

# Optimization of Best Practice Wound Care in the Netherlands

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## Abstract

Estimates regarding the prevalence of chronic wounds in the Netherlands vary from 350 000 to 500 000. The cross-sectional multicenter study presented here provides evidence for the incidence and prevalence of wounds and chronic wounds. The primary aim of the present study was to provide evidence for incidence and prevalence of (chronic) wounds outside the hospital. The secondary aim was to optimize the organization for chronic wounds care within our region. From January 2017 until January 2018, information was prospectively collected of patients with new onset of wounds in 2 general practitioner practices to which 19 100 patients are enrolled. For the patients with new onset of wounds the “fast track protocol” was used and outcomes including etiology and wound healing were measured. This protocol included a structured treatment protocol and predetermined triage moments. The Alrijne Wound Centre database 2014 was used as a control group (469 records). The incidence of new onset of wounds was 364/19 100 (1.9%). The prevalence of wounds was 405/19 100 (2.1%). The prevalence of *chronic* wounds, that is, wounds that did not show a sufficient healing rate after 4 to 6 weeks, was 78/19 100 (0.4%). Time to referral to a wound physician (the triage moment) was 5 weeks versus 19 weeks in 2014 ( $P < .001$ ). Unnecessary referrals to the hospital was reduced by 17.4% ( $P = .007$ ). In conclusion, the prevalence of the chronic wounds was 4 per 1000 patients. The use of the “fast track” protocol optimizes wound care, wounds heal faster, and unnecessary referrals decrease significantly.

## Keywords

chronic wounds, ulcer, prevalence, incidence, referrals, wound protocol

## Introduction

Normal wound healing is well described and is generally grouped into 3 phases: inflammation, proliferation, and remodeling.<sup>1,2</sup> Wound healing occurs within weeks, but also could take months,<sup>3,4</sup> depending on several factors ranging from genetic to environmental.<sup>5,6</sup> Common factors of stagnation in wound healing are the following: the presence of pressure or infection, the nutritional status chronic venous insufficiency or other peripheral edema, peripheral artery disease, and diabetes mellitus.<sup>1,7-9</sup> More unusual causes of stagnation in wound healing are systemic inflammatory conditions and (skin) malignancies.<sup>10,11</sup> Wounds without healing within 4 to 6 weeks are chronic and should be recognized early and treated in a multidisciplinary setting where etiology should be explored,<sup>12-15</sup> since they are a major challenge to health care systems worldwide.<sup>16</sup> Chronic wounds are defined as wounds that fail to proceed through the normal phases of wound healing in an orderly and timely manner.<sup>16</sup> These wounds should better referred to as “hard to heal wounds” rather than the now commonly

referred term “chronic wounds.” The term chronic suggests the absence of a closure, as if there is no healing possible, whereas it really refers to the stagnation in wound healing. To avoid ambiguity and in order to follow current consensus, we will continue to call these wounds chronic in this article.

In the Netherlands, these chronic patients should visit a multidisciplinary (hospital) setting<sup>17</sup> that are required to facilitate high-quality wound care.<sup>18-22</sup> In the Netherlands,

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the care of patients in terms of reimbursement and medical responsibility is divided into 2 main groups: first line of care and second line of care. In the first line (the home care setting/primary care), medical responsibility lies with the general practitioner (GP). The treatment of wounds is often carried out by nurses of the home care or the GP team, who are trained nurses. The second line consists of hospital care, with the medical specialist being responsible. The health care system in the Netherlands is based on a gatekeeper role of the GP, which means that secondary care is exclusively accessible through referral by a GP.<sup>23</sup> This system generally works efficiently but can also lead to unnecessary delays. There is a risk that patients suffering from illness or underlying pathology leading to stagnation of wound healing, which can only be diagnosed and/or treated in the hospital may be delayed in referral. But unnecessary referrals to the hospital lead to increased patient burden and costs. It is important to have a good balance in this patient flow.

