Quality of Care and Cost Effectiveness: Optimization of Wound Care in the Netherlands

Wouter Brekelmans, MD1,2,3*, Boudewijn LS Borger van der Burg, MD1,2,3 and Rigo Hoencamp, MD, PhD1,2,3,4

1Division of Surgery, Alrijne Ziekenhuis, Leiderdorp, The Netherlands
2Alrijne Wound Centre, Leiderdorp, The Netherlands
3Division of Surgery, Leids Universitair Medisch Centrum, Leiden, The Netherlands
4Ministry of Defence, The Hague, The Netherlands

*Corresponding author: Wouter Brekelmans, Division of Surgery, Alrijne Ziekenhuis, Simon Smitweg 1 2353 GA Leiderdorp, The Netherlands, Tel: +31-626502849, Fax: 031-715828147

Abstract

Recently Brekelmans, et al. analyzed a new “fast-track protocol, the intervention “fast track protocol” was implemented to shorten the time to referral of patients when the need for diagnostic test was deemed necessary because of the suspicion of underlying pathology preventing wound healing. This sub-analysis of a cross-sectional study presents the cost reduction, using that “fast track protocol”. Our conservative estimate is that between approximately €135,000,000 and €293,000,000 can be saved in annual healthcare costs in the Netherlands. Using a new wound protocol that includes triage, prompt analyses and treatment of underlying causes by specialized doctors in a multidisciplinary setting provides an enormous potential for cost savings.

Keywords
Cost-effectiveness, Chronic wounds, Prevalence, Incidence, Referrals, Wound protocol

Introduction

The prevalence of chronic wounds in the Netherlands varies from 1-3%. The estimated annual cost of wound care in the Netherlands is 1.5 billion euro [1]. The healthcare (direct) costs (2014-2015) of the diabetic foot in the United Kingdom are 0.8% to 0.9% of the National Health Service (NHS) budget [2]. The direct costs of diabetes care in general in the United States of America was $237 billion in 2017 and up to one-third of the direct costs of care for diabetes may be attributed to the lower extremity. This should be compared to $80 billion for cancer care in 2015 [3]. Optimalisation of wound care is a major challenge, including costs control, but receives little attention in terms of organization and treatment strategy development. Wounds without healing within 4-6 weeks are chronic and should be recognized early and treated in a multidisciplinary setting where aetiology should be explored [4-8].

Before 2015, the average time to referral to the Alrijne Wound Centre (AWC), Leiderdorp, the Netherlands was 19 weeks, (range from 1-5479 days) [9]. Recent data from another region in the Netherlands showed a time to referral to a medical specialist of 30 weeks [10]. In 2009 the mean duration to referral to a medical specialist in Germany was 62 weeks (range, 14-1867 days) [11].

Recently Brekelmans, et al. analyzed a new “fast-track “protocol [9], the intervention “fast track protocol” was implemented to shorten the time to referral of patients when the need for diagnostic test was deemed necessary because of the suspicion of underlying pathology preventing wound healing. Time to referral to a wound physician (the “triage moment”) was 5 weeks versus 19 weeks in the control group unnecessary referrals to the hospital were reduced by 17.4%. This showed that an enormous health gain potential can be achieved. This study presents the cost

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reduction, using that “fast track protocol”. The aim of the study is calculating the cost reduction using best practice wound care in the Netherlands.

**Methods**

**Study design**

Sub-analysis of a cross-sectional study.

**Study population**

The data of the cross-sectional study was collected at the AWC from January 2017 until January 2018 and included patients with new onset of wounds of two general practitioner practices. The data was registered by the general practitioners and ActiVite, a large home care organization in the western region of the Netherlands. The practices had a total of 19.100 people registered to their care in 2017, one is located in Alphen aan den Rijn and the other in Leiderdorp, South Holland, the Netherlands. The data of 2017 were compared to outcomes of the AWC from 2014 (data from the period before the start of the study) and outcomes from relevant literature.

**Fast track protocol**

To ensure the logistics and to gain insight into the duration of wound healing, patients were divided into five different groups following a standard protocol (Table 1 and Figure 1). Group 1 included patients affected by wounds with a healing rate of maximum six weeks or a healing rate with a minimum of 15% per week, treated by the homecare wound nurses or GP. A superficial debridement was performed if deemed necessary. Group 2 consisted of patients with wounds without a healing rate of 15% per week. These patients were seen and diagnosed by a wound physician provided by the AWC during a triage moment. This triage moment was performed at the GP clinic. After the consultation with the wound physician (WP), the patient remained in treatment at the GP with additional advice given by the WP (group 2a) or if necessary, the patient was sent to the AWC for additional diagnostics (group 2b). Group 3 consisted of patients that needed acute (wound) care or assessment at a hospital. This group included patients with infected diabetic foot. Group 4 were patients that were referred to the hospital for diagnosis and possible intervention (group 2b + 3).

