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Claudia Bull
School of Nursing and Midwifery, Griffith University

Julia Crilly
School of Nursing and Midwifery, Griffith University; Gold Coast Hospital and Health Service

Sharon Latimer
School of Nursing and Midwifery, Griffith University; Gold Coast Hospital and Health Service; NHMRC Centre of Research Excellence in Wiser Wounds, Menzies Health Institute Queensland, Griffith University

Emma Hall
Gold Coast Hospital and Health Service

Brigid M. Gillespie
School of Nursing and Midwifery, Griffith University; Gold Coast Hospital and Health Service; NHMRC Centre of Research Excellence in Wiser Wounds, Menzies Health Institute Queensland, Griffith University

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Cover Page Footnote

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Research

The initial psychometric evaluation of a new Emergency Department Patient-Reported Experience Measure (ED PREM)

Claudia Bull, *School of Nursing and Midwifery, Griffith University, claudiabull06@gmail.com*
Julia Crilly, *School of Nursing and Midwifery, Griffith University, julia.crilly@health.qld.gov.au*
Sharon Latimer, *School of Nursing and Midwifery, Griffith University, s.latimer@griffith.edu.au*
Emma Hall, *Gold Coast Hospital and Health Service, emma.hall4@health.qld.gov.au*
Brigid M. Gillespie, *School of Nursing and Midwifery, Griffith University, b.gillespie@griffith.edu.au*

Abstract
Patient-reported experience measures (PREMs) are critical to evaluating the person-centeredness, safety, and quality of healthcare services internationally. The aim of this study was to describe the initial psychometric evaluation of a new Emergency Department (ED) PREM. Adult patients presenting to the ED of a tertiary hospital in southeast Queensland, Australia during January 2022 were recruited in-person. Participants selected their preferred ED PREM mode of administration from online, telephone, or postal, and had 14 days from recruitment to complete the survey. Item reduction, structural validity, discriminant validity, and internal consistency reliability were assessed. A sample of 349 (68.4%) was achieved. Item reduction analysis indicated ceiling effects for all ED PREM items (ranging between 34.4-79.7%). Exploratory factor analysis revealed a 4-factor solution comprising 26-items that explained 55% of model variance. Cronbach's α ranged between 0.84-0.97 per factor, demonstrating internal consistency reliability. Known groups analysis demonstrated the ED PREMs' ability to discriminate experiences based on gender, age, and ED length of stay. The ED PREM is a valid and reliable instrument for capturing patient experiences in the ED. The content of the ED PREM emphasizes person-centeredness and shared decision making, making it suitable for use in clinical practice evaluation and health service performance measurement. The factor structure of the ED PREM should be confirmed in future research, and item redundancy addressed.

Keywords
Patient experience, Patient-Reported Experience Measure (PREM), person-centered care, measurement, quality of care;, Emergency Department.

Introduction

Capturing patient experiences of care is integral to understanding safety, quality, and value in healthcare.[1-5] Measuring patient experiences helps elucidate the patient's perspective of what happened during their care encounter and how it happened.[6] This enables the integration of the patient voice into service quality improvement initiatives and supports health systems to provide person-centered care.[7-10] Evidence also demonstrates that patient experiences positively correlate with patient safety and improved health outcomes.[5,11-13] Additionally, the patient voice is important in how we define value in healthcare, with patient-reported experience measures (PREMs) included in several value-based purchasing programs internationally.[14-16]

An area of growing interest and need is patient experiences in the Emergency Department (ED). Here, experiences are characterized by the relationships patients have with their care providers, and the experience of being in the ED environment.[17] Relationships founded on mutual respect, robust communication, care, and instilling confidence are more likely to result in positive patient experiences.[17] Patients also reported being acutely aware of their surroundings, including other patients in the ED, how comfortable the environment is, the duration of their wait, and why they are waiting.[17] These findings have been echoed throughout the literature,[18,19] evidencing a comprehensive understanding of patient experience in the ED internationally.