In general, little is known about the number of patients with chronic wounds and the duration of wound healing outside of the hospital and their etiological factors. From previous reports, prevalence rates of patients in the Netherlands with chronic wounds are estimated at 1% to 3%.<sup>24</sup> There is insufficient data on cost involved with wound healing.<sup>24</sup> Since 2003, the Alrijne Woundcare Centre (AWC) is a regional provider of high-quality multidisciplinary secondary wound care.<sup>21</sup> The basis of our treatment strategy is fast diagnosis of underlying pathology and intervening the underlying causes of wounds.

Dutch data show that supervision of the general practitioners of patients with (chronic) wounds in the primary home care is always not possible.<sup>14</sup> Due to the lack of (complex) diagnostic equipment and expertise, underlying pathology is hardly recognized. This results in unnecessary and often delayed referrals to the hospital.<sup>22,25</sup>

The primary aim of the present study was to provide evidence for incidence and prevalence of wounds and chronic wounds outside the hospital. The secondary aim was to optimize the organization of multidisciplinary chronic wounds care within our region.

## Methods

This cross-sectional study was conducted under a protocol reviewed and approved by the Institutional Review Board and Medical Ethical Committee of Alrijne Hospital, the Netherlands (NWMO 19.286yw.tk).

### Study Group

All data were collected at the AWC from January 2017 until January 2018 from patients with new onset of wounds of the 2 GP practices. The data included were reported by

either the 2 GPs or ActiVite, a large home care organization. These practices have a total of 19 100 people registered to their practices,\* one is located in Alphen aan den Rijn and the other in Leiderdorp, the Netherlands. Close collaboration between AWC and these 2 practices already existed prior to this study. The home care organization is the largest home care provider in the region of these 2 cities in the province South Holland. Wounds of patients who had good mobility are treated in the GP office. Wounds of patients who are less well mobilized or who already receive home care were treated in a home setting by the home care organization. The data have been obtained from patient files of both GP practices and the home care organization. Patients consented to use the outcomes for this study analyses and publication.

### Control Group

Patients treated at AWC in 2014 served as a control group (group 5), as scientific evidence on the duration and incidence of chronic wounds is lacking in the Netherlands. The development of this study design started in 2014. The study started in 2017 due to various factors. In order not to allow the protocol to affect the control group, the results are compared with the data from 2014.

### Patient Characteristics

The following variables were collected: age, gender, history of ulceration, the size of the wound, the time of onset, referral time (duration until diagnosed by a wound physician), patients' comorbidities, and etiology of the wound. Unnecessary references were analyzed.

Criteria for unnecessary references were the following: patients with wounds healed within 4 weeks (measured from the first visit to AWC), without the need of admission to hospital, or no intervention needed to achieve wound closure. Only standard wound care, including adequate debridements, was performed.

### Fast Track Protocol

To ensure the logistics and to gain insight into the duration of wound healing, patients were divided into 5 different groups following a standard protocol (Table 1). Group 1 included patients affected by wounds with a healing rate of maximum 6 weeks or a healing rate with a minimum of 15% per week, treated by the home care 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

\* In the Netherlands every citizen is obligated to register at the general practitioners office.

**Table 1.** Grading Score.

Group	Characteristics
1	Wounds with a healing rate of maximum 6 weeks or a healing rate with a minimum of 15% per week, treated by the home care wound nurses or GP. A superficial debridement was performed if seemed 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 had been referred to the hospital for diagnosis and possible intervention.
5	Patients were referred to the AWC for diagnostics, interventions, and treatment in 2014.

Abbreviations: GP, general practitioner; AWC, Alrijne Wound Centre.

wound physician provided by the AWC using a triage moment (Figure 1). This triage moment was performed at the GP clinic, so patients did not have to go to the hospital. After the consultation with the wound physician, the patient was treated with additional advice by the GP (group 2a) or if necessary, sent to the wound center for additional diagnostics (group 2b). Group 3 included patients who need acute (wound) care or assessment at a hospital, for example, patients with an infected diabetic foot. Group 4 are all the patients who have been referred to the hospital for diagnosis and possible intervention (group 2b + 3). For clarification, group 5 was the existing data from 2014 and functioned as the control group. The important adjustment compared with the normal protocol was the introduction of a triage moment. Follow-up was performed until wound closure.

