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Standardizing the classification of skin tears: validity and reliability testing of the International Skin Tear Advisory Panel Classification System in 44 countries

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Summary

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Background Skin tears are acute wounds that are frequently misdiagnosed and under-reported. A standardized and globally adopted skin tear classification system with supporting evidence for diagnostic validity and reliability is required to allow assessment and reporting in a consistent way.

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Conflicts of interest
None to declare.

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Objectives To measure the validity and reliability of the International Skin Tear Advisory Panel (ISTAP) Classification System internationally.
Methods A multicountry study was set up to validate the content of the ISTAP Classification System through expert consultation in a two-round Delphi procedure involving 17 experts from 11 countries. An online survey including 24 skin tear photographs was conducted in a convenience sample of 1601 healthcare professionals from 44 countries to measure diagnostic accuracy, agreement, inter-rater reliability and intrarater reliability of the instrument.
Results A definition for the concept of a 'skin flap' in the area of skin tears was developed and added to the initial ISTAP Classification System consisting of three skin tear types. The overall agreement with the reference standard was 0·79 [95% confidence interval (CI) 0·79–0·80] and sensitivity ranged from 0·74 (95% CI 0·73–0·75) to 0·88 (95% CI 0·87–0·88). The inter-rater reliability was 0·57 (95% CI 0·57–0·57). The Cohen's Kappa measuring intrarater reliability was 0·74 (95% CI 0·73–0·75).
Conclusions The ISTAP Classification System is supported by evidence for validity and reliability. The ISTAP Classification System should be used for systematic assessment and reporting of skin tears in clinical practice and research globally.

What's already known about this topic?

- Skin tears are common acute wounds that are misdiagnosed and under-reported too often.
- A skin tear classification system is needed to standardize documentation and description for clinical practice, audit and research.

What does this study add?

- The International Skin Tear Advisory Panel Classification System was psychometrically tested in 1601 healthcare professionals from 44 countries.
- Diagnostic accuracy was high when differentiating between type 1, 2 and 3 skin tears using a set of validated photographs.

Skin tears are common acute wounds with high potential risk of evolving into complex chronic wounds if not properly managed.[1–4] The International Skin Tear Advisory Panel (ISTAP) defines skin tears as 'traumatic wounds caused by mechanical forces, including removal of adhesives. Severity may vary by depth (not extending through the subcutaneous layer)'.[5] They are reported across all healthcare settings and are predominantly found in the elderly, neonates, and the critically and chronically ill populations.[6,7] Although skin tears can occur on any location of the body, they are particularly common on the upper and lower extremities.[5,8,9]

The prevalence of skin tears varies across countries, healthcare settings and patient populations.[5,10] Studies report skin tear prevalence between 3·3% and 19·8% in acute care;[3,11–17] 14·3% in palliative care;[18] 5·5%–19·5% in the community;[19,20] and 3·0%–26·0% in long-term care.[1,5,21–28] Skin tear incidence rates vary between 2·2% and 92·0%, with highest incidence in long-term care facilities.[9,23,29–34] The variety in prevalence and incidence rates may in part be attributed to varying patient populations, differences in prevention and management practices, nurses' knowledge and equipment, but can also be explained by the lack of a uniform method for assessment and documentation.[5,35] A cross-sectional international study including 1127 healthcare professionals from 16 countries revealed significant problems with the assessment, classification and documentation of skin tears.[35] The majority of respondents (70%) reported issues with the assessment and documentation of skin tears in their settings, with an overwhelming majority (90%) preferring a simplified method. Eighty-one per cent of respondents reported not using any tool or classification system for the classification of skin tears, and 40% admitted to ignoring and not documenting any information about these wounds.[35] In addition, skin tears are often not recognized as unique wounds distinct from other wound types, making them frequently misdiagnosed and under-reported.[5]

The lack of diagnostic accuracy results in delayed or inappropriate management, causing increased pain and suffering,

delayed wound healing, infection, prolonged hospitalization and high healthcare costs, all negatively affecting the quality of care.[7,26] In order to set appropriate treatment goals and optimize management from the earliest possible stage of care, the systematic assessment of skin tears using a valid and reliable international classification tool is recommended.[5]