Despite substantial investigation into what constitutes an ED patient experience, there are few PREMs developed for this context. A 2017 review of PREMs designed for the ED context identified four instruments with supporting evidence of psychometric evaluation.[20] The Centers for Medicare and Medicaid Services have since also developed and evaluated the Emergency Department Consumer Assessment of Healthcare Providers and Services (ED CAHPS) survey.[21] Notably however, no

PREMs designed for the ED context have been developed for use across the unique Australian healthcare context. EDs in Australia are becoming increasingly busy, servicing patients across large geographical catchments. The annual increase in ED presentations across the nation is almost double the rate of population growth and is projected to increase significantly by 2050.[22] Moreover, the National Hospital Cost Data Collection identified that in the 2018-19 financial year, roughly 12% of total hospital expenditure was consumed by ED patient activity alone.[23] Partnering with consumers to support the planning, design, delivery, measurement and evaluation of care across the Australian healthcare system is a key government priority.[24] Thus, there is clear impetus for a PREM designed for the Australian ED context. The aim of this paper was to describe the initial psychometric evaluation of the new ED PREM.

Methods

Study design

This cross-sectional, multi-modal survey study sought to evaluate the psychometric properties of the new ED PREM in a tertiary public hospital ED in southeast Queensland, Australia. Specifically, this study sought to undertake item reduction analysis, and establish the ED PREMs' structural validity, internal consistency reliability, and discriminant validity. Study reporting was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cross-sectional studies,[25] and the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) reporting guidelines for studies on measurement properties.[26] Ethics approval was received from the relevant institutions.

ED PREM development

The ED PREM is an English language instrument designed to capture adult patient experiences of care in public hospital EDs. Using the findings of a systematic mixed studies review,[17] and semi-structured qualitative telephone interviews with 30 patients from two southeast Queensland EDs,[27] a conceptual model of patient experience in the ED was first developed.[28] The conceptual model describes five domains from which the ED PREM was constructed: person-centered relationships between patients and ED care providers (10 items); confidence in ED care providers (7 items); patient engagement in ED care (6 items); safety, comfort, and privacy in the ED (7 items); and receiving timely ED care (5 items).[28] A two-round online, modified Delphi study was undertaken with patient participants to refine the ED PREM and establish its content validity.[28] The resultant 35-item instrument had a scale-level content validity index (CVI) score of 0.95, indicating excellent content validity.[28] Additionally, a pilot test was undertaken with 15 patient participants to assess the feasibility of each mode of administration; estimate how long each modality would take participants to complete; and trial the planned follow-up, data entry and descriptive analyses processes.

All ED PREM items used a 5-point Likert response scale, including the options 'never' (1), 'rarely' (2), 'sometimes' (3), 'very often' (4), and 'always' (5). The ED PREM was designed for online, postal and telephone administration. Online administration was supported by institutional LimeSurvey access. An ED PREM postal pack comprising the ED PREM, demographic questions, and a prepaid express return envelope supported postal administration. An ED PREM telephone pack comprising the ED PREM and demographic questions supported telephone administration. A telephone script was developed to enable consistency in telephone interviews undertaken by a research nurse.

Recruitment

Adult patients presenting to one southeast Queensland ED were recruited face-to-face between 5 and 29 January 2022. Individuals were eligible to participate if they were ≥18 years old; able to speak, read and comprehend English; provide written consent at the time of recruitment; and complete the ED PREM independently either postally, over the telephone, or online. Individuals were ineligible if they were unconscious or semi-conscious for most of their ED presentation; triaged as category 1 (immediately life-threatening)[29]; transported to the ED by police or correctional services; presented for mental health reasons; or unsafe for the recruiting researcher to approach (e.g., suspected alcohol or drug intoxication, or exhibiting COVID-19 symptoms).

Face-to-face recruitment occurred during consecutive 8-hour recruitment shifts that alternated between 7:30am-3:30pm and 12-8pm. This maximized the variation of patient experiences captured, as well as the volume of patients approached. Emergency department physicians, nurses, nurse practitioners, and physiotherapists were informed about the study and supported recruitment by approaching eligible participants after their treatment had commenced (but prior to discharge) and asking them to provide written consent if they agreed to be approached by the recruiting researcher. Consenting patients were then approached by the recruiting researcher, informed of the study (including information privacy), and invited to complete the ED PREM within 2-weeks. Consenting patients provided the researcher with their full name, telephone number, email address, and indicated their preferred mode of ED PREM administration. Online participants were informed that they would receive a survey link via email within 24-hours of recruitment. Telephone participants were given a telephone pack and asked to indicate suitable times to be contacted by the trained research nurse for surveying. Postal participants were provided a postal pack and informed of how to return their responses.

