The S-LANSS Score for Identifying Pain of Predominantly Neuropathic Origin: Validation for Use in Clinical and Postal Research

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Abstract: **This article describes the development and validation of the S-LANSS score, a self-report version of the Leeds Assessment of Neuropathic Symptoms and Signs pain scale. The S-LANSS aims to identify pain of predominantly neuropathic origin, as distinct from nociceptive pain, without the need for clinical examination. Two hundred patients with chronic pain were asked to complete the S-LANSS unaided. A researcher then administered the S-LANSS scale and the Neuropathic Pain Scale (NPS) in interview format. An independent clinician determined the pain type (neuropathic versus nociceptive) and rated his or her certainty about diagnosis. The S-LANSS scale was also incorporated into a chronic pain questionnaire that was sent to 160 community patients and 150 newly referred patients waiting for pain clinic assessment. The S-LANSS scale correctly identified 75% of pain types when self-completed and 80% when used in interview format. Sensitivity for self-completed S-LANSS scores ranged from 74% to 78%, depending on the cutoff score. There were significant associations between NPS items and total score with S-LANSS score. In the postal survey, completed questionnaires were returned by 57% of patients (n = 174). Internal consistency and convergent validity of the survey S-LANSS scores were confirmed. The findings support the S-LANSS scale as a valid and reliable self-report instrument for identifying neuropathic pain and it is also acceptable for use in postal survey research.**

Perspective: ***Establishing valid measures of symptoms and signs in neuropathic pain will allow standardized comparisons with other investigational measures. This might lead to new insights into the relationship between pathophysiologic mechanisms and clinical manifestations of pain.***

Key words: *Neuropathic pain, validation, S-LANSS, chronic pain, questionnaire, pain measurement.*

Neuropathic pain remains a significant clinical challenge in relation to diagnosis and treatment. In the clinical setting, tools to diagnose and measure neuropathic symptoms and signs have evolved in the last few years. The diagnostic tools include the Leeds Assessment of Neuropathic Symptoms and Signs pain scale (LANSS)[4] and the Neuropathic Pain Questionnaire (NPQ).[13] The LANSS is a simple and valid 7-item tool for identifying patients whose pain is dominated by neuropathic mechanisms; it has been tested in a number of settings.[14,16] Each item is a binary response (yes or no) to the presence of symptoms (5 items) or clinical signs (2 items). The NPQ has been developed to function as a diagnostic and measurement tool. It assesses the intensity of 12 neuropathic symptoms and uses discriminate function coefficients to arrive at a total score. The NPQ requires complex calculations to score and has not been validated against treatment changes.[13] Its ability to discriminate between pain types is less than that of the LANSS pain scale.[4,13]

Two neuropathic pain measurement tools have been published. The first of these was the Neuropathic Pain Scale (NPS),[10] which measures the intensity of 10 pain qualities described by patients with neuropathic pain, including an "unpleasantness" rating. This scale has been validated within groups of patients with neuropathic pain and is sen-

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sitive to treatment changes.[11] More recently, the Neuropathic Pain Symptom Inventory (NPSI)[5] has been shown to have criterion validity and is sensitive to the effects of treatment. It consists of 10 descriptors grouped into four categories, plus two items that describe the frequency and duration of spontaneous pain. Neither the NPS nor the NPSI were designed to discriminate between neuropathic and nonneuropathic pain.

Since its publication in 2001, the LANSS Pain Scale has been used widely, but the need for clinician examination limits the instrument's use in large-scale research and in particular it has been criticized for the use of pin-prick testing.[1] Currently, epidemiologic research on neuropathic pain is hampered by lack of adequate case identification instruments. We wanted to further develop the LANSS for self-completion to make it useful for large-scale symptom-based research in clinical settings and for use in epidemiologic surveys. Toward this end, we modified the LANSS pain scale to make it capable of self-completion and then tested its validity in (1) a clinical setting and (2) a postal survey. The self-completed LANSS (S-LANSS) is designed to be capable of identifying *pain of predominantly neuropathic origin* (POPNO) on the basis of the patient's current symptoms and signs.

