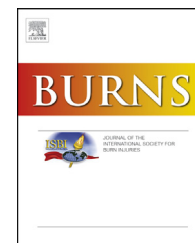


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Towards a clinical and empirical definition of burn scarring: A template analysis using qualitative data

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ABSTRACT

Objective: This study aimed to describe the nature, scope or meaning of the concept 'burn scar', from the perspective of adults and children with burn scarring, caregivers of children with burn scarring and health professionals who were considered experts in the treatment of burn scarring. The impact of the identified characteristics on burn scar health-related quality of life (HRQOL) was also examined.

Method: Using a phenomenological qualitative approach, 43 transcripts from semi-structured interviews with people with burn scars (n=10 adults and n=11 children), their caregivers (n=9) and health professionals (n=13) were analyzed using template analysis.

Results: Ten characteristics of burn scars were identified by health professionals: 'stretchability', 'hardness', 'raised', 'thickness', 'surface area', 'scar sensitivity', 'scar surface appearance', 'hydration', 'fragility', and 'color'. However, 'thickness', 'scar surface area' and 'hydration' were not described by children with burn scars and 'scar surface area' was not described by adults with burn scars or caregivers. All groups (adults, children, caregivers and health professional) perceived that the burn scar characteristics of 'stretchability' and 'scar sensitivity' impacted upon all indicators of burn scar HRQOL. The burn scar characteristics of 'fragility', 'scar surface appearance' and 'color' were largely perceived by all groups to impact upon the emotional and physical indicators of burn scar HRQOL alone.

Conclusions: This study identified there are differences in the burn scar characteristics considered important by health professionals and those characteristics that adult/child/caregivers perceived to impact on indicators of burn scar HRQOL. It is recommended that outcome measures of burn scarring include the burn scar characteristics of 'stretchability' and 'scar sensitivity' at a minimum. The inclusion of 'fragility', 'scar surface appearance' and 'color' should also be considered.

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1. Introduction

Studies utilizing both qualitative and quantitative research designs across the ages and using different perspectives have demonstrated that scarring after burn injury causes challenges beyond the physical characteristics of burn scars [1-3]. However, studies measuring the impact of interventions on burn scarring are often reported without consistent terminology and lack a conceptual definition of burn scarring [1,4-6]. This is problematic as researchers may be unaware of the conceptual underpinnings of the aspect of burn scarring they selected to investigate, thus resulting in poor validity or a lack of comprehensiveness when measuring the impact of interventions on burn scarring. For example, two recent systematic reviews investigating the effectiveness of scar massage [7] and pressure garments [8] on characteristics of burn scarring identified only one shared outcome of interest (vascularity) across the two studies. Within the clinical environment, the use of diverse terminology and inconsistent definitions of burn scarring can result in confusion and inconsistencies in assessment and treatment provision, including a focus by health professionals on the physical features of a scar alone. This is important to understand further, as measuring the burn scar characteristics of interest from a patient's perspective is integral to maintaining an accurate interpretation of treatment effectiveness [9].

Scar characteristics recently described by adults and caregivers of pediatric and adolescent patients with burns during qualitative interviews (N=40) as important to outcomes were: height, texture, color, size and shape [9]. Sensory characteristics (itch, pain and sensitivity), scar appearance and movement were also considered important characteristics amongst the thirteen outcome categories identified in total. The impact of burn scarring on health-related quality of life (HRQOL) has been recently examined [10,11], with a contextual model developed by the authors of this paper that applies specifically to explaining the health status of patients with burn scarring [10]. Central to the conceptual model are the indicators of impact that focused on sensory and physical symptoms of burn scars (termed proximal indicators). Distal indicators included social functioning, physical functioning, cognitive functioning and emotional functioning, as well as individual factors and the environment. Overall quality of life was represented as being impacted by HRQOL. In that paper it was proposed that the model of HRQOL would provide a context to examine the impact of burn scarring on patient's lives and the basis from which to empirically test the clinical relevance of different scar interventions [10]. However, an empirical definition of burn scarring is needed alongside this model to advance research and practice [12]. A first step towards an empirically-derived definition of burn scar is specification of the components that are linked to a burn scar. The specification of a construct has been described as a prerequisite of validity, without which the validity of research hypotheses can be threatened [12].

Therefore this study aimed to: (1) explore the nature, scope or meaning of characteristics that define the concept of a burn scar, from different perspectives (people with burn scars, caregivers of people with burn scars, health professionals

considered to be experts in burn scars); and (2) explore the impact of these characteristics on burn scar HRQOL. For the purpose of this study, 'defining the concept of a burn scar' was operationalized as describing the nature, scope or meaning of the components (herein termed 'characteristics') of a burn scar.

