Title: Development and psychometric testing of an instrument to measure safety climate perceptions in community pharmacy

Authors: Newham, R[1]; Bennie,M [12]; Maxwell, D[3] ; Watson, A[4]; de Wet, C[5]; &Bowie, P[4].

Corresponding author details:
Rosemary Newham
Strathclyde Institute of Pharmacy and Biomedical Sciences,
University of Strathclyde,
161 Cathedral Street,
Glasgow,
G4 0RE
Telephone: 0141 548 2478
Fax: 0141 552 2562
Email: rosemary.e.newham@strath.ac.uk

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[1] Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, 161 Cathedral Street, Glasgow,G4 0RE
[2] NHS National Services Scotland, Public Health Intelligence, Gyle Square, 1 South Gyle Crescent, Edinburgh, EH12 9EB
[3] Healthcare Improvement Scotland, Gyle Square, 1 South Gyle Crescent, Edinburgh, EH12 9EB
[4] NHS Education for Scotland, 3rd floor, 2 Central Quay, 89 Hydepark Street, Glasgow, G3 8BW
[5] Logan Hyperdome Doctors, Loganholme, Brisbane, QLD 4129

Abstract

Rationale

A positive and strong safety culture underpins effective learning from patient safety incidents in health care, including the community pharmacy (CP) setting. To build this culture, perceptions of safety climate must be measured with context-specific and reliable instruments. No pre-existing instruments were specifically designed or suitable for CP within Scotland. We therefore aimed to develop a psychometrically sound instrument to measure perceptions of safety climate within Scottish CPs.

Method

The first stage, development of a preliminary instrument, comprised three steps: (i) a literature review; (ii) focus group feedback; and (iii) content validation. The second stage, psychometric testing, consisted of three further steps: (iv) a pilot survey; (v) a survey of all CP staff within a single health board in NHS Scotland; and (vi) application of statistical methods, including principal components analysis and calculation of Cronbach reliability coefficients, to derive the final instrument.

Results

The preliminary questionnaire was developed through a process of literature review and feedback. This questionnaire was completed by staff in 50 CPs from the 131 (38%) sampled. 250 completed questionnaires were suitable for analysis. Psychometric evaluation resulted in a 30-item instrument with five positively correlated safety climate factors: Leadership, Teamwork, Safety Systems, Communication and Working Conditions. Reliability coefficients were satisfactory for the safety climate factors ($\alpha>0.7$) and overall ($\alpha=0.93$).

Conclusion

The robust nature of the technical design and testing process has resulted in the development of an instrument with sufficient psychometric properties which can be implemented in the community pharmacy setting in NHS Scotland.

Introduction

It is now widely accepted that a significant minority of patients suffer unintentional harm during their interactions with healthcare [1, 2]. While there are many possible reasons for this unacceptable state of affairs, investigations of high-profile patient safety incidents (PSIs), such as that undertaken recently in the Mid Staffordshire hospitals in the United Kingdom (UK), have identified a lack of a strong, positive safety culture within organisations as one of the most important [3].

Safety culture is important because it is thought to shape the discretionary and safety-related behaviours of health care workers and determines whether they are able to learn lessons and make meaningful improvements in care systems to minimise recurrence of PSIs [4]. A positive safety culture is characterised by effective communication and trust between management and other staff groups; a shared understanding of the importance of safety; supportive leadership; and not automatically blaming and punishing individual health care professionals and staff in response to a PSI [5, 6]. A common definition of safety culture is simply 'the way things are done around here'. Safety climate, on the other hand, provides 'a snapshot' of culture by examining its measurable aspects [7]. In practice, the terms culture and climate are often used interchangeably.

Initial efforts to measure and improve safety culture focused mainly on secondary care settings. However, approximately 90% of patient care in the UK is delivered in primary care with its own specific safety threats and recognized challenges to improvement [8]. It is therefore desirable to develop and validate specific instruments suitable for these settings and which reflects the health care workforce, service tasks performed as well as the workplace purpose, context and design. In response, instruments such as the Manchester Patient Safety Assessment Framework (MaPSaF) [6]and SafeQuest [9] were developed and validated to facilitate teams to collectively and consciously reflect on their workplace safety cultures and direct patient safety-related learning needs.

