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Association of wound genesis on varying aspects of health-related quality of life in patients with different types of chronic wounds: Results of a cross-sectional multicentre study

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Abstract

Patients with chronic wounds are significantly impaired in their health-related quality of life (HRQoL). The validated Wound-QoL questionnaire allows assessing the impact of chronic wounds on different aspects of HRQoL including physical, psychological, and everyday life-related impairments. The aim of our study was to investigate associations of these HRQoL dimensions with age, sex, and particularly wound genesis. In this retrospective, cross-sectional, multicentre study, Wound-QoL questionnaires from clinical routine of patients with venous leg ulcers, arterial leg ulcers, mixed leg ulcers, and diabetic foot ulcers (DFU) were evaluated. Effects of wound genesis, sex, and age were assessed with analysis of variance as well as correlation and multiple linear regression analyses. The completed questionnaires of 381 patients ($f = 152$/m $= 229$; mean age 68.9) were included. The wound genesis groups showed significantly different distributions of age and sex. We also found significant differences between those groups in everyday life-related QoL, with the greatest impairments in patients with DFU. Physical QoL scores showed significant differences between men and women depending on diagnosis group: in patients with venous leg ulcers, women had greater impairment of physical QoL than men. Independent of the underlying diagnosis, women had significantly higher scores in the psychological subscale as well as in the Wound-QoL sum scale. Within the subgroup of arterial leg ulcer patients, overall HRQoL sum score was significantly worse in older patients. Regression analyses supported negative effects of DFU diagnosis and female sex on HRQoL. Our data offer evidence that HRQoL shows clinically relevant differences between patients with chronic wounds of different genesis. Moreover, our data revealed that HRQoL is associated with age and sex, which

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should be considered when treating the patient groups. In order to be able to capture these important aspects and to offer individualised and patient-oriented treatments, the Wound-QoL should be implemented as a quick and uncomplicated standard instrument in daily routine. Patients with chronic wounds are significantly impaired in their health-related quality of life. Validated Wound-QoL questionnaire is a quick and easy-to-use instrument for daily practice. Wound-related quality of life shows clinically relevant differences between patients with chronic wounds of different genesis. Wound-related quality of life is associated with age and sex, which should be considered when treating these patient groups. Health-related quality of life should be regularly objectified in all patients with chronic wounds with a validated measuring instrument.

KEYWORDS
age differences, chronic wounds, health-related quality of life, wound genesis, wound-QoL

1 | INTRODUCTION

Patients with chronic wounds are severely impaired in their health-releated quality of life (HRQoL).[1] One definition of chronic wounds is that they are so-called whether, despite apparently adequate therapy, they show no tendency to heal after 8 weeks.[2] Chronic wounds are accompanied by several distressing symptoms such as pain, sleep disturbances, unpleasant odour, and/or wound exudates and typically require a burdening treatment. This may induce feelings of hopelessness, frustration, anxiety or worries related to the wound and the slow healing process.[3] Moreover, HRQoL may also be reduced with respect to daily activities.[4] Patients complain about restricted mobility, limitations in leisure activities and social interactions, the need of external help, and financial burden.[4]

Consequently, the systematic treatment of patients with chronic wounds should not be restricted to anamnesis, diagnostics, debridement, intervention, dressings, and compression management, but should also consider the psychological consequences of the chronic wound and aim to improve wound-related QoL. Studies showed that sole positive expectation of receiving a new wound therapy could significantly improve HRQoL as measured with the Wound-QoL.[5] This questionnaire is suitable for patients with chronic wounds of any aetiology and evaluates HRQoL in a standardised, easy, and quick way. The Wound-QoL questionnaire was published first in 2014 and has been tested for validity, reliability, and feasibility.[4,6-10] The Wound-QoL allows assessing the impact of chronic wounds on different aspects of HRQoL, including physical, psychological, and everyday life-related impairments. Although previous studies have documented significantly impaired HRQoL in chronic wound patients,[11] it remains yet unclear how HRQoL impairment differs depending on wound genesis.

Key messages

- patients with chronic wounds are significantly impaired in their health-related quality of life
- validated Wound-QoL questionnaire is a quick and easy-to-use instrument for daily practice
- wound-related quality of life shows clinically relevant differences between patients with chronic wounds of different genesis
- wound-related quality of life is associated with age and sex, which should be considered when treating these patient groups
- health-related quality of life should be regularly objectified in all patients with chronic wounds with a validated measuring instrument

Therefore, the aim of our study was to investigate differences in physical, psychological, and everyday life-related QoL in patients with different chronic wound genesis. In addition, we explored how HRQoL impairments in different types of wounds were associated with age and sex.

