Journal of Tissue Viability xxx (xxxx) xxx

Contents lists available at ScienceDirect

Journal of Tissue Viability

journal homepage: www.elsevier.com/locate/jtv

Chronic wound assessment: Cultural and linguistic adaptation for European Portuguese of RESVECH-2 scale

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ARTICLE INFO

Keywords:
Chronic wound
Wound healing
Measuring instruments
RESVECH 2.0

ABSTRACT

Introduction: In order to assess and to follow up the evolution of chronic wounds, it is advisable to apply measurement scales. This procedure allows clinicians to verify the appropriateness of their activities and whether the healing process is evolving as expected.

Aim: To conduct a cross-cultural adaptation and psychometric analysis of Portuguese version of RESVECH 2.0.

Methods: A quantitative and correlational study was designed and, to perform the cross-cultural adaptation of RESVECH 2.0, we followed the classic sequential approach for linguistic equivalence to European Portuguese. The study occurred at a Portuguese oncology hospital and the sample encompassed 281 patients with multiple chronic wounds.

Results: RESVECH 2.0 is a practical measurement instrument, easy to use, and well accepted by nurses to know all kinds of wounds' etiologies. The reliability test revealed an acceptable internal consistency and high proportion of agreement between two raters assessing the same patient.

Construct validity was considered average/good and the principal component factor analysis with varimax rotation obtained six factors corresponding to 59.5% of explained variance.

When comparing the domains from RESVECH 2.0 with those from BWAT we found statistically significant correlations.

Conclusion: The adapted version of RESVECH 2.0 scale presents a good internal consistency and is valid for the Portuguese language and culture, being useful and effective in clinical practice.

1. Background

When a wound appears, there are necessarily changes in skin structure and, regardless of their classification, the biological response phenomena of the healing process are immediate.

In the process of physiological wound healing, we usually identify three successive phases in a normal path of scar evolution: (i) hemostasis, the inflammatory phase, (ii) granulation tissue refurbishment, the proliferative phase, and (iii) epithelialization, the remodeling phase [1]. However, when changes occur in this physiological chain of steps, there are factors that influence the behavior of the wound, such as hypoxia, recurrent ischemia, and some intrinsic factors of the host and bacterial infections [2,3].

Within this trade-off between adequate and inadequate evolution, the action of an organized, systematized and uniform wound monitoring is very relevant. Therefore, since the very first contact and at all phases of the treatment, a systemic evaluation of the individual and of the wound is essential, from the wound bed to the perilesional skin.

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https://doi.org/10.1016/j.jtv.2022.07.004
Received 10 February 2022; Received in revised form 30 June 2022; Accepted 12 July 2022
Available online 16 July 2022
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Please cite this article as: Alexandre Marques Rodrigues, *Journal of Tissue Viability*, https://doi.org/10.1016/j.jtv.2022.07.004

Regarding the assessment of the injured person, we should include clinical characteristics and comorbidities considering the perception of conditioning factors of local and systemic metabolic activity. Therefore, to perform a local wound assessment, we should identify the type of tissues in the bed, the location, the extension, the depth, the exudate, the characteristics of the perilesional skin, the infection and the odor [4,5].

In order to understand at which stage of the wound healing process we are, it is necessary to evaluate all the changes identified by these parameters, to point out the evolutionary process of healing, and to associate all the local factors present. However, to carry out a more rigorous wound evaluation, clinical judgment of health professionals should also be captured through a measurement instrument, allowing for more objective and consistent results.

Nowadays, in fact, there are several measurement instruments, usually grouped in two main areas: (i) instruments for risk assessment and (ii) specific instruments for assessing wound-related quality of life or wound healing.

Risk assessment is associated to primary prevention and aims at limiting the incidence of a disease by controlling specific causes and risk factors [6]. The tests to use must be accurate and valid. They will be accurate if they provide consistent results, and they will be valid if they have high sensitivity and specificity. Currently, for risk assessment there are, at least, five measuring instruments available: Norton scale [7], Waterlow scale [8], Cubbin and Jackson scale [9], Sunderland scale [10], and Braden scale [11]. This last scale is considered the one with higher sensitivity.