To date, three skin tear classification tools have been developed.[36–38] The Payne–Martin Classification System grades skin tears based on the extent of tissue loss, measured as a percentage.[36] In 2007, Carville *et al.* established and psychometrically tested the Skin Tear Audit Research Classification System, which was developed as a modified version of the Payne–Martin scale, additionally including skin/flap colour distinction.[37] However, both systems were found to be complex for use in clinical practice and neither of them gained widespread acceptance.[7,39] In addition, the Payne–Martin Classification System has never been evaluated on its psychometric properties.[5] In an effort to fulfil the need for a user-friendly and simple classification tool,[35] an ISTAP consensus panel developed and psychometrically tested the ISTAP Classification System, which categorizes skin tears as type 1 (no skin/flap loss), type 2 (partial skin/flap loss) or type 3 (total skin/flap loss).[38,39] The ISTAP tool classifies skin tears based on the severity of 'skin flap' loss, but does not provide a definition of a 'skin flap'. In their best-practice document, developed in 2018, the ISTAP panel indicated a need for standardized terminology in order to avoid confusion.[5] Since 2013, the ISTAP Classification System has been translated and its psychometric properties have been measured in Denmark, Sweden, French Canada and Brazil.[10,40–42] It is acknowledged that further psychometric testing with larger samples of healthcare professionals across settings and countries is required.[39]

The aim of this study was to evaluate the validity and reliability of the ISTAP Classification System internationally.

Materials and methods

The study consisted of two phases. Phase 1 was a study to validate the content of the ISTAP Classification System through expert consultation in a two-round Delphi procedure. Phase 2 included the measurement of the psychometric properties of the instrument. Diagnostic accuracy, agreement, inter-rater reliability and intrarater reliability were measured.

Phase 1: design and content validation of a definition for the concept of a 'skin flap' in skin tears

Following the development of the ISTAP best-practice document,[5] a definition of a 'skin flap' was proposed to be added to the current ISTAP classification tool. A first proposal of a definition was developed by the core team of this study based on a literature review. A two-round Delphi procedure (March–May 2018) was conducted to collect feedback and to achieve consensus on the proposed definition. The expert panel consisted of 17 international key opinion leaders based in Australia (n = 1), Belgium (n = 1), Canada (n = 3), Chile (n = 1), Italy (n = 1), Japan (n = 1), South Africa (n = 1), Switzerland (n = 1), the United Arab Emirates (n = 1), the U.K. (n = 2) and the U.S.A. (n = 4). All were executive board members of ISTAP. In the first Delphi round, the experts were invited to provide comments on the proposed definition. The feedback was summarized and a new proposal was developed. In the second round, the experts were asked for approval and/or additional comments on the revised definition. Consensus was achieved after the second Delphi round.

Phase 2: psychometric evaluation of the International Skin Tear Advisory Panel Classification System

The aim of this phase was to examine diagnostic accuracy, inter-rater reliability, intrarater reliability and agreement of the ISTAP Classification System. An online survey including 24 photographs of skin tears was developed using the software package LimeSurvey (www.limesurvey.org). A second survey was sent to the participants 1 week after completion of the first survey. This survey (retest) included the identical 24 photographs in a different random order to reduce potential bias. No feedback was provided between the test and retest. Both English-language surveys were translated into 15 languages by native speakers with extensive content expertise to allow data collection in 44 countries. Survey participants were invited to categorize the photographs using the ISTAP Classification System. They did not receive an education session prior to the survey or between the test and retest. Diagnostic accuracy was evaluated by comparing the classifications of the participants with those of three experts in skin integrity research as reference standard (K.L.B., K.V.d.B., D.B.). Inter-rater reliability and agreement was measured within the ratings of the participants. Intrarater reliability and agreement with a 1-week interval between ratings was calculated for all participants who completed both the first and the second survey.