2 | MATERIALS AND METHODS

2.1 | Patients

In this retrospective, multicentre, cross-sectional study, Wound-QoL questionnaires were evaluated that had

already been completed in the clinical routine of patients with venous leg ulcers, arterial leg ulcers, mixed leg ulcers (arterial and venous), and diabetic foot ulcers. Only one Wound-QoL questionnaire per patient was considered for evaluation. Four German centres participated, three of those were located at the Essen University Hospital (the certified wound outpatient departments of the Department of Dermatology, Venerology and Allergology, the Vascular Medicine Department of the West German Heart Centre, and the Division of Vascular and Endovascular Surgery of the General, Visceral and Transplantation Surgery Department) and one in Dortmund (Foot Centre of the municipal clinics). Adult patients were included if diagnosis was confirmed by appropriate diagnostic tests.

2.2 | Wound-QoL

The Wound-QoL comprises 17 items, which address physical (items 1–5), psychological (items 6–10), and everyday-related (items 11–16) aspects of HRQoL impairment. An additional item (item 17) focuses on the financial burden. Wound-QoL impairments during the past 7 days are assessed with Likert-scaled items (from 0, not at all, to 4, very much). Sum scores can be calculated across all items (general HRQoL), as well as for the physical, psychological, and everyday life-related subscales separately, with higher scores indicating greater HRQoL impairments. The instrument has been translated into 27 languages.[8-10]

2.3 | Statistics

The statistical analyses were performed with SPSS (Statistical Package for Social Science, SPSS Inc., Chicago) version 25. To compare sociodemographic patient data, analysis of variance (ANOVA), followed by Bonferroni-corrected posthoc *t*-tests, was calculated for age, and a chi-square test was computed for sex distribution across all wound genesis groups, followed by posthoc chi-square tests on sex distribution within wound entity groups. Wound-QoL scores were compared using ANOVA (with wound genesis and sex as group factors) to analyse the effects of wound genesis and sex on HRQoL. Bonferroni-corrected posthoc tests were computed in case of significant effects of wound genesis or wound genesis x sex interaction. To explore associations between age and HRQoL, correlation analyses within diagnosis groups were conducted using Pearson's *r* value. Finally, to simultaneously assess effects of wound genesis, sex, and age on wound related QoL, stepwise multiple linear regression analyses were computed. Data are reported as mean ± SD, if not otherwise indicated. The significance level was set at 0.05 for all analyses.

3 | RESULTS

In total, questionnaires from 381 patients could be evaluated. The patients presented with venous leg ulcers (33.9%, n = 129), diabetic foot ulcers (44.8%, n = 171), arterial leg ulcers 13.6% (n = 52), and mixed leg ulcers 7.6% (n = 29). The mean age was 68.9 ± 13.6 years; 39.9% (n = 152) were female and 60.1% (n = 229) male.

The wound genesis groups showed significantly different distributions of age ($F = 5.0$, $P = .002$) and sex ($\chi^2 = 60.6$, $P < .001$). Posthoc Bonferroni tests revealed that patients with diabetic foot ulcers were significantly younger (66.7 ± 11.9 years) compared with patients with an arterial leg ulcer (72.5 ± 12.0 years; $P = .042$) or mixed ulcers (75.4 ± 11.8 years; $P = .008$), while the age difference to patients with venous leg ulcers (68.7 ± 15.9 years, $P = .23$) was not significant.

Posthoc testing within wound entity groups revealed that significantly more male than female patients suffered from arterial leg ulcers (m = 35/f = 17; $\chi^2 = 6.23$, $P = .013$) or diabetic foot ulcers (m = 135/f = 36; $\chi^2 = 57.32$, $P < .001$). In contrast, significantly more women than men had venous leg ulcers (m = 48/f = 81; $\chi^2 = 8.44$, $P = .004$). In patients with mixed leg ulcers, no difference in sex distribution was found (m = 11/f = 18; $\chi^2 = 1.69$, $P = .19$).

