# Quantifying the economic value of diagnostics in wound care in the UK

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## AIM:

Chronic wounds present a significant financial and resource burden to the NHS. The annual cost of wound care in the UK has been estimated to be £2 million per 100,000 population. A recent study found that 28% of all non-healing chronic wounds had elevated protease activity (EPA), which can now be assessed using a new point of care protease test*, and that these wounds had only a 10% chance of healing without appropriate intervention. A separate study showed that 77% of venous leg ulcers responded to Collagen/ORC therapies, when targeted to wounds with EPA. This work aimed to quantify the economic value of testing for EPA and targeting treatment accordingly.

## METHODS:

An economic model was developed to calculate the potential saving that could be achieved by identifying chronic wounds with EPA and targeting protease modulating treatment** accordingly. Published effectiveness data and UK relevant resource use data were used to populate the model.

## RESULTS & CONCLUSIONS:

The model estimated potential savings of £1,906 per EPA wound identified when compared to usual care. This equates to over £50,000 for every 100 non-healing chronic wounds tested.
The model demonstrates that implementing a 'test and treat' algorithm of care in the UK involving testing for EPA and targeting protease modulating treatment accordingly can achieve savings while dramatically improving the healing chances of EPA wounds, thus confirming previously published consensus opinion on this topic.

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# Background: The burden of chronic wounds

- There are around 200,000 chronic wounds in the UK and they represent a significant burden to the patient and NHS[1]
- One study estimated annual costs for all wounds to be £2.03 Million per 100,000 population, based on 2006-2007 prices[2]
- Chronic wounds are estimated to cost the NHS around £2.3-3.1bn 2006 prices – 3% of NHS budget[1], however with proper diagnosis and treatment much of the disease burden can be avoided
- Chronic wounds contain a hostile biochemical environment including elevated levels of inflammatory cytokines, free radicals and proteases irrespective of the underlying aetiology [3,4]
- Many studies have investigated the role of proteases in human chronic wounds, and have concluded that elevated protease activity contributes to their chronicity [5,6,]


1. Posnett J Franks P (2008) The burden of chronic wounds in the UK. Nursing Times 104(3) 44-5
2. Vowden K, Vowden P. Posnett J (2009) The resource cost of wound care in the Bradford and Airedale primary care trust in the UK. Journal of wound care 18(3) 93-102
3. M. Muller, C. Trocme, B. Lardy, F. Morel, S. Halimi, P. Y. Benhamou Matrix metalloproteinases and diabetic foot ulcers: the ratio of MMP-1 to TIMP-1 is a predictor of wound healing. Diabetic Medicine (2008) 25(4):419-426.
4. Trengove NJ, Stacey MC, MacAuley S, Bennet N, Gibson J, Burslem F, Murphy G, Schultz G. Analysis of the acute and chronic wound environments: the role of proteases and their inhibitors.7, Wound Repair Regen : 1999, pp. 442-52.
5. Lobmann R, Ambrrosch A, Schultz G, Waldmann K, Schiweck S, Lehnert H (2002) Expression of matrix-metaoproteinases and their inhibitors in the wounds of diabetic and non-diabetic patients., Diabetologia 45:1011-6.
6. Lui Y, Min D, Bolton T, Nube V, Twigg SM, Yue DK, McLennan SV (2009) increased MMP 9 predicts poor wound healing in diabetic foot ulcers. Diabetes Care 32:117-9.

# Background: elevated protease activity (EPA) and chronic wounds

- A chronic wound with EPA has only a 10% chance of healing without appropriate intervention[1], however there are no visual cues to detect EPA[2]
- Until recently, there has been no point of care (POC) diagnostic test to detect EPA in chronic wounds in routine clinical practice
- Without the aid of targeted diagnostics, decision making is largely based upon intuition; this may often lead to inappropriate treatment choices and the use of advanced therapies as "last resorts"[1]
- A point of care test* is now available to detect EPA
- In an International consensus document, experts agree that the introduction of a POC diagnostic tool to detect EPA could aid a more structured, cost-effective and timely approach to wound management[3]