### Statistical Analysis

This dataset consisted of all patients treated in the AWC during this period. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, IBM Corporation) and MS Excel (Microsoft Corporation). The nonparametric Mann–Whitney *U* test and the  $\chi^2$  test were used to analyze differences between the different study groups.

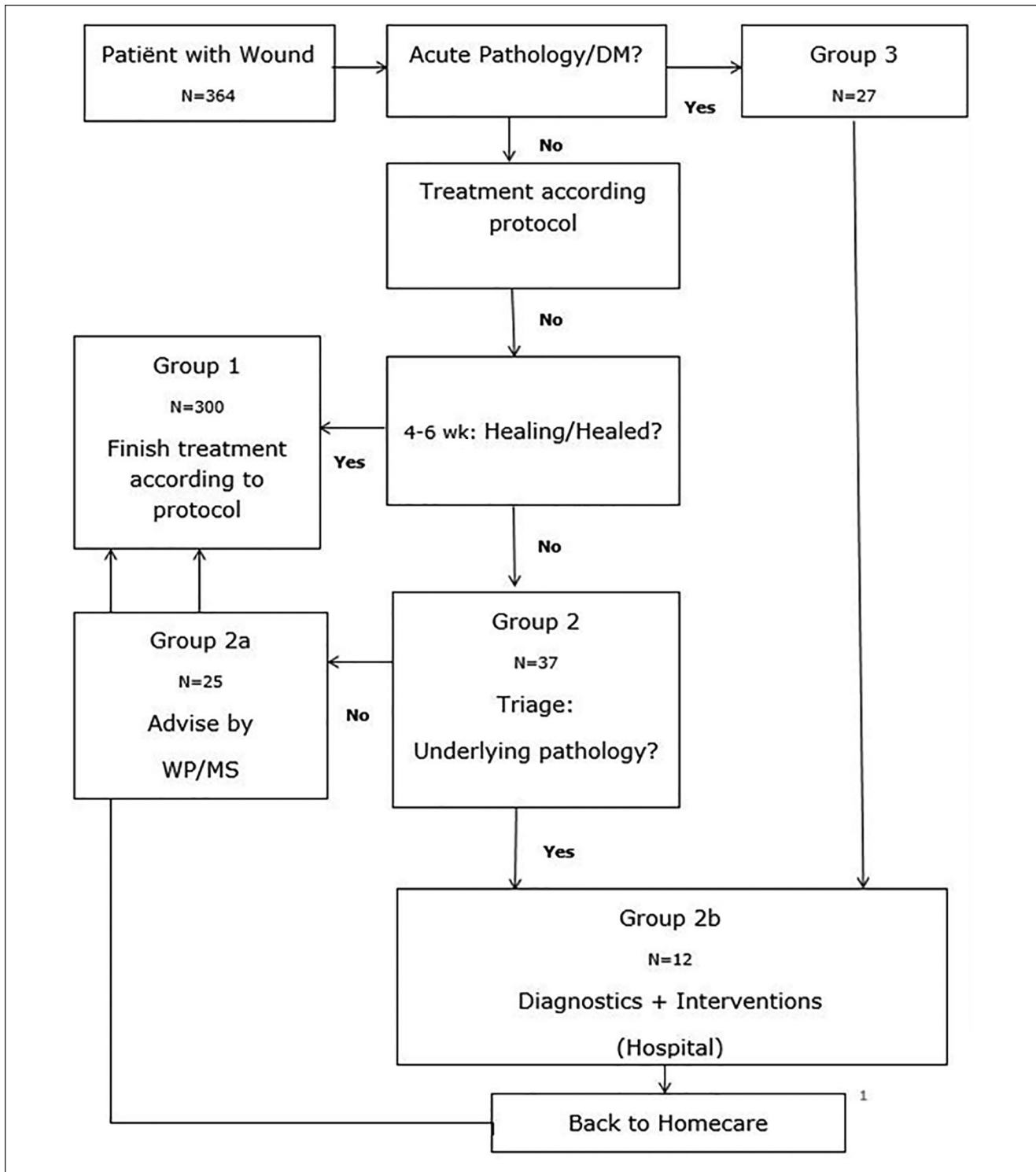
## Results

### Study Group

In 2017, a total of 415 patients received wound care from the GPs or home care organizations. The patient characteristics are shown in Tables 2 and 3. Ten patients were excluded, because of the uncertainty of which GP was responsible and missing data. At AWC 41/405 patients were already under treatment, resulting in 364 eligible patients with new onset of wounds.

