Scar Assessment Scales

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14.1 Background

Over the last decades, standardized measurements of medical treatment outcome have become increasingly important. First of all, application of evidence-based medicine requires that the research field evaluates the effectiveness of new and existing treatments. Therefore, no clinical trial can exist without the appropriate outcome measurement instruments to determine the study outcomes in a reliable and valid way. These outcome measurement instruments are not only vital in the research setting but also indispensable in daily clinical practice to monitor scars in individual patients. Furthermore, standardized scar measurements are performed and recorded in clinical registries with the aim to improve the quality of care and patient health outcomes.

Scar outcome measurement instruments can be either measurement devices or scar assessment scales. Measurement devices are often seen as objective instruments that provide solid quantitative analyses of scar characteristics. However, measurement devices have to be purchased for sometimes high prices and can only be used at one place at a time. Another disadvantage may be that most devices are only able to evaluate one scar characteristic. In addition, cutting-edge measurement technologies often involve time-consuming measurements and analyses that require training of the observer, which might be appropriate in research settings but is less suitable in clinical practice. Contrary to measurement devices, scar assessment scales are qualitative evaluations of multiple scar characteristics provided by an individual, either the patient or the clinician/researcher. Scar assessment scales are sometimes criticized by their subjective nature. However, advantages of scar assessment scales are their ability to provide fast evaluation of multiple scar characteristics, their (usually) free and easy accessibility, and their ability to capture the patient's view on their scars. The latter is especially important as nowadays patients are receiving more information about treatment options and are getting more involved in making treatment decisions and in reporting treatment outcomes. In this chapter, an overview of the content and development of most frequently used scar assessment scales is provided.

14.2 Domains

Scars can influence patients in several health domains, ranging from appearance to quality of life. These different domains require different levels of measurements. Measurements acquired with clinician-reported scales are limited to observable aspects of the scar, such as appearance, physical characteristics, and functional impairment of the scar. On the other hand, patient-

reported scar scales allow for the evaluation of additional health domains that cannot be observed by clinicians, such as scar symptoms and quality of life.

14.3 Scar Assessment Scales

■ Table 14.1 provides an overview of consecutive developed scar assessment scales, the constructs measured, and whether it is reported by the patient or clinician.

■ Table 14.2 shows which scar aspects are assessed in the most frequently used scales. The first concepts of scar assessment scales were reported in the late 1980s, but the first widely used, validated scar scale was developed in 1990 by Sullivan et al., which became widely known as the Vancouver Scar Scale (VSS) [1]. The VSS consists of four items: vascularity, pigmentation, thickness, and pliability. Since this first introduction to scar assessment scales, the development of many other scales followed. Various authors modified the original version of the VSS by adding extra items to the scale or altering the answering categories of the existing items [2–4]. This resulted in an abundance of modified VSS versions—of which the modified VSS by Baryza et al. is the most widely used [2]. The Seattle, Hamilton, and Manchester scar scales were consecutively developed from 1997 to 1998 [5–7]. The Seattle and Hamilton scales were both developed for photographic evaluation of scar [5, 6]. The Manchester scar scale introduced two new items: an “overall assessment,” rated on a VAS scale (0–10), and if the scar appeared matte or shiny [7]. Until 2000, the focus remained on the clinician/observer, as all developed scales were clinician-reported, focusing on visual and physical scar characteristics. This changed when Nedelec et al. added a symptomatic assessment (i.e., items of pain and itch) to the original VSS [3]. However, it was not until 2004 that in addition to symptoms such as pain and itch, the patient's opinion on visual and physical scar characteristics was incorporated into a scar assessment scale called the *Patient and Observer Scar Assessment Scale* (POSAS) [8]. The POSAS captures both the clinician's (observer's) and the patient's perspective on multiple-characteristics scar quality. A few years after the introduction of the POSAS, Bock et al. made it possible to evaluate the quality of life of patients with keloid and hypertrophic scars by the development of the *Bock Quality of Life Scale* [9]. This was the first patient-reported scar scale measuring at the level of quality of life. Around the same time, the *Stony Brooks Scar Evaluation Scale* was introduced, which is a clinician-reported scar scale specifically designed for the assessment of surgical scars [10]. Therefore, it included an item to evaluate the presence of suture marks. The *Patient Scar Assessment Questionnaire*, *Patient-Reported Impact of Scars Measure* (PSAQ), and *Brisbane Burn*