Participants

Data were collected between September and November 2018 in a convenience sample of healthcare professionals in 44 countries. The sample included healthcare professionals within the network of the study team and a selection of major wound care organizations, such as the World Council of Enterostomal Therapists, Nurses Specialized in Wound, Ostomy and Continence Canada, Wounds Canada, Wounds Australia, Tissue Viability Society, Wound, Ostomy and Continence Nurses Society, Wound Healing Association of Southern Africa, Saudi Chapter of Enterostomal Therapy, V&VN Wound Expertise and the Swedish Wound Care Nurses Association.

Photographs

Twenty-four skin tear photographs (obtained with informed consent from patients to be applied for research purposes) were selected and categorized by three experts in skin

integrity research (Table 1). The set equally represented the three types of skin tears and included three photographs from patients with a darkly pigmented skin. There was 100% consensus between the raters in categorizing the photographs (reference standard). Sample size calculation was performed by the statistical software package R using the function CI3Cats in the kappaSize package (version 1·2).[43–45] The confidence interval (CI) approach was used to determine the number of photographs needed to examine inter-rater reliability with three outcome categories. A minimum of 23 photographs was required, based on an anticipated κ value of 0·65 (based on previous research),[39] an expected lower bound for a one-sided 95% CI of 0·51 and the proportions per skin tear type (type 1 = 0·33, type 2 = 0·33, type 3 = 0·34).

Ethical considerations

This study was approved by the Ethics Committee of Ghent University Hospital (B670201836271). All participants received written information about the purpose and procedure before the start of the study. The confidentiality and anonymity of the participants were guaranteed. Return of a completed survey was considered as consent to participate.

Data analysis

Diagnostic accuracy, agreement, interrater reliability and intra rater reliability were analysed.

Summary measures of overall and specific agreement were calculated based on the comparison between the participants' ratings and the reference standard. The summary measures were the estimated mean with 95% CI, the estimated median value with the interquartile range (IQR), and the 2·5th and 97·5th percentile. In order to calculate diagnostic accuracy, three binary measures were considered: type 1 vs. type 2 and 3, type 2 vs. type 1 and 3, and type 3 vs. type 1 and 2 skin tears. Diagnostic accuracy was assessed by summary measures for sensitivity and specificity of each rater to the reference standard.

Inter-rater reliability among raters was assessed using the multirater Fleiss Kappa. Reference standard scores were not included in the analysis. Intrarater reliability and agreement were examined by comparing the first and second ratings of the same photographs for participants who completed both the first and the second survey. Summary measures of Cohen's Kappa, overall and specific agreement were calculated for each individual rater.

Kappa coefficients criteria by Landis and Koch were applied (< 0·00 = poor; 0·00–0·20 = slight; 0·21–0·40 = fair; 0·41–0·60 = moderate; 0·61–0·80 = substantial; 0·81–1·00 = almost perfect).[46] All statistical analyses were performed in R (version 3·5·1).[43] The concordance function in the R-library 'raters' (version 2·0·1) was used to obtain Fleiss Kappa and 95% CIs, and the kappa2 function in the R-library 'irr' (version 0·84·1) to calculate Cohen's Kappa.

Table 1 Classification of photographs by three experts

	Type	No. of photographs[a]		
		Nonpigmented skin (n = 21)	Pigmented skin (n = 3)	Total (n = 24)
1	No skin/flap loss	8	0	8
2	Partial skin/flap loss	5	3	8
3	Total skin/flap loss	8	0	8

[a]The set of 24 photographs used in both survey 1 (test) and survey 2 (retest) was identical.

Results

Phase 1: design and content validation of a definition for the concept of a 'skin flap' in skin tears

The Delphi process resulted in the following definition of a 'skin flap' associated with the condition of a skin tear: 'A flap in skin tears is defined as a portion of the skin (epidermis/dermis) that is unintentionally separated (partially or fully) from its original place due to shear, friction, and/or blunt force. This concept is not to be confused with tissue that is intentionally detached from its place of origin for therapeutic use e.g. surgical skin grafting'. The three categories of the initial ISTAP tool have remained unchanged. The ISTAP Classification System including the newly developed 'skin flap' definition is shown in Figure 1.

