

REVIEW

Impact of Chronic Wounds on Quality of Life: A Review from the Perspective of Humanized Care

Impacto de las Heridas Crónicas en la Calidad de Vida: Una Revisión desde la Perspectiva del Cuidado Humanizado

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Cite as: Jaimes Contreras Y, Coronado Castro AM, Pulido MA, Rincón Romero MK. Impact of Chronic Wounds on Quality of Life: A Review from the Perspective of Humanized Care. Nursing Depths Series. 2024; 3:101. <https://doi.org/10.56294/nds2024101>

Submitted: 10-06-2023

Revised: 22-09-2023

Accepted: 30-12-2023

Published: 01-01-2024

Editor: Dra. Mileydis Cruz Quevedo 

ABSTRACT

Introduction: chronic wounds are characterized by slow healing, difficult scarring, and duration of more than three months. They not only affect the body physically, but also have an emotional, social, and psychological impact on those who suffer from them. The consequences include pain, foul odor, excessive exudate, social exclusion, and impaired self-esteem, which significantly reduce health-related quality of life (HRQoL).

Development: through an international, national, and local literature review, it was found that people with chronic wounds faced functional, emotional, and economic difficulties. In Canada, Brazil, and Colombia, limitations in performing basic activities, dependence on caregivers, and a high emotional burden due to persistent symptoms were reported. The predominant sociodemographic characteristics included women over 60 years of age, with low educational attainment, minimal income, and no partner. In the theoretical framework, humanistic nursing theory was integrated, promoting a holistic approach to care, centered on empathy and patient accompaniment, recognizing their individuality and social environment.

Conclusions: the study concluded that chronic wounds significantly compromised several dimensions of HRQoL. Pain was the most frequent symptom, and social exclusion was a common consequence. The need for interdisciplinary care that considers not only physical treatment but also emotional and social support was reaffirmed. Humanized care was established as a key strategy for improving patients' experience and overall well-being.

Keywords: Chronic Wounds; Quality Of Life; Symptoms; Humanized Care; Nursing.

RESUMEN

Introducción: las heridas crónicas se caracterizaron por su lenta evolución, difícil cicatrización y duración superior a tres meses. Estas no solo afectaron el cuerpo físicamente, sino que también impactaron emocional, social y psicológicamente a quienes las padecieron. Las consecuencias incluyeron dolor, mal olor, exudado abundante, exclusión social y deterioro de la autoestima, lo que redujo notablemente la calidad de vida relacionada con la salud (CVRS).

Desarrollo: a través de una revisión bibliográfica de alcance internacional, nacional y local, se evidenció que las personas con heridas crónicas enfrentaron dificultades funcionales, emocionales y económicas. En Canadá, Brasil y Colombia se reportaron limitaciones para realizar actividades básicas, dependencia de los cuidadores, y una alta carga emocional por los síntomas persistentes. Las características sociodemográficas predominantes incluyeron mujeres mayores de 60 años, con baja escolaridad, ingresos mínimos y sin pareja. En el ámbito teórico, se integró la teoría humanística de enfermería, la cual promovió un abordaje holístico del cuidado, centrado en la empatía y el acompañamiento del paciente, reconociendo su individualidad y entorno social.

Conclusiones: el estudio permitió concluir que las heridas crónicas comprometieron significativamente varias dimensiones de la CVRS. El dolor fue el síntoma más frecuente y la exclusión social, una consecuencia común. Se reafirmó la necesidad de brindar una atención interdisciplinaria que considere no solo el tratamiento físico, sino también el soporte emocional y social. El cuidado humanizado se estableció como una estrategia clave para mejorar la experiencia de los pacientes y su bienestar general.

Palabras clave: Heridas Crónicas; Calidad De Vida; Síntomas; Cuidado Humanizado; Enfermería.