There is growing interest in measuring safety culture in diverse primary care settings. In justifying *why* this is desirable for CP in the UK, we can outline at least three specific reasons. The first reason is based around knowledge of patient safety. While the incidence of PSIs originating in community pharmacy is currently unknown, there is evidence to suggest errors with potential for serious patient harm occur, and not infrequently [10]. For example, dispensing error rates of 1.7% and 3.8% have been detected in recent CP studies in the UK and USA [11, 12] and it has been estimated that there are approximately four dispensing errors and 22 near misses for every 10 000 dispensed items in the

UK [13]. While incident reporting systems have been introduced recently for use within community pharmacies in the UK [14, 15], early findings suggest staff were unlikely to report adverse medication incidents because of their lack of trust in the anonymity of the system, while there was also a perceived 'blame' culture [16].

The second reason is related to the composition of available instruments. Typically these vary in numbers of questionnaire items; description of safety climate terms, constructs and factors; and the degree to which their findings can be generalized across different health care professions, geographical settings, workplace contexts and systems of care [7]. As a result, the direct transferability of existing surveys questionnaires and methods for CP to a Scottish setting is questionable.

The third reason is the evolving nature and responsibilities of CP within the Scottish context. CPs are independently contracted by the NHS to deliver four important health care services: (i) A Minor Ailment Service providing advice, treatment and referral of unselected patients; (ii) Acute Medication Service, e.g. dispensing 'one-off' prescriptions; (iii) Chronic Medication Service, including the management of long- term conditions; and (iv) Public Health Services. In addition, CPs are increasingly acquiring additional prescribing responsibilities with the expectation of delivering more and more complex patient care. The complex workload and responsibilities are forecast to only increase in the future as patients are advised or choose to access pharmacies as a first point of contact in preference to traditional ports of call. These services are typically delivered by multidisciplinary teams located in small, independently owned pharmacies (independents) or in increasingly complex and large chains of pharmacies (multiple). All are factors that are highly likely to impact on the quality and safety of patient care and the prevailing culture within and between these types of business service organisations.

The nascent patient safety agenda in CP, its service-delivery model of multidisciplinary teams comprising pharmacists, pharmacy technicians and pharmacy support staff, and geographical and professional contexts affords a complex environment in which to examine safety climate. We therefore aimed to develop, validate and test a survey instrument with adequate psychometric properties to measure perceptions of safety climate amongst CP team members in Scotland.

Method

Underlying theoretical considerations

Instrument development was guided by a small number of related theories (notably high reliability theory, attribution theory and the models described by Zohar and Gershon) that suggest that organisations and teams can make significant contributions towards minimising the risk of incidents and accidents by assessing and reflecting on safety climate perceptions. These also describe an inter-linked association between safety climate perceptions, individual safety behaviours and workplace safety outcomes [17].

Study design

Our two-stage study design was informed by Flin et al's recommendations for the development of a psychometrically sound safety climate metric [18] and the method previously used by de Wet et al [9]. The two stages, development of a preliminary instrument and psychometric testing to derive a final instrument, comprise six consecutive steps described as follows:

Stage I: Development of a preliminary instrument

Step 1: Literature review to generate questionnaire items

A literature review was undertaken of the Medline and EMBASE databases for the period 1996 – 2012 using the following search terms: safety climate, acute care, primary care, community pharmacy, safety assessment. In addition, health care quality organisations websites and professional/regulatory pharmacy organisation websites were reviewed. Many of the questionnaire items were derived from two safety climate instruments judged to be of relevance to the CP setting, but which were considered as being limited for the Scottish CP context: SafeQuest[9](which was developed for use within General Practice) and the Pharmacy Safety Climate Questionnaire (PSCQ-4; developed within the English CP system and validated in five European countries' pharmacies) [19]. In addition, the literature suggested the importance of work pressure and regular scheduled breaks to safety climate[20]. The relevant findings were discussed by the project steering team, comprising MB, AW, PB and DM, in order to generate the preliminary questionnaire items.