Phase 2: psychometric evaluation of the International Skin Tear Advisory Panel Classification System

Participant characteristics

A total of 1601 participants [89·4% female, age (mean ± SD) 41·2 ± 12·2 years] completed the first survey (test), of whom 952 (59·5%) completed the second survey (retest). No statistically significant differences were found in the demographic characteristics of the responders and nonresponders of the retest. Table 2 provides an overview of the sample demographics. Additional participant demographics are given in Table S1 (see Supporting Information).

Diagnostic accuracy and agreement

The diagnostic accuracy and agreement between the ratings of the participants and the reference standard are presented in Table 3. The average overall agreement was 0·79 (95% CI 0·79–0·80). The mean specific agreement ranged from 0·75 (95% CI 0·74–0·75) for type 2 to 0·76 (95% CI 0·76–0·77) for type 3 to 0·86 (95% CI 0·85–0·86) for type 1 skin tears. A higher overall agreement was found in participants who considered themselves as proficient or expert (0·82, 95% CI 0·81–0·83), participants with a master's degree (0·81, 95% CI 0·79–0·82) and participants who were familiar with the use of the ISTAP Classification System (0·82, 95% CI 0·81–0·83).

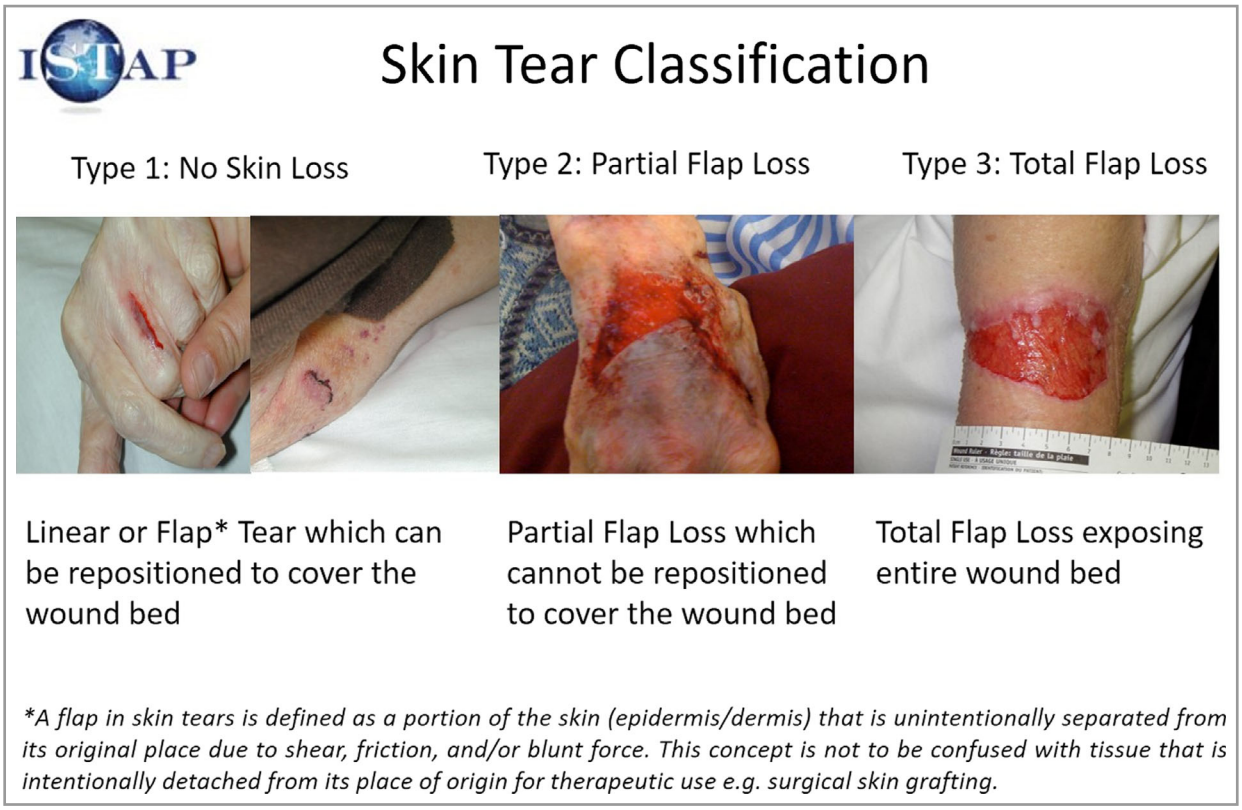

Fig 1. The International Skin Tear Advisory Panel (ISTAP) Classification System.

A mean sensitivity of 88% (95% CI 0·87–0·88) and a mean specificity of 92% (95% CI 0·92–0·93) were found for differentiating type 1 from type 2 and 3 skin tears. Slightly lower sensitivity and specificity were observed for differentiating type 2 from type 1 and 3 skin tears, and type 3 from type 1 and 2 skin tears.

Inter- and intrarater reliability

The multirater Fleiss Kappa for the entire group of participants was 0·57 (95% CI 0·57–0·57; Table 4). Inter-rater reliability was higher in more experienced healthcare professionals. The mean Cohen's Kappa representing the intrarater reliability was 0·74 (95% CI 0·73–0·75) and the average overall agreement was 0·83 (95% CI 0·82–0·84; Table 5). Higher mean specific agreement was found compared with the first time of assessment, ranging from 0·78 (95% CI 0·77–0·79) for type 2 to 0·83 (95% CI 0·82–0·84) for type 3 to 0·86 (95% CI 0·85–0·87) for type 1 skin tears.