INTRODUCTION

Chronic wounds are conditions that not only affect the body physically but also represent a more intimate problem with oneself, which is reflected in psychological, social, and economic conditions.⁽¹⁾

The presence of pain, foul odor, and high levels of exudate cause increased anxiety, depression, negative self-image, and social exclusion due to feeling different and limited. Similarly, many people reduce or eliminate all types of activity involving movement or effort from their daily lives because they believe this will cause and increase complications with their wounds.⁽²⁾ In turn, this significantly impacts their self-esteem, as they feel limited by their health and unable to live their desired life.

It should be emphasized that all of the above directly affects these individuals' quality of life, as reflected in their difficulty in performing daily activities, common problems with wounds such as professional management, wound healing, and care by family members, and comorbidity factors, which cause a high psychological impact on the patient, even more so when the wound persists over time.⁽¹⁾

For this reason, quality of life has taken a very important turn in the health sector today. The main objective is not only to heal or control physical illnesses but also, among other intentions, to provide a better quality of life for each person living in different social contexts and experiencing alterations in any aspect of their life due to a pathology, in this case, chronic wounds.⁽³⁾

Therefore, it is essential to emphasize that patients with any injury should be seen as holistic beings who can be touched and felt, who have limitations and a loss of positive self-image with their own needs, where healthcare personnel must be neutral in their treatment of these patients, providing confidence and, most importantly, humane care, since, according to Woo et al.⁽⁴⁾, the treatment given is stigmatizing and uncomfortable, causing other wounds that can be even more difficult to treat than those that manifest themselves on the body; these are the "wounds of the soul," which also affect the quality of life of each of these individuals.

Considering the significant impact that chronic wounds have on the health-related quality of life of those who suffer from them, which is significantly affected and reflected in how the disease, the presence of the wound, and its treatment affect mental, physical, and social aspects, it is essential to determine, through a review of the literature, which dimensions of their quality of life are affected, as well as which wound symptoms are most frequent and which sociodemographic data are most reflected due to the presence of chronic wounds.

DEVELOPMENT

Theoretical Framework

This paper aims to highlight studies conducted on people with chronic wounds, showing that personal conditions lead to the presence of wounds.

International

According to a study conducted in Canada,⁽⁵⁾ most patients with chronic wounds suffer from mobility problems, and their ability to perform daily activities is severely limited due to pain, excessive wound exudate, and, even more so, odor, which becomes uncomfortable and unavoidable for them. This is reflected in the difficulty in activities such as showering, dressing, and even climbing stairs; the presence of the wound can become a significant challenge for these individuals.

Similarly, a study conducted by Esparza et al.⁽⁶⁾ in Brazil identified that people with chronic wounds show a significant deterioration in their quality of life, especially in social aspects, as it causes isolation, hinders or prevents them from developing their working life and functional aspects, limits their mobility, and leads to dependence on family members.

Similarly, a review of the literature conducted by Albuquerque⁽⁷⁾ in Brazil, in the state of Rio de Janeiro, found that the most common risk factors in people with complex chronic wounds are female gender, age over 60, income equal to or less than the minimum wage, low education, difficulty accessing employment, and living without a partner.

National

According to a literature search on studies conducted at the national level, there is little information on the quality of life in people with chronic wounds. Among the findings are the following:

A study conducted by Malguizo⁽⁸⁾, entitled *Quality of Life in People with Complex Wounds in Cartagena, Colombia*, aimed to estimate the HRQoL of people with complex wounds who were receiving care and attention at an extramural institution in that city, using an instrument known as the “Multicultural Quality of Life Index,” which was applied to 93 adults. The results showed that people perceive their health-related quality of life as poor, as evidenced by low scores in personal fulfillment, functioning during daily activities, and physical and psychological well-being.

Location

In the Bucaramanga area, a study was conducted by Cáceres et al.⁽⁹⁾ entitled “Health-related quality of life in the general population of Bucaramanga, Colombia.” The objective of this study was to determine the health-related quality of life in the general population of the urban area of that city. To this end, the SF-36 questionnaire was used to measure this aspect, and 1,098 people between the ages of 15 and 99 were interviewed and classified according to their age, sex, occupation, education, and socioeconomic status.

