cm². Say for example the new surface area is 14 cm²

• Work out the reduction in surface area by using the following equation:

  \[
  \text{New surface area (14)} \div \text{last surface area (21.75)} \times 100 = 64.36\%
  \]

4. Next take the % figure (64.36) from 100 (100 – 64.36 = 35.6%)

This means that there has been a 35.6% reduction in wound area since the last measurement
In summary:

- Understand normal healing so you can recognise the abnormal
- Assess holistically to enable you to identify the risks for healing
- Recognise why a wound is ‘behaving’ in a certain way and be able to put an evidence-based plan in place to manage the problem.
- Measure the effectiveness of your management plan taking appropriate action if outcomes aren't being met.
Your role ...

- Don’t accept the status quo
- Strive for excellence
- Embed best practice
- Inspire others
- Monitor outcomes
- Challenge
- Escalate (safeguarding)
- Prove your worth
Most importantly... be the patients advocate!
Lunch!!!