The study group could be divided into 3 main groups: Group 1 consisted of 300 patients 300/364 (82.4%), these are the patients who showed undelayed wound healing using

primary wound care conforming to standard protocol without the need for medical interventions. Group 2 consisted of 37 patients 37/364 (10.2%), these are the patients who did not show wound healing within the first 6 weeks and underwent a triage by the GP. Group 3 consisted of 27 patients, 27/364 (7.4%), patients who needed acute (wound) care or assessment at a hospital. We were unable to correctly analyze or categorize 9 patients in group 1 because of registration and follow-up errors; the wounds were not healed at the end of the inclusion. The wounds of the remaining 291 patients healed completely with an average of 15 days (range [R] = 1-88, standard deviation [SD] = 14.6). In group 2, 25/37 (67.6%) patients were referred back to group 1 after the triage with a supportive treatment advise (group 2a). In 21/25 (84%) of the patients these wounds healed completely within an average of 39.6 days (R = 3-134, SD = 40.0). One patient died before wound closure occurred and 1 patient did not accept further treatment. One patient was transferred to another hospital. Wound closure occurred in 36/37 patients during the study period. Twelve out of 37 (32.4%) patients of group 2 were referred to the AWC (group 2b). These patients received diagnostic evaluation for etiological factors. An intervention treating the diagnosed etiological factor(s) was performed in 8/12 (66.7%) of these patients. In 1/12 (8%) patients the wound had healed prior to the intervention. Ten of 12 patients showed complete wound healing with an average of 114.8 (R = 34-210, SD = 52.1) days. Two of 12 (16%) patients had an indication for arterial, but due to the presence of severe comorbidities the intervention could not be safely performed. At the end of the study these wounds were still present. In 12 patients, subsequent diagnostics were performed following triage. These were 2/12 (16.7%) biopsies, 4/12 (33.4%) venous diagnostics, and 6/12 (50.0%) arterial diagnostics. Eight interventions were performed to enhance wound healing following diagnostic evaluation. These include 2/8 (25%) excisions malignances, 2/8 (25%) endolaser venous surgery, 2/8 (25%) arterial revascularization (2 percutaneous transluminal angioplasty), and 2/8 amputations (1 minor and 1 major).



**Figure 1.** Flowchart of the Fast track protocol.

Overall, 325/364 (89.2%) patients (group 1 + 2a) were treated in a home care setting and no interventions in the hospital were needed to achieve wound closure. A total of 312/325 (96%) patients were healed with an average of 17.6 (1-134) days.

Triage of patients with stagnating wound healing by the AWC wound physician occurred at a mean of 34.5 days (R = 0-202, SD = 42.4; 5 weeks). All the patients of group 2b + 3 were correctly referred according to the study protocol. A total of 39/346 (11.3%) of the patients were referred to

**Table 2.** Patient Characteristics and Healing Time (Days)<sup>a</sup>.

	N	Mean age (range)	Male (%)	DM (%)	Healing time (days)
Study population	364	60 (1-95)	164/364 (45.1)	69/364 (19.0)	
Patients AWC <sup>b</sup>	41	68 (33-89)	18/41 (43.9)	9/41 (22.0)	
Total	405	61 (1-95)	182/405 (44.9)	78/405 (19.2)	
Groups					
1	300	59 (1-95)	137/300 (45.7)	44/300 (14.6)	(n = 291) 15.0
2a	25	68 (31-87)	12/25 (48.0)	7/25 (28.0)	(n = 21) 39.6
2b	12	76 (44-91)	5/12 (41.7)	5/12 (41.7)	(n = 10) 114.8
1 + 2a	325	60 (1-95)	149/325 (45.8)	51/325 (15.7)	(n = 312) 17.6
3	27	62 (3-84)	14/27 (51.9)	11/27 (40.7)	(n = 20) 65.4

Abbreviations: DM, diabetes mellitus; AWC, Alrijne Wound Centre.