Other measurement instruments are intended to assess the severity of the wound and the healing process, such as the Pressure Ulcer Scale for Healing (PUSH) [12], Leg Ulcer Measurement Tool (LUMT) [13], Sessing Scale (SS) [14], Sussman Wound Healing Tool (SWHT) [15], Bates-Jensen Wound Assessment Tool (BWAT) [16], and DESIGN, an acronym derived from the six components of the tool: depth, exudate, size, inflammation/infection, granulation tissue, and necrotic tissue [17]. Also, to measure the quality of life of individuals with wounds there is the Cardiff Wound Impact Schedule (CWIS) [18].

A useful 9-item tool to measure the healing process in chronic wounds is the RESVECH 1.0 [19], created in 2010 and used after the detection of the chronic wound until its healing. It evaluates physical and psychological components, with its internal consistency supported by experts. Currently, the RESVECH 2.0 measurement instrument, using a Likert-type scale, has only six dimensions: wound area; depth; edges; type of tissue in the wound bed; exudate; and infection/inflammation - biofilm sign. The total score ranges between 0 and 35, with 0 meaning a complete healing.

The purpose of this paper is to present the process carried out by the authors to create and validate a Portuguese version of RESVECH 2.0.

2. Methods

This study encompassed three main phases: (i) cultural and linguistic adaptation of RESVECH 2.0 to European Portuguese; (ii) tests of reliability; and (iii) test of validity.

2.1. Cultural and linguistic adaptation

To create the Portuguese version of RESVECH 2.0, we firstly asked permission from the authors and followed the forward/backward process [20,21]. Initially, two Portuguese translators, fluent in English, performed two separate translations. Next, both translations were analyzed in order to detect any conceptual differences, reaching a final consensus version. A backtranslation was then performed by an English translator, fluent speaker of Portuguese language. At the end, the original and the back translated versions were compared and the obtained Portuguese version was analyzed by three nurse experts for a clinical review. These experts were members of wounds group in three different hospitals and they had more than five years wounds experience.

Next, a cognitive debriefing was performed on a meeting with ten professionals, aimed at detecting the feasibility and comprehension of the instrument, as well as possible problems of clarity, understanding and redundancy of the items. Finally, the last Portuguese version was reviewed in order to correct possible grammar errors.

2.2. Study design and participants

The target population consisted of all patients with chronic wounds undergoing treatment in an oncology hospital. We included inpatients from head and neck surgery, general surgery, otorhinolaryngology surgery, maxillofacial surgery, urology surgery, medical oncology and palliative care departments. Ambulatory patients were also included from a stomal therapy outpatient clinic, and dressing and biopsy rooms. Wounds that were already in the epithelialization phase were excluded, as well as all non-ulcerated oncological lesions. The sample included all patients admitted in internment and ambulatory with one or more wounds with four months of evolution.

Data collection was performed with the collaboration of reference nurses from each department and one of the authors made the second observation (when necessary), without contact or analysis discussion between the two observers.

We have asked authorization of the directors and nurses in chief from the departments involved and of the Hospital Board for the implementation of the project. We also obtained the permission of the hospital's Ethics Commission (ref. number: 05/TI/16). All individuals gave free informed and written consent to the study.

2.3. Measures

Along with the Portuguese version of RESVERCH 2.0, we also applied the Portuguese versions of BWAT and a generic quality of life instrument (EQ-5D-5L), in addition to the sociodemographic and clinical variables.

The current version of BWAT contains 13 dimensions: size, depth, edges, undermining, type of necrotic tissue, amount of necrotic tissue, type of exudate, amount of exudate, skin color surrounding the wound, peripheral tissue edema, peripheral tissue induration, granulation tissue, and epithelialization. The total score obtained ranges from 13 to 65 points, and the wound is closer to healing the lower the score.

EQ-5D-5L is a generic preference-based measure of health that has five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), each one with five levels of impairment that together describe a total of 3125 health states [22]. To estimate utilities using this new EQ-5D-5L, we used the tariffs based on the preferences from the general public [23]. This instrument was selected as it is a brief scale used to assess the impact of the healing process in chronic wounds in the quality of life of the patient.

