

Wound healing...

Is it really that difficult?

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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 - definition

- 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...’
- Exudate ‘Stench’, ‘dirty’, ‘unpleasant’, ‘horrible’, ‘obnoxious’, ‘rotten’, ‘terrible’
- ‘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

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

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:

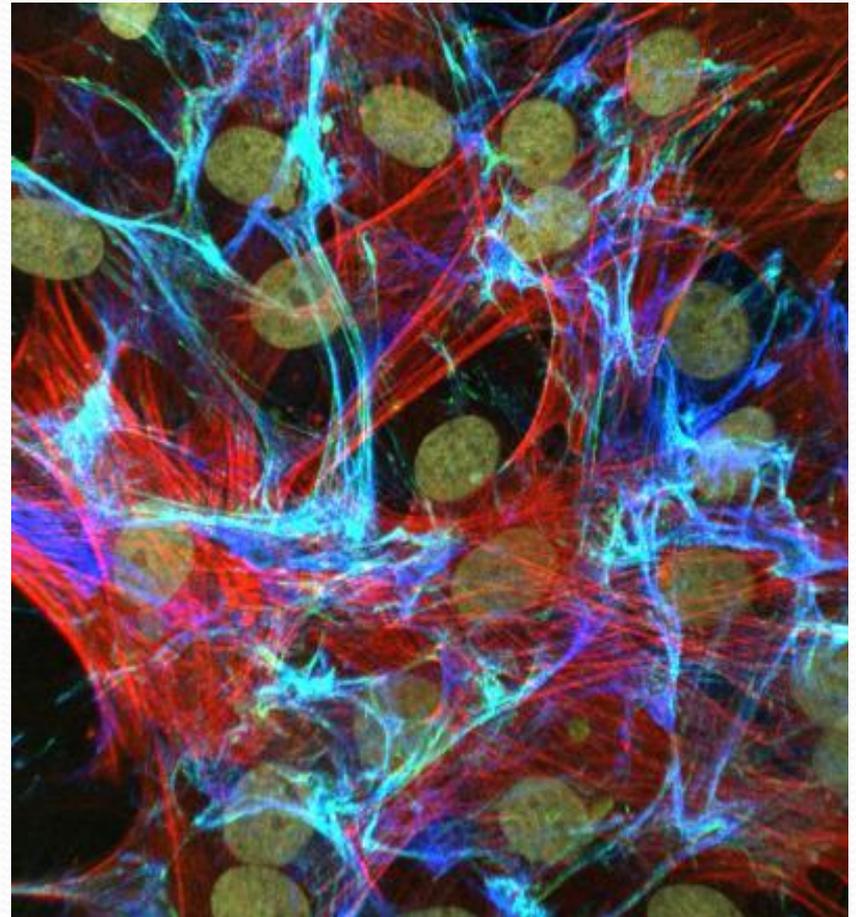
1. Vascular response (or coagulation)
2. Inflammation
3. Proliferation
4. Maturation

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...



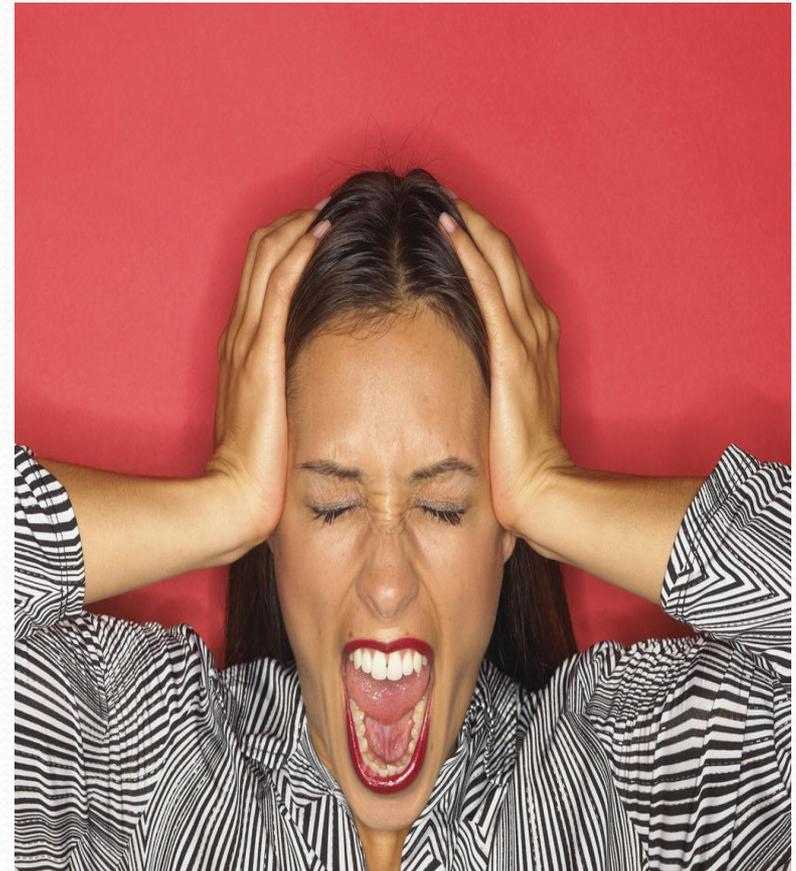
Vascular response

- 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.