All online and postal participants were informed that they would be sent a text (SMS) or email 5 and 12-days after their ED presentation as a reminder to complete the ED PREM if they had not already. Telephone participants were informed that they would receive a reminder text on the morning of the agreed survey date that the research nurse would call them. All participants were entered into a prize-draw to win 1-of-5 $100 gift vouchers by returning their ED PREM responses.

Data collection

Data collection occurred concurrent to participant recruitment to minimize recall bias between participant experiences and ED PREM completion. Figure 1 outlines the data collection and follow-up procedures undertaken. A target of 245 responses to the ED PREM was sought, as this is consistent with COSMIN guidance noting that a 'very good' sample size for factor analysis is 7 times the number of items and ≥100 respondents.[30]

Statistical analysis

Data were exported from the online survey platform (online respondents), and manually entered (postal and telephone respondents) into a Microsoft Excel spreadsheet, cleaned, and anonymized before being imported into SAS 9.4 (SAS Institute, Cary NC) for analysis. No items required reverse coding.

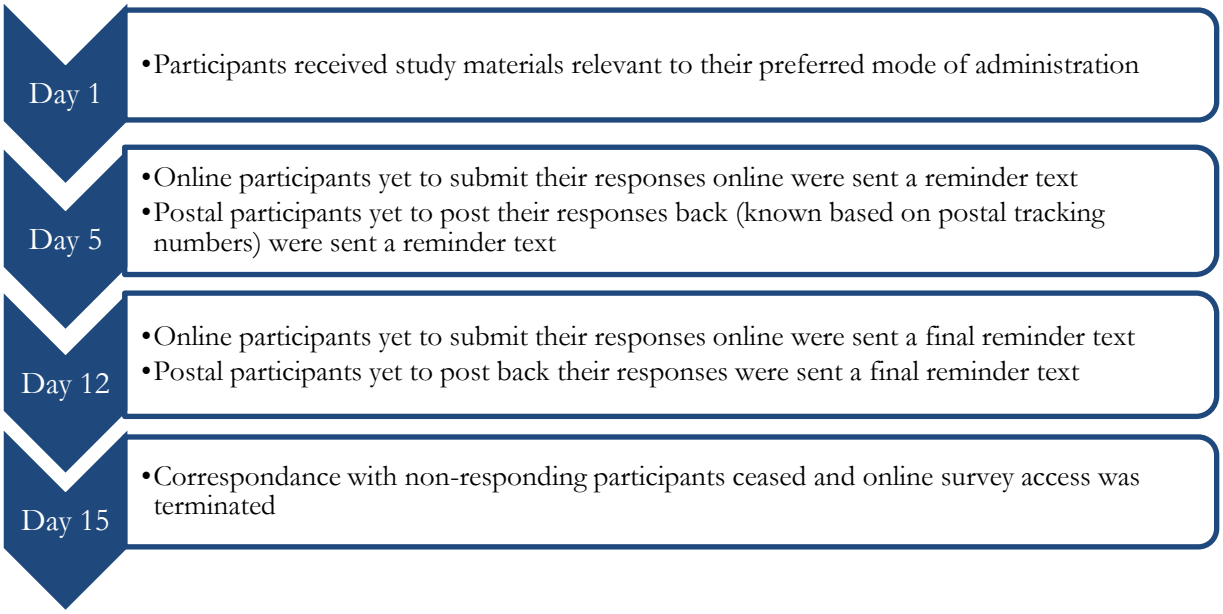
Participant characteristics were described using medians, 25th – 75th percentiles, counts and percentages. The overall response rate to the ED PREM and administration mode-specific response rates were calculated. The average time for completion, and proportion of respondents completing the ED PREM before the day 5 and 12 follow-up reminders were described for online participants only as this data was collected through the online survey platform. Data related to the proportion of patients who accessed the online survey but did not complete it were also described. All other analyses are described according to the goals of psychometric evaluation.