Material and Methods

Design of S-LANSS Score

The two examination items on the original LANSS scale were reworded, asking the patients to examine themselves, and were allocated the same scores as in the original LANSS (see Appendix). This was based on the assumption that the items remained essentially similar to the original LANSS scale and therefore the scoring system would not need adapting. Other items were modified to improve the clarity of the original descriptions, but their essence remained the same. The modified instrument was renamed the S-LANSS score, reflecting its ability to be self-completed. Although the original LANSS was titled a "pain scale," the S-LANSS was more properly named a "score" because it aimed to identify cases, on the basis of a cutoff score, rather than perform as a measurement scale. Additional modifications consisted of a body map for identifying pain sites areas and an 11-point numeric rating scale asking patients to rate "how bad their pain has been in the last week." This is similar phrasing to the scales within the Brief Pain Inventory.[7] The scale is anchored 0 = no pain and 10 = pain as severe as it could be.

Clinic Validation Study

Study Setting

The clinic study was undertaken at the Chronic Pain Management Service at Leeds Teaching Hospitals Trust, Leeds, United Kingdom. This is a tertiary pain referral center for the Yorkshire region and consists of four consulting physicians experienced in the assessment and treatment of chronic pain. The study was approved by the local research and ethics committee.

Sample

Patients referred to the service and seen in pain clinics, day care wards, or inpatient wards were invited to take part in the study and all participants provided informed consent. Eligibility criteria included age more than 18 years, English speaking, and having chronic pain defined as pain of more than 3 months in duration or related to a progressive disease.[20] Patients were assessed clinically by a consultant in pain management, and a binary diagnosis of neuropathic or nociceptive pain was assigned on the basis of evidence from history, clinical examination, and investigations. In the absence of a formally recognized "gold standard," this was regarded as the "gold standard" against which the ability of the S-LANSS to identify neuropathic pain would be compared. In all cases, a diagnosis of neuropathic pain was made if pain was clearly attributable to a lesion or dysfunction of the nervous system; this was supported by clinical signs with or without evidence from appropriate investigations. Patients with cancer were included in the study provided that their pain was either predominantly neuropathic in origin (for example, brachial plexopathy) or nociceptive (for example, bone metastases). Patients with cancer pain of indeterminate origin were excluded.

In addition, clinicians were asked to rate their certainty of the presence of neuropathic pain mechanisms on a 100-mm visual analog scale anchored 0 = not at all neuropathic in origin and 100 = completely neuropathic in origin. This was used to judge the ability of the S-LANSS to detect POPNO. One hundred patients classified as having each pain type constituted the sample.

Study Material

Patients were asked by the researcher to complete an S-LANSS score unaided. The researcher then administered the S-LANSS score and the NPS in interview format, without having seen the results of self-completion. This allowed comparisons between administration formats to assess reliability of self-completion.

Analysis

As with the original LANSS scale, the ability of the S-LANSS score to discriminate neuropathic from nociceptive pain was validated against the gold standard of detailed expert clinical examination and assessment. Optimum cutoff scores were determined for the S-LANSS administered unaided and at interview to generate sensitivity, specificity, and positive and negative predictive values (maximum score is 24). Scores above the optimum cutoff score were regarded as "S-LANSS positive" and were considered to be highly suggestive of POPNO. Construct and convergent validity were assessed by comparing responses to S-LANSS items with clinical diagnosis and ratings of certainty and with NPS total scores. The α was set at $P < .01$ rather than $P < .05$ for comparisons between S-LANSS and NPS because of multiple testing. Internal consistency, a measure of reliability, was assessed by use of the Cronbach α. Differences between

Table 1. Patient Characteristics in Clinic Validation Study

	Nociceptive Group (n = 100)	*Neuropathic Group (n = 100)*	*P value*
Mean age (y)	57.1	50.5	<.002
Sex (male)	32	41	.24
Pain intensity (median)			
S-LANSS unaided	8	8	.621
S-LANSS interview	8	8	.607
NPS	8	8	.353
Clinician rating of neuropathic pain presence (median (IQR))*	12.5 (4–24) mm	83.5 (69.5–91) mm	<.001

*. 0 mm = not at all neuropathic, 100 mm = completely neuropathic in origin.

unaided and interview S-LANSS scores were assessed by use of the Wilcoxon signed ranks test.