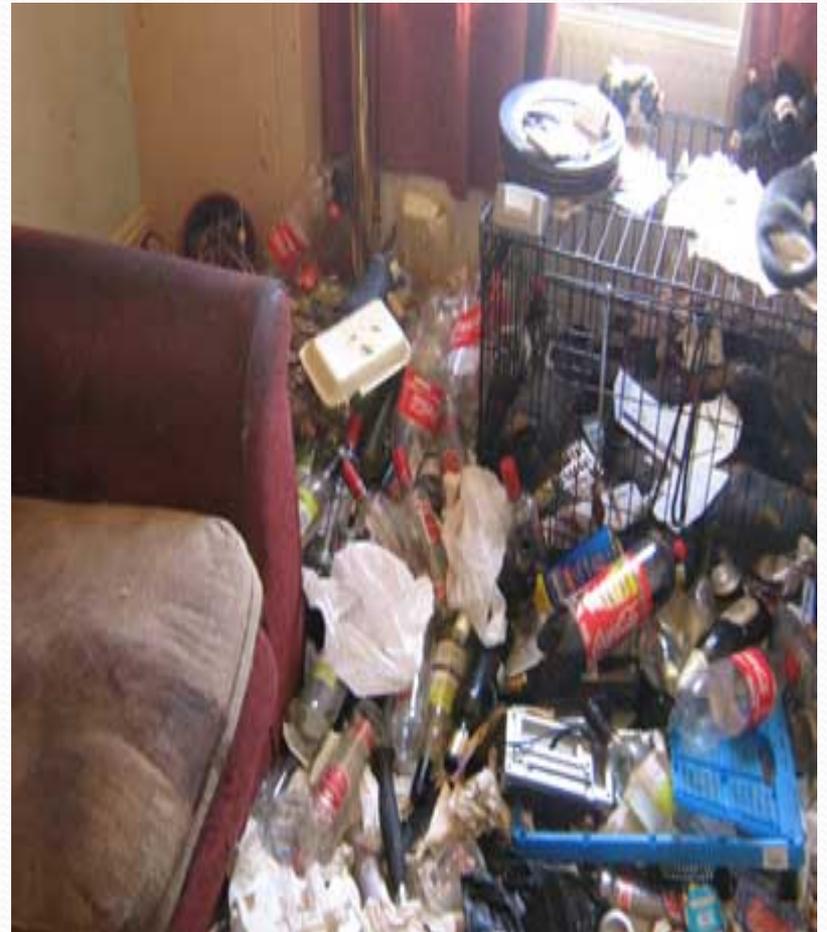
Inflammation 1

- 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
- Phagocytotic 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)