This study’s results found that the domains’ scores were higher than 60 %, which is estimated to be an indicator of good HRQoL. However, there is a difference in HRQoL regarding older age. In contrast, men showed more satisfactory HRQoL scores than women in all domains studied, and students and people with higher education levels had higher HRQoL levels.^(9,10)

In conclusion, HRQoL in this population was reported as good; however, some changes were identified by age, sex, education, and occupation, which may infer safe access to and use of health services.

This contributes to the orientation of health promotion actions whose main objective is to improve SRQ in vulnerable groups, which is part of the strategies of the city’s Ten-Year Public Health Plan.⁽⁹⁾

On the other hand, Josephine Paterson and Loretta Zderad’s humanistic nursing theory states that nurses actively try to meet patients’ needs by listening, observing, and evaluating the patient. At the same time, they give verbal and nonverbal signals. A relationship is necessary because, through it, people grow more; that is, they evolve and form a “we,” meaning to be existentially and genuinely present with one another.⁽¹¹⁾

This theory indicates that the nurse-patient ratio goes beyond physical accompaniment since when this occurs, the opportunity arises to share experiences while being with the patient during the process of their illness, understood as holistic care where the nurse not only does for the patient (treatment of the illness) but also does with the patient, helping them to see and improve their environment and emotional state, making their CVRS more pleasant.⁽¹¹⁾

Taking the above into account, it can be deduced that humanistic nursing theory relates to and/or encompasses the aspects to be taken into account in people with chronic wounds: their emotional, physical, psychological, and social state, in which nurses must see the person as a holistic being, where everyone is special, with unique, multidimensional experiences, and where they are more than just a disease. To do this, nurses must be able to provide empathy, creativity, care, and communication, thus significantly improving the person by getting involved in their disease and quality of life.

Disciplinary framework

Taking into account the literature review, we found contributions from studies carried out in the field of nursing, including a study conducted by the nursing school of the University of Sao Paulo (Brazil), carried out by (Samaniego, Palomar & Sanmartín, 2018), which evaluated the quality of life of people with chronic wounds, relating this index to clinical signs. This is a cross-sectional study conducted in outpatient care during nursing consultations, in which quality of life was assessed using the quality of life index (wound version).

According to this study, the presence of a chronic wound can significantly affect quality of life, as the recovery process involved in the injury brings problems that affect the person in various dimensions, which can be physical, psychological, or social. Chronic wounds are defined as those that do not heal quickly and remain stagnant during some stage of their healing process.⁽²⁾

Similarly, according to this study, the etiology of chronic wounds is associated with advanced age, low educational attainment, and cognitive impairment. As a result, quality of life is affected, which, according to Samaniego et al.⁽²⁾, is identified as “an important assessment parameter for people suffering from some type of chronic disease.” This study demonstrates that quality of life is lower among people with chronic wounds, as they cause deterioration in functional capacity, health, physical well-being, and social integration. In this case, research on the etiology, risk factors, and treatment of chronic wounds has resulted in guidelines and treatment tests.

However, the overall management of the problem is still new, as people with chronic wounds have negative functional and psychological effects, which generally result in poor-quality treatment. Even when the care

considered best according to evidence is promoted, many wounds do not heal easily. Therefore, quality of life becomes an even more important element in the nursing care plan.⁽²⁾

In addition to considering the impact on psychosocial areas, clinical variables carry weight in assessing a person with a wound during treatment, and their influence on quality of life should be investigated to improve the care provided.⁽²⁾

It should be noted that sufficient information was not found when searching within the disciplinary framework for studies related to quality of life in people with chronic wounds. Given its importance, it could be suggested that health personnel conduct more studies on the subject.