2. Method

2.1. Study design and setting

A phenomenological qualitative approach was applied, using secondary analysis of semi-structured interview data from a previous study completed by the authors [6]. A phenomenological inquiry was considered the most suitable approach for the current study due to the lack of an existing conceptual definition of burn scarring from the patient's (or any other defined group's) perspective. Phenomenology is the study of structures of consciousness as experienced from the first-person point of view and is important in health care to facilitate a deeper understanding of lived experience [13]. In secondary analysis, data is re-examined with a distinct aim that is different from the original research question [14]. Therefore, in keeping with this phenomenological stance underpinning analysis, salient findings from initial reviews of a sub-set of the adult and child data informed the selection of *a priori* themes as a focus for the initial template and not burn scar characteristics included in existing patient-reported outcome measures of burn scars [6,20-22]. The study received ethical clearance from Metro South Human Research Ethics Committee (HREC/12/QPAH/212) for the sites of Royal Children's Hospital, Brisbane (now relocated) and Royal Brisbane and Women's Hospital. Approval and ethical clearance (where required) was received from the relevant administration body for the health professionals that participated. Written consent was obtained from all parents, children aged 8-18 years with burn scarring, adults with burn scarring and health professionals. Verbal assent was obtained from children aged 5-8 years for their parents to discuss information regarding their burns scars with the researcher.

2.2. Participants

Children with burn scars and caregivers were recruited from a quaternary, metropolitan-based, pediatric hospital and adults from a quaternary, metropolitan-based adult hospital and a regional hospital in Queensland, Australia. Health professionals involved in the management of, or research with, people with burn scarring were recruited from several different countries. Participants (N=43) included: Australian adults and children with burn scarring (n=10 adults and n=11 children), caregivers of children with burn scarring (n=9) and health professionals from Australia, the US, Ireland, Canada, and the Netherlands who were involved in the management of, or research with, people with burn scarring (n=13) at the time of the study. Participants (adult and children) were aged between 12 months to 68 years, with total body surface area from 0.5% to 84%. There were a variety of scar types and scar locations represented, from 2 months to 37 years post-injury. Details of

demographic and clinical characteristics are further described in Tyack et al. [6].

2.3. Procedure

Health professionals were approached via electronic communication to consider their participation. Semi-structured interviews were completed by a single interviewer (ZT) with both clinical and research experience in burns. Interviews were completed either in the hospital setting or in the patient's home, depending on their preference. Health professionals were interviewed either face-to-face or via telephone. The use of semi-structured interviews enabled flexible data collection, with the opportunity to elicit open responses while ensuring relevant topics were addressed [15]. All participants were asked to respond to questions from their own perspective about the look and feel of burn scarring. Adults, children and caregivers were asked about the impact of burn scarring on life from time of injury to present (see Tyack et al. [6] for examples of questions). Each interview was audio-recorded, transcribed verbatim (by MS or a paid transcription service) and checked for accuracy by the respondent (member checking).

2.4. Data analysis

Data was analyzed using template analysis method [16,17]. Template analysis is a form of thematic analysis where the development of a coding template is central, yet the style and the format of the template is flexible. When using template analysis, a set of *a priori* themes from a sub-set of data or existing theory can inform the initial template, which is then revised and refined when applied to further data [17]. However, the initial template in the current study was developed based on analysis of the child and adult data, so that analysis was firmly grounded in participants' own accounts in keeping with the phenomenological stance. Two researchers (MS and PCCL) independently applied a constant comparative technique [18] when coding. Analysis progressed through an iterative process of applying, modifying and re-applying the template, with three versions in total (including initial and final template which is available in the on-line supplemental file). There were two modifications to the initial template: (1) revision of the higher-order and integrative themes to include impact on HRQOL and removal of 'emotive' as a theme (as this data was more appropriately captured as a HRQOL impact arising from burn scar characteristics); and (2) the inclusion of thickness (as separate from height), scar surface area and hydration as a higher-order theme following analysis of the health professional's transcripts. Agreement among the authorship group was facilitated by regular meetings (face-to-face and on-line) throughout the data analysis phase. By completing analysis in sub-groups (adult, child, caregiver, health professional), clarity was maintained to distinguish whose perspective was represented. The unique perspective of caregivers and health professionals were considered important to include to allow for exploration of the broader contextual environment for people with burn scars. To inform translation of the findings to clinical practice, following completion of template analysis, the descriptors of characteristics were presented (by MS) for consideration at a

burns clinical meeting which is typically attended by up to twenty health professionals from a variety of backgrounds including medical, nursing, allied health and research.