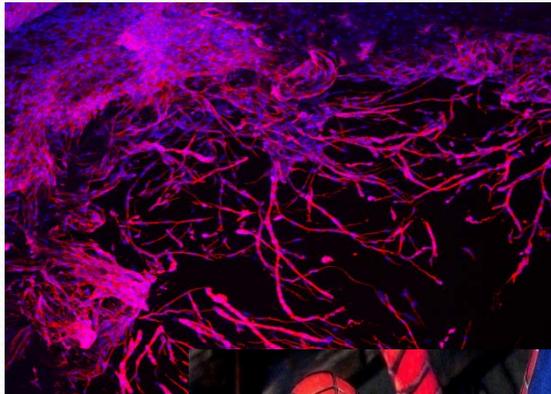


Proliferation 2

- 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

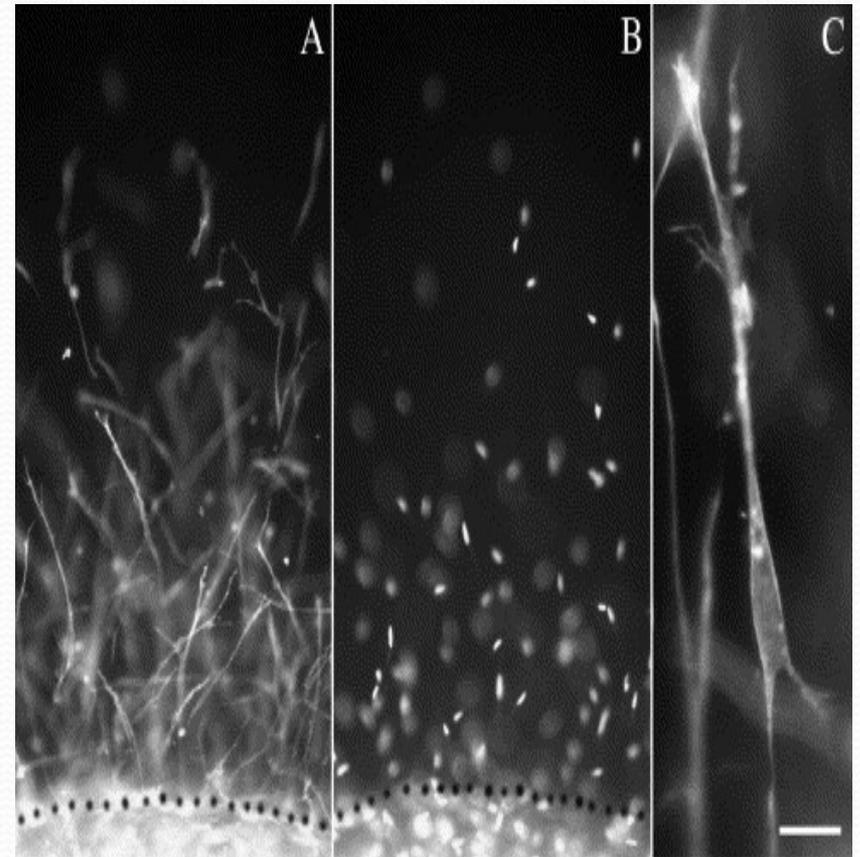
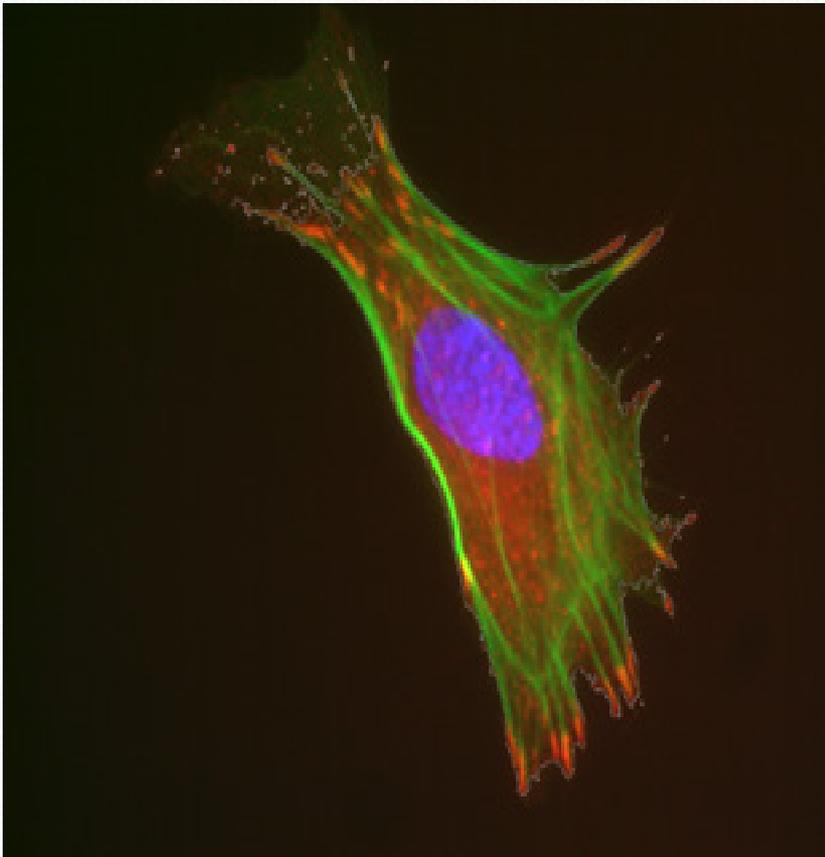


Migration of fibroblasts



- 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

Role of MMPs	Main phase of healing
<ul style="list-style-type: none">• Removal of damaged ECM and bacteria	Inflammation
<ul style="list-style-type: none">• Degradation of capillary basement membrane for angiogenesis (temporary breakdown of the ECM)• Migration of epidermal cells	Proliferation
<ul style="list-style-type: none">• Contraction of scar ECM• Remodelling of scar ECM	Maturation/ remodelling

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?