Step 2: Content validation

In order to maximise recruitment, a convenience sample of pharmacists and staff engaged in medicine processes was identified by the project steering team and through existing CP employee education networks across Scotland. Participants were recruited from two community pharmacies, a training event for technicians and a pre-existing community pharmacists' group. Forty-two members

of staff were approached. The returned feedback form included a content validity index (CVI) for the questionnaire items, where questionnaire items were rated from 1 to 4 for relevance and clarity (where 1=not relevant/clear and 4 = very relevant/clear), and written feedback on the content of the introduction (which included the questionnaire's 7-item rating scale identical to the one used in the original SafeQuest survey[9]) and demographic sections of the questionnaire. Instructions detailing how to complete the CVI and a worked-through example were included with the feedback form. Participants were asked to rate each item for clarity and the relevance of it to their day-to-day work.

[Insert Table 1 near here]

A modified Delphi technique was used whereby the generated questionnaire items, previously refined through the CVI and focus groups undertaken by the CP employees, were presented for review by experts. Although differing from a traditional Delphi process, which would generate the initial questionnaire items, this is a common modification[21]. A group (n=21) of 'experts' in the fields of pharmacy, organisational psychology, human factors, and safety science were identified from the literature and existing professional networks within the UK. These included (among others) academics, senior pharmacists within Scotland, and a human factors consultant. Items were retained if sufficient experts scored a 3/4 for relevance to establish content validity beyond 80% agreement [22]. Based on the first round of feedback received, the questionnaire was revised and re-circulated to the experts for further review and feedback.

Step 3: Feedback from pharmacy staff groups

Twenty-one pharmacy workers who returned the CVI took part in four focus groups, with between 4 and 6 participants in each group. Three of the focus groups were held on community pharmacy premises and one was held in a hired venue used for continuing education for technicians. All focus groups were conducted by DM. The purpose of the focus groups was to record any suggested changes or points for clarification that were not captured by the CVI responses. The participants discussed the acceptability, relevance and phrasing of the potential questionnaire items; the key points raised were recorded in field notes taken during the session and later collated by DM and presented back to the project team. In light of the feedback, the project team refined the questionnaire items, the introductory section and demographic information requested of potential participants.

Stage II. Psychometric testing to derive a final instrument

Step 4. Pre-test pilot

The preliminary instrument was piloted with multiple members of staff from a single CP (outwith the Board used for the final survey) to establish the approximate time required to complete the questionnaire and to check the feasibility of the data collection methods. This ensured that the guidelines provided were understandable and resulted in no change to the survey or supporting documents.

Step 5: Survey of CP staff

Setting and sample

In order to obtain a heterogeneous sample of employees from different work settings but who shared the same local practice frameworks and regulations within which the pharmacies ran, all community pharmacies (n=131) from a single NHS Scotland health board were invited to participate in the survey. The sample therefore included multiples and independents, and rural and urban pharmacies. The minimum sample size of 195 respondents was calculated on a subjects-to-variables ratio of 5. In other words, the 39 preliminary questionnaire items multiplied by five[23]. Adequacy of the sample size was measured by calculating the Kaiser-Meyer-Olkin (KMO) coefficient. This coefficient ranges from 0 to 1 and values ≥0.6 are considered sufficient to allow factor analysis [24].

Data collection

CPs were invited by the health board's Pharmacy and Medicine's Directorate to participate in the study via email, which included a study information sheet giving background information about the study, to each pharmacy's manager/owner . All pharmacies were then sent a pack of 10 questionnaires, 10 small envelopes, a large pre-paid envelope for return to NHS Scotland and an information sheet detailing how they should proceed. Respondents were instructed to rate the questionnaire items according to how well each statement applies to or describes the community pharmacy in which they work on a 7-item scale, from 1 (not at all) to 7 (to a very great extent). Questionnaires were completed anonymously by individual members of staff and sealed in the small envelopes and then collated for the pharmacy premises as a whole, and returned to NHS Education for Scotland in large prepaid envelopes. All members of staff engaged in medicines processes (including pharmacists, pharmacy technicians, dispensers, counter staff, van drivers) were eligible to return the questionnaire. Reminder emails were sent at 3 and 7 week intervals, with a phone-call to

non-returning pharmacies at week 5. Some pharmacies requested further copies of the questionnaire, which were duly sent. A further follow up phone call to these pharmacies was made at the time of the second reminder email. Returned questionnaires were excluded from the final sample if: more than 3 items were unanswered, or all responses were given as '1' or '7'.