3. Results

3.1. Defining the characteristics of a burn scar

From the analysis, ten characteristics defining the components of a burn scar were identified. These characteristics were: stretchability, hardness, raised, thickness, surface area, scar sensitivity, scar surface appearance, hydration, fragility, color. However, there was a variety of terminology used by participants, depending on their perspective to describe the look and/or feel of the characteristic (Table 1). Some characteristics ('hardness', 'raised', and 'scar surface appearance') were described along a continuum with end-points of 'hard' and 'soft'; 'scar deficit' and 'elevated'; 'smooth' and 'lumpy'. One integrative theme was identified: change over time.

The integrative theme 'change over time' captured two meanings. The first was that changes of both a physical and sensory nature occurred naturally: all burn scar characteristics will change (for better or worse) as time passes since the burn injury itself. All groups (adult, child, caregiver and health professional) described this aspect. For example,

"In the early days I guess . . . when you stretch you have a lot more pain. Because the scarring was fresh and it was a lot more sensitive." (Adult 003, 66-67)

"It's gone . . . maybe a little bit to my color. Only a little bit, not much." (Child 004, 47)

"I want to see how stretchy the scar is at that time, so um . . . um...I would say elasticity . . . extensibility of the scar. Because as I am approaching maturation of the scar...I want to make sure I have achieved maximum elasticity of the scar. In addition to that I am looking at the height and I am looking at um . . . suppleness, how supple . . . how SOFT the scar is . . . which directly relates to elasticity." (HP 001, 71-76)

The second meaning captured by 'change over time' represented the effectiveness of the intervention based upon an improvement or worsening of a burn scar characteristic. For example,

"Because of my splint . . . it [pulled up toe] is going back down." (Child 002, 43)

The patient and caregiver experience as to the responsiveness of the burn scar characteristic to the intervention (such as improved 'stretchability'), or their expectation that the intervention would result in a positive change (including future state), was considered important for adherence.

"I think we were told fairly early on . . . the thing that we were told we didn't want to happen was for it to thicken. If it thickens on her foot it will pull her toes up. So we've been really conscious

Table 1 – ‘Burn scar’ characteristics as described by adult/child/caregiver and health professionals.

Burn scar characteristics	Adults	Children	Caregivers	Health professionals
Stretchability (reduction in flexibility or elasticity that may or may not cause contracture)	Tight/tightness Contracted/contracting/ Restrictive/restricted Pulling Not as elastic	Tight/tighter Stretched more	Tight	Skin mobility (=limitation in the motion around the scar, can be located anywhere) Contracture Scar banding/scar bands (=distortion of the features or skin around the scars) Range of motion/joint motion Extensibility Limitations to movement/limiting motion Tightness
Pliability	Soft Malleable Hard	Hard Soft	Hard Rubbery Rigid	Pliability (=how much it moves relative to the regular skin) Skin pliability Scar pliability Elasticity Soft/softness Supple Stiffness/stiff Hardness/pliability Texture
Raised	Flattening down/flattened/flatter Raised/rise	Raised up Flat	Flat Risen/raised/starting to rise Height	Height (=only relative hypertrophy next to skin) Flat Elevated Planar scar (=on one surface with the surrounding tissue) Scar deficit Raised
Thickness	Thick	–	Thick/thickening	Thickness/thickening/thicker Thick Change in volume
Surface area	–	–	–	Surface area Surface area (may be contracting or very pliable) SA combined with thickness will give a volume measurement to track over time
Scar sensitivity	Itchy/itch Tightness Pain Tender Sensitive Hurts Like little explosions Tingling Pins and needles Numbness Funny feeling/some different sensation Hypersensitive Bad gravel rash (donor)	Itchy Hurts Tickle Sore Painful Tender	Painful Itch Sensitive	Increased or decreased sensation (hypo or hyper-sensitivity) Pain Itch/itchiness Sensitivity Stinging Prickly pain Burning Tightness Blood rush Tenderness Hyperaesthesia to touch and warmth Intolerance of clothing
Scar surface appearance	Bumpy Lumpy	Smooth Bumpy	Bumpy/bumpiness/bubbled Lumpy/lumpiness	Wrinkles Little indents/little holes in between thick bands