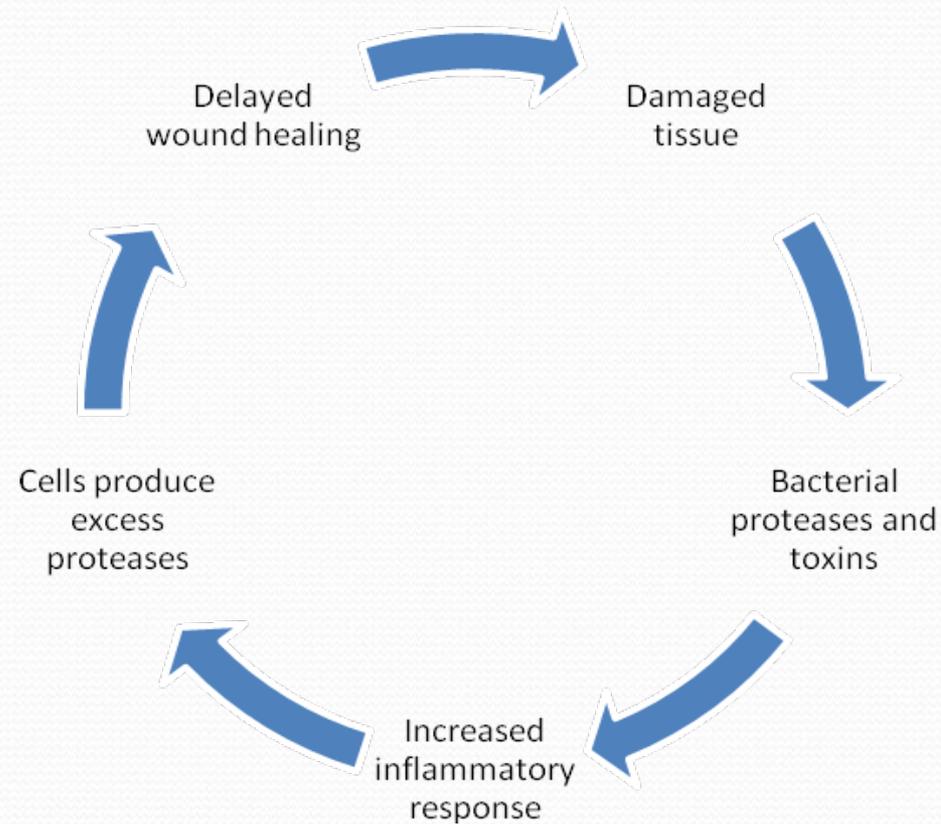
- Ability to heal is affected by a wide range of intrinsic and extrinsic factors. However,
- Regardless of underlying cause of the delay, H2H wounds generally share similar characteristics, including:
 - Elevated inflammatory markers
 - High levels of proteases
 - Diminished growth factor activity
 -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



Assessment



How can we improve healing rates?



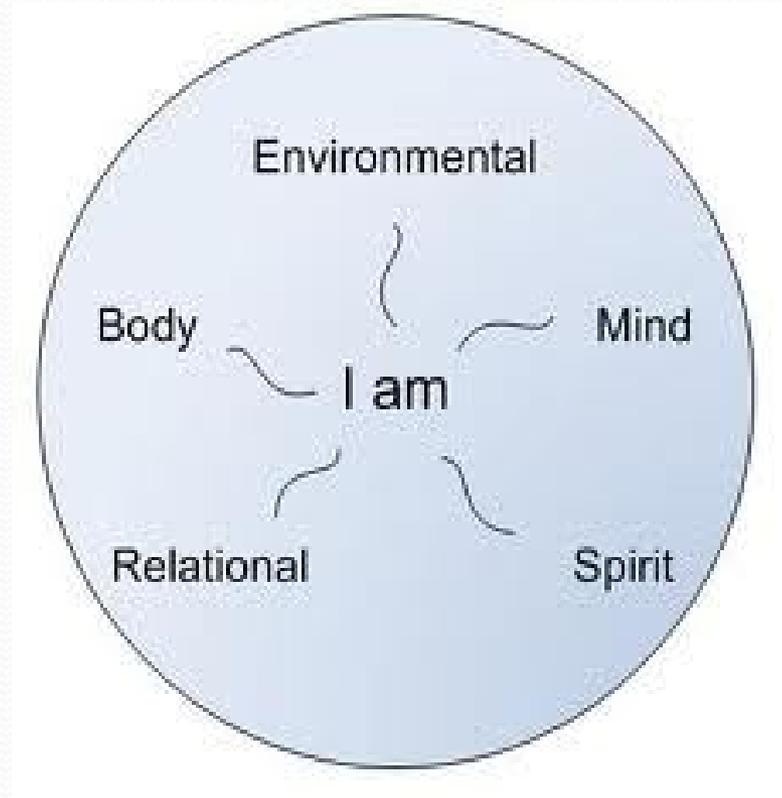
Putting the patient at the centre of wound care...

