



RESEARCH ARTICLE

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

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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]. Optimisation 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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Table 1: Grading score.

Group	Characteristics
1	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.
2a	Patients were triaged by a wound physician: Wounds with a healing rate less than 15% per week Advice was given to the GP or wound nurse. A more extensive debridement was performed if necessary.
2b	Patients were triaged by a wound physician and referred to AWC: Wounds with a healing time less than 15% per week and underlying pathology was suspected
3	Acute referral to AWC: Patients who need acute (wound) care or assessment at a hospital.
4	All patients who have been referred to the hospital for diagnosis and possible intervention.

GP: General practitioner; AWC: Alrijne Wound Centre.

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^a, 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 general practitioner (GP). A superficial debridement was performed when 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

^aIn the Netherlands every citizen is obligated to register at general practitioners office.

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:

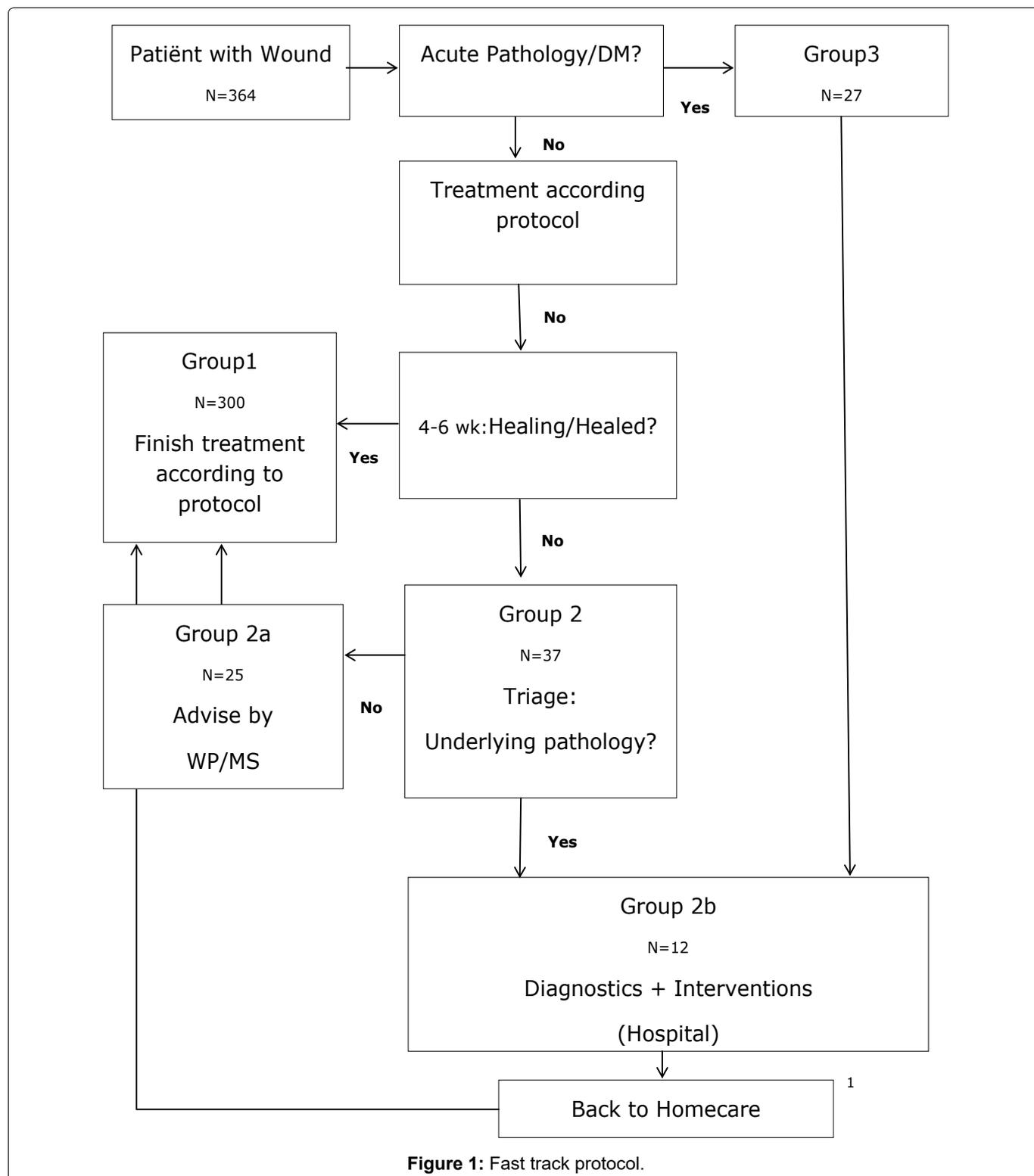
- Based on the reimbursements of the Dutch Exceptional Medical Expenses Act, approximately 70% of patients with a complex wound is nursed for 3.5 hours per week on average [12].
- The maximum amount per hour a home care organization can charge for reimbursement in 2020 is €74. The hourly wage of a specialized 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