Postal Validation Study

Setting and Sample

The validity, reliability, and acceptability of the S-LANSS for postal research were tested in two populations. The first consisted of a random sample of 160 adults aged more than 18 years from a general practice population in Aberdeen (total practice size 6841 patients), stratified for age and sex, labeled "GP sample." The second consisted of 150 adults selected consecutively from the waiting list of the Chronic Pain Management Service at Leeds Teaching Hospitals Trust, labeled "pain clinic sample." This research was approved by the local research and ethics committees for both Grampian and Leeds.

Study Materials

The postal survey included the S-LANSS, the NPS, and demographic questions. A covering letter and reply-paid envelope were included, and a single reminder was sent to nonrespondents from the pain clinic sample. No reminder letter was sent to the GP sample.

Analysis

Response rates to the questionnaire and basic frequencies of S-LANSS scores were computed. Responses from the GP sample and the pain clinic sample were combined and analyzed together because we aimed to assess validity and completion of the S-LANSS rather than assess prevalence of POPNO in either of the samples.

Convergent validity was assessed by comparison with the NPS. For the postal survey we used the NPS as a proxy gold standard against which we could compare the performance of the S-LANSS because we were unable to make clinical assessments of these respondents. Those items in the NPS that had correlated significantly with a clinical diagnosis of neuropathic pain during the clinic-based validation study (labeled as core NPS items) were considered to be markers of neuropathic pain in the postal survey. We tested the S-LANSS by comparing the scores of these core NPS items in S-LANSS–positive patients with S-LANSS–negative patients. Significant differences in scores between the positive and negative S-LANSS groups would demonstrate the validity of the S-LANSS in identifying groupings of patients in the postal survey similar to those in the clinic validation study. Internal consistency of the postal S-LANSS was again assessed with use of the Cronbach α.

Table 2. Causes of Pain Among Patients in Clinic Validation Study*

	No.
Nociceptive	
Arthritides	26
Neck or back pain without radiculopathy	26
Bone metastases (various primary cancers)	12
Musculoskeletal	11
Headache/migraine	9
Abdominal viscera	8
Ischemic claudication	6
Mediastinal viscera	2
Total	100
Neuropathic	
Nerve entrapment	25
Complex regional pain syndrome I	8
Complex regional pain syndrome II	11
Phantom limb	10
Peripheral neuropathy	9
Postsurgical neuropathy	9
Posttraumatic neuropathy	8
Postherpetic neuralgia	7
Cancer-related brachial plexopathy	3
Cancer-related lumbar plexopathy	2
Post stroke	3
Trigeminal neuralgia	3
Diabetic neuropathy	2
Total	100

*As determined by specialist pain clinician on the basis of history, examination, and results of investigations.

Results

Clinic Validation Study

Sample Characteristics

Data from 200 patients were collected in the clinic between April and December 2003. The mean age of the sample was 53.8 years and the majority were female (Table 1). Patients diagnosed with nociceptive pain were older than those with neuropathic pain, but there were no significant gender differences between the groups. Patients generally rated their pain intensity as severe, but there were no significant differences in pain intensity between pain types as assessed by the numeric rating scales of pain severity on the S-LANSS (unaided and interview completion) and the NPS. Clinicians' certainty of the presence of neuropathic pain was significantly dif-

Table 3. Optimum Cutoff Scores for S-LANSS; Unaided and Interview Completion

	S-LANSS Unaided Completion		*S-LANSS Interview Completion*	
	Cut Point 12 or More	*Cut Point 10 or More*	*Cut Point 12 or More*	*Cut Point 10 or More*
Sensitivity (95% CI) (%)*	74 (65.2-82.7)	78 (69.7-86.2)	74 (65.2-82.7)	80 (72-87.9)
Specificity (95% CI) (%)*	76 (67.5-84.5)	68 (58.7-77.3)	83 (75.5-90.5)	80 (72-87.9)
Positive predictive value (%)*	76	71	81	80
Negative predictive value (%)*	75	76	76	80
Overall classification (%)*	75	73	78.5	80

*Compared with clinical assessment of pain type.

ferent between the two pain types (Table 1). Allocation of pain type by clinicians matched their certainty rating closely; 98% of patients in the nociceptive group had a rating of less than 49 mm and 98% of patients in the neuropathic group had a rating of more than 50 mm. Each pain group consisted of a range of clinical diagnoses reflecting the case mix of an established pain management service (Table 2).