- 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)

		Wound Bed Contamination Patient's immune system is maintaining bacteria at safe levels Healing / patient not compromised	Wound Bed Colonisation Multiplying bacteria has the ability to tip patient and wound defences Healing compromised	Local Wound Bed Infection Patient's defences are overwhelmed Healing and patient compromised	
LOCAL SIGNS & SYMPTOMS ⁴	Wound bed	Wound surface area has reduced in size by 40% at 6 weeks. Positive granulation/epithelialisation	Healing has slowed /or stopped (non-progressing wound). Sloughy/necrotic tissue may be present	Healing has stopped or Wound has deteriorated / extended	
	Exudate Levels	Normal exudate for patient/wound type	Increased exudate (sometimes mild odour)	Malodorous / Copious / purulent exudate	
	Pain	No change	Increased / changed pain	Acute / changed pain	
	Erythema	Erythema not usually present ¹	Erythema not usually present ¹	Local Wound bed Infection Erythematous border <2cm	Systemic infection Erythematous border >2cm
SYSTEMIC SIGNS & SYMPTOMS ⁴		None	None	Abnormal/changed odour Discoloured/friable Tissue/ Pocketing Bridging/Necrosis slough	Pyrexia Tachycardia General malaise Raised WBC & CRP Soft tissue infection
MANAGEMENT	Systemic antimicrobials (antibiotics)	No	No	No	Yes
	High Risk patient? ⁴		consider antibiotics in line with local prescribing protocols/guidelines	Yes	
	Wound Swabs for M, C & S	No ²	No ²	No ²	Yes
	Topical Antimicrobial dressing	Standard formulary dressing	1 st Line Honey-impregnated dressing 2 nd Line Iodine-based dressing	1 st Line Honey-impregnated dressing 2 nd Line Iodine-based dressing	
	Other actions	Debride sloughy/necrotic tissue ³ Treat / optimise co-existing morbidities Assess wound for colonisation/ wound bed infection at every dressing change	Consider referral to Tissue Viability Treat/optimize co-existing morbidities Assess wound for infection at every dressing change Debride sloughy/necrotic tissue ³	Refer to Tissue viability if support needed Treat / optimise co-existing morbidities	

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 < 1cm

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 colonisation 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?



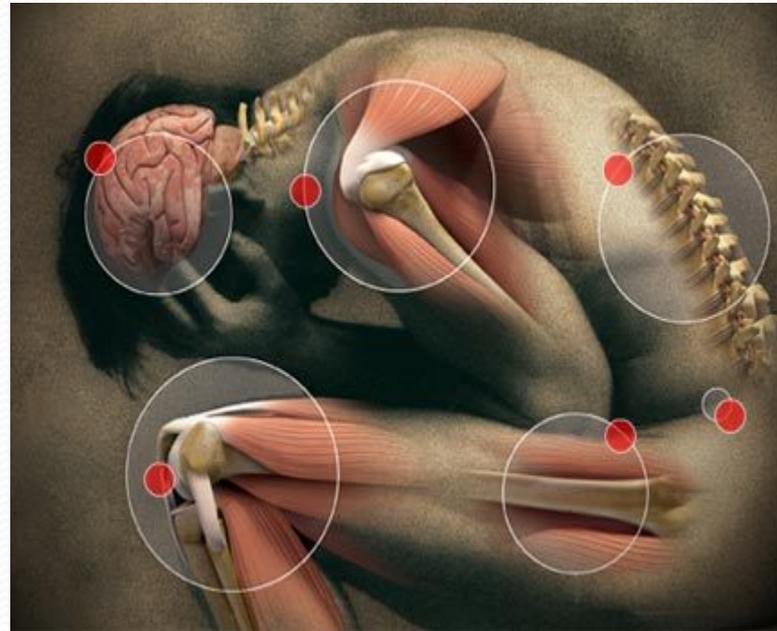
Pain

‘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 5th 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...!

WARNING

**MASS
CONFUSION
AHEAD**

Tools for assessing or measuring Wound healing

Assessing

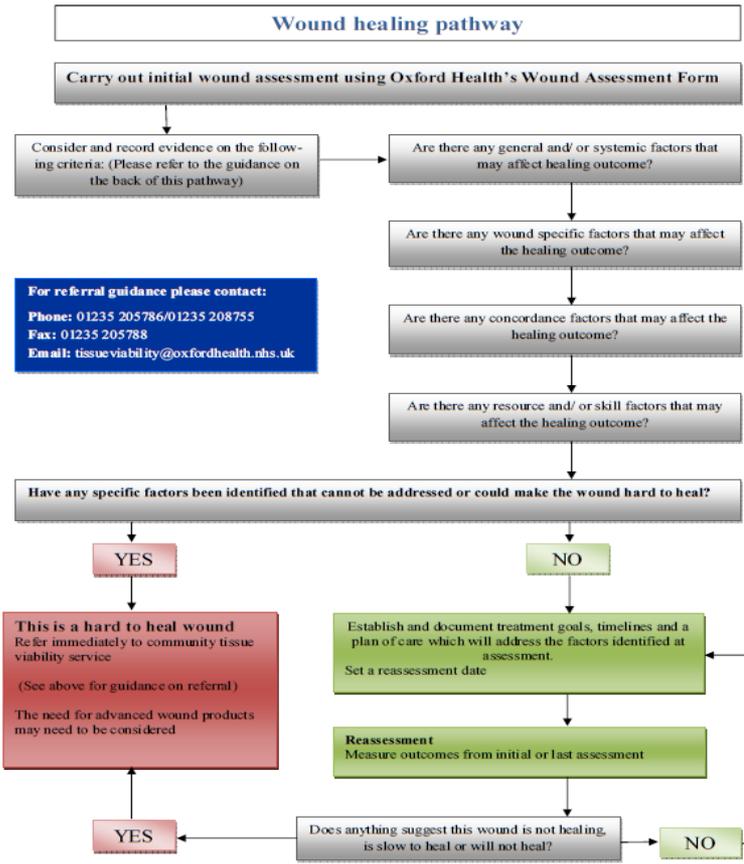
- Risk tools
- AMBL tool
- Wound assessment tools
- QoL tools
- Anxiety/ Depression scores
- Pain tools
- MMP testing