Conceptual framework

Chronic wound

Chronic wounds have evolved into an important issue. They are characterized by the difficulty in achieving spontaneous healing and generally affect older people. The most prevalent chronic wounds are pressure ulcers and diabetic foot, which are now significant problems due to their impact on different areas, such as health, the consumption of resources provided by the service provider, and, most importantly, the significant deterioration in the quality of life of those who suffer from them.⁽¹²⁾

Types of chronic wounds

The Clinical Manual for the Standardization of Care and Treatment of Patients with Acute and Chronic Wounds identifies several types of chronic wounds:

1. Pressure ulcers (PUs): Any skin and tissue injury caused by an ischemic process produced by pressure and/or friction, resulting in ulceration.⁽¹³⁾
2. Venous and arterial ulcers: These are chronic tissue lesions mainly caused by the venous or arterial system's functional failure, which leads to blood flow obstruction.⁽¹³⁾
3. Diabetic Foot Ulcers: highlights that the WHO considers diabetic foot to be caused by infection, ulceration, and loss of deep tissue in the lower extremities, related to neurological disorders and other degrees of peripheral vascular disease.⁽¹³⁾ Similarly, it indicates that the National Center for Health Technology Excellence's Clinical Practice Guideline (CPG) for the Diagnosis and Management of Neuropathy and Diabetic Foot states that the definition of "diabetic foot" includes several pathologies, such as diabetic neuropathy, peripheral vascular disease, ulceration, osteomyelitis, and, in some cases, amputation.
4. Neoplastic ulcers: These skin lesions increase rapidly, causing an open ulcer that does not heal and destroys the surrounding tissue. Neoplastic ulcers are classified as primary and secondary; the former is caused by two types of skin cancer, melanoma and non-melanoma, and the latter is due to partial or total metastasis of a tumor and ulcers that develop into carcinomas.⁽¹³⁾
5. Dehiscence: The postoperative separation of a previously sutured surgical incision usually occurs spontaneously.⁽¹³⁾
6. Burns: These are injuries caused by various physical agents (fire, liquids, hot objects, radiation, electric current, and cold), chemicals, and biological agents, causing changes and alterations such as erythema and even destruction of dermal and subdermal tissues.⁽¹³⁾

Etiology of chronic wounds

The primary etiology of chronic wounds is valvular insufficiency, obstruction, and difficulty in blood flow to achieve venous return in the deep veins of the lower limbs, causing venous hypertension and compromising blood supply to the tissues in the affected limb, which leads to the development of a venous or chronic ulcer.⁽¹⁴⁾

Quality of life

According to Ramírez⁽¹⁵⁾, "quality of life is not an object, but is reflected as a value judgment related to the perception that surrounds and complements each person's life" (p. 10). This author also believes "that quality of life is the self-criticism a person has about themselves and that their thinking changes over time."

Quality of life is subjective, and everyone has a unified idea of what it means. Individuals will respond according to their beliefs, customs, habits, tastes, plans, and lifestyles.^(16,17,18,19,20,21,22,23)

Health-related quality of life

According to Sodelvilla⁽²⁴⁾, this aspect is understood as: "the value assigned to the duration of life based on the perception of physical, psychological, and social limitations and the reduction of opportunities due to illness, its sequelae, and treatment." Here, the person takes their personal and social satisfaction social satisfaction in the process involved, closely relating it to the presence of the chronic wound.

Similarly, Malguizo et al.⁽²⁵⁾ define HRQoL as "the subjective perception, influenced by the current state of health and the ability to perform activities that are important to the individual".

For this reason, CVRS is affected by the presence of chronic wounds, which may be accompanied by life changes such as dependence on family members and caregivers, suffering, sometimes severe pain, physical limitations, altered self-esteem, fear, distress, and isolation, among others.^(26,27,28,29,30)

In addition, this author indicates an association between HRQoL and healing time, inflammation and wound size, pain, and physical impairments due to wounds and amputation.^(25,31,32,33,34,35)

Likewise, the deterioration of HRQoL in people with chronic wounds is associated with an impact on their emotional and physical well-being.⁽³⁷⁾ An example of this is the shame and insecurity caused by the foul smell and fluid leakage from wounds, which leads these people to avoid contact and social activities intentionally.⁽⁴⁾

CONCLUSIONS

This study concluded that chronic wounds represent a health problem that transcends the physical realm, significantly affecting the psychological, social, emotional, economic, family, and spiritual dimensions of those who suffer from them. A review of the literature showed that chronic wounds, due to their prolonged duration and difficult healing, led to functional limitations that altered patients' autonomy, affected their self-esteem, and reduced their health-related quality of life (HRQoL).