Discriminant Validity

Compared with the gold standard (clinical examination), the S-LANSS correctly identified between 73% and 75% of pain types when used unaided and between 79% and 80% when used in interview format, depending on the cutoff score used to determine neuropathic pain (Table 3). The interview format generally improved specificity more than sensitivity of the S-LANSS score. Optimum cutoff points were 12 for unaided S-LANSS and 10 for interview format. Median ratings (interquartile range) of clinician certainty for presence of neuropathic pain were 15 (4-54) mm and 78 (50-88) mm for patients with S-LANSS scores below 12 (n = 102) and S-LANSS scores of 12 or more (n = 98), respectively. There was a strong association between clinician rating of presence of neuropathic pain and S-LANSS score: Spearman $r = 0.536$, $P < .001$.

The ability of the S-LANSS to identify neuropathic features in patients with potentially mixed pain types was explored further. Clinician ratings of presence of neuropathic pain were divided into thirds to reflect empiric groups of nociceptive pain (0-33 mm), mixed pain (34-67 mm), and neuropathic pain (68-100 mm). Median S-LANSS scores (interquartile range) for these empiric groups were 6 (2.5-11) for nociceptive pain, 14 (6-18.5) for mixed pain, and 18 (10-22) for neuropathic pain. These findings suggest that the S-LANSS was sensitive to neuropathic features (POPNO) within the mixed pain group.

The odds ratio (95% CI) for the presence of clinician-defined neuropathic pain with use of the unaided S-LANSS score of 12 or more was 8.1 (4.3-15.3). A similar odds ratio by use of an interview-administered S-LANSS score of 10 or more was 16.0 (8.0-31.9).

Construct Validity

The relationship between each S-LANSS item to the total score and to the clinical diagnosis was evaluated separately. A positive response to each S-LANSS item was significantly related to a positive total S-LANSS score and also to the presence of neuropathic pain, confirming the contribution of each item to the overall score and the discriminant and construct validity of the S-LANSS (Table 4).

Convergent/Criterion Validity

Responses to S-LANSS were compared with responses to NPS to determine convergent validity. Median NPS total scores were 40.0 and 61.5 for negative and positive unaided S-LANSS scores, respectively, $P < .001$. Median NPS total scores for negative and positive interview-administered S-LANSS were also 40.0 and 61.5, respectively, $P < .001$.

Five of the 10 NPS items that are scaled were significantly associated with a clinical diagnosis of neuropathic pain (Table 5). These were labeled as core NPS items. A positive S-LANSS score (unaided) was associated with significantly greater scores on the same 5 core NPS items ("sharp," "hot," "cold," "sensitive," and "intensity of surface pain") than a negative S-LANSS score was. Three further items were also associated with a positive unaided S-LANSS score: "intensity," "itchy," and "unpleasantness." The remaining two items ("dull pain" and "intensity of deep pain") showed no association with either clinical diagnosis or unaided S-LANSS score.

Reliability

Internal consistency can be evaluated by calculating the Cronbach α.[19] The S-LANSS has a Cronbach α of .76 when completed unaided, rising to $\alpha = .81$ when completed at interview, demonstrating a good level of internal consistency. For the sample as a whole, Wilcoxon signed ranks tests demonstrated differences between patient scores obtained by interview compared with unaided completion: $Z = -2.34$, $P = .02$. Further analysis showed that this was due to differences in the scores of patients with nociceptive pain ($Z = -3.79$, $P < .01$) rather than differences in scores of patients with neuropathic pain ($Z = -1.07$, $P = .29$). Thus, interview

Table 4. Odds Ratios (95% CI) for Positive S-LANSS Items with Presence of Neuropathic Pain, as Diagnosed by a Pain Clinician, and with a Positive S-LANSS Score