The wound genesis groups showed a significant difference in everyday life-related QoL ($F = 5.9$, $P = .001$) (Table 1), with the greatest impairments in patients with diabetic foot ulcers ($P < .001$, result of posthoc Bonferroni test for diabetic vs venous foot ulcer patients). No significant differences between wound genesis groups were observed for physical ($F = 0.6$, $P = .59$), psychological ($F = 1.1$, $P = .34$) or total ($F = 0.8$, $P = .53$) Wound-QoL scores (Table 1).

Physical QoL scores showed significant diffences between men and women depending on diagnosis group ($F = 3.3$, $P = .022$, ANOVA interaction diagnosis × sex) (Figure 1). Posthoc analysis revealed that women with venous leg ulcers had a significantly greater impairment of physical QoL than men ($t = -3.6$, $P < .001$) (Figure 1B). Sex-related differences within the other diagnostic groups were observed as a trend, but did not reach statistical significance.

Independent of the underlying diagnosis, women had significantly higher scores in the psychological subscale ($F = 11.2$, $P = .001$) as well as in the Wound-QoL sum scale ($F = 5.6$, $P = .018$), indicating significantly greater

TABLE 1 Wound-QoL related to wound entity group

	Diabetic foot ulcer	Venous leg ulcers	Arterial leg ulcers	Mixed leg ulcers	*F* statistic[a]	*P* value[a]
Total QoL	1.92 ± 0.99	1.78 ± 0.98	1.75 ± 0.95	1.79 ± 1.24	$F = 0.8$	.53
Physical QoL	1.38 ± 1.06	1.59 ± 1.03	1.36 ± 0.98	1.50 ± 1.15	$F = 0.6$	.59
Psychological QoL	2.25 ± 1.22	2.21 ± 1.24	2.02 ± 1.03	2.09 ± 1.49	$F = 1.1$	.34
Everyday life-related QoL	**2.26 ± 1.34**[b]	**1.68 ± 1.23**[b]	2.00 ± 1.21	1.89 ± 1.42	**$F = 5.9$**	**.001**

Note: QoL = Quality of Life assessed with the Wound-QoL questionnaire. Higher scores indicate greater impairment. Data are shown as mean ± SD. Significant differences are printed in bold.

[a]*F*- and *P* values refer to analysis of variance main effects of wound entity group.

[b]$P < .001$, result of posthoc Bonferroni test.