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.

Table 2: Benefits using the fast tract protocol.

Minimal Benefits			
Reduced hours of home	$P \times R$	$34.800 \times \text{€}3734.19$	€129.949.6380
Reduced use of dressing materials	$P \times D$	$34.800 \times \text{€}75.4$	€2.623.920
Decrease of unnecessary referrals to the hospital	€ 140 × per 1000 inhabitants	€140 × 17400	€2.436.000
Total			€135.009.558

P: Incidence chronic wounds in the Dutch population, using the fast track protocol (2 per 1.000 patients); R: Average of reduced hours of home care; D: Average of reduced use of dressing materials.

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

Maximal Benefits:			
Reduced hours of home	$P \times R$	$34.800 \times \text{€}8106,80$	€282.116.570
Reduced use of dressing materials	$P \times D$	$34.800 \times \text{€}261,04$	€9.084.192
Decrease of unnecessary referrals to the hospital	€140 × per 1000 inhabitants	€140 × 17400	€2.436.000
Total			€ 293.636.762

P: Incidence chronic wounds in the Dutch population, using the fast track protocol (2 per 1.000 patients); R: Average of reduced hours of home care using wage of a specialized nurse; D: Average of reduced use of dressing materials using an average time to wound healing of 26 weeks

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 1.000 inhabitants. The cost per triage of wound physician was €200 per triage. 1.9 patients per 1.000 inhabitants needed a triage, which results in a cost of €380 per 1.000 inhabitants. This means a net cost saving of €140 per 1.000 inhabitants.