The collected sociodemographic data included gender, age and education, as well as BMI and some comorbidities of the individuals. Among these comorbidities and clinical history, we included alcoholism, anemia, stroke, vascular surgery, diabetes, HTA, dyslipidemia, autoimmune disease, depression, previous history of wounds, smoking, heart problems, vascular changes, and respiratory problems.

2.4. Reliability

As this measure is supposed to be filled by professionals, the reliability of the Portuguese version of RESVECH 2.0 was tested through agreement between raters and internal consistency.

For the former, we used the Cohen's kappa (κ), corresponding to the proportion of agreement over and above chance and ranging from −1 to +1. A significance lower than 0.001 means that k is statistically significantly different from zero [24]. The internal consistency was measured by the Cronbach's alpha coefficient. A score between 0.70 and 0.90 is recommended [25].

For this study two hypotheses were then raised regarding the Portuguese version of RESVECH 2.0:

- H_1: RESVECH 2.0 showed good agreement between raters
- H_2: RESVECH 2.0 shows good internal consistency

2.5. Validity

We tested content, construct and criterion validity. The content validity was qualitatively tested in both clinician reviews and the cognitive debriefing. We formulated the following hypothesis for the content validity of the Portuguese version of RESVECH 2.0:

- H_3: RESVECH 2.0 is well accepted by experts and other professionals

Construct validity encompasses both structural validity and hypotheses arising from known-group testing. Structural validity was tested by exploratory factor analysis with a previous measure of sample adequacy Kaiser-Meyer-Olkin (KMO) and by Bartlett's sphericity measure. A KMO score smaller than 0.5 is unacceptable, it is poor if between 0.50 and 0.60, fair if between 0.60 and 0.70, average if between 0.70 and 0.80, good if between 0.80 and 0.90, or very good if higher than 0.90. The associated significance for the Bartlett's sphericity test should be lower than 0.001. The hypotheses on known-groups included the variables gender, age, education and associated diseases. The known-group tests are assessed by correlation coefficients.

Then, we formulated the following hypothesis for the Portuguese version of RESVECH 2.0:

- H_4: RESVECH 2.0's scores present a logical structure
- H_5: RESVECH 2.0's total scores are dependent from sociodemographic variables
- H_6: RESVECH 2.0's total scores are dependent from patients' comorbidity

Criterion validity was tested by comparing RESVECH 2.0 score with the scores obtained by BWAT and EQ-5D-5L. We formulated the following hypotheses for the Portuguese version of RESVECH 2.0:

- H_7: RESVECH 2.0's scores are related with BWAT's sores
- H_8: RESVECH 2.0's scores are related with EQ-5D-5L index.

2.6. Statistical analyses

Data analysis included descriptive and inferential statistics, using the statistical program SPSS version 25. Student's t-test was used for independent samples, when the dependent variable was divided into two groups and ANOVA One-way test was used when dependent variable was divided into more than two groups. On the other hand, Pearson correlation coefficient was used when the measurement level of the independent variable was continuous. A significance of 0.05 was the accepted cutoff used to reject or not the null hypotheses.

3. Results

3.1. Sample

The sample was composed by 281 patients. Sociodemographic and clinical characteristics are presented in Table 1.

As we can see from this table, individuals in this sample were between 25 and 95 years old, with an average of 69.7 years of age. Of these individuals, 151 (53.7%) were female. In what concerns the level of education more than one third (99; 34.5%) didn't have any formal education and 135 (48.0%) had completed the first 4 years of education.

Regarding the clinical characteristics, the mean BMI for the total number of individuals was 26.4. Most of them had normal weight 104 (39.5%), but an important part was still above the ideal weight. In what concerns the comorbidity of these oncologic patients, the more frequent ones are HTA (196; 69.8%), changes in circulation (125; 44.5%) and depression (117; 41.6%).

Table 1
Sociodemographic and clinical characteristics of the sample (n = 281).