Measuring

- ◎ Treatment pathways
- ◎ Wound measurement in cm²
- ◎ Wound progression charts
- ◎ Photography
- ◎ Audit

Wound healing pathway & risk assessment tool

Oxford Health 
NHS Foundation Trust



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.

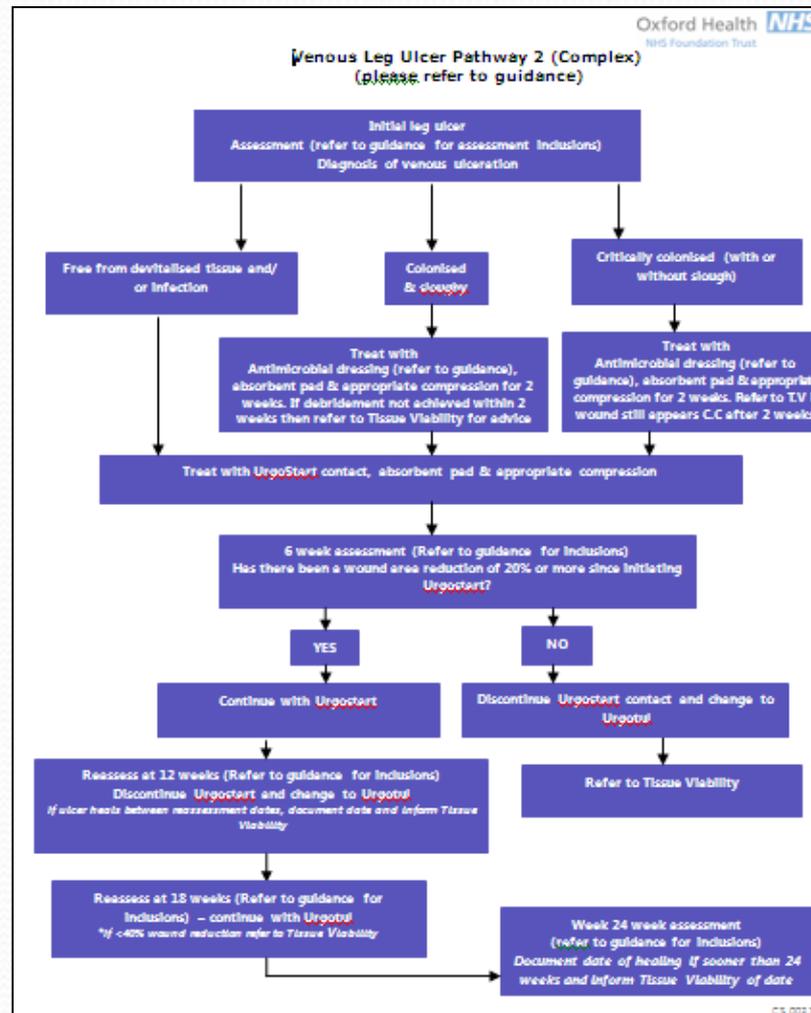
General	Tick	Systemic	Tick
Medication includes steroids, cytotoxic therapy or warfarin.		Poor perfusion/ ischaemia/ peripheral vascular disease	
Impaired mental capacity (inability to make informed decisions)		Anaemia	
Social isolation		Auto-immune disease – i.e. rheumatoid arthritis, lupus etc	
Health & social care needs		Diabetes mellitus	
A carer for others		End of life status	
Financial/ employment issues		Poor nutritional status	
Pain		Immobility	
		Smoker	

Wound specific	Tick
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 100cm ² or a length equal to or greater than 10cm	
A wound deeper than 5mm, undermining or tracking (sinus/ cavity)	
Heavily exuding wound	
Devascularised tissue (Slough/ necrosis) in wound bed	
Maceration and/ or excoriation to wound edges	
Local wound bed infection (Critical colonisation)	
Systemic wound infection (Cellulitis)	
Oedema/ lymphoedema in afflicted limb	
Wound malignancy	
Full thickness wound, Exposed tendon, bone exposed	

Concordance – consider:	Tick
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 health care provider? i.e. The day/ time of visits or appts, the competence of staff, nurse/ patient relationship, interpersonal skills, lack of empathy.	