Table 14.1 Overview of consecutive developed scar assessment scales

Scar scale	Year	Clinician-reported	Patient-reported	Type of scars	Construct
Vancouver Scar Scale	1990	X		Burn	Physical characteristics and appearance
Modified Vancouver Scar Scale by Baryza et al.	1995	X		Burn	Physical characteristics and appearance
Seattle Scar Scale	1997	X		Burn	Physical characteristics and appearance
Hamilton Scar Scale	1998	X		Mix	Physical characteristics and appearance
Manchester Scar Scale	1998	X		Mix	Physical characteristics and appearance
Modified Vancouver Scar Scale by Nedelec et al.	2000	(X)		Burn	Physical characteristics and appearance, scar sensation
Patient and Observer Scar Assessment Scale	2004	X	X	Mix	Physical characteristics and appearance, scar sensation
Bock Quality of Life	2006		X	Hypertrophic/keloid	Quality of life
Stony Brooks Scar Evaluation Scale	2007	X		Surgical	Scar characteristics and appearance
Patient Scar Assessment Questionnaire	2009		X	Surgical	Scar characteristics and appearance, scar sensation Consciousness (body image and confidence)
Patient-Reported Impact of Scars Measure	2010		X	Surgical	Scar sensation Quality of life
Brisbane Burn Scar Impact Profile	2016		X	Burns	Scar characteristics and appearance Scar sensation Quality of life
Scar Cosmesis Assessment and Rating scale	2016	(X)		Surgical	Scar characteristics and appearance Scar sensation
Scar Q	2018		X	Mix	Scar characteristics and appearance Symptoms Psychological problems

(X) = Clinician-reported scale in which the presence of pain and itch is included

Scar Impact Profile (BSSIP) are more recently developed patient-reported scales which measure aspects of quality of life, in addition visual and physical scar characteristics, symptoms, and/or satisfaction [11–13]. Most recently, the *Scar Q* was developed for the evaluation of physical characteristics, scar appearance, symptoms, and physiological problems [14].

14.4 Measurement Properties/Clinimetrics

To evaluate the quality of available scar assessment scales, several measurement properties must be considered, i.e., validity, reliability, and responsiveness [15]. The most important property is content validity. Content

validity is the degree to which the content of a measure is an adequate reflection of the construct to be measured [15]. Good content validity means that all items included in the scale are relevant and no relevant items are missing for the construct of interest (within a specific population and context of use). Furthermore, it means that patients should understand the content as intended. Lack of content validity can influence all other measurement properties [16]. To ensure good content validity, it is important that well-designed scale development studies are performed that use qualitative methods to gain patient/professional input on the content of the scale. In addition, the draft scale must be pilot tested to ensure its content is relevant, comprehensive, and comprehensible for patients. In Table 14.3, it is noted if

Table 14.2 Overview of the content of most frequently used scar assessment scales

	VSS	Modified VSS by Baryza et al.	Manchester Scar Scale	POSAS (2.0)	Boek Quality of Life	SBSSES	PSAQ	PRISM	BBSIP	Scar Q
Number of subscales	1	1	1	2	1	1	5	2	10	2
Number of items ^a	4	4	6	14	15	5	39	37	66	24
<i>Visual and physical scar characteristics</i>										
Vascularity	X	X		X			X			
Pigmentation	X	X		X			X			
Color			X	X		X	X		X	X
Thickness	X	X	X	X		X	X		X	X
Pliability/ hardness	X	X	X	X					X	X
Roughness							X		X	
Surface irregularities				X			X		X	X
Distortion			X	X						
Shiny surface			X				X			
Hatch marks						X				
Width						X	X			X
Length							X			X
Overall appearance			X	X		X	X			X
<i>Symptoms</i>										
Pain				X			X	X	X	X
Itch				X	X		X	X	X	X
Stinging								X		
Burning								X		
Discomfort							X		X	