Variable	Value	N	%
Gender	Female	151	53.7
	Male	130	46.3
Age (years)	25–35	2	0.7
	36–45	10	3.6
	46–55	33	11.7
	56–65	55	19.6
	66–75	71	25.3
	76–85	69	24.6
	86–95	41	14.6
	Min-max	25–95	
	Mean ± standard deviation	69.7 ± 13.6	
Years of education	0-4 or no formal education	232	82.6
	5–9	15	5.3
	10–12	11	3.9
	>12	23	8.2
BMI	Underweight (<18.5)	10	3.8
	Normal weight (18.5–24.9)	104	39.5
	Overweight (25–29.9)	86	32.7
	Obesity (30 or greater)	63	24.0
	Min-max	14.0–52.6	
	Mean ± standard deviation	26.4 ± 5.5	
Comorbidity	Min-max	0–8	
(# of associated diseases)	Mean ± standard deviation	3.2 ± 1.6	
Wound evolution (weeks)	Min-max	4–201	
	Mean ± standard deviation	23.6 ± 35.8	
Nb. of chronic wounds	Min-max	1–9	
by patient	Mean ± standard deviation	1.4 ± 1.1	

Looking at the time of wound evolution, it was found that the average was 23.8 weeks, with a large range from a minimum of four and a maximum of 201 weeks. In the whole sample, the minimum number of chronic wounds per patient was one and the maximum nine, with an average per individual of 1.4 ± 1.1. Most of the locations of chronic wounds (58; 20.6%) were in the head and neck, 50 (17.8%) in the legs, 40 (14.2%) in the abdomen and only 31 (11%) in the sacred region, coccyx or trochanters.

In relation to chronic wounds measured by the RESVECH 2.0 scale (Table 2), we may verify that 110 (39,1%) are smaller than 4 cm^2, 169 (60.1%) are superficial reaching only the dermis, and 23 (8.2%) reach the muscle layer. Just over a third of the wounds (98; 34.9%) have delimited edges, and in the majority devitalized tissue was found 161 (57.3%).

From the results obtained by BWAT scale (Table 3) we can also confirm that 108 (38.4%) of the chronic wounds were smaller than 4 cm^2 in size and only 13 (4.6%) had dimensions greater than 80 cm^2. A large part of the chronic wounds (178; 63.4%) were superficial with a partial loss of skin involving the dermis and only a small part (2; 0.7%) was covered with necrosis. The necrotic tissue found was devitalized yellow and not adherent in 139 (49.5%) of the cases, but in 11 (3.9%) it was firmly adherent. We found 75 (26.7%) chronic wounds with 50–75% of the bed covered with necrosis and only 28 (10%) had necrosis in more than 75% of their bed.

The edges were distinct in 138 (49.1%) cases and 216 (76.9%) presented undermining smaller than 2 cm^2. The exudate was purulent fluid and brownish yellow color in 89 (31.7%) and the color of the surrounding skin was pink in 144 (51.2%) of the wounds.

In the results obtained with the EQ-5D-5L scale (Table 4), the dimensions mobility, self-care and usual activities showed about 30% of patients without any problem and about 20% with slight problems. In the dimension pain/discomfort, there was a slight homogeneous distribution of all levels, except few of them (27; 9.6%) that had extreme pain/discomfort. Regarding the anxiety/depression dimension, 146

Table 2
Scores obtained by RESVECH 2.0 (n = 281).

Variable	Value	N	%
Wound dimensions (area)	<4 cm^2	110	39.1
	4 - < 16 cm^2	103	36.7
	16 - < 36 cm^2	38	13.5
	36 - < 64 cm^2	14	5.0
	64 - < 100 cm^2	10	3.6
	100 cm^2	6	2.1
Depth/tissues involved	Dermis-epidermis involved	169	60.1
	Subcutaneous tissue involved	61	21.7
	Muscle involved	23	8.2
	Bone and/or attached tissues involved	28	10.0
Edges	Not distinguishable (no wound edges)	3	1.1
	Diffuse	72	25.6
	Delimited	98	34.9
	Damaged	91	32.4
	Thickened	17	6.0
Type of tissue in the wound bed	Granulation tissue	90	32.0
	Necrotic tissue and/or slough in the bed	161	57.3
	Necrotic (dry or moist black scab)	30	10.7
Exudate	Dry	52	18.5
	Moist	99	35.2
	Wet	20	17.8
	Saturated	58	20.6
	Leaking exudate	22	7.8
Infection/inflammation (biofilm signs)	Increasingly painful	105	37.4
	Erythema around the wound	108	38.4
	Edema around the wound	62	22.1
	Rising temperature	37	13.2
	Increasing exudate	95	33.8
	Purulent exudate	101	35.9
	Tissue is friable or bleeds easily	150	53.4
	Wound stationary, no progress	171	60.9
	Tissue compatible with biofilm	178	63.3
	Odor	97	34.5
	Hyper granulation	21	7.5
	Wound increasingly larger	44	15.7
	Satellite lesions	22	7.8
	Pale tissue	70	24.9
Total score	Min-max	5–32	
	Mean ± standard deviation	14.8 ± 5.0	