1. Serena T et al (2011) Protease activity levels associated with healing status of chronic wounds. Poster Wounds UK
2. Snyder R J, Cullen B (2011) Point of Care Diagnostic Tests in Wound Management: Targeted therapy for excessive protease activity… the first frontier. Journal Of Wound Technology (13) :16-23
3. International consensus. The role of proteases in wound diagnostics. An expert working group review. London: Wounds International


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# Methods: Clinical assumptions

An economic model was developed to calculate the potential saving that could be achieved by identifying chronic wounds with EPA and targeting protease modulating treatment accordingly.

All non-healing chronic wounds *(n=100)*

**Prevalence of EPA: 28%** of non-healing chronic wounds[1] *(n=28)*

*All other wounds (low protease activity) – not followed by economic model i.e. offered standard care*

***Today / Baseline:***

NON-DIRECTED TREATMENT*:
**Healing probability of chronic wound with EPA: 10%** (without appropriate intervention)[1]

***Future scenario:***

EPA DETECTED → TARGETED TREATMENT**:
**Healing probability of chronic wound with EPA: 77%** based on response rate at 4 weeks[2]

**Assumed healing times:** Healing = 12 weeks[3]; Non-healing 52 weeks[4]


1. Serena T et al (2011) Protease activity levels associated with healing status of chronic wounds. Poster Wounds UK
2. Cullen, B., Gibson, M., Nesbit, L. Targeted use of protease modulating dressings improves clinical outcomes. Presented at Wounds UK, Harrogate 2011.
3. Weeks to heal a responder - based on predictive nature of 4 weeks wound area reduction - Gelfand JM, Holstad O,Margolis DJ. Surrogate Endpoints for the Treatment of Venous Leg Ulcers Journal of Investigative Dermatology (2002) 119, 1420–1425
4. 52 weeks minimum to heal a non-healing chronic - based on UK where >50% of VLUs require more than 1 year to heal assuming EPA wounds are part of the 50%, also not accounting for prior treatment duration - Extension of Choice of Any Qualified Provider Venous Leg Ulcer & Wound Healing Implementation Pack. (2012)


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# Methods: Cost assumptions

Chronic wounds with EPA

***Today / Baseline:***

**NON-DIRECTED TREATMENT*:**

- Current total cost of care: £96 / visit[1]
- One dressings change per week

= **£96** per week
(during standard care)

***Future scenario:***

**EPA DETECTED → TARGETED TREATMENT**:**

- **Cost to detect EPA: £21.50** per test[2] (avg 3.6 wounds tested to detect 1 wound with EPA = 28% prevalence)
- **Targeted protease modulating treatment**:** incremental costs £5.19/dressing change[3] in addition to standard costs of care
- **Healing wounds / responders:** Two (2) dressing changes per week during a six (6) week targeted treatment period, followed by standard care to healing
- **Non-healing wounds / non-responders:** Two (2) dressing changes per week until wound identified as non-healing after four (4) weeks, then return to standard care

= **£202.38** per week
(during protease modulating treatment)


1. NHS (2011) Extension of Choice of Any Qualified Provider Venous Leg Ulcer and Wound Healing Implementation Pack.
2. Systagenix Wound Management
3. Drug Tariff. April 2013.