	VSS	Modified VSS by Baryza et al.	Manchester Scar Scale	POSAS (2.0)	Boek Quality of Life	SBSSES	PSAQ	PRISM	BBSIP	Scar Q
Numbness							X			X
(Hyper) Sensitivity								X	X	X
Tingling							X	X		X
Tightness							X		X	X
Impaired movement					X				X	X
Dryness									X	X
Sensitive to temperature (changes)					X			X	X	
Swelling										X
Inflammation								X		
Open wounds									X	
Tiredness									X	
<i>Psychosocial</i>										
Self- consciousness							X	X		
Self-confidence					X			X	X	
Embarrassment					X			X		X
Unhappy feelings								X	X	X
Angry feelings								X	X	
Sexual concerns					X			X		
Feeling unattractive					X			X		
Not accepting scars					X					
Hiding scars					X		X			

(continued)

Table 14.2 (continued)										
	VSS	Modified VSS by Baryza et al.	Manchester Scar Scale	POSAS (2.0)	Boek Quality of Life	SBSES	PSAQ	PRISM	BBSIP	Scar Q
Avoid talking about scars					X					
Reactions of others					X		X	X	X	
Impact on social interactions and activities					X			X	X	
Impact of scar treatments									X	
Suicidal thoughts					X					
<i>Satisfaction</i>										
Overall satisfaction										
Appearance							X			
Symptoms							X			

^aNot all items included in the scales are scored in this table. *VSS* Vancouver Scar Scale, *POSAS* Patient and Observer Scar Assessment Scale, *SBSES* Stony Brooks Scar Evaluation Scale, *PSAQ* Patient Scar Assessment Questionnaire, *PRISM* Patient-Reported Impact of Scars Measure, *BBSIP* Brisbane Burn Scar Impact Profile

Table 14.3 Methods used for the development of most frequently used scar assessment scales

	VSS	Modified VSS by Baryza et al.	Manchester Scar Scale	POSAS (2.0)	Bock Quality of Life	SBSES	PSAQ	PRISM	BBSIP	Scar Q
<i>Scale development</i>										
Literature search		X		X	X		X	X	X	X
Expert opinion	X	X	X	X	X	X	X	X	X	X
Patient interviews							X	X	X	X
Pilot testing					X		X	X	X	X

VSS Vancouver Scar Scale, POSAS Patient and Observer Scar Assessment Scale, SBSES Stony Brooks Scar Evaluation Scale, PSAQ Patient Scar Assessment Questionnaire, PRISM Patient-Reported Impact of Scars Measure, BBSIP Brisbane Burn Scar Impact Profile

these requirements were met for the included scar assessment scales. Besides content validity, reliability is an important clinimetric property. Reliability refers to the extent to which scores for patients who have not changed are the same for repeated measurements [15]. Reliability and measurement error are related but distinct measurement properties. Reliability refers to the ability of a measure to distinguish between patients, and measurement error refers to the systematic and random error attributed to the measurement instrument [17]. The responsiveness is the ability of a scale to detect changes over time in the construct to be measured (e.g., scar quality) [15]. All measurement properties should be evaluated in the specific population in which it will be used. The context of use, referring to the application of use (i.e., discriminative, evaluative, or diagnostic application) and to the setting (e.g., hospital or at home), should also be taken into account. Furthermore, the instrument must be practical and user-friendly in order to be easily applicable in clinical practice: an aspect which is defined as feasibility [18]. It is crucial to consider the measurement properties, the context of use, and the feasibility when choosing a measurement instrument. Measurements obtained by poor-quality or non-validated instruments are not trustworthy, and thus, studies that utilize these instruments yield unreliable results and invalid conclusions.

14.5 Conclusion

Scar assessment scales are useful tools to measure various domains of scars. This chapter provides an overview of the most frequently used scar scales, including their

content and development. It is of paramount importance to evaluate the clinimetric properties of an instrument prior to using it for scar assessments for clinical or research purposes in order to prevent measurements obtained by poor-quality instruments.

Take-Home Messages

- Scar assessment scales are important to evaluate the effectiveness of scar treatments and to monitor patients over time.
- Traditional scar scales are clinician/researcher-reported, focusing on the appearance and physical characteristics of the scar, while more recently, developed scales are patient-reported scales which measure aspects of quality of life.
- (Content) Validity, reliability, and responsiveness are important measurement properties which must be evaluated prior to using a scale for scar assessments.

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