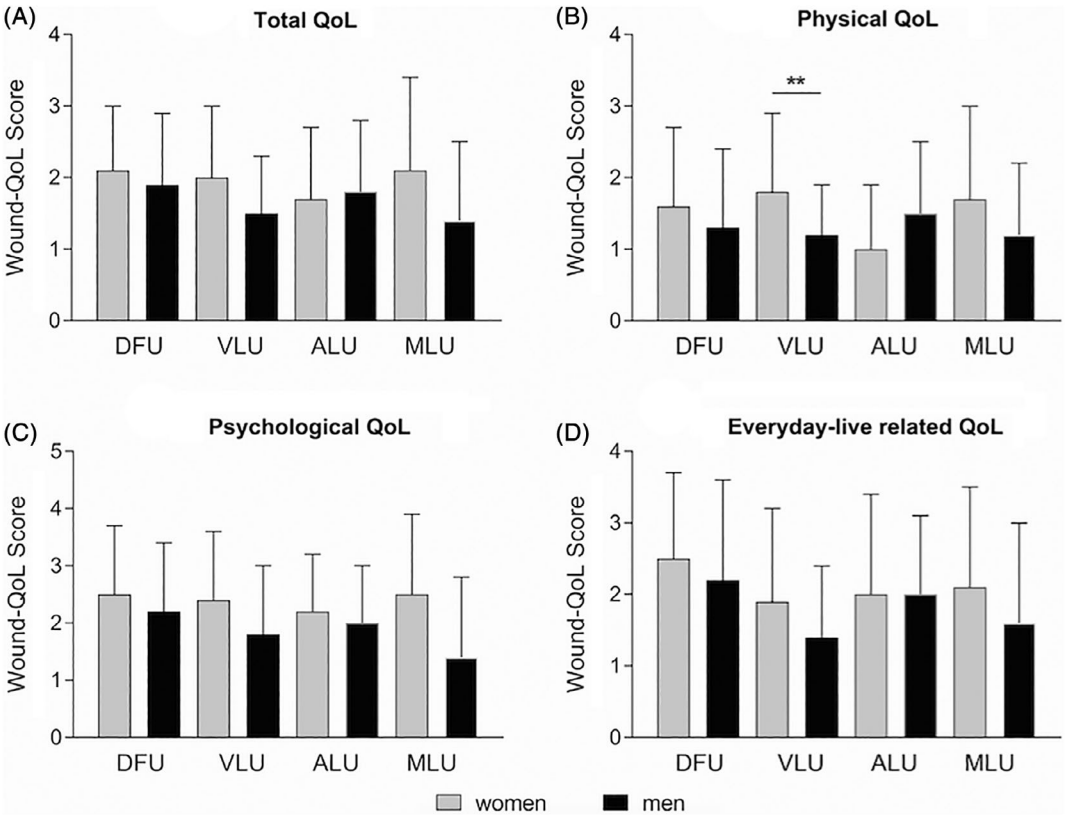

FIGURE 1 Total wound-QoL scores (A), physical (B), psychological (C), and everyday life-related (D) Wound-QoL scores in male and female patients with diabetic foot ulcers (DFU), venous leg ulcers (VLU), arterial leg ulcers (ALU), and mixed leg ulcers (MLU). Higher scores indicate greater impairments. **$P < .01$, result of posthoc Bonferroni test (women vs men) within VLU patients, indicating significantly impaired physical QoL in women compared with men with venous leg ulcers. For results of analysis of variance, see text

impairments in psychological and global (general) wound-related QoL compared with men (ANCOVA main effects of sex) (Table 1).

To address putative associations between wound-related QoL and age, exploratory correlation analyses were conducted. Within the subgroup of arterial leg ulcer patients, a significant negative correlation between age and Wound-QoL sum score was found ($r = -0.36$, $P = .008$), indicating that greater impairments of wound-related QoL were associated with younger age (Figure 2). No significant correlations for age were observed within the other diagnosis groups (data not shown).

Finally, to simultaneously assess effects of wound genesis, sex, and age on wound-related QoL, multiple regression analyses were computed. Lower scores in physical QoL were predicted by female sex ($b = 0.31$, standardised $\beta = 0.14$, $t = 2.8$, $P = .005$; $F = 8.0$, $P = .005$). Lower psychological subscale scores were

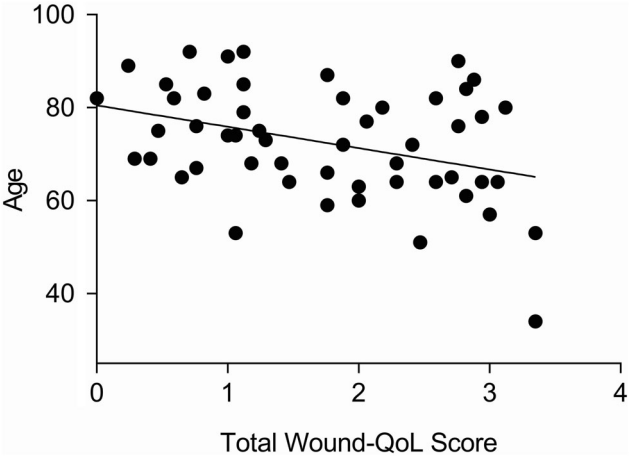

FIGURE 2 Correlation between total Wound-QoL scores and age within patients with arterial leg ulcers. Higher Wound-QoL scores indicate greater impairment in quality of life

predicted by female sex ($b = 0.47$, standardised $\beta = 0.19$, $t = 3.5$, $P < .001$) and diagnosis of diabetic foot ulcer ($b = 0.26$, standardised $\beta = 0.11$, $t = 2.0$, $P = .049$) ($F = 6.5$, $P = .002$). Decreased everyday life-related QoL was predicted by diabetic foot ulcer diagnosis ($b = 0.47$, standardised $\beta = 0.18$, $t = 3.5$, $P < .001$; $F = 12.4$, $P < .001$). For reduced global wound-related QoL (Wound-QoL sum score), female sex ($b = 0.32$, standardised $\beta = 0.15$, $t = 2.8$, $P = .005$) and diagnosis of diabetic foot ulcer ($b = 0.26$, standardised $\beta = 0.13$, $t = 2.4$, $P = .017$) emerged as predictor variables ($F = 5.2$, $P = .006$). Overall, results of regression analyses support a higher risk of wound-related QoL impairment in patients with diabetic foot ulcers and female sex, respectively.