Discussion

Although skin tears are unique and highly prevalent wounds, they are often under-recognized, misdiagnosed and poorly reported in clinical practice. Best practice includes early and accurate identification, classification, documentation and the application of an evidence-based treatment protocol.[5] A standardized and globally accepted skin tear classification system is needed to support consistent assessment and reporting.[6,7] This study aimed to evaluate the validity and reliability of the ISTAP Classification System internationally.

Content validity of the ISTAP Classification System including the newly developed 'skin flap' definition was established by a panel of 17 international experts. After a two-round Delphi process, consensus was achieved on the definition for the concept of a 'skin flap' in skin tears. The development of such definition for the area of skin tears is important because this concept may be interpreted differently depending on one's educational background.[42] In the field of reconstructive surgery, for example, a 'skin flap' is considered a mass of tissue intentionally detached from its original place to be used for grafting for wound repair and organ reconstruction.[47,48] A clear, internationally accepted definition of a 'skin flap' associated with the condition of a skin tear should help to eliminate confusion and to facilitate best practice.[5]

In this study, psychometric properties of the ISTAP Classification System were examined in a sample of 1601 healthcare professionals from 44 countries. The results indicated a high level of agreement and diagnostic accuracy for differentiating between the three types of skin tears when healthcare professionals apply the ISTAP tool on presented photographs. Differences in classifications were primarily limited to distinguishing between type 2 and type 3 skin tears, which is similar to the findings of Källman *et al.*[41] The high level of