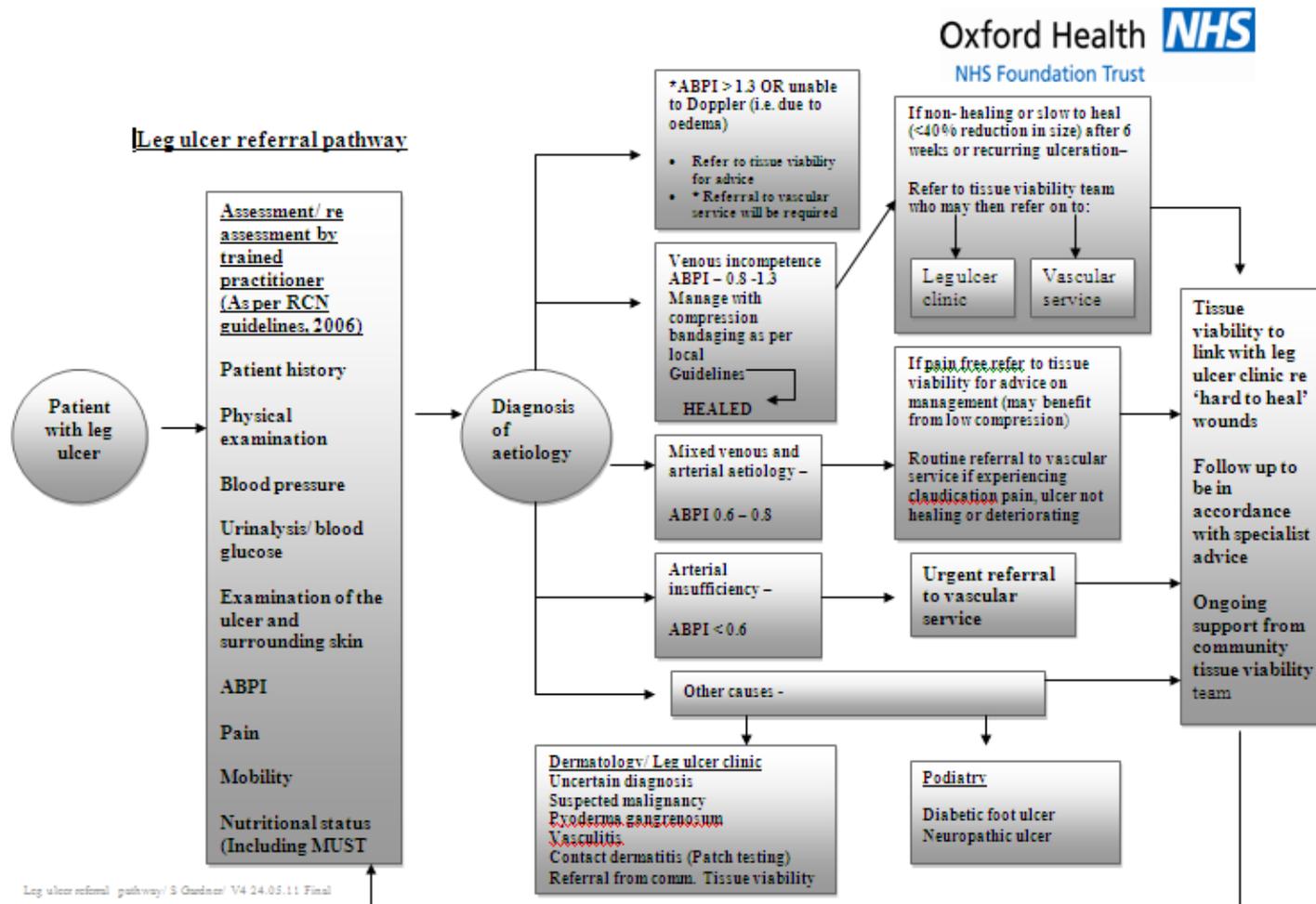
Resource/ skill specific – consider:	Tick
Lack of adequate equipment available.	
No or limited access to the dressings required for managing this wound.	
No or limited access to specialists to support you with this wound.	
No or limited access to education and training to enhance wound care knowledge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