	Unaided Completion (Score 12 or More)		*Interview Completion (Score 10 or More)*	
S-LANSS Items	*Presence of Neuropathic Pain*	*Positive S-LANSS Score*	*Presence of Neuropathic Pain*	*Positive S-LANSS Score*
Item 1 (dysesthesia)	4.2 (2.3-7.6)	13.5 (6.7-27.0)	6.0 (3.2-11.1)	20.8 (10.1-42.8)
Item 2 (autonomic)	4.8 (2.4-9.6)	30.1 (10.2-88.2)	6.4 (3.2-12.7)	22.5 (9.0-56.4)
Item 3 (evoked)	5.2 (2.9-9.7)	24.6 (11.5-52.7)	8.5 (4.5-16.2)	29.9 (13.9-64.7)
Item 4 (paroxysmal)	3.6 (2.0-6.5)	5.2 (2.8-9.5)	4.3 (2.3-7.8)	8.5 (4.5-16.1)
Item 5 (thermal)	2.2 (1.2-3.8)	6.9 (3.7-13.0)	2.7 (1.5-4.7)	5.0 (2.7-9.2)
Item 6 (allodynia)	7.3 (3.9-13.7)	67.7 (27.5-166.4)	8.9 (4.7-17.1)	139.3 (47.2-411.4)
Item 7 (tender/numb)	4.2 (2.2-8.0)	14.8 (6.5-33.7)	5.5 (2.8-10.6)	27.8 (11.1-69.9)

administration of S-LANSS led to more reliable classification of patients with nociceptive pain. For patients with neuropathic pain, self-completion was as reliable as interview format.

Postal Validation Study

Response Rates

In the postal survey, completed questionnaires were returned by 174 of 310 (56%) patients. These included 89 of 160 replies from the GP sample and 85 of 150 replies from the pain clinic sample. A χ^2 comparison of age (two strata) and sex of respondents versus nonrespondents showed no significant differences in the GP sample or the pain clinic sample. The mean age of the GP sample respondents was 57.9 years and 51% (n = 45) were male. The pain clinic respondents were slightly younger, with a mean age of 54.0 years, and 42% (n = 36) were male. There were no significant differences between nonrespondents and respondents in the combined sample of GP and pain clinic patients: 47% of respondents were male (n = 81) (χ^2 for difference, $P = .58$) and the mean age of the respondents was 56.0 years (*t* test, $P = .46$). Completion rates for individual S-LANSS items ranged from 95% and 99%.

Proportion of Sample S-LANSS Positive on Postal Questionnaire (Aberdeen, Leeds)

S-LANSS–positive scores (12 or more) were found in 33% of respondents (58/174). This included 12% (11/89) of the GP sample and 55% (47/85) of the pain clinic sample, reflecting the difference in prevalence of chronic pain between the two samples.

Comparison with NPS Items

Postal survey respondents who were S-LANSS positive (n = 58) had significantly higher median NPS composite scores than did S-LANSS–negative patients (57.5 vs 35.0, $P < .001$, Table 5). S-LANSS–positive patients also scored significantly higher on the same five core NPS items as in the clinic validation study. Within these five core NPS items, the absolute scores and the magnitude of the difference in scores between the S-LANSS groups were remarkably similar to the clinic validation sample. This suggests that the S-LANSS is identifying a similar population of patients in both the clinic validation and postal validation studies. Furthermore, two of the three additional items identified in the clinic validation study ("intensity" and "itchy") also showed significant differences between S-LANSS groups (Table 5).

Internal Consistency

The Cronbach α for S-LANSS for the whole sample was .80. Values for α were .79 for the pain clinic sample and .72 for the GP sample.

Discussion

Summary of Main Findings

Our study shows that the S-LANSS score is a valid and reliable self-complete instrument for identifying neuropathic pain in both clinic-based and postal research. We have used a novel validation approach to achieve this. We validated the S-LANSS against both clinical judgment and the NPS in a clinic setting and then used the NPS items that were considered to be reliable markers of neuropathic pain in the clinic setting as a proxy gold standard for S-LANSS in the postal study. The S-LANSS is the only case identification tool for neuropathic pain that is both simple to score and has been validated against exisiting measurement scales and clinical judgement. Interview administration of S-LANSS led to more reliable classification of patients with nociceptive pain than did self-completion compared with clinical diagnosis. However, self-completion was as reliable as interview in classifying patients with neuropathic pain.

