The use of a novel haemoglobin spray to promote healing in chronic wounds whilst reducing treatment costs

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Background
Chronic wounds present a huge burden to the NHS; these include pressure ulcers, leg ulcers and diabetic foot ulcers. Many intrinsic and extrinsic factors impact on wound healing. One of these is hypoxia, the lack of oxygen to the wound bed. This can lead to the wound entering a pro-inflammatory phase which delays the healing process. Research has shown that improving the oxygen available to the wound can stimulate wound healing but it has been difficult to achieve in practice.

A novel product, Granulox®, offered the opportunity to assess if introducing oxygen to the wound by topical application of a haemoglobin spray could stimulate wound healing. Granulox® is an aqueous solution containing haemoglobin molecules which is delivered via a non-aerosol based spray.

The haemoglobin molecule can bind oxygen from the atmosphere, transport it and release it into the wound bed where oxygen levels are low. This increases tissue oxygen levels and stimulates the healing process. The haemoglobin is not “used up”, so this step constantly repeats itself, allowing large quantities of oxygen to be brought to the wound bed over a period of 72 hours.

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Method
10 patients with wounds, of different aetiologies, were treated with the Granulox® over a period of 8 - 15 weeks. Photographs and wound measurements were obtained at base line. Granulox® was applied and an appropriate secondary dressing used depending on exudate levels. The treatment was applied twice weekly. Further photographs and measurements were obtained at intervals of 2 weeks, 4 weeks and at the end of evaluation period. Cost of Granulox® assumed at £125/can, with average of 30 applications per can.

Rinse as per routine wound cleaning
Spray with Granulox® from a distance of 5 to 10 cm
Cover with (any) breathable wound dressing.

Average weekly cost of care reduced from £94 to £86 (-8%) with introduction of Granulox®

Patient A – Rheumatoid Ulcer > 10 months
52 year old female, Unable to tolerate Doppler ABPI, multiple dressing regimes including antimicrobials, multiple allergies, on anti inflammatory.

19/03/15
Size - 1.5cm x 0.9cm. 100% slough. Verbal pain score: 8-9 constantly
Granulox® applied 2 x weekly plus non-adherent foam dressing.

08/05/15
Size - 1.4cm x 0.4cm 80% granulation and 20% slough. Grade pain as a “3”
Patient reported Granulox® as “easy to use”, and applied herself at home in between appointments with the Practice Nurse.

Average weekly cost of care reduced from £94 to £86 (-8%) with introduction of Granulox®

Patient B - Venous leg ulcers > 12 months
43 year old male, PWID (Person Who Injects Drugs) now stopped. Doppler ABPI plus gold standard treatment for 12 months with no improvement.

30/03/15
Size - 8cm x 4cm
Dull in colour with 100% slough
Pain score: 11/10 in his own words “I want my legs cut off”
Granulox®, superabsorbent dressings and two layer system of compression bandages.

27/07/15
At five weeks the pain score had been reduced to between 3-4
At four months, size reduced to - 7cm x 2.3cm. Healthy 100% granulation tissue. Surrounding tissue improved. Quality of Life had much improved.

Average weekly cost of care reduced from £277 to £241 (-13%) with the introduction of Granulox®

Patient C - Dehisced Surgical Wound (BKA) > 9 months
59 year old male with peripheral vascular disease, a range of treatments including antimicrobials, Topical Negative Pressure, Protease Modulating therapy had been tried.

13/04/15
Size -1cm x 1.5cm x 0.3cm deep
Granulox® applied plus silicone foam dressing
At month one, 12/05/15, reduced in size to - 0.5cm x 1.3cm x 0.3cm deep

12/05/15
By 03/08/15 the wound had healed. After the evaluation period, when the wound had healed, the patient continued to use Granulox® and reported improved skin condition. He was able to wear his prosthesis which improved his quality of life.

Average weekly cost of care reduced from £163 to £42 (-74%) with introduction of Granulox®

Patient D - Healing Grade 4 Pressure Ulcer > 15 Years
70 year old female with MS. Long standing PU right ischial tuberosity. Tried all known treatments over the last 15 years. Challenge balancing bed rest and quality of life to heal ulcers. Moisture/excoriation of surrounding skin.

24/04/15
Size – Long side of V shape = 5cm (upper and lower edges), Width across centre = 2.1cm. 50% slough.

08/05/15
At two weeks, size – Long side of V shape 7cm (lower edge) and 6cm (upper edge). Width across centre = 2cm. 100% granulation tissue. Although wound increased in size this was due to slough debriding. Tissue quality improved. Patient continued using Granulox® after the evaluation with continued improvements.

Average weekly cost of care reduced from £140 to £111 (-18%) with introduction of Granulox®

Patient E – Healing Grade 4 Pressure Ulcer > 15 Years
70 year old female with MS. Long standing PU right ischial tuberosity. Tried all known treatments over the last 15 years. Challenge balancing bed rest and quality of life to heal ulcers. Moisture/excoriation of surrounding skin.

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Discussion and Conclusions
This small study shows how a novel haemoglobin spray can significantly impact patient lives:

- Improving healing rates
- Supporting patient self management.
- Reducing pain associated with chronic wounds
- Reduce cost of a care episode

There is the potential to reduce long term costs to the healthcare system for both wound treatments pain management.

Recommendation
Larger studies of patients with chronic wounds using Granulox®. This would confirm that patient outcomes around healing and quality of life could be significantly improved.

Results
Of the 10 patients who started the evaluation, 8 patients finished with 2 patients excluded from the results as they did not follow the treatment plan. Four patient examples are shown in the illustrations.

Outcomes:
- 1 healed
- 5 progressed towards healing
- 2 became infected and stopped treatment

For the illustrated cases the average weekly cost of care was evaluated in detail, see below. The average saving in weekly cost of care was -38% (A weekly saving of £71.30). 25% of this saving was from reduced cost of dressings and 75% from reduced nursing time.

Average weekly cost of care

<table>
<thead>
<tr>
<th>With Granulox</th>
<th>Reduced by</th>
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<tbody>
<tr>
<td>£211</td>
<td>£140</td>
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Pre Granulox
With Granulox

Additionally an unexpected, but positive, result was that some patients showed a marked reduction in pain. For these patients this had become a chronic problem impacting on their quality of life.