<sup>a</sup>For content of the groups, see Table 1.

<sup>b</sup>Patients AWC: Patients already under treatment at the AWC before inclusion.

**Table 3.** Differences between study and control group.

	G2 <sup>a</sup>	G4 <sup>b</sup>	G5 <sup>c</sup>	P G2 vs G5	P G4 vs G5
N	37	39	469		
Age, years	70.6	67.5	69.4	<i>P = .740</i>	<i>P = .811</i>
Male	45.9	46.2	47.3	<i>P = .871</i>	<i>P = .887</i>
DM	35.1	38.5	28.4	<i>P = .382</i>	<i>P = .183</i>
TTT	34.5		135.7	<i>P &lt; .001<sup>d</sup></i>	
RR		2.6	20.0		<i>P = .009<sup>d</sup></i>

Abbreviations: N, numbers; DM, diabetes mellitus; TTT, time to triage (days); RR, rightly referred.

<sup>a</sup>G2 = group 2a + group 2b.

<sup>b</sup>G4 = group 2b + group 3.

<sup>c</sup>G5 = control group.

<sup>d</sup>Italic: significant.

the hospital. A total of 27/39 (69.2%) patients were referred by the GP, and 12/39 (30.7%) were referred after triage of the AWC wound physician.

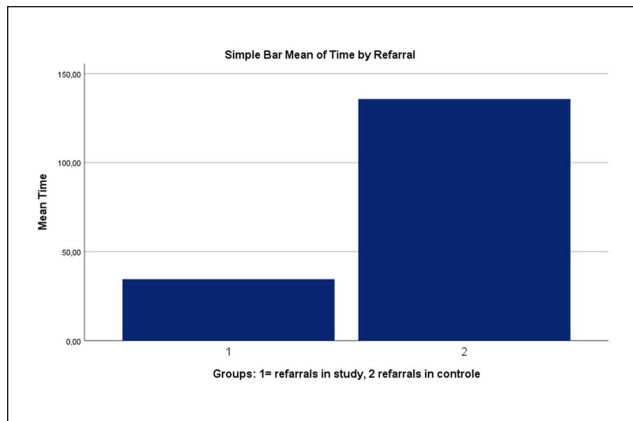
Of the referred patients 1/39 (2.6%) patient was referred to hospital without the need for diagnostic or intervention for complete wound healing. This was registered as an unnecessary referral. In group 3, 17/27 (63.0%) patients did not have a chronic wound. They suffered traumatic wounds, for instance, wounds associated with fractures or infection, which required extensive debridement and reconstruction in the hospital. Five out of 27 (18.5%) patients were immediately referred by the GP, due to high suspicion of malignancy and 5/27 (18.5%) patients had an acute diabetic foot and were referred without delay of a triage moment. Figure 2 shows a decrease in triage moments during the pilot phase. Over time fewer triages were needed. The incidence of wounds in this region was 364/19.000 (1.9%). The prevalence of wounds was 405/19.000 (2.1%). This figure consists of the total patients with a new wound (364) together with the patients in this region who were already known with a wound before 2017 (41). The prevalence of chronic wounds, that

is, wounds which did not show a sufficient healing rate after 4 to 6 weeks, was 78/19.100 (0.4%). This figure consists of the total patients with a new wound with a healing rate less than 15% per week (n = 37, group 2) together with the patients (n = 41) in this region who were already known with a wound before 2017.

### AWC Control Group (Group 5)

In 2014, 469 patients were referred to the AWC for diagnostics, interventions, and treatment. The time between onset of the wound and referral to the AWC was 135.7 days (R = 0-5479, SD = 331.9). Compared with the duration until triage in the study, it was found to differ significantly (34.5 days vs 135.7 days, *P < .001*; Figure 2). In 2014, 94/469 (20.0%) of the patients with wounds healed within 4 weeks (measured from the first visit to AWC). In this patient group no admission to hospital or intervention was needed to achieve wound closure. Standard wound care, including adequate debridements, was performed. These unnecessary referrals were significantly (*P = .007*) different from the unnecessary referrals in the study group (Figure 3).