Step 6: Application of statistical methods

Data were coded and entered into a Microsoft Excel spread sheet by two coders. The response scales of negatively phrased items were reversed for consistency, so that for all responses "1" implied a negative response and "7" a positive response. To check the accuracy of coding, a sub-sample of returned questionnaires (10%, n=26, 1222 data points) were re-entered by a third coder. Three errors were found to have been made by the original coders and these were altered in the main data set. The accuracy rate was calculated as 99.75% and the project steering group's pragmatic decision was that this was acceptable. Data were imported and analysed in SPSS v17.0. All items were considered to have equal weighting and anonymity meant that non-respondents could not be identified or accounted for by weighting.

Principal Components Analysis (PCA) was used to reduce data dimensionality and as a measure of construct validity. The original factors were extracted using PCA with a promax rotation (because of the assumption that questionnaire items are correlated) and Kaiser normalization. Factor loadings ≤0.4 are considered weak and are not reported to aid interpretation of the results section. The final number of retained safety climate factors was determined in three ways: (i) a visual inspection of the Scree plot to identify, as per convention, the number of factors to the left of the 'elbow' of the curve; (i) the minimum Eigenvalue, e.g. the percentage of variance that a given factor accounts for, of retained factors were greater than 1.0 [24] and; (iii) to be retained a factor had to have at least four questionnaire items 'loading' to it. Items were deleted in a step-wise manner if their omission improved validity and reliability until only the minimum number of items that still represented the data with consistent results remained.

Cronbach's alpha (α) coefficient was used as a measure of the instrument's internal reliability and we considered ≥0.7 adequate. Finally, Pearson's product-moment correlation coefficients were calculated as a measure of the degree of linear correlation (dependence) between extracted factors. The value of coefficients vary from –1 through 0 to +1, indicating a perfect negative, no linear correlation or perfect positive correlation between factors.

Results

Stage I: Development of a preliminary instrument

Initially, 58 potential questionnaire items were developed by the project steering team following the literature review. Of the 42 pharmacy workers approached, 26 returned a feedback form but only 23(54.8%, see Table 1 for sample details) were suitable for inclusion in the database. In light of CVI scores for relevance, and if the items were agreed to be repetitive (due to the two, pre-existing tools being merged), the project steering team refined the questionnaire through discussion. Items which rated poorly for clarity were altered to read more clearly. Ultimately this resulted in 40 items being retained; slight modifications were made to the introduction and demographic sections. For the modified Delphi, 18 of the 21 experts approached returned the form but CVI scale was not completed. Seventeen experts therefore provided the CVI for the items and suggested changes regarding wording and overall content. The three experts who did not return the CVI supplied feedback outwith the form. Items were retained if at least 14/17 experts scored a 3/4 for relevance to establish content validity beyond 80% agreement[22]. The CVI results indicated that one item was rated as either a 3 or 4 by only 12 experts and this item was therefore excluded. This process resulted in the generation of a 39-item questionnaire grouped into five safety climate factors: Leadership; Communication; Teamwork; Safety Systems and Learning; and Working Conditions

Stage 2: Psychometric testing to derive a final instrument

The pilot identified that the time required to complete the form was approximately 10 to 12 minutes and the format of the questionnaire was acceptable. In total, 131 CPs were approached for inclusion in the study. A total of 256 questionnaires were returned. Six questionnaires were subsequently excluded due to the aforementioned exclusion criteria. The final sample therefore comprised 250 questionnaires, with <1% of missing data. Of these, 4 questionnaire's origin sites could not be identified but the remaining questionnaires came from 50 sites out of the 131 sampled (38%). CP teams returned between 1 and 9 questionnaires. The characteristics of the respondents are summarized in Table 2. The KMO coefficient was 0.912.

[Insert Table 2 near here]

Factor analysis, reliability and item reduction

Visual inspection of the Scree plot (Figure 1) and application of our criteria resulted in five safety climate factors being retained - Leadership; Teamwork; Safety Systems and Learning; Communication; and Working Conditions. Safety Systems and Learning was renamed as 'Safety

Systems' at this point as this better reflected the retained items. All five factors have eigenvalues greater than 1.3. Of the original 39 items, 30 items were retained. Items were deleted because they did not load strongly (factor loading <0.4) onto a single factor (6 items). One factor, 'safety systems and learning', had 10 items loading to it, so three of these with the lowest factor loadings were deleted without decreasing the instrument's reliability or significantly affecting the instrument's structure. The factor loadings of the retained items are shown in Table 3. The final instrument's overall Cronbach α was 0.93 and the five safety climate factors were >0.7, suggesting good internal reliability.