Concept of POPNO

The ratings by clinicians of their certainty of the presence of neuropathic pain served as a continuum against which the S-LANSS could be judged. This allowed more insights into the ability of the S-LANSS to reflect clinical judgment than a dichotomous allocation of pain type would. The strong correlation between clinician ratings and S-LANSS scores highlights the ability of the S-LANSS to reflect clinical judgment. This is further demonstrated by the median S-LANSS scores for the mixed pain type

Table 5. Comparison of Median (Interquartile Range) NPS Item Scores Between Clinician Diagnosis of Pain Type and Unaided S-LANSS Responses in Clinic and Postal Studies (Mann-Whitney *U* Test)

	Clinician Diagnosis (n = 200)			*Clinic Study (n = 200)*			*Leeds and Aberdeen Postal Study (128/174 With Chronic Pain)*		
NPS Item	*Nociceptive Group (n = 100)*	*Neuropathic Group (n = 100)*	*P Value*	*S-LANSS Negative (n = 102)*	*S-LANSS Positive (n = 98)*	*P Value*	*S-LANSS Negative (n = 70)*	*S-LANSS Positive (n = 58)*	*P Value*
1. (intensity)	8 (6-9)	8 (7-9)	.35	7 (5-9)	8 (7-9.25)	.002	7 (3-9)	8 (7-9.8)	.001
2. (sharp)	5 (0-8)	8 (5-9)	.002	4 (0-8)	8 (6-9)	<.001	4 (2-8.3)	8 (6-9)	.003
3. (hot)	1.5 (0-7)	5 (0-8)	<.001	0 (0-4)	7 (3.5-8.25)	<.001	1 (0-4.8)	6 (3-9)	<.001
4. (dull)	8 (5-9)	7 (5-9)	.34	8 (5-9)	7 (5-9)	.28	5 (2-8)	8 (5-9)	.003
5. (cold)	0 (0-0)	0 (0-5)	<.001	0 (0-0)	0 (0-6)	<.001	0 (0-1)	1 (0-5)	.006
6. (sensitive)	0 (0-3.5)	7 (0-9)	<.001	0 (0-0.25)	7 (5-9)	<.001	0 (0-3.3)	6 (2-8)	<.001
7. (itchy)	0 (0-0)	0 (0-4)	.049	0 (0-0)	0 (0-5)	<.001	0 (0-0)	0 (0-3.3)	.003
9. (unpleasant)	8 (6-10)	9 (7.5-10)	.23	8 (6-10)	9 (8-10)	.002	6 (3-9)	8 (6-9.8)	.021
10a. (deep)	8 (6.5-9)	8 (6-9)	.51	8 (6-9)	8 (6-9)	.71	8 (4-9)	9 (7-10)	.003
10b. (surface)	3 (0-7)	7 (3.25-9)	<.001	2 (0-6)	7 (5-9)	<.001	4 (0-6)	6.5 (4-8)	<.001
Composite score	45 (36-55.5)	57 (47-69)	<.001	40 (30.75-52)	61.5 (51-72.25)	<.001	35 (22-51)	57.5 (49-67.5)	<.001

group and supports the use of the S-LANSS within a typical chronic pain population. This continuum approach also supports a concept of "dominance of neuropathic features" when assessing chronic pain. Our contention is that the S-LANSS identifies POPNO.

We hypothesized that the item scores for the original LANSS would be appropriate for the S-LANSS. The odds ratios for item scores and clinician diagnosis of pain type demonstrate that the discriminant ability of the items is similar to that found in the original LANSS study[3] (Table 4). Thus, features of dysesthesia, autonomic dysfunction, evoked pain, and allodynia are more likely to lead to a diagnosis of neuropathic pain than paroxysmal or thermal pain features in a mixed population of chronic pain. This confirms the importance of weighting individual items when attempting to identify POPNO.