Table 1 (continued)

Burn scar characteristics	Adults	Children	Caregivers	Health professionals
	Smooth	Rough	Smooth/not smooth/ smoothing out	Texture
	Rough Wrinkles	Lumpy	Wrinkled/wrinkles/wrinkly Puckering Rough/inconsistent	Roughness Unappealing to the touch Cosmetically unappealing Knobbly Pebbliness Surface roughness Smooth
Hydration	Dry and cracking	–	Dry looking	Moisture on the surface Dry/dryness Hydration
Fragility	Tearing to bits Open/did not heal Not as strong	Not as tough	Sores on it/not healing Really thin skin Breakdowns	Skin breakdowns/break down Open wounds Thin, shiny skin Fragileness
Color	Red/redness/bright bright red White	Red Pink/pinky red	Red Pink	Color Vascularity/vascular/hyper-vascularity Hyper-vascularized
	Brown	Purple	Brown/brown spots/ brownish	Pigmentation/pigment Florid
	Purple Inflamed/angry Paler Darker	Black White Blue Dark brown Tan Darker/dark patches Lighter/light patches	Reddy purple/dark purple Almost mahogany White Discolored/discoloration Faded Dark Lighter	Redness/red/dark red/brawny red Angry Highly vascular Devascularized Pale Pink/pale pink Purple/deep purple/florid purple Engorged Brown Hyperpigmented Hyperaemia Erythema

about trying to make sure that that doesn't happen." (Caregiver 001, 103-104)

"I do think that, also from a patient and a caregiver . . . their idea or impressions with what is happening with the scar is going to impact on compliance. So it is important to get that feedback. If they're not getting good feedback . . . if they think 'I don't think anything's changed' or "I think it is getting worse". Well it's like if we keep doing the same thing . . . are you going to be compliant with that knowing . . . you are not getting anywhere." (HP 006, 153-158)

3.2. Impact on indicators of burns scar health-related quality of life

Analysis of the impact of burns scarring on indicators of health-related quality of life demonstrated differences in how HRQOL is considered by adult, children and their caregivers compared to health professionals. The impact of burn scar characteristics on

the indicators of HRQOL are described from the perspective of adult and children with burn scarring and their caregivers in Table 2. From all these perspectives, the burn scar characteristic 'stretchability' and 'scar sensitivity' impacted on all of the indicators of HRQOL [10], as well as, were interpreted uniquely by the individual with burn scars (adult or child). For example, "it is moves so much that I feel that stretch pain...I feel that's good pain so I can bear [it]" (Adult 005, 445) is one participant's description of their interpretation of a physical (tightness) and sensory (pain) symptom that is influenced by their individual belief about the pain. The characteristic of 'fragility' also impacted on the majority of HRQOL indicators and were interpreted uniquely by the individual with burn scars (adult or child). For example, one child described the impact of their expectations or experiences of fragility on physical function as their burn scar stopped them running and playing touch football 'just so I don't fall over and cut it open again' (child 010, 106). The other burn scar characteristics predominantly impacted on symptoms and emotional functioning alone, regardless of whose perspective was examined among these groups (adult, child, caregiver).

Table 2 – Impact of burn scar characteristics on the indicators of HRQOL from adult/child/caregiver experiences.

Symptoms (physical and sensory)	Emotional function	Physical function	Cognitive function	Social function	Overall quality of life
Stretch-ability (sensory, physical)	Stretch-ability	Stretch-ability	Stretch-ability	Stretch-ability	Stretch-ability
Hardness (physical)	Hardness	–	–	–	–
Thickness (physical)	Thickness	–	–	–	–
Scar surface appearance (physical)	Scar surface appearance	–	–	Scar surface appearance	–
Hydration	Hydration	–	–	–	–
Fragility (physical)	Fragility	Fragility	–	–	Fragility
Color (physical)	Color	–	–	–	–
Scar sensitivity (sensory and physical)	Scar sensitivity	Scar sensitivity	Scar sensitivity	Scar sensitivity	Scar sensitivity

However, while the group of health professionals described the impact of ‘burn scar’ on HRQOL indicators and the influence of an individual’s characteristics, this impact was not typically linked to a specific burn scar characteristic (Table 3). For example,

“Kind of the psychological aspect of it. [emotional function] Transfers . . . um . . . again depending on where the scar is. Transfers, fine motor, walking . . . (. . .) I kind of do it as a whole thing. And kind of self care . . . (sort of fall) under the ADLs. [physical function] But with children we also look at the parent response to the child. So is the parent interacting normally. [social function].” (HP 005, 284-289)