[Insert Figure 1 near here]

[Insert Table 3 near here]

The five factors are positively correlated (Table 4), with the 'working conditions' and 'teamwork' factors the least correlated (0.15) and 'leadership' and 'teamwork' factors the most highly correlated (0.54). The factors' correlations account for between 2.34% and 29.16% of the observed variance in the data and suggest that the factors assess different, albeit related, dimensions of patient safety.

[Insert Table 4 near here]

Discussion

We developed, validated and tested a safety climate assessment questionnaire for use in community pharmacies in NHS Scotland, henceforth referred to as the SafeQuest-CP. The final instrument comprised 30 items grouped into five factors: Leadership; Teamwork; Safety Systems; Communication; and Working Conditions. It has adequate psychometric properties with acceptable reliability and a robust factor structure, with all the retained items loading to one factor only.

Our questionnaire's structure is comparable to SafeQuest's, although the questionnaires' items are tailored to the pharmacy setting. One of the main differences is the factor "working conditions" rather than SafeQuest's "workload", as this better reflected the items. This suggests that the same areas are important both in community pharmacies and general practice within Scotland when assessing safety climate in primary care but that language is important for participants. This emphasises the importance of the context within which safety culture evolves when seeking to generalise from one area of primary care to another.

The factors retained in SafeQuest-CP reflect aspects of the four measures within the PSCQ-4 and their related six dimensions from the original PSCQ [19, 25], from which the PSCQ-4 is derived,

329 although the items and structure differ. The comparison does not reveal a perfect match between
330 factors, nor would it be expected to due to the perceived importance of context and hierarchical
331 effects [5, 7, 26]. The PSCQ was developed in England using community pharmacists only, while the
332 factorial testing for the PSCQ-4 was conducted in five European countries' CPs. CP is not
333 homogeneous internationally and, therefore, it may be that the same safety climate areas are
334 relevant between countries (and health care areas) but how these factors interplay within a cultural
335 context differs, resulting in differing factorial structures.
336
337 The correlation matrix indicated that the factors were inter-related to varying degrees, which is
338 comparable with other questionnaires' development findings [19, 25]. The strongest relationships
339 were between leadership, team work and communication. Although the direction of causality
340 cannot be inferred without further empirical research, intuitively these relationships are logical
341 when assessing safety climate; for example, good leadership would be related to positive team
342 working, of which an essential part might be effective, two-way communication. Within a CP
343 environment, leadership may be particularly important due to variations in staffing strategies
344 between multiple and independent pharmacies. Speculatively, it may be that the use of locums and
345 transient staff is a specific area of importance within CPs leading to a less positive safety climate
346 than in more stable staff group.
347
348 *Strengths and limitations.*
349
350 Effective assessment of safety climate is dependent on the methods used to develop a safety climate
351 questionnaire. These should be robust and include consultation with the target audience and
352 adequate psychometric evaluation [9, 18, 27, 28]. While the original items were based on the
353 literature review and developed, these were refined through an iterative process of questionnaire-
354 based feedback and focus groups. The participants involved in this process were reflective of the
355 general area of CP and safety climate research in general comprising both recognised experts and a
356 broad range of staff who worked with medicines. The items included in the piloted questionnaire
357 therefore had a high degree of face validity prior to the statistical testing.
358
359 The technique used here followed Flin at al's suggested 'best practice' development method[18],
360 while achieving minimum test numbers. Additionally, a range of pharmacies were sampled which
361 varied in size from small, independent pharmacies to members of a large chain, with just under a
362 quarter of our respondents from large chains. This resulted in a heterogeneous sample of employees

from different work settings but, by recruiting from a single health board, the local practice frameworks and regulations within which the pharmacies ran were kept constant.

Reliability and validity could be further examined through additional psychometric testing such as test-retest for reliability or convergent/discriminative or predictive validity. Ideally, confirmatory factor analysis could be carried out to test the proposed factor solution. Additionally, further work examining how SafeQuest and SafeQuest-CP correlate to each other would be beneficial for example.