78/19.100 (0.4%) of the patients with wounds did not show a sufficient healing rate after 4-6 weeks. Time to referral to a wound physician (the triage moment) was 5 weeks versus 19 weeks in 2014 (p < 0.001). Unnecessary referrals to the hospital were reduced by 17.4%. (p = 0.007) [9].

**Health economic model**

**Calculating the average of reduced hours of home care and the associated cost reduction:**

- Based on the reimbursements of the Dutch Exceptional Medical Expenses Act, approximately 70% of patients with a complex wound is nursed for 3.5 hours per week on average [12].

- The maximum amount per hour a home care organization can charge for reimbursement in 2020 is €74. The hourly wage of a specialized nurse in 2020 is €92.28 per hour [12]. There are no data on which percentages of care is provided by regular and specialized nurses in the Netherlands. To avoid overestimation, the average home care nurse’s rate is used.

**Calculating the average of reduced use of dressing materials and the associated cost reduction**

- In 2019 there were 339.900 patients in the Netherlands eligible for reimbursement of wound dressing materials. The total national cost of all dressing materials in 2019 was more than €92 million [13]. There is no data on the average duration of wound healing in the Dutch population; therefore an average price per week cannot be calculated. However, if the average price per patient per week is nevertheless calculated, this results in an amount of €5.20 per week; (€ 92.000.000/339.900)/52 weeks.

**Calculating the cost reduction by the decrease of unnecessary referrals to the hospital**

- Various data show that the average cost of a
Patient with Wound  
N=364

Acute Pathology/DM? 

Group 3  
N=27

Treatment according protocol

No

4-6 wk: Healing/Healed?

Yes

Triage: Underlying pathology?

No

Yes

Group 2

N=37

Group 2a

N=25

Advise by WP/MS

Group 2b

N=12

Diagnostics + Interventions (Hospital)

Back to Homecare

Figure 1: Fast track protocol.

referral to a hospital for regular wound care without the need for additional analysis or (surgical) treatment is €400 [1,9].

Results

Cost reduction of care consumption per patient in home care

In 2014 the time between onset of the wound and referral to the AWC was 135.7 days (R: 0-5479, SD: 331.9). After triage by the AWC wound physician of patients with stagnating wounds, healing occurred at a mean of 34.5 days (0-202, SD 42.4). With the implementation of the fast track protocol, a reduction of 101.2 days (14.5 weeks) in duration to triage was achieved. This would reduce the need for wound care of 50.75 hours per patient, resulting in a €3.734 cost reduction.

Cost reduction of wound care materials

Using the difference of 101.2 days (14.5 weeks) in duration to triage and a mean weekly cost of €5.20, a cost reduction of €75.40 per patient could be achieved using the fast track protocol.
time to triage (30 weeks) the savings will increase by a factor of 1.57. The hourly wage of a specialized nurse in 2020 is €92.28 per hour. In our calculations the hourly wage of a home care nurse of €73.58 per hour is used. In recent years, the trend has been that more and more specialized nurses are used for wound care in a homecare-setting. The savings will increase by a factor of 1.25 if the reimbursement fee of the specialized nurse is used. The calculated average dressing costs per week is divided by 52 weeks. The data on the average wound healing time differs. Brekelmans data shows that groups one, two and three showed an average healing time of 15 days, 40 days and 115 days respectively [9]. Time to wound closure in patients with underlying pathology is not included in this study. Depending on the etiology, wound healing in patients with underlying pathology can take up 6 months or longer [15]. Above data suggests that the average healing time average is much shorter than 52 weeks. Calculating the average of reduced use of dressing material, using an average healing time of 26 weeks, results in an increase of savings by a factor 2.

The calculations mentioned above indicate savings that could amount up to €294 million in the Netherlands (Table 3).

The savings are mainly obtained from outpatient care by shortening the time to triage and thereby reducing care hours with home care. Knowing that primary care is responsible for a large part of the total cost of wound care (60-65%) [2,16], it seems realistic to realize the highest savings there as well. It is assumed that treating the wound patients at the right time and in the right place, less complications will develop. Follow-up of these groups will provide more insights.