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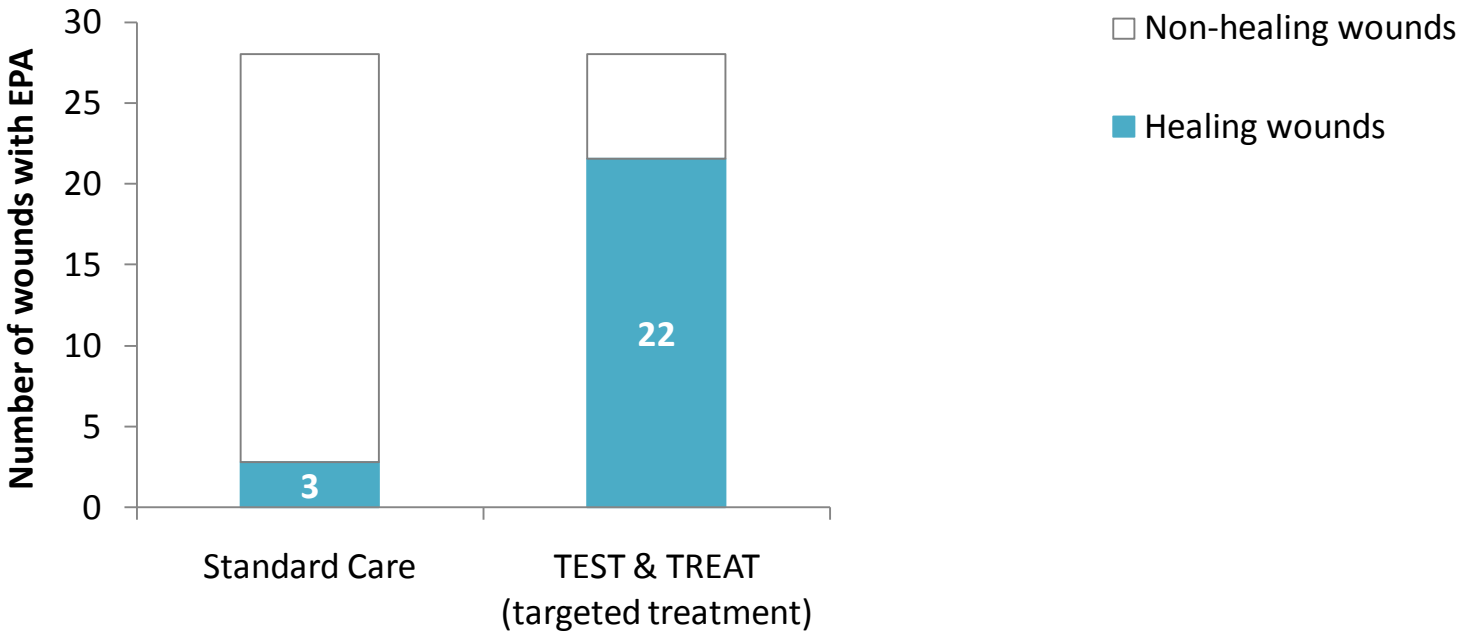
# Methods: Economic Model