A questionnaire method is ideal when conducting large scale studies as they are more economical than qualitative studies – both in time and money. However, questionnaires have limitations. They provide a snapshot at a single point of time. Additionally, the answers given are influenced by self-presentation effects and may serve a function (e.g. expressing discontentment with a working situation through giving low ratings). These qualifications do not imply that questionnaires are not useful, merely that they may not give a "true" depiction of the safety climate. That is to say, answering in a particular way may consistently predict behaviour – for example a general disregard for patient safety – rather than reflect the veracity of the item's rating.

Finally, it is unclear what the relationship is between employees' ratings on the questionnaire and physical measure of safety within pharmacies (for example medication errors or the reporting of minor incidents). Similarly research is required to ascertain the relationship between safety climate ratings generated using this survey instrument and other related variables (that are indicative of the prevailing safety culture in other high risk industries) for example, preparedness to report safety incidents, numbers of incidents reported, organisational performance measures, job satisfaction, work stress related illness, staff absenteeism and turnover, and internal staff grievances about supervision and management issues.

Further research and next steps

Patient safety is a health policy priority in NHS Scotland, with a 2013 focus on the implementation of a national improvement initiative in primary care via the Scottish Patient Safety Programme (SPSP-PC). This reflects a policy move to a much more integrated primary care service through collaborative clinician partnerships across the multidisciplinary team [29, 30].

SafeQuest was included as a core component of the Scottish Patient Safety Programme for Primary Care (SPSP-PC) [31] in 2013. All general practice teams in Scotland (c1000) are also financially

incentivized through the Quality and Outcomes Framework [32]to use SafeQuest to measure and reflect on their safety culture. In CP, it is intended that SafeQuest-CP will form part of an intervention to improve the safety climate in CP as part of a general programme to promote the safe and effective use of medicines. At the national and macro-organisational level SafeQuest-CP offers a snapshot, cross- sectional measure of the prevailing safety climate. As with the GP equivalent, the survey results will provide feedback on team members' perceptions of safety climate within the pharmacy and how these compare against other pharmacies (a type of norm-referencing). This would inform and prioritise reflective discussion, analysis and action plans for improvement on climate issues perceived by the team as being of importance (e.g. communication within the practice or heavy workload levels which are reported as impacting on safe performance). In this way the survey can raise awareness of the importance of the safety climate construct in the workplace and direct related learning and improvement activities. At present, funding has been secured from the Health Foundation to use SafeQuest-CP within four NHS Scotland health boards. Critically, in the future there will be a need to tailor educational arrangements and/or regulations to enshrine positive safety culture within community pharmacies as a key component to improving patient care.

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Ethics

The development of the safety climate questionnaire was considered by the West of Scotland Research Ethics Service Office and deemed to not require ethical review under the terms of the Governance Arrangements for Research Ethics Committees in the UK.

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Competing Interests

DM and RN were funded part-time by NES for the duration of the project.

AW and PB are currently employed by NES. CW was employed by NES at the time of the project.