**Figure 2.** Duration until triage.

## Discussion

Our analysis shows that around 19 per 1000 patients in our region were affected by wounds. The prevalence of the *chronic* wounds was 4 per 1000 patients. Using the “Fast track” protocol, time to referral and starting a triage was significant shortened from 135.7 days (19 weeks) to 34.5 days (5 weeks;  $R = 0-202$ ,  $SD = 42.4$ ). Current literature shows much higher prevalence rates. In the United Kingdom and France the prevalence of patients with a wound was, respectively, 4.5% and 10.2%.<sup>22,26</sup> This difference could be explained by selection bias. In our study, wounds treated by patients themselves were not included. The prevalence of chronic wounds is also comparable with the outcomes of Posnett and colleagues.<sup>27</sup> They reported a prevalence of 3.5 to 3.7 per 1000.<sup>27</sup> More recent data from Germany showed a prevalence of 2.4 per 1000 patients.<sup>28</sup> This study collected data by a survey with a response rate of 51% to 69%, which could explain the lower prevalence. In Wales, the prevalence of chronic wounds was 6% in 2012/2013.<sup>29</sup> This is much higher compared with other data and the findings of this study. The GP and district nurses (first line) treated these patients, chronicity was based on duration and not on pathology, which was not reported.

Estimates for the Dutch population in 2014-2015 were between 350 000 and 500 000 patients with a chronic wound.<sup>24</sup>

In our study 312/364 (85.7%) patients had a wound healing between 2 and 3 weeks (17.6 days).<sup>2,3</sup> These patients needed good-quality basic wound care. No extra diagnostics evaluation or interventions in a hospital setting were required to achieve wound healing. The wounds of these patients did not become chronic, partly due to rapid triage and additional advice from the AWC. Our results support the theory that wounds will not heal within a “normal” period and will not show an adequate healing trend, if underlying pathology remains untreated. In these cases, an

intervention is needed to prevent unnecessary stagnation of wound healing, pain, and costs. Our results show that using a protocolled wound care program including adequate wound care 325/364 (89.2%) of patients can be treated without referral to a hospital.