The most frequent symptoms were pain, excessive exudate, and foul odor, which directly influenced the development of feelings of shame, hopelessness, frustration, and anxiety. These symptoms also led to isolation, abandonment of daily activities, and a negative perception of health status. The constant presence of these signs generated dependence on caregivers and affected the social integration of patients.

In terms of the most common sociodemographic data, a higher prevalence was found in women, with a mean age of 61 years, low levels of education, unfavorable socioeconomic status, predominantly married marital status, and high unemployment rates. Many of these patients did not have health insurance or the financial resources necessary to ensure adequate treatment, which increased their vulnerability and further deteriorated their quality of life.

Likewise, it was reaffirmed that the care of people with chronic wounds must be approached from a holistic perspective, recognizing each individual as a whole person with physical, emotional, and social needs. Humanized care was identified as a fundamental pillar, as the treatment received from healthcare personnel directly impacted patients' emotional well-being.

Finally, it was concluded that the approach to chronic wounds should not be limited to the physical healing process but should include strategies that promote general well-being, social inclusion, emotional support, and family accompaniment. Improving HRQoL in this population requires interdisciplinary, person-centered care that considers both clinical factors and the personal and social contexts in which each patient lives.

REFERENCES

1. Mengarelli R, Bengoa G, Soracco J. El impacto psicológico en pacientes con heridas crónicas. *Rev Esp Heridas Crón.* 2016.
2. Samaniego Ruiz M, Palomar Llatas F, Sanmartín Jiménez O. Valoración de las heridas crónicas en el adulto: una revisión integrativa. *Rev Esc Enferm USP.* 2018.
3. García Vargas WG, Pastrana Vargas MF. Calidad de vida en personas que presentan úlceras venosas en miembros inferiores. *Shielo.* 2018.
4. Woo K, Vera L, Alam T. Potimización de la calidad de Begoña de las personas con heridas crónicas que no cicatrizan. *Heridas Int.* 2018.
5. Araújo R, da Silva CD, Souto RQ, Marconato AMP. Impacto de las heridas crónicas en personas atendidas en atención primaria. *Rev Univ Fed Rio Grande (Brasil).* 2016.
6. Esparza Imas G, Fuentes Agundez A, Nova Rodriguez J. Experiencias de enfermeras coordinadoras de unidades de heridas crónicas. *SciELO.* 2016.
7. Alburquerque Almeida W, Ferreira AM, Ivo M, Rigotti M, Nogueira A. Factores asociados con la calidad de vida de las personas con heridas complejas crónicas. *Rev Online Pesquise.* 2016.
8. Malguizo E, Díaz A, Ozorio L. Calidad de vida en personas con heridas complejas en Cartagena, Colombia. *Universidad Nacional de Colombia;* 2018.
9. Cáceres F, Parra Prada L, Espinoza Pico O. Calidad de vida relacionada con la salud en población general

de Bucaramanga, Colombia. Rev Salud Pública. 2017.

10. Costa RRO, Medeiros SM, Martins JCA, Cossi MS, Araújo MS. Percepção de estudantes da graduação em enfermagem sobre a simulação realística. Rev Cuidarte. 2017;8(3):1799-808. doi:10.15649/cuidarte.v8i3.425.

11. Teoría Humanística de Paterson y Zderan. Teoría Humanística. SciELO. 2017.

12. Acedra Jinete J, Aguilar Morales R, Amell Lastre G. Curaciones de heridas crónicas: reto para el cuidado en la enfermería. Rev Cienc Innov Salud. 2013.

13. Organización Panamericana de la Salud. Manual clínico para la estandarización del cuidado y tratamiento a pacientes con heridas agudas y crónicas [Internet]. OPS; s.f. Disponible en: http://www.calidad.salud.gob.mx/site/editorial/docs/Manual_Clinico_Heridas.pdf

14. Araújo TY, Fernandes IK, Medeiros MD. Calidad de vida de pacientes con úlceras venosas. SciELO. 2014.

15. Ramírez R. Calidad de vida relacionada con la salud como medida de resultados en salud: revisión sistemática de la literatura. SciELO. 2017.