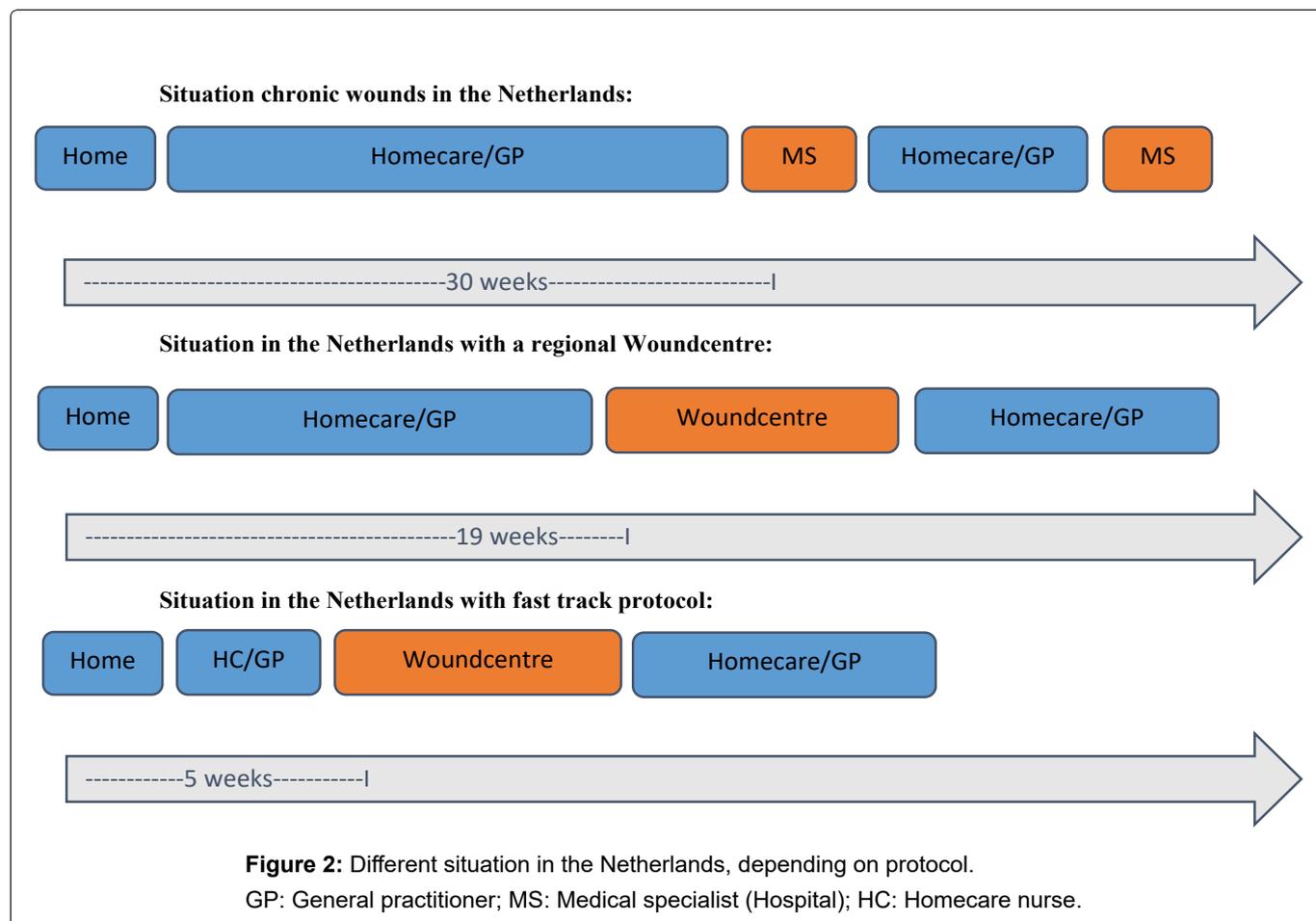
If we extrapolate this data over the Dutch population, we get the following results, using the real incidence of the *chronic* wounds of 2 per 1.000 inhabitants [9] and the current population numbers in the Netherlands of 17.4 million [14]; Our conservative estimate is that approximately €135.000.000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

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.

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.



The challenges in implementing this protocol are related to up scaling-issues. The described advantages and benefits in several levels substantiate a large scale national introduction. Several factors are essential for implementing this protocol, which is in accordance with the Dutch quality standard for organization [17]. First, each region needs at least one qualified wound care center. This center must have access to rapid diagnostic options, availability of interventions (24/7) and a specialized multidisciplinary team. The AWC yearly diagnose and treat 1.000 new patients with a potentially chronic wound. The incidence of patients with chronic wounds is 2 in 1.000 patients [9], which results in 34.800 patients in the Netherlands annually. If the AWC would be used as a template, there would be a need for 35 identical wound care centers across the Netherlands. To actually diagnose on etiology, triage should be performed by experienced doctors, specialist nurses or physician assistants. It is time consuming to have wound patients physically assessed by hospital wound specialists in an outpatient clinic. Unfortunately, few doctors in the Netherlands specialize in wounds, which results in minimal capacity. One option could be to provide the triages via e-health. Thirdly, there must be good communication between all practitioners. Unfortunately, there are numerous and difficult to link electronic patient data systems in the Netherlands. Finally, funding should be organized centrally. In the Netherlands, the various practitioners are contracted

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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