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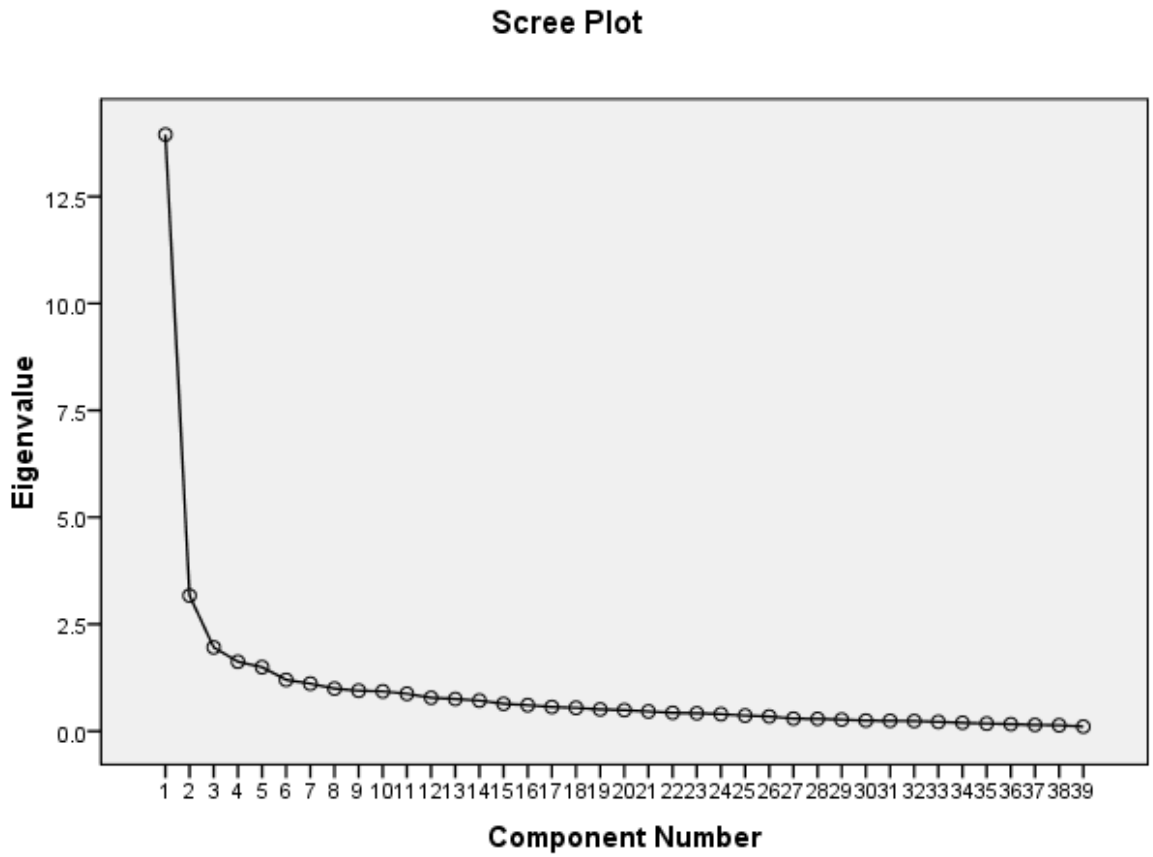
Figure Legend

Figure 1: Scree plot with eigenvalues of the factors extracted from the preliminary 39-item instrument.



527 **Table 1: Number and roles of respondent who completed feedback forms (n=23)**

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Job Title		Job Role	N
Pharmacists (n =8, 34.8%)			
	Pharmacist proprietor/owner	Owner of small, independent community pharmacy	2
	Pharmacist branch manager	Responsible pharmacist for single outlet of a community pharmacy business with multiple shops	1
	Second pharmacist	A pharmacist who is not an owner or branch manager who works alongside another pharmacist	2
	Relief pharmacist	Pharmacist providing work cover.	2
	Pre-registration pharmacist	Pharmacist doing their training year after graduating from pharmacy degree course.	1
Support Staff (n=15, 65. 2%)			
	Accredited Checking Technician	Worker who holds a professional qualification allowing them to check prescriptions.	5
	Pharmacy technician	Work under the supervision of a pharmacist to supply medicines and products to patients.	1
	Dispensary assistant	Help the pharmacist to assemble prescriptions and manage dispensary stock.	3
	Medicines counter assistant	Support the supply of non-prescription medicines	5
	Delivery driver	Staff member who delivers prescriptions	1

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536 **Table 2: Characteristics of survey respondents (n=250) and participating pharmacies**

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Characteristic	Category	Total	
		N*	%
Gender (n=247)	Male	24	9.6
	Female	223	89.2
Length of time worked in CP (n=249)	<1 year	20	8
	1--5 years	94	37.6
	6--10 years	51	20.4
	11--15 years	29	11.6
	16-20 years	14	5.6
	>20 years	41	16.4
Current job role (n=231)	Pharmacist proprietor/ owner	9	3.9
	Pharmacist branch manager	43	18.6
	Second pharmacist	13	5.6
	Technician	22	9.5
	Dispenser	61	26.4
	Medicines counter assistant	64	27.7
	Other	19	8.2
Size of CP (n=242)	Single independent pharmacy	35	14
	Member of small chain (2 to 4 pharmacies)	60	24
	Member of medium chain (5-30 pharmacies)	88	35.2
	Member of large chain (over 30 pharmacies)	59	23.6

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Table3: Mean scores with standard deviations (SD), factor loadings and reliability coefficients of the final questionnaire items (30), extracted factors (5) and overall safety climate perception.