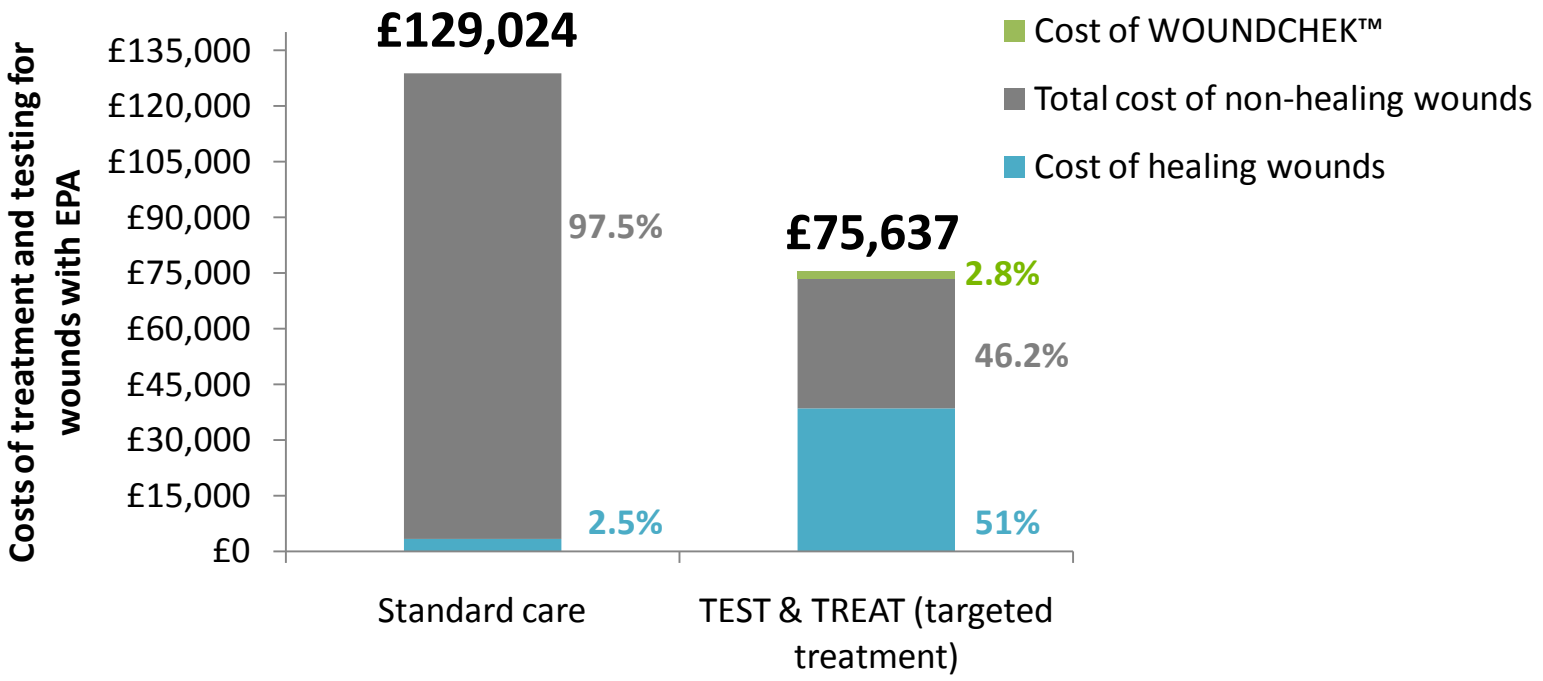
| | Standard Care (non targeted treatment) | TEST & TREAT (targeted treatment) | Potential cost savings |
|---|---|---|---|
| **Cost of detecting EPA** | £0 | 100 wounds x £21.50 = **£2,150** | |
| **Cost of healing wounds with EPA** | 10% x 28% x 100 wounds x 12 weeks x £96 = **£3,226** | 77% x 28% x 100 wounds x 6 weeks x £202.38 = £26,180 + 77% x 28% x 100 wounds x 6 weeks x £96 = £12,419 = **£38,599** | |
| **Cost of non-healing wounds with EPA** | 90% x 28% x 100 wounds x 52 weeks x £96 = **£125,798** | 23% x 28% x 100 wounds x 4 weeks x £202.38 = £5,213 + 23% x 28% x 100 wounds x 48 weeks x £96 = £29,676 = **£34,889** | |
| **Total cost** | **£129,024** | **£75,637** | **-£53,387** |
| **Per EPA wound identified** | £4,608 | £2,702 | **-£1,906** |

# Results: Clinical Value




Based on the healing probability and EPA prevalence assumptions input, out of 100 non healing chronic wounds, the model estimates that **19 additional wounds with EPA could heal** by implementing TEST & TREAT algorithm