Table 2 Participant demographics

	Test (n = 1601)	Retest (n = 952)	P-value[a]
Sex			0·901
Female	1432 (89·4)	853 (89·6)	
Mean ± SD age (y)	41·2 (12·2)	42·1 (11·7)	0·131
Role			0·329
Student nurse	39 (2·4)	13 (1·4)	
Nurse assistant	26 (1·6)	12 (1·3)	
Nurse	745 (46·5)	416 (43·7)	
Head nurse	61 (3·8)	44 (4·6)	
Nurse specialist	644 (40·2)	404 (42·4)	
Educator	45 (2·8)	34 (3·6)	
Researcher	21 (1·3)	15 (1·6)	
Other	16 (1·0)	10 (1·1)	
Missing	4 (0·2)	4 (0·4)	
Education			0·289
Undergraduate	417 (26·0)	241 (25·3)	
Bachelor degree	633 (39·5)	352 (37·0)	
Master degree	475 (29·7)	310 (32·6)	
Doctoral degree	73 (4·6)	49 (5·1)	
Other /unknown	3 (0·2)	0 (0·0)	
Expertise in skin tears[b]			0·272
Novice	219 (13·7)	112 (11·8)	
Advanced beginner	261 (16·3)	138 (14·5)	
Competent	389 (24·3)	229 (24·1)	
Proficient	400 (25·0)	252 (26·5)	
Expert	332 (20·7)	221 (23·2)	
Wound care module[c]			0·230
Completed	869 (54·3)	540 (56·7)	
Experience with ISTAP tool[d]			0·096
No previous experience	1143 (71·4)	650 (68·3)	
Language[e]			0·065
Arabic	8 (0·5)	3 (0·3)	
Chinese	146 (9·1)	72 (7·6)	
Czech	112 (7·0)	61 (6·4)	
Danish	18 (1·1)	12 (1·3)	
Dutch	295 (18·4)	216 (22·7)	
English	381 (23·8)	195 (20·5)	
French	70 (4·4)	55 (5·8)	
German	109 (6·8)	62 (6·5)	
Hebrew	62 (3·9)	35 (3·7)	
Italian	31 (1·9)	15 (1·6)	
Japanese	54 (3·4)	46 (4·8)	
Portuguese	47 (2·9)	37 (3·9)	
Spanish	70 (4·4)	45 (4·7)	
Swedish	56 (3·5)	35 (3·7)	
Turkish	141 (8·8)	63 (6·6)	

Data are n (%) unless otherwise indicated. [a]χ^2-test ($P < 0·05$ considered statistically significant). [b]Expertise in relation to the assessment and management of skin tears (based on the levels of proficiency defined by Benner).[55] [c]Completion of a recognized wound care module. [d]Previous experience with using the International Skin Tear Advisory Panel (ISTAP) Classification System. [e]Languages in which the ISTAP Classification System and the online survey were translated.

Table 3 Diagnostic accuracy and agreement with reference standard (n = 1601 raters)

	Mean (95% CI)	Median (IQR)	2·5th–97·5th percentile
P_o[a]	0·79 (0·79–0·80)	0·83 (0·75–0·88)	0·42–0·96
$P_{type\ 1}$[b]	0·86 (0·85–0·86)	0·89 (0·80–0·94)	0·43–1·00
$P_{type\ 2}$[b]	0·75 (0·74–0·75)	0·78 (0·67–0·88)	0·31–0·94
$P_{type\ 3}$[b]	0·76 (0·76–0·77)	0·80 (0·71–0·88)	0·32–1·00
Type 1 vs. 2+3			
Sensitivity	0·88 (0·87–0·88)	0·88 (0·88–1·00)	0·38–1·00
Specificity	0·92 (0·92–0·93)	0·94 (0·88–1·00)	0·69–1·00
Type 2 vs. 1+3			
Sensitivity	0·77 (0·76–0·77)	0·75 (0·62–0·88)	0·25–1·00
Specificity	0·86 (0·86–0·87)	0·88 (0·81–0·94)	0·56–1·00
Type 3 vs. 1+2			
Sensitivity	0·74 (0·73–0·75)	0·75 (0·62–0·88)	0·25–1·00
Specificity	0·91 (0·90–0·91)	0·94 (0·88–1·00)	0·62–1·00

CI, confidence interval; IQR, interquartile range; type 1, no skin/flap loss; type 2, partial skin/flap loss; type 3, total skin/flap loss. [a]Overall proportion of agreement; [b]proportion of specific agreement.