New Number	Item	Mean N=250	SD	Factor loadings*					Reliability	
				Leader	Teamwork	SS	Comm	Work	α	α**
	Overall	5.48	.854						.928	
	Leadership (Ldr)	5.78	1.11						.786	
1a	Staff frequently do not follow standard operating procedures (SOPs)	5.81	1.42	.627						.767
1b	The way this pharmacy is managed is a barrier to effective working	5.61	1.9	.589						.793
1c	When an incident is reported it feels like the person is being reported and not the incident	5.85	1.52	.727						.736
1d	Safety is not taken seriously until an actual safety incident occurs	6.05	1.43	.797						.740
1e	Managers in this pharmacy do not deal effectively with 'problem' members of staff (e.g. those with a poor attitude or who frequently makes mistakes etc.)	5.43	1.77	.485						.758
1f	Investigations into safety incidents aim to assign blame to individuals rather than identify causes	6.07	1.44	.743						.730
	Teamwork (Tm)	5.84	.93						.904	
2a	The responsibilities of each staff member are clearly understood	5.71	1.27		.632					.901
2b	Pharmacy staff treat each other with respect	6.13	1.01		.834					.888
2c	Disagreements between pharmacy staff are resolved appropriately	5.66	1.38		.663					.896
2d	Staff are generally satisfied with their jobs	5.43	1.19		.670					.887
2e	Team members recognize the importance of working together	6.06	1.01		1.004					.889
2f	This pharmacy is a good place to work	5.96	1.17		.566					.885
2g	Staff work well together at all levels within this pharmacy	5.89	1.11		.766					.878
	Safety systems and Learning (SS)	5.10	1.15						.873	
3a	All staff are encouraged to highlight safety incidents that happen in this pharmacy	5.72	1.17			.692				.856
3b	When a safety incident happens in this pharmacy an investigation is conducted to understand why it happened	5.45	1.3			.765				.850
3c	Safety incident investigations are seen as learning opportunities	5.60	1.22			.784				.854
3d	All staff are given the opportunity to participate in the analysis of safety incidents	4.93	1.57			.697				.849
3e	Pharmacy staff are involved in reviewing SOPs	4.64	1.94			.651				.886
3f	The pharmacy team routinely discuss ways to prevent safety incidents from happening	4.58	1.66			.739				.847
3g	The effectiveness of any changes made as a result of a safety incident are evaluated	4.81	1.47			.780				.843

Table 3 (continued)

*Factor loadings ≤0.4 have been omitted from the table to aid clarity.

New Number	Item	Mean N=250	SD	Factor loadings*					Reliability	
				Leader	Teamwork	SS	Comm	Work	α	α**
	Communication (Cm)	5.28	1.30						.890	
4a	Managers in this pharmacy seriously consider staff suggestions for improving safety	5.49	1.35				.530			.887
4b	Staff feel free to question the decisions of those with more authority	4.69	1.78				.867			.855
4c	Staff are comfortable in expressing concerns to the managers about the way things are done in this pharmacy	4.93	1.77				.848			.853
4d	There is open communication between staff members across all levels in this pharmacy	5.55	1.49				.734			.852
4e	Staff are encouraged to maintain and improve their knowledge and skills	5.76	1.39				.523			.876
	Working conditions (WC)	5.40	1.15						.748	
5a	There are adequate opportunities for staff to take the breaks that they are entitled to	4.99	1.82					.796		.708
5b	The level of staffing in this pharmacy is sufficient to manage the workload safely	4.87	1.7					.830		.655
5c	The performance of staff is impaired by excessive workload	4.81	1.74					.638		.713
5d	It is just by luck that more serious safety incidents don't happen in this pharmacy	5.91	1.6					.712		.703
5e	Staff in this pharmacy work longer hours than is safe for patient care	6.33	1.25					.867		.730

**Item coefficients reflect the change in its factor's overall reliability if that item were to be omitted.

Table 4: Correlation matrix of the five extracted safety climate factors

Factor	Ldr	Tm	SSL	Cm	WC
Leadership (Ldr)	1.000	0.54	0.49	0.56	0.33
Teamwork (Tm)		1.000	0.34	0.51	0.15
Safety systems and Learning (SSL)			1.000	0.34	0.26
Communication (Cm)				1.000	0.38
Working conditions (WC)					1.000