The characteristic of ‘stretchability’ and ‘scar sensitivity’ were described by health professionals as impacting on the emotional and physical function indicators of HRQOL. ‘Scar surface appearance’ and ‘color’ impacted on emotional function indicators, whereas ‘fragility’ impacted on physical function indicators. For example, this health professional described the impact of pain (sensory symptom) on physical function:

“But those people that the pain continues . . . into the six to twelve month period are often the people that you do– are having a lot more trouble either with their scars or with their . . . function or their return to work or things like that because of the pain.” (HP 013, 134-138)

Table 3 – Impact of burn scar characteristics on the indicators of HRQOL by health professional’s report.

HRQOL indicators	Burn scar characteristic
Emotional function	Stretchability Scar sensitivity Scar surface appearance Color
Physical function	Stretchability Scar sensitivity Fragility

Health professionals also described HRQOL elements driving their priorities for assessment and/or interventions to manage the symptoms of burns scarring. For example,

“So although I’m assessing it and looking at the color and the thickness and the scar banding and the contracture [symptoms] . . . the reason why we are keeping on assessing it is because of the functional problems. [physical function]. He’s got similar scars on the trunk for example that are not a priority for him to keep managing [emotional function, individual factors]. But the neck because of driving and the hand because of computer and writing . . . and you know utensil use and things like that they’re what we’re still managing . . . because of the functional problem [overall quality of life].” (HP 013, 97-103)

4. Discussion

The purpose of this study was to explore the nature, scope or meaning of characteristics that define the concept of a burn scar, from different perspectives (people with burn scars, caregivers of people with burn scars, health professionals who were considered expert in the treatment of burn scars); and examine the impact of these characteristics on burn scar health-related quality of life. In the current study, there was agreement from all groups that the burn scar characteristics of ‘stretchability’ and ‘scar sensitivity’ (includes itch, pain, tenderness and sensitivity) impacted upon indicators of burn scar HRQOL. All groups were also supportive of the burn scar characteristic ‘fragility’ impacting upon the HRQOL indicator of physical function and ‘scar surface appearance’ and ‘color’ on the emotional function indicator.

Until recently, patient-reported or health professional-reported burn scar assessments have generally focused on judging physical symptoms such as vascularity, pigmentation, pliability, height [19-22] and to a lesser extent the sensory aspects of pain and itch [23]. Health professionals have previously considered height/thickness, vascularity, color, pliability, joint function and patient/client opinion important when rating scars in-person as compared to vascularity, surface area, color, contour, height and overall opinion when

rating burn scarring from photographs [24]. Only the characteristics of color, pliability and stretchability (assumed likely relevant to the health professional's assessment of joint function) were described by all groups in the current study. For height/thickness, whilst adults, caregivers and health professionals described both height and thickness as a characteristic of burn scarring, children with burn scars only described height. In this study, no adult, child or caregiver described the characteristic of surface area, which has been included in scar scales developed by health professionals [25,26] and that was described by health professionals in this study.

Objective measures of burn scar characteristics are available for the concepts of pliability [27], firmness [28], color [29-31], thickness [27,32] and height [33]. The perspective of health professionals in this study must be interpreted in light of the knowledge that the content of existing measures or the measures used routinely by health professionals in the study might have biased the information they imparted in the interview and thus the data we obtained. It might also unintentionally bias the way a health professional thinks about and conceptualize burns scarring to be different to characteristics that are more relevant for people living with burn scars.

Findings from quantitative and qualitative studies appear to support the proposition of differences between how health professionals and people living with burn scars conceptualize burn scarring. Burn scar characteristics of height, texture, tightness/pliability, color, scar sensation and general scar appearance were also recently described in qualitative interviews (N=40) with adults and parents of children aged from 1 to 14 years with burn scars [9]. In that study, thickness as a descriptor by participants was not separated from height, nor did the characteristic of fragility appear to be described. However, their findings that the scar characteristic of tightness/pliability on movement and function (termed 'stretchability' in this study) impacted physical, social and emotional indicators of HRQOL, as well as the scar characteristic of color impacted emotional indicators alone, appeared to be supported by the current study. From interviews with 12 adults at 2 months to 2 years, 5 months after a split-skin graft, altered sensation was part of adjusting to 'a new normal' [34]. Whilst 'change over time' was identified in this study as a feature of burn scarring, the concept of 'return to normal' is emerging as an important feature to monitor one's adjustment to burn scar characteristics and effectiveness of scar interventions [9,34]. Scar appearance was reported as a concern for a smaller number of participants [34], however challenging social responses to the appearance of burn scars have resulted in the use of avoidant coping strategies, such as hiding scars beneath pressure garments [1,35]. Body image and confidence have been suggested as individual factors that are likely to impact on the extent to which burn scar characteristics impact HRQOL [9]. When investigating adult burn survivor's experiences of interpersonal and social relationships as potential barriers to post-traumatic growth, burn scar characteristics such as itch, dryness and hypersensitivity contributed to self-consciousness and changes to daily routines [1]. This was also reported by participants in the current study which included children with burn scars.