Table 4 Inter-rater reliability (n = 1601 raters)

	Fleiss Kappa coefficient (95% CI)
Total sample (n = 1601)	0·57 (0·57–0·57)
Expertise in skin tears	
Novice (n = 219)	0·43 (0·42–0·43)
Advanced beginner (n = 261)	0·56 (0·56–0·56)
Competent (n = 389)	0·57 (0·57–0·57)
Proficient (n = 400)	0·62 (0·62–0·62)
Expert (n = 332)	0·64 (0·64–0·64)
Education	
Undergraduate (n = 417)	0·55 (0·55–0·55)
Bachelor's degree (n = 633)	0·58 (0·57–0·58)
Master's degree (n = 475)	0·59 (0·59–0·59)
Doctoral degree (n = 73)	0·53 (0·52–0·53)
Experience with ISTAP tool	
Previous experience (n = 458)	0·64 (0·64–0·64)
No previous experience (n = 1143)	0·55 (0·55–0·55)

CI, confidence interval; ISTAP, International Skin Tear Advisory Panel.

agreement may reflect the ease of use of the tool.[39] Inter-rater reliability was found to be 'moderate' to 'substantial' according to the interpretation by Landis and Koch. Similar results have been reported in previous studies.[10,39–41] The results showed a 'substantial' to 'almost perfect' level of intrarater reliability and agreement. Diagnostic accuracy, agreement and reliability may have been higher if live situations instead of photographs were used to classify skin tears. In order to be able to classify a skin tear accurately, the wound must be cleansed, necrotic tissue debrided, and the skin flap reapproximated where possible, which might be difficult to observe in photographs.[5,38] Skin assessment in clinical practice, video recordings, or the exclusive use of photographs in which the skin flap, if viable, has been reapproximated could possibly offer a better alternative.

Table 5 Intrarater reliability and agreement (n = 952 raters)

	Mean (95% CI)	Median (IQR)	2·5th–97·5th percentile
Cohen's Kappa coefficient	0·74 (0·73–0·75)	0·75 (0·68–0·87)	0·31–0·94
P_o [a]	0·83 (0·82–0·84)	0·83 (0·79–0·92)	0·54–0·96
$P_{type\ 1}$ [b]	0·86 (0·85–0·87)	0·89 (0·82–0·94)	0·54–1·00
$P_{type\ 2}$ [b]	0·78 (0·77–0·79)	0·82 (0·71–0·89)	0·39–0·95
$P_{type\ 3}$ [b]	0·83 (0·82–0·84)	0·86 (0·78–0·92)	0·50–1·00

CI, confidence interval; IQR, interquartile range; type 1, no skin/flap loss; type 2, partial skin/flap loss; type 3, total skin/flap loss. [a]Overall proportion of agreement; [b]proportion of specific agreement.

In general, we found higher reliability and agreement in more experienced and more highly educated healthcare professionals. As skin tears have a complex aetiology, extensive knowledge and experience are required to identify and classify these wounds correctly.[5] Sufficient and adequate education and training of healthcare professionals may enhance the reliability of skin tear assessment. In 2006, a randomized controlled trial including 1217 nurses was conducted to assess the effectiveness of a training program on pressure ulcer classification skills.[49] The results of this study revealed a significant improvement in pressure ulcer identification and classification skills after attending the training program based on the Pressure Ulcer Classification (PUCLAS) education tool. In line with the PUCLAS tool, the development of an (e-learning) education tool for skin tear identification and classification that can be easily implemented by educators and healthcare organizations might facilitate learning and improve skills. Further research is needed to evaluate whether, and to what extent, education and training of (future) healthcare professionals would improve skin tear assessment and classification skills.

In the field of pressure ulcers, the National Pressure Ulcer Advisory Panel (NPUAP)[50] and European Pressure Ulcer Advisory Panel (EPUAP)[51] classification systems are widely used for the classification and documentation of pressure ulcers.[52,53] To support the assessment of incontinence-associated dermatitis (IAD), the Ghent Global IAD Categorization Tool (GLOBIAD) has been developed and globally validated in 2017.[54] In line with the GLOBIAD, NPUAP and EPUAP classification systems, the systematic assessment and reporting of skin tears using a valid and reliable international classification tool is recommended.[5] The results of this study show that skin tear photographs can be assessed in a valid and reliable way based on the ISTAP Classification System. In the context of our study, the ISTAP Classification System including the 'skin flap' definition has been translated into 15 languages and disseminated across 44 countries, encouraging global awareness and implementation.[39] Integration of the ISTAP tool into the (electronic) medical record should be considered so that consistent documentation is guaranteed and more accurate skin tear prevalence and incidence data are obtained. Furthermore, the common use of the ISTAP Classification System to support skin tear assessment and documentation will facilitate and standardize communication, benchmarking, clinical audits and research.[6,7,16]