Item reduction analyses

First, item response distributions were examined via histograms and the Kolmogorov-Smirnov goodness-of-fit statistic, where $p<0.05$ indicates that data are not normally distributed.[31] Items were described using medians, 25th – 75th percentiles, means and standard deviations to demonstrate their distributions. Floor effects were evident if ≥15% of respondents chose the lowest response option (never); ceiling effects were evident if ≥15% of respondents chose the highest response option (always).[32] The proportion of missing data per item per respondent was also examined, where missingness <10% was considered acceptable and unlikely to pose bias in analysis.[33]

An item correlation matrix was generated to examine the strength of correlation between individual items of the ED PREM. Correlations <0.3 suggested poor correlation between items.[34] Corrected item-total correlations were examined to determine the strength of correlation between an individual item and the rest of the ED PREM. Correlations <0.5 suggested poor correlation with the rest of the instrument.[33]

Figure 1. 2-week data collection and participant follow-up procedure



Structural validity

Exploratory factor analysis (EFA) was undertaken to assess the structural validity of the ED PREM. It was selected as this is the first time the ED PREM has undergone psychometric evaluation, so it was important to first *explore* the instruments' factor structure. Factor analysis suitability was assessed using the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy and Bartlett's test of sphericity.[35] A KMO ≥0.70 and significant ($p<0.05$) Bartlett's test are considered acceptable.[36] Exploratory factor analysis was undertaken using Principal Axis Factor (PAF) extraction as all ED PREM items violated the assumption of data normality.[36,37] An oblique rotation (Promax) was selected as a high degree of item correlation was expected.[37,38]

An *a priori* 5-factor solution was initially specified for analysis in line with the ED PREMs' conceptual foundations.[28] Subsequent refinement of the factor structure was based on inspection of scree plots; parallel analysis (plotting random data alongside the study data to identify retainable factors in a 'generalizable' population)[38]; the percentage of variance explained by the extracted factors (where ≥50% is considered acceptable)[36,39]; and the conceptual clarity of the extracted factors.[38]

During EFA, items were considered for deletion if they exhibited factor loadings <0.50 (suggesting they were not substantially contributing to the factor)[33,38-40]; communality <0.50 (suggesting the item was acting independently of the factor it was grouped in)[33]; and cross-loading (where an item loads substantially on more than one factor, suggesting that it does not uniquely contribute to a distinct factor).[33,38-40]

Decisions related to the final factor structure and item retention/ deletion were considered by the research team relative to accepted analytical cut-offs, and the conceptual underpinnings of the ED PREM. Once the final structure was determined, descriptive labels were assigned to each factor.

Internal consistency reliability

Cronbach's alpha was calculated to assess the internal consistency reliability of the entire ED PREM and individual factors as determined by EFA. Cronbach's alpha represents the extent to which items in an instrument capture the same latent variable, and confirms the unidimensionality of individual factors.[41] Alpha values between 0.70-0.90 are considered acceptable for newly developed instruments, where values above 0.90 suggest item redundancy.[38,41]

Discriminant validity

Discriminant validity using known groups examines the extent to which a measure can discriminate between groups known to differ on a variable of interest.[42] It is documented in the literature that men,[43-45] older patients,[46-48] and those who have a shorter ED length of stay[49-51] report better experiences. To test the discriminant validity of the new ED PREM, we hypothesized that we would see significant ($p<0.05$) differences in these subgroups across all ED PREM factors using the Mann-Whitney U test. Gender was categorized as women and men; age was categorized as <65 years and ≥65 years; and self-reported ED length of stay was categorized as ≤5 hours and >5 hours (as 5 hours was the median self-reported length of stay reported by participants).

Results

Participant characteristics

Of the 510 patients recruited, 349 returned ED PREM responses (68.4%). Mode of administration response rates are presented in Table 1 alongside other participant characteristics. Online participants were youngest. Postal participants self-reported a higher average number of ED presentations in the past 12-months and longer ED length of stay. More men participated in telephone surveying compared to online and postal. A greater proportion of online participants reported educational attainment equivalent to or greater than Year 12, whereas 56.5% of postal participants and 41.9% of telephone participants reported educational attainment below Year 12. Most participants either transported themselves to the ED or were taken by family/ friends. Over