Limitations of Study

A clinical diagnosis of neuropathic pain remains the closest to a gold standard against which standardized tools can be compared. This is increasingly recognized as being potentially open to error because of the absence of consistent, clear, and testable definitions of neuropathic pain.[2,3,15] Our study is open to these errors; patients may have been wrongly classified, which will influence the validity of the S-LANSS. We did not assess the interrater reliability of the clinical diagnosis of pain type, and this may also influence the validity of the S-LANSS. Although clinical diagnosis of cause of pain (eg, diabetic neuropathy, arthritis) may have face validity, future research will be strengthened by test-retest reliability of diagnosis of pain type. Until such clear definitions have been agreed on, clinical diagnosis is likely to remain the only basis for clinical decisions and determining eligibility for clinical trials.[18] We did not validate the responses of the postal survey samples against a clinical diagnosis. This would have been a more robust method, but it was not possible given the resources available and the need to retain the anonymity of respondents. We consider the NPS as the best available proxy for clinical diagnosis in this context.

The NPS was used as the comparator standard for the S-LANSS, but this scale was not developed for or been validated as a case identification tool. However, at the time of the study, it was the only published and validated measurement tool for neuropathic pain. Although it was not the primary purpose of our study, we have shown that several of the NPS items have significantly different distributions between patients with clinically determined nociceptive and neuropathic pain, supporting the potential of some of the NPS items for discriminating neuropathic from nociceptive pain.

The S-LANSS was able to correctly classify pain type in 75% or three in four patients with chronic pain if completed unaided. This improved to a correct classification rate of 80% when the tool was administered in an interview format. However, despite the ability of the S-LANSS to classify patients, around 20% to 25% of the sample were incorrectly classified; some patients with nociceptive pain appear to have a number of features of neuropathic pain and some patients with neuropathic pain appear to have few. Nonetheless, this is still a better classification rate than for any other available instrument.[13] However, it seems clear from the literature that at least 20% of patients with neuropathic pain are not identified by any existing tool that relies on assessment of clinical features. A critical area of research would be to test whether this group of patients responds differently to analgesic management than do patients with overt features of neuropathic pain. Perhaps patients with chronic pain who are S-LANSS negative or NPQ negative will respond more satisfactorily to conventional analgesia regardless of clinical diagnosis. Patients with more overt features of neuropathic pain might then require

the addition of other therapies, such as coanalgesics. If this hypothesis were supported, clinical management would then be based more on identifying pain of predominantly neuropathic origin and less on pathophysiologic mechanisms or syndromes, but further research is required to explore this speculation.

The response rate in the postal survey was relatively low. Because the aim was not to secure a representative sample, we did not pursue nonrespondents aggressively, sending only one reminder to the pain clinic sample and none to the GP sample. This was mainly for ethical reasons, and the main aims of this study were achieved by the responses that were received. It is likely that higher response rates would be achieved if greater effort were made to remind nonresponders.[9] The very high completion rates for each individual item in the postal study (95% to 99%) support the acceptability of S-LANSS in postal research.

Future Research Applications

Progress in the further understanding of neuropathic pain is hindered by lack of epidemiologic research in this area. This information is vital to understand the distribution, etiology, and natural history of this type of chronic pain in the community, as well as target and evaluate interventions. Many existing studies have lacked objective standards for case identification, relying instead on diagnostic categories (eg, diabetic neuropathy or postherpetic neuralgia[17,21]) rather than more direct evidence of the patients' symptoms and signs on which a diagnosis of neuropathic pain is made. This raises questions about the validity of generalizing outcomes in these populations to a wider variety of neuropathic pains.

In turn, establishing the prevalence of neuropathic pain has been hampered by the lack of reliable tools, used consistently, to capture these symptoms and signs. Bowsher[6] has suggested that around 1% of the general population has chronic neuropathic pain, although this is based on estimates rather than on direct evidence. Two studies based in pain clinics suggest that neuropathic pain constitutes a significant proportion of all chronic pain in this context. Davies et al[8] found that 27% of 3106 patients attending a pain clinic had neuropathic pain. In another study that examined 593 patients with cancer pain, approximately 36% had pain that involved neuropathic mechanisms.[12] There is no published study that has examined the prevalence of neuropathic pain in a general population. The S-LANSS score is currently being used in the first United Kingdom population prevalence study of neuropathic pain.