(51.9%) reported feeling none or slightly anxious or depressed, but 19 (6.8%) described themselves as extremely anxious or depressed.

In general, individuals had a moderate QoL either measured by the EQ-5D-5L index or by the visual analog scale EQ-VAS. However, we should notice that some patients perceived their quality of life as very low. In fact, 11 (3,9%) patients scored between 0 and 0.2 on the EQ-5D-5L index score and 83 (29.5%) showed extreme scores, worse than death.

3.2. Cultural and linguistic adaptation

The process followed to create the Portuguese version of RESVECH 2.0 ran smoothly, without any obstacles. Specifically, no significant questions were raised by the experts used in the clinical reviews nor by the professionals who participated in the cognitive debriefing meetings.

On the other hand, in our final sample, the Portuguese version of RESVECH 2.0 was completely filled by professionals and no one showed any difficulty (H_3).

3.3. Reliability

Analyzing the agreement between two raters looking at the same patient, we computed the Cohen's kappa (k) coefficient to determine whether such raters agreed. From Table 5 we evidenced that, for all

Table 3
Scores obtained by BWAT.

Variable	Value	N	%
Size	<4 cm^2	108	38.4
	4–16 cm^2	106	37.7
	16.1–36 cm^2	38	13.5
	36.1–80 cm^2	16	5.7
	>80 cm^2	13	4.6
Depth	Partial thickness skin loss	178	63.4
	Full thickness skin loss	63	22.4
	Obscured by necrosis	2	0.7
	Full thickness skin loss	38	13.5
Edges	Indistinct, diffuse, none clearly visible	69	24.6
	Distinct, outline clearly visible, attached	138	49.1
	Well-defined, not attached to wound base	54	19.2
	Well-defined, rolled under, hyperkeratotic	18	6.4
	Well-defined fibrotic, scarred or hyperkeratotic	2	0.7
Undermining	<2 cm^2 in any area	216	76.9
	2–4 cm^2 involving <50%	41	14.6
	2–4 cm^2 involving> 50% wound margins	15	5.3
	>4 cm^2 or tunneling in any area	7	2.5
		2	0.7
Necrotic tissue type	None visible	86	30.6
	White/grey non-viable tissue	25	8.9
	Loosely adherent yellow slough	139	49.5
	Adherent, soft, black eschar	20	7.1
	Firmly adherent, hard, black eschar	11	3.9
Necrotic tissue amount	None visible	86	30.6
	<25% of wound bed covered	43	15.3
	25%–50% of wound covered	49	17.4
	>50% and <75% of wound covered	75	26.7
	75%–100% of wound covered	28	10.0
Exudate type	None	62	22.1
	Bloody	58	20.6
	Serosanguineous	54	19.2
	Serous	89	31.7
	Purulent	18	6.4
Exudate amount	None, dry wound	53	18.9
	Scant	83	29.5
	Small	58	20.6
	Moderate	63	22.4
	Large	24	8.5
Skin color surrounding wound	Pink or normal for ethnic group	144	51.2
	Bright red &/or blanches to touch	84	29.9
	White or grey pallor or hypopigmented	35	12.5
	Dark red or purple &/or non-blanchable	16	5.7
	Black or hyperpigmented	2	0.7
Peripheral tissue edema	No swelling or edema	222	79.0
	Non-pitting edema extends <4 cm around wound	39	13.9
	Non-pitting edema extends >4 cm around wound	8	2.8
	Pitting edema extends <4 cm around wound	10	3.6
	Crepitus and/or pitting edema extends >4 cm around wound	2	0.7
Peripheral tissue induration	None present	258	91.8
	Induration, < 2 cm around wound	14	5.0
	Induration 2–4 cm extending <50% around wound	3	1.1
	Induration 2–4 cm extending> 50% around wound	4	1.4
	Induration> 4 cm in any area around wound	2	0.7
Granulation tissue	Bright, beefy red; 75%–100% of wound filled	82	29.2
	Bright, beefy red; < 75% & > 25% of wound filled	68	24.2
		104	37.0