Our study was a global validation study including a large number of international experts and healthcare professionals with different backgrounds across a variety of settings and countries. This increases the generalizability of our findings and may contribute to global awareness and implementation of the ISTAP Classification System. A main limitation of this study might be the use of photographs, which only provide a static, two-dimensional image of wounds. Assessment in clinical practice might allow a more holistic evaluation involving additional factors such as the cause of the wound, accurate flap visualization, partial/full-thickness, health status, wound history and dependency for daily living activities.[5,40] Whether skin tear assessment in clinical practice is more accurate than with photographs is yet to be established. Furthermore, we only included photographs of skin tears, but it is well known that skin tears are frequently incorrectly diagnosed as other lesions, such as pressure ulcers.[7,39] Therefore, it would be recommended to also include photographs of other wound types in future validation studies to evaluate whether the differential diagnosis between skin tears and other types of lesions can be made. Another limitation might be that there were only three photographs of darkly pigmented skin included, which may limit the applicability of our findings to all skin phototypes.

In conclusion, the global validation of the ISTAP Classification System is a major step forward towards a more systematic assessment and reporting of skin tears in clinical practice and research. The ISTAP Classification System seems to be a valid, reliable and easy-to-use tool for classifying skin tears according to their severity level. The ISTAP tool is available in 15 languages, which may enhance global implementation.

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Table S1 Supplementary participant demographics.

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68.2% (n=238/349)

of patients with PsO achieved **PASI 100 at Week 16**

(vs 1.2% placebo [n=1/86], p<0.0001)*** [2]

75.9% (n=265/349)

of patients with PsO achieved **PASI 75 at Week 4**

(vs 1.2% placebo [n=1/86], p<0.0001)*** [2]

76.9% (N=52)†

of patients with PsO achieved **PASI 100 at 5 years**[3]

51.5% (n=222/431) and **50.6%** (n=135/267)

of biologic-naïve and TNFi-IR PsA patients achieved **ACR 50 at Week 104/100,** respectively‡ [1,4–6]

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These data are from different clinical trials and cannot be directly compared.

Co-primary endpoints PASI 90 and IGA 0/1 at Week 16 were met.**Secondary endpoints. †N= mNRI, missing data were imputed with mNRI (patients with missing data following treatment discontinuation due to lack of efficacy or a TRAE were counted as non-responders; multiple imputation methodology was used for other missing data). ‡43.9% (n=189/431), and 43.4% (n=116/267) of biologic-naïve and TNFi-IR PsA patients achieved the primary endpoint of ACR 50 at Week 16 in BE OPTIMAL and BE COMPLETE, respectively (vs 10.0% [n=28/281] and 6.8% [n=9/133] placebo, p<0.0001); 54.5% (n=235/431) and 51.7% (n=138/267) maintained it at Week 52 (NRI).[4–6]

ACR 50, ≥50% response in the American College of Rheumatology criteria; **AS**, ankylosing spondylitis; **CRP**, C-reactive protein; **DMARD**, disease-modifying antirheumatic drug; **HS**, hidradenitis suppurativa; **IGA**, Investigator's Global Assessment; **(m)NRI**, (modified) non-responder imputation; **MRI**, magnetic resonance imaging; **nr-axSpA**, non-radiographic axial spondyloarthritis; **NSAID**, non-steroidal anti-inflammatory drug; **PASI 75/90/100**, ≥75/90/100% improvement from baseline in Psoriasis Area and Severity Index; **PsA**, psoriatic arthritis; **PsD**, psoriatic disease; **PsO**, psoriasis; **TNFi-IR**, tumour necrosis factor-α inhibitor – inadequate responder; **TRAE**, treatment-related adverse event.

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