Treatment pathways



Referral pathway

Leg ulcer referral pathway

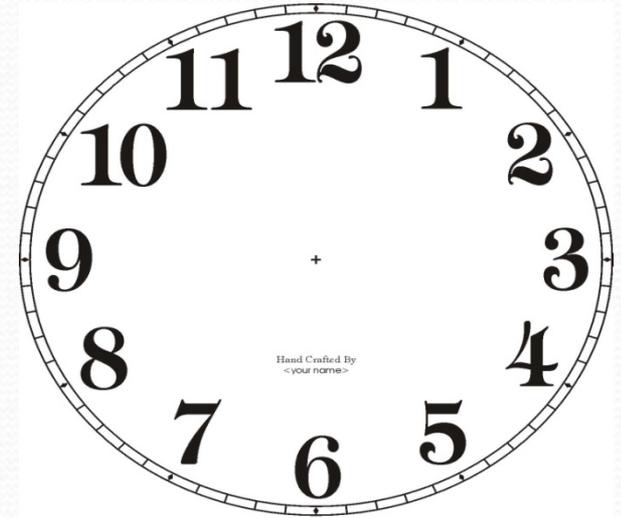


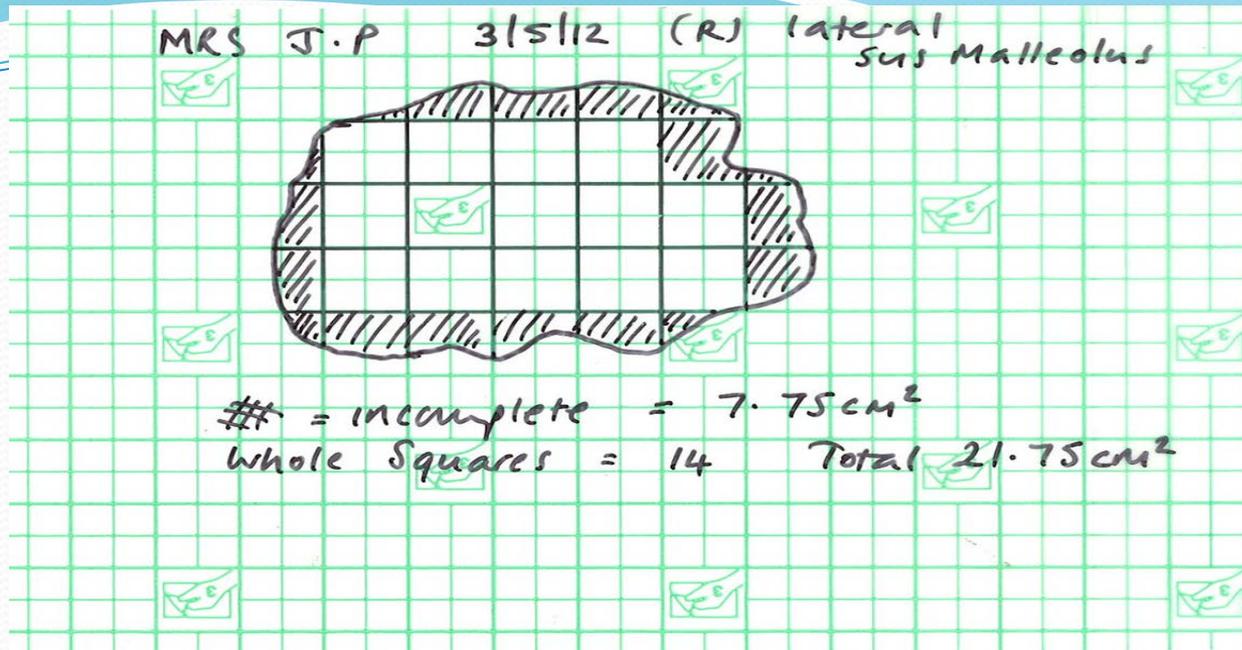
Measuring.....



Assess size and depth

- Map/ trace and work out surface area in cm^2
- 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%)

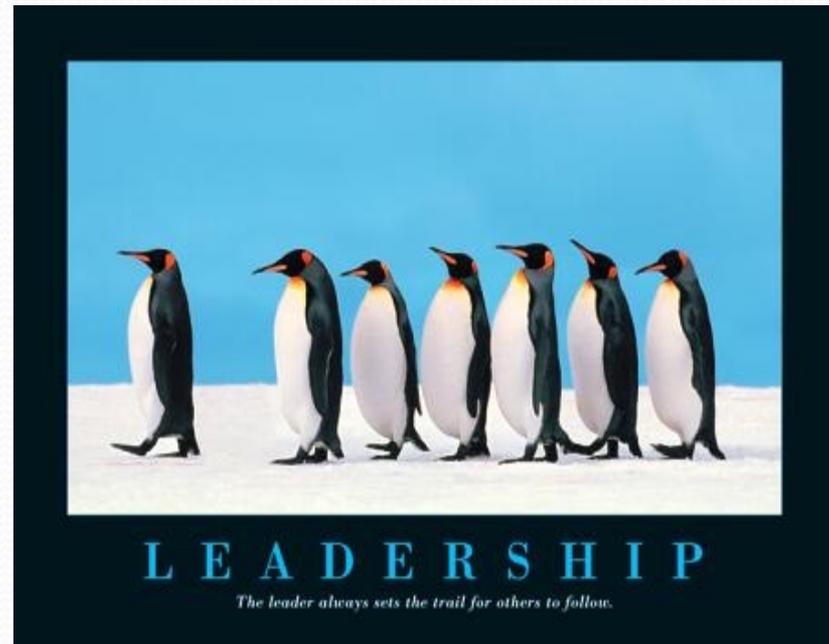
This means that there has been a 35.6% reduction in wound area since the last measurement

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 a 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!!!