16. Acendra J, Aguilar RM, Lastre AG. Heridas crónicas: un reto para el cuidado de enfermería. Cienc Innov Salud. 2017.

17. Kapp S, Miller C, Healt A. Calidad de vida en personas con heridas crónicas y que se autotratan. Enferm Glob. 2019.

18. Lis R, Rokne Hanestad B, Moum T. Health-related quality of life among patients with diabetes and foot ulcers: association with demographic and clinical characteristics. Elsevier. 2018.

19. Lorenzo Hernández MP, Hernández Cano RM, Soria Suarez MI. Heridas crónicas. SciELO. 2018.

20. Lorenzo Hernández M, Hernández Cano R, Soria Suarez MI. Heridas crónicas atendidas en servicio de urgencias. SciELO. s.d.

21. Gonzáles RV. Calidad de vida y cicatrización en personas con heridas crónicas [tesis doctoral]. Primavera; 2015.

22. Meléndez C, Garza R, Castañeda-Hidalgo H, González JF, Turrubiates J. Percepción del paciente quirúrgico acerca de la seguridad en el ámbito hospitalario. Rev Cuidarte. 2015;6(2):1054-61. doi:10.15649/cuidarte.v6i2.165.

23. Corrales Pérez JM, Aguiló Pollo MD, Vázquez Aguilera M. Repercusión de las heridas crónicas en las unidades de rehabilitación funcional. SciELO. 2015.

24. Sodelvilla Agreda J. Heridas y calidad de vida. SciELO. 2015.

25. Melguizo Herrera S, Díaz Gómez A, Lambis Osorio M. Calidad de vida en personas con heridas crónicas complejas en Cartagena, Colombia. Enferm Glob. 2018.

26. Organización Mundial de la Salud. Calidad de vida. OMS; 2017.

27. Ministerio de Salud México. Calidad de vida. México: Secretaría de Salud; 2018.

28. Otero González G, Agorio Norstrom C, Martinez Asuaga M. Úlceras en miembros inferiores: características epidemiológicas de los pacientes asistidos en la unidad de heridas crónicas. Rev Dermatol Fac Med Univ República. 2018.

29. Puerto HM. Calidad de vida en cuidadores familiares de personas en tratamiento contra el cáncer. Rev Cuidarte. 2015;6(2):1029-40. doi:10.15649/cuidarte.v6i2.154.

30. Vera L, Dos Santos A. Calidad de vida en pacientes con heridas crónicas: magnitud de los cambios y factores predictivos. Rev Esc Enferm. 2017;12.

31. Beaskoetxea Gómez P, Bermejo Martínez M, Capillas Pérez R. Situación actual sobre el manejo e impacto de las heridas crónicas. SciELO. 2015.

32. Muñoz MB. Calidad de vida en personas con heridas crónicas: estudio cualitativo fenomenológico. SciELO. 2018.

33. Sommer R, Agustin M, Hampel C, Blome C. El cuestionario Woo-QoL sobre calidad de vida en heridas crónicas es altamente confiable. SciELO. 2019.

34. Bautista LM, Vejar LY, Pabón MR, Moreno JJ, Fuentes L, León KY, et al. Grado de adherencia al protocolo de registros clínicos de enfermería. Rev Cuidarte. 2016;7(1):1195-203. doi:10.15649/cuidarte.v7i1.237.

35. Universidad de Alicante. Calidad de vida y cicatrización en pacientes con úlceras crónicas [tesis doctoral]. Alicante: Universidad de Alicante; 2016.

36. Vera Santos L, Dos Santos Amaral A, Betteloni J, Nischi E. Calidad de vida en pacientes con heridas crónicas: magnitud de los cambios y factores predictivos. Rev Enferm. 2017.

37. García Moita P, Contrera L, Furlanetto AC, Santana Fava J. Calidad de vida de pacientes con heridas crónicas. Promoc Salud. 2017.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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