Cost reduction of unnecessary referrals to the hospital

The incidence is 19 per 1000 patients in our region with wounds [9]. According to our study 10.2% of the patients with wounds showed no wound healing within the first 6 weeks and underwent subsequent triage. 67.6% of patients did not need additional in hospital procedures and treatment. These wounds healed after an expert wound advice including how to treat stagnating factors and more extensive debridement by the WP. By using the AWC protocol, 1.3 out of every thousand inhabitants is prevented from being unnecessarily referred to the hospital (group 2a) [9]. This results in a cost saving of €520 per 1000 inhabitants. The cost per triage of wound physician was €200 per triage. 1.9 patients per 1000 inhabitants needed a triage, which results in a cost of €380 per 1000 inhabitants. This means a net cost saving of €140 per 1000 inhabitants.

If we extrapolate this data over the Dutch population, we get the following results, using the real incidence of the chronic wounds of 2 per 1.000 inhabitants [9] and the current population numbers in the Netherlands of 17.4 million [14]; Our conservative estimate is that approximately €135.000.000 can be saved in annual healthcare costs in the Netherlands (Table 2).

Table 2: Benefits using the fast tract protocol.

| Benefit                                      | Incidence | Cost        | Total       |
|----------------------------------------------|-----------|-------------|-------------|
| Reduced hours of home                        | €34,800   | €8106.80    | €282,116.570|
| Reduced use of dressing materials            | €34,800   | €261.04     | €9,084.192  |
| Decrease of unnecessary referrals to the hospital | €140 × 1000 | €140 × 17400 | €2,436.000  |

**Total**: €293,636,762

Table 3: Benefits using the fast tract protocol versus situation in the Netherlands (time to referral of 30 weeks).

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**Discussion**

The results of this analysis are captivating. By applying a triage system for wound care, we calculated that approximately €135,000,000 Euros could be saved in annual healthcare costs in the Netherlands. In this analysis, 2014 regional data were used as the control group. In the AWC region, the mean time to triage in 2014 was 19 weeks. Using the national average of the time to triage (30 weeks) the savings will increase by a factor of 1.57 [10]. The hourly wage of a specialized nurse in 2020 is €92.28 per hour. In our calculations the hourly wage of a home care nurse of €73.58 per hour is used. In recent years, the trend has been that more and more specialized nurses are used for wound care in a homecare-setting. The savings will increase by a factor of 1.25 if the reimbursement fee of the specialized nurse is used. The calculated average dressing costs per week is divided by 52 weeks. The data on the average wound healing time differs. Brekelmans data shows that groups one, two and three showed an average healing time of 15 days, 40 days and 115 days respectively [9]. Time to wound closure in patients with underlying pathology is not included in this study. Depending on the etiology, wound healing in patients with underlying pathology can take up 6 months or longer [15]. Above data suggests that the average healing time average is much shorter than 52 weeks. Calculating the average of reduced use of dressing material, using an average healing time of 26 weeks, results in an increase of savings by a factor 2.

The calculations mentioned above indicate savings that could amount up to €294 million in the Netherlands (Table 3). Figure 2 shows schematic the outcomes using different protocols in the Netherlands.
separately, this could lead to unclear reimbursement flows, which increases the risk of unnecessary costs. Centralizing the management and care pathways alone will reduce costs \[18, 19\].

One major limitation of the current analysis is the population size. Extrapolation to a national level can be complicated since confounders exist such as case mix variations and differences in social economic status (SES). The SES scores of the patients included in our study group \[9\] were between the average and the highest SES in 2016 \[20\]. In regions where the SES is lower, the costs and savings when using this protocol can be even greater \[21\]. Secondly, the outcomes describing the cost savings are calculated estimates. Therefore a minimum and maximum cost saving is discussed. Thirdly, patients living in a nursing home or similar care facility are not included in the original article. The incidence of chronic wounds, and thereby the potential savings are therefore, in reality, higher.

**Conclusion**

Using a new wound protocol that includes triage, prompt analyses and treatment of underlying causes by specialized doctors in a multidisciplinary setting provides an enormous potential for cost savings. AWC-like centers provide optimal terms for wound care specialized in recognizing and treating pathology. The challenge is implementing these new reimbursement strategies with an overarching communication system.
between different practitioners and an implementation of a standardized national referral protocol.

Conflict of Interest
The authors have no conflicts of interest and no competing financial interests to report.

Authors Declaration
The authors have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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