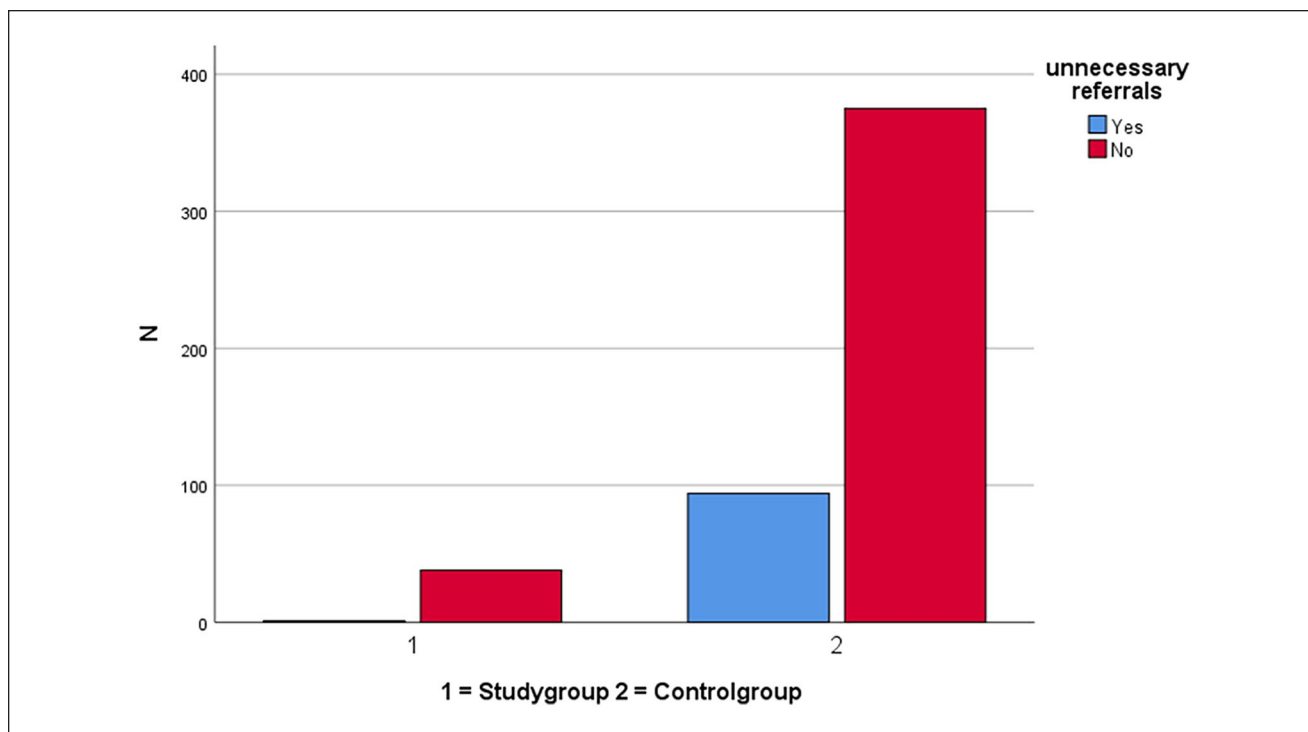
Using this protocol, unnecessary and delayed referrals are prevented, thereby limiting costs and preventing wounds of becoming chronic. The decrease in triage moments performed during the study may indicate a learning curve of the home care nurses and GP.

Comparing our data with previous AWC outcomes, this new protocol helps shortening the total time to wound healing. Before 2015, the average time of referral to the AWC was 19 weeks. In 2009, the mean duration of referral to a medical specialist in Germany was 433 days (62 weeks).<sup>30</sup> Recent data from another region in the Netherlands showed a time to referral of 30 weeks.<sup>31</sup> Implementing this study protocol in our total region, the time to referral could be shortened to 5 weeks. Treatment of the underlying pathology can be initiated 14 weeks earlier as compared with 2014. Compared with these data, the time to referral using the new protocol, is dramatically quicker ( $P < .001$ ).

Nearly 2.6% of the patients were referred to the hospital, but healed before an intervention was performed. This has therefore been an unnecessary referral. Before 2015, our data show that 20.0% ( $n = 94$ ) of the referrals were unnecessary and could have been treated by home care. This difference was significant ( $P = .009$ ). Using this new protocol, the unnecessary referrals were reduced. This 7.7-fold reduction will also lead to a reduction in health care costs.

Future research should focus on extending this protocol, by educating the home care nurses and GPs. Evaluation and implementation of e-health adjuncts will be necessary to be able to serve a larger region.

One major limitation of the current analysis is the population size. The population is only 1% to 2% of our total region. Extrapolation to a regional or even national level can be complicated since confounders exist such as case mix variations and differences in social economic status. In our study group, the socioeconomic status in 2016 was between the average and the highest social economic status.<sup>32</sup> Nevertheless, comparison and observed improvements with our AWC cohort shows promising and real improvements in referrals and decreased treatment times. Second, we are aware of the prospective design with a limited follow-up. Recurrences of wounds after the study period can occur and were not included in this analysis. In 2.5% of the patients, data were not sufficient due to the lack of follow-up and registration or full wound closure had not occurred at the end of the study period. Third, patients who were not receiving care of the GP or home care were not included. Since these patients were able to treat themselves, they were unlikely to benefit from our protocol.



**Figure 3.** Unnecessary referrals.

## Conclusion

The prevalence of the chronic wounds was 4.0 per 1000 patients. Using this “fast track” protocol for optimization of wounds care, wounds heal faster and the unnecessary referrals have decreased. Prompt analyses and treatment of underlying causes by specialized doctors in a multidisciplinary setting is necessary for treating patients with a chronic wound.

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