# Results: Economic Value



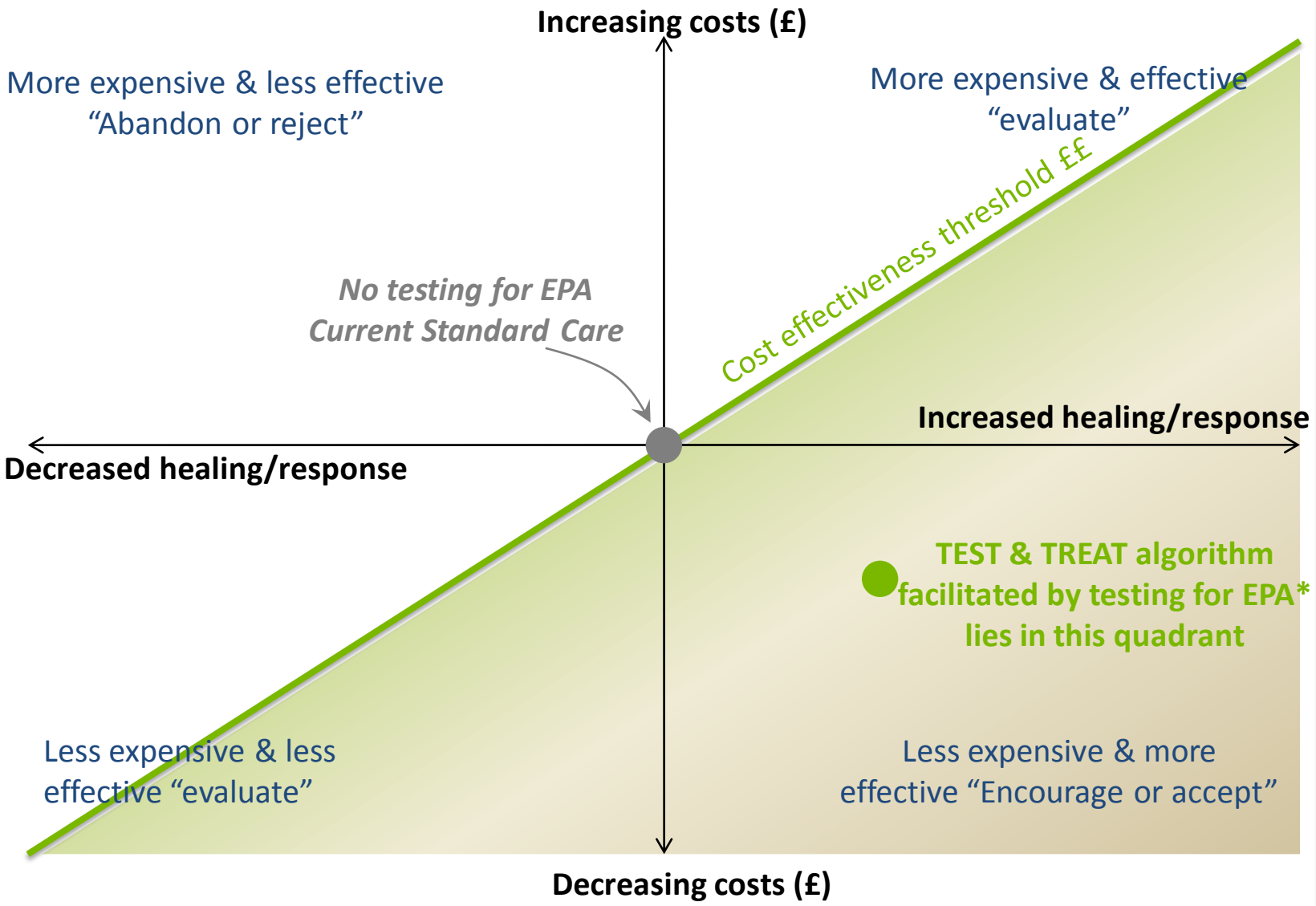

**£53,387 total potential cost savings** per 100 wounds tested

= **£1,906** potential cost savings **per EPA wound identified**

This frees up **556** clinical episodes

or **£7,229** in cash release (dressing materials)

# Results: Assessing cost-effectiveness of TEST & TREAT algorithm

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## Conclusions

- An economic model (based on 100 non-healing chronic wounds) has shown that implementing a 'TEST & TREAT' algorithm in the UK to test chronic wounds for EPA and provide targeted protease modulating treatment for those wounds with EPA...
  - ✓ ... could result in **19 additional healing wounds**,
  - ✓ while enabling potential **cost savings of over £50,000**,
  - ✓ i.e. a potential savings of **£1,906 per EPA wound identified**,
  - ✓ or **556 episodes of care** freed up,
  - ✓ or **£7,229 cash release** (dressing materials).

- TEST &TREAT algorithm is therefore a **dominant strategy** with regard to cost-effectiveness when compared to the current standard care and the test is **self funding**