4.1. Implications for clinical practice and research

Based on the findings of our study, the use of patient-reported outcome measures that include the burn scar characteristics of 'stretchability', 'scar sensitivity', 'fragility', 'scar surface appearance' and 'color' are important. The impact of the characteristic 'fragility' appeared to extend beyond whether open wounds were present, to whether the person expected that they could be present as a result of engagement in usual activities. The health professional's interest in vascularity appears likely to have arisen from supposed linkages between increased vascularity and risk of hypertrophy [36]. However, there is strong emerging evidence of correlation between altered sensation (itch) and hypertrophy [37-39] that appears to be supported by personal experiences of participants in the current study. Cognitive and emotional responses such as pain catastrophizing during the experience of pain impact on the pro-inflammatory immune system [40] and are predictive of pain and itch experiences after grafting post-burn [41]. Furthermore, medium-strength associations between emotional functioning and time to re-epithelialization have been reported [42-44]. The interest in scar thickness by health professionals is likely due to the ease of reliable measurement as a scar characteristic [32,33] and demonstrated correlation with burn depth using longitudinal, quantitative designs [45,46]. Scar height is considered a quantitative, specific and reliable measure of scar fibrosis independent of vascularity or pigmentation [47]. Given pressure garments are the most widely accepted method of treating burn scars, with the commonly held belief that their method of action is reduced fibrosis and parallel realignment of the collagen fibres [48], the interest in measuring height/thickness is likely to continue. However, further longitudinal investigation of the characteristic of height versus thickness is warranted, to determine the most accurate means of measuring the construct that may impact HRQOL. Other burn scar characteristics, such as pliability and hydration, also warrant further investigation given their impact on HRQOL.

4.2. Limitations of the study

A limitation of the current study is that the qualitative data available was limited to information that arose during the original investigation to develop a measure of burn scar HRQOL. Template analysis is strengthened by use of respondent feedback following consideration of the researcher's interpretation of the findings. However, access to the original respondents was not available for the current study. Further patient involvement will be a part of ongoing work to define burn scarring.

Our patient data was obtained from participants living in a relatively warm climate; hence factors pertinent to HRQOL within other geographic locations and climates may have been overlooked. Finally, there are no participants aged 16-22 years in the current study. Therefore, burn scar characteristics of relevance to this transition period into adulthood may have been missed.

4.3. Future directions

Qualitative research examining burn scar HRQOL has to date been limited to non-longitudinal, cross-sectional data collection

[10,35]. Further longitudinal, qualitative research designs that utilize a trajectory analysis approach [49] would be useful to examine the complexity of the relationships between characteristics of burn scarring and its impact on HRQOL and is recommended to deepen current understanding of an individual's (or group of individual's) experience over time. More work is also needed to further delineate the characteristics identified in this work that are most important to patients. For example, does fragility of the skin cover difficulty getting open wounds to close, susceptibility to break down of the healed skin and for how long post-burn is this characteristic important. Identifying the nature of the relationships between the concepts and building those into an empirical definition of burn scarring remains outstanding. The conceptual model of burn scar HRQOL may need modifying as new evidence emerges.

5. Conclusions

This study provides insights into the characteristics of 'burn scars' from different viewpoints: adults and children with burn scarring, caregivers of children with burn scarring and health professionals considered expert in the treatment of burn scarring. The impact on the proposed indicators of burn scar HRQOL were also considered according to different perspectives. The overlap of the ten burn scar characteristics identified by health professionals and those characteristics that adult/child/caregiver reported to impact the indicators of burn scar HRQOL were 'stretchability' and 'scar sensitivity'. Including the burn scar characteristics of at least 'stretchability' and 'scar sensitivity', but also ideally fragility, scar surface appearance and color are recommended to comprehensively assess scars considering a range of perspectives.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.burns.2018.04.006>.

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