In summary, the S-LANSS is capable of correctly identifying pain of predominantly neuropathic origin in at least 75% of patients with chronic pain in both clinic and postal research settings. We have demonstrated that the S-LANSS is valid, reliable, and acceptable in these contexts (see the Appendix).

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APPENDIX

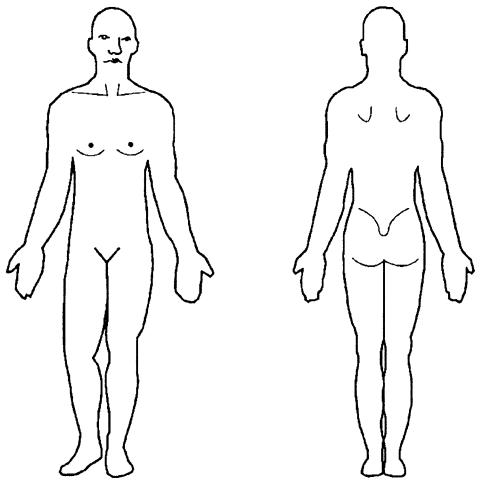
THE S-LANSS PAIN SCORE

Leeds Assessment of Neuropathic Symptoms and Signs (self-complete)

NAME_____ **DATE**_____

- This questionnaire can tell us about the type of pain that you may be experiencing. This can help in deciding how best to treat it.

- Please draw on the diagram below where you feel your pain. If you have pain in more than one area, **only shade in the one main area where your worst pain is.**



- On the scale below, please indicate how bad your pain (that you have shown on the above diagram) has been in the last week where:
'0' means no pain and '10' means pain as severe as it could be.

NONE 0 1 2 3 4 5 6 7 8 9 10 **SEVERE PAIN**

- On the other side of the page are 7 questions about your pain (the one in the diagram).

- Think about how your pain that you showed in the diagram has felt **over the last week.** Please circle the descriptions that best match your pain. These descriptions may, or may not, match your pain no matter how severe it feels.

- Only circle the responses that describe your pain. **Please turn over**.

S-LANSS

1. In the area where you have pain, do you also have 'pins and needles', tingling or prickling sensations?

a) NO – I don't get these sensations (0)

b) YES – I get these sensations often (5)

2. Does the painful area change colour (perhaps looks mottled or more red) when the pain is particularly bad?

a) NO – The pain does not affect the colour of my skin (0)

b) YES – I have noticed that the pain does make my skin look different from normal (5)

3. Does your pain make the affected skin abnormally sensitive to touch? Getting unpleasant sensations or pain when lightly stroking the skin might describe this.

a) NO – The pain does not make my skin in that area abnormally sensitive to touch (0)

b) YES – My skin in that area is particularly sensitive to touch (3)

4. Does your pain come on suddenly and in bursts for no apparent reason when you are completely still? Words like 'electric shocks', jumping and bursting might describe this.

a) NO – My pain doesn't really feel like this (0)

b) YES – I get these sensations often (2)

5. In the area where you have pain, does your skin feel unusually hot like a burning pain?

a) NO – I don't have burning pain (0)

b) YES – I get burning pain often (1)

6. Gently <u>rub</u> the painful area with your index finger and then rub a non-painful area (for example, an area of skin further away or on the opposite side from the painful area). How does this rubbing feel in the painful area?

a) The painful area feels no different from the non-painful area (0)

b) I feel discomfort, like pins and needles, tingling or burning in the painful area that is different from the non-painful area (5)

7. Gently <u>press</u> on the painful area with your finger tip then gently press in the same way onto a non-painful area (the same non-painful area that you chose in the last question). How does this feel in the painful area?

a) The painful area does not feel different from the non-painful area (0)

b) I feel numbness or tenderness in the painful area that is different from the non-painful area (3)

Scoring: a score of 12 or more suggests pain of predominantly neuropathic origin