(continued on next page)

Table 3 (*continued*)

Variable	Value	N	%
	Pink, &/or dull, dusky red &/or fills ≤25% of wound		
	No granulation tissue present	27	9.6
Epithelialization	75% to <100% wound covered &/or epithelial tissue extends >0.5 cm into wound bed	7	2.5
	50% to <75% wound covered &/or epithelial tissue extends to < O.5 cm into wound bed	5	1.8
	25% to < 50% wound covered	55	19.6
	<25% wound covered	214	76.2
Total score	Min-max	16–65	
	Mean ± standard deviation	30.9 ± 7.4	

Table 4
Quality of life scores obtained by EQ-5D-5L.

Variable	Value	N	%
Mobility	I have no problems in walking about	85	30.2
	I have slight problems in walking about	54	19.2
	I have moderate problems in walking about	26	9.3
	I have severe problems in walking about	34	12.1
	I am unable to walk about	82	29.2
Self-care	I have no problems washing or dressing myself	85	30.2
	I have slight problems washing or dressing myself	61	21.7
	I have moderate problems washing or dressing myself	24	8.5
	I have severe problems washing or dressing myself	22	7.8
	I am unable to wash or dress myself	89	31.7
Usual activities	I have no problems doing my usual activities	88	31.3
	I have slight problems doing my usual activities	58	20.6
	I have moderate problems doing my usual activities	21	7.5
	I have severe problems doing my usual activities	26	9.3
	I am unable to do my usual activities	88	31.3
Pain/discomfort	I have no pain or discomfort	74	26.3
	I have slight pain or discomfort	66	23.5
	I have moderate pain or discomfort	65	23.1
	I have severe pain or discomfort	49	17.4
	I have extreme pain or discomfort	27	9.6
Anxiety/ depression	I am not anxious or depressed	70	24.9
	I am slightly anxious or depressed	76	27.0
	I am moderately anxious or depressed	71	25.3
	I am severely anxious or depressed	45	16.0
	I am extremely anxious or depressed	19	6.8
EQ-5D-5L index score	Min-max	−0.60 - 1.00	
	Mean ± standard deviation	0.42 ± 0.51	
	Less than 0.0	83	29.5
	[0.0–0.2[	0	3.6
	[0.2–0.4[	24	7.5
	[0.4–0.6[	24	8.5
	[0.6–0.8[	45	16.0
	[0.1–1,0[	98	34.9
EQ-VAS index score	Min-max	0–95	
	Mean ± standard deviation	50.3 ± 26.8	

nineteen RESVECH 2.0 items, the proportion of agreement over and above chance was high, meaning that the agreement scores obtained were statistically significantly different from zero (H_1).

This same table shows the internal consistency of 0.735 which can be considered acceptable (H_2).

Table 5
Agreement between raters for RESVECH 2.0 (n = 281).

	k	Sig.	A
Internal consistency (19 items)			0.735
Wound dimensions	0.948	<0.001	
Depth/tissues involved	0.945	<0.001	
Edges	0.975	<0.001	
Type of tissue in the wound bed	0.869	<0.001	
Exudate	0.883	<0.001	
Increasingly painful	0.802	<0.001	
Erythema around the wound	0.779	<0.001	
Edema around the wound	0.904	<0.001	
Rising temperature	0.829	<0.001	
Increasing exudate	0.960	<0.001	
Purulent exudate	0.914	<0.001	
Tissue is friable or bleeds easily	0.719	<0.001	
Wound stationary, no progress	0.847	<0.001	
Tissue compatible with biofilm	0.519	<0.001	
Odor	0.968	<0.001	
Hyper granulation	0.897	<0.001	
Wound increasingly larger	0.945	<0.001	
Satellite lesions	0.949	<0.001	
Pale tissue	0.854	<0.001	

Agreement between raters (k: Cohen's kappa; Sig: Significance).
Internal consistency (α: Cronbach's α).