4 | DISCUSSION

Chronic wounds can have a different impact on different aspects of HRQoL, depending on age, sex, co-morbidities, but also wound location. However, existing data are scarce. The current study aimed to analyse the association of wound genesis and sociodemographic patient characteristics with HRQoL, allowing to identify patients who are in need of psychosocial support at an early stage of treatment.

4.1 | Sociodemographic variables

In our study, the mean age, as well as the diagnosis-dependent age- and sex-specific differences corresponded to the literature.[12,13] A large study on the aetiology, comorbidities, and cofactors of 1000 German patients with chronic leg ulcers from 2016 showed a mean age of 69.9 vs 68.9 years in the current study.[14] One difference is that no patients with diabetic foot ulcers were included in the 2016 study. In the current study, these patients are significantly younger than, for example, patients with arterial leg ulcers or mixed leg ulcers.

The age of the patients often plays an important role in terms of genesis. The 2016 study showed a significant positive correlation of patient age with an arterial or mixed entity. International but older prevalence studies also showed that the risk of developing chronic ulceration of the lower extremity increases with age in industrialised countries.[15]

In terms of sex, significantly more women in our study had venous leg ulcers than men and conversely, significantly more men had arterial leg ulcers or diabetic foot ulcers. With the exception of diabetic foot ulcerations, these results also correspond to those from 2016.[14]

4.2 | Wound-QoL related to diagnosis group

No significant differences between wound genesis were found in the total Wound-QoL score or the physical and psychological subscales. However, for the subscale on everyday life, there were significant differences with the greatest impairment found in patients with diabetic foot ulcer. The respective items include aspects such as poor movement and difficult stair climbing, often due to the anatomical location of the wounds and pain. Here, professional advice on the choice of shoes and the use of aids, gait training, and physiotherapeutic measures should be offered to patients.

The patients with diabetic foot ulcers examined by us were, at an average age of 66.7 years, in a decade of life before patients with arterial and mixed leg ulcers (72.5 and 75.4 years, respectively). Even though age did not emerge as an independent factor to predict HRQoL impairment in regression analyses, it is indeed conceivable that younger people have higher demands on their leisure and social activities, as well as on coping with their everyday life including domestic activities such as shopping, cleaning, washing and gardening, and are equally reluctant to be dependent on external help. It is therefore a difficult task to find out which activities the patient can take over by himself without excessive or insufficient demands and where help is accepted, for example by a social service, friends and family. Depending on the level of the relationship, the latter can simultaneously promote the social level and also help plan joint leisure activities. This plays a very important

role in preventing the development of depression and depressive episodes in this already vulnerable group of patients with a diabetic foot ulcer.[16] In the literature, rates of up to 32% for depression in patients with diabetic foot ulcers are reported, which increase the mortality risk 3-fold.[17] Furthermore, it has been shown that depression increases the risk of foot ulceration or recurrence of foot ulceration. Conversely, daily, well-executed self-examinations of the feet reduce the risk, but this is difficult in a stressful psychological situation.[18]

4.3 | Wound-QoL related to sex

In the analysis of Wound-QoL dependent on diagnosis, there were significant sex differences for the physical QoL subscale. Here, it was particularly noticeable that women with venous leg ulcers had significantly greater physical limitations than men. Physical factors as measured with the Wound-QoL include wound discharge, which is often also associated with an unpleasant odour, stressful treatment (maybe due to physical distance and lack of mobility), pain, and impaired sleep. Changing therapists and their personal level also play a role. The most important factors here are pain at rest, during activity, and during dressing changes, which often disturb the night's rest in addition to the thoughts of worry. It has been known for some time that women suffering more frequently from pain sensitivity and pain processing are well-established disorders than men.[19] This sex-dependent difference is also documented in current studies on the development and prevalence of mental disorders such as anxiety disorders, insomnia, and burnout.[20]

Independent of the underlying genesis of the wound, women in our study also had significantly greater impairment in the psychological Wound-QoL subscale scores as well as in total Wound-QoL scores. Psychological factors as measured with the Wound-QoL include in particular worries and fears, for example, of bumping into the wound, of the development of further wounds and/or worsening of existing wounds, and frustration over the slow healing process.