3.4. Validity

Apart from the content validity already mentioned in the previous cultural and linguistic adaptation, we tested the construct validity, starting by looking at the structural validity. The indicator KMO was equal to 0.776, considered average/good, and the Bartlett's sphericity measure was less than 0.001. The principal component factor analysis with varimax rotation obtained six factors that correspond to 59.5% of explained variance (H_4). Table 6 shows the loadings associated to each factor.

As we can see, the data obtained by the Portuguese version of RESVECH 2.0 can be organized into six main factors. Factor 1 (F1) may represent the association of complications resulting from the presence of infection; F2 aggregates inflammatory signs; F3 represents the evolution

Table 6
Factor structure for the Portuguese version of the RESVECH 2.0

Item	F1	F2	F3	F4	F5	F6
Purulent exudate	0.721					
Wound dimensions	0.702					
Odor	0.691					
Increasing exudate	0.571					
Exudate	0.544					
Satellite lesions	0.511					
Erythema around the wound		0.787				
Edema around the wound		0.750				
Rising temperature		0.638				
Wound stationary, no progress			0.704			
Tissue compatible with biofilm			0.554			
Increasingly painful			0.517			
Wound increasingly larger			0.428			
Edges				0.768		
Depth/tissues involved				0.689		
Tissue is friable or bleeds easily					0.806	
Type of tissue in the wound bed					−0.515	
Pale tissue						0.756
Hyper granulation						0.592
% of variance	22.8%	10.5%	7.3%	7.0%	6.5%	5.4%

Var.

of healing; F4 links depth and edges; F5 allows to classify the type of tissues; and F6 concentrates the epithelial tissue characteristics.

We also tested the dependency of the RESVECH 2.0 scores from sociodemographic and clinical variables. Table 7 presents the outcomes of t-tests and ANOVA performed to assess these dependencies.

Regarding the sociodemographic variables, gender, age and years of education seem not to have any influence on the final scores obtained by RESVECH 2.0 (H_5). Same conclusion can be drawn when the comorbidity associated to oncologic disease were considered (H_6). On the other hand, BMI seems to influence the total score, meaning that more obese patients tend to have lower total RESVECH 2.0 scores, i.e. better healing.

At last, to test the criterion validity, we related final RESVECH 2.0 scores with final BWAT scores and with the EQ-5D-5L index scores. The comparison between the two wound-specific measurement instruments revealed a Pearson correlation coefficient of 0.836 ($p < 0.01$) (H_7). Regarding the domains of both scales, we correlated each dimension and we found all correlations statistically significant ($p < 0.001$).

The relation between the specific measure RESVECH 2.0 and the generic quality of life measure EQ-5D-5L showed a negative and significant correlation (−0.231; $p < 0.01$), revealing the association of lower RESVECH 2.0 scores with higher perceived quality of life (H_8). Looking to each of the five EQ-5D descriptive system dimensions, we also compared the total score of RESVECH 2.0 in patients with or without problems. Table 7 presents these results, evidencing that there was a statistically significant difference ($p < 0.05$) in all dimensions, with RESVECH 2.0 scores always showing higher in people with problems.

4. Discussion

We developed and validated a European Portuguese version of the RESVECH 2.0 measurement instrument to follow the healing process of chronic wounds. The RESVECH 2.0 scale presented reliable internal consistency with Cronbach's alpha values of 0.73, with strong accordance between observers. These values were higher than those obtained by the authors of the original scale [34,35], but along with Gutierrez (2012) in a subsequent study [36].

From the results obtained in this study, the sociodemographic characteristics of patients with chronic wounds gender and age have been shown in accordance with several studies results or data [26,27]. However, [28] male gender shows a higher percentage of chronic wounds.

Considering maxillofacial, head and neck, the main surgical specialties where data collection was performed, the wound locations were relatively distant from epidemiological studies conducted in this area. In fact, the wounds appear mostly in the lower body, specifically in the lower limbs [29]. In what regards the number of wounds per patient and the time management during the wound evolution process we obtained results similar to studies conducted by Cheng et al. (2020) and by Martinengo et al. (2019).