In general, sex/gender-dependent differences in pain sensitivity and pain processing are well established, especially with respect to the female preponderance in for chronic pain conditions.[21] Guarnera et al have described in their multicentre study on pain and QoL of patients with vascular leg ulcers that women had significantly more pain and greater restrictions in QoL than men.[22] A study by Herberger et al on the QoL of patients with chronic venous leg ulcers did not support this; in this study, clinical patient characteristics such as duration and size of wounds and treatment characteristics such as pain therapy were identified as predictive of QoL and satisfaction with care, while sociodemographic characteristics such as sex were not.[23] To the best of our knowledge, there are currently no studies that specifically focus on the pain sensation and QoL of patients with venous leg ulcers, but according to our results, special attention should be paid to them during treatment. This is particularly important because pain is (regardless of sex) one of the most stressful factors for patients with chronic venous leg ulcers.[24] To support patients in the area of physical quality of life, pain should be regularly assessed by using a visual analogue scale, and causes of pain and pain avoidance should be analysed.[25] This will help to implement an appropriate and individualised analgesia concept.

In order to control wound discharge, particularly in the decongestion phase of venous ulcerations, for example, increased dressing intervals with appropriate absorbent dressings or superabsorbents and individually adapted compression systems are useful.[26,27] Examples include the use of activated carbon pads to neutralise odours and the wearing of long, dark clothing and adapted footwear. Treatments and dressing changes should be planned and agreed individually. Night sleep and supporting pharmacological measures as well as relaxation techniques should also be addressed. In order to counteract frustration and depression on a psychological level, the causes can be clarified and education about the disease can be helpful. Psychosocial counselling may also reduce fears and worries.

4.4 | Wound-QoL and age

A significant negative correlation between the total Wound-QoL score and age was found in patients with arterial leg ulcers, indicating a greater impairment of HRQoL in younger patients within this subgroup.

Due to the constant degenerative changes of the vessels, peripheral arterial occlusive disease is usually a disease of the elderly over 50 years of age. However, there are also rarer causes, such as inflammatory vascular diseases, compression syndromes and mechanical damage, thrombembolic events, arterial dysplasia, infections, and physical and toxic noxae, which can lead to permanent vascular damage even in younger people.[28] There are also cofactors such as genetic disposition, overweight, lack of exercise, smoking, diabetes mellitus, arterial hypertension, hyperlipidaemia, and also stress. A review from 2019 on patient-related outcomes of peripheral arterial occlusive disease interventions showed that interdisciplinary work yielded the best results from the patient's perspective. Early therapies and education in the form of

smoking cessation and nutrition programmes, appropriate medication, structured walking exercises, and sports activities combined with invasive interventions were able to increase patient satisfaction and QoL in the best possible way.[29] Younger people could often have more access to the above-mentioned non-invasive interventions through the use of modern media, and possibly also a better response to them due to the shorter course of the disease. This should be used to improve the HRQoL on a physical, psychological, and everyday level in an individually adapted therapy concept.

4.5 | Limitations

The results of this study should be discussed in the light of some limitations, which may reduce the generalizability of findings. First, the health care system in Germany ensures that the financial burden on patients is significantly lower than in many other countries, where many patients have to buy wound products themselves and have to pay for treatment in special centres. Second, the choice of specialised centres can lead to bias, since patients with wounds that are refractory to treatment are more likely to be treated here than by general practitioners and practising dermatologists, who tend to look after more uncomplicated wounds. In addition, the questionnaires were collected at only one time point, which could not be standardised for organisational reasons. Thus, our data do not allow analysing the dynamics of Wound-QoL development during the treatment of chronic wounds, which would offer further important insights. In addition, there are other important predictors of HRQoL that were discovered in previous studies but could not be considered in this study.

5 | CONCLUSION

Our data show that wound-related QoL shows clinically relevant differences between patients with chronic wounds of different genesis. In addition, our data showed that HRQoL is associated with age and gender, which should be taken into account when treating these patient groups.

Particular attention should be paid to the psychological level of women in order to be able to offer support in time, for example in the form of psychosocial counselling. For patients with diabetic foot ulcers, the focus should be on coping with everyday life and offering aids. For younger patients with arterial leg ulcers, the HRQoL at all levels should be a priority.

In order to capture these important aspects and to be able to offer an individualised and patient-oriented treatment, the Wound-QoL questionnaire should be used regularly in daily routine as a quick and uncomplicated standard instrument.

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CONFLICT OF INTEREST

In the context of this study, there are no conflicts of interests to declare.

DATA AVAILABILITY STATEMENT

Data available on request due to privacy/ethical restrictions.

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