In terms of wound assessment, it was reported that they were essentially superficial and of small size, yet with the presence of devitalized tissue and/or necrosis. These aspects are extremely relevant from the perspective of care plan, considering that the most appropriate treatment is delivered according to the wound evaluation chart [30].

The specific characteristics of each wound classification and person's health status are directly influencing their quality of life as well as their relatives' [31]. According to the data reported in this study, it is important to mention that the results obtained are identical to other studies and the quality of life in a person with chronic wound has tendentially a low quality of life and health [32,33]. In fact, the study reported that in healing process (wound classification and assessment) according to the RESVECH 2.0 scale patients with lower outcomes had lower levels of quality of life.

The Portuguese version of the scale had also a criterion validity, so when its dimensions were correlated with the BWAT scale, it presented a Pearson correlation of 0.83, which is higher than the one found by the authors Restrepo-Medrano (2010).

According to the study outcomes, the body mass index BMI had significant impact on the score of the RESVECH 2.0 scale, which is in line with the pathophysiological principles associated with malnutrition, due to deficit or excess, as conditioning factors of the wound healing process. According to Alves et al. (2021) there are crucial nutritional needs for the wound healing and treatment [37]. In addition, Stechmiller (2010) adds that healing is an anabolic process that requires adequate energy supply for an effective improvement [38].

The factor analysis in this scale demonstrates that we need to perform a deep reflection on the infection parameters and their division in other elements, as in the case of exudate, inflammatory signs and wound progression. These parameters are reported by some authors as being relevant for an effective and reliable local wound exploration or evaluation [39,40].

This study has a limitation related with the wounds' typology, because head and neck wounds in cancer patients may affect the diversity and specificities of the healing process in other types of wounds.

Table 7
Sociodemographic and clinical determinants of the total score for RESVECH 2.0

Variable	Value	n	Mean	|t| ou F	Sig.
Gender	Male	130	14.5	0.822	0.412
	Female	151	15.0		
Age	≤65 year	100	14.2	1.405	0.161
	>65 years	181	15.1		
Education	No formal education	97	15.7	2.234	0.109
	4–9 years	150	14.4		
	10+ years	34	14.1		
BMI	Normal weight or less	114	15.7	3.375	0.036
	Overweight	81	14.2		
	Obesity	63	13.9		
Comorbidity	≤3	173	14.5	1.194	0.234
	4+	108	15.3		
EQ-5D-5L Mobility	Without problems	85	14.0	2.016	0.045
	With problems	196	15.2		
EQ-5D-5L Self-care	Without problems	85	13.9	2.271	0.024
	With problems	196	15.2		
EQ-5D-5L Usual activities	Without problems	88	13.9	2.523	0.012
	With problems	193	15.2		
EQ-5D-5Lpain/ discomfort	Without problems	74	13.1	4.186	<0.001
	With problems	207	15.4		
EQ-5D-5L anxiety/ depression	Without problems	70	13.5	2.780	0.006
	With problems	211	15.2		

5. Conclusion

Living with a chronic wound with odor and remaining exposed due to its location means living excluded from the family and social context. We noticed that the individuals in this sample found themselves in a psychic suffering that caused them a significant loss of quality of life and well-being.

A total of 281 chronic wounds were evaluated, most of them located in the head and neck, lower limbs and abdominal region. Through the application of RESVECH 2.0, it was found that this scale presents a good internal consistency, with a Cronbach's alpha of 0.735, and high coefficients of agreement between raters were obtained. The scale also presented a good acceptability.

We conclude that there are no statistically significant differences between gender, education, age and comorbidities. Comparing the RESVECH 2.0 scale with the BWAT scale, there was a statistically significant positive and strong correlation and, comparing it with the EQ-5D-5L, there was also a statistically significant difference for all dimensions, although it increases in people with other problems.

We developed an European Portuguese version of the RESVECH 2.0 that presented acceptable internal consistency and good validity; this version can be used in research and in clinical practice. Further investigation is required to assess its psychometric properties in other settings.

The use of rigorous instruments adjusted to the Portuguese reality may produce indicators of important outcomes that demonstrate the success of the interventions of health professionals in the treatments, reducing the time of prevalence of chronic wounds.

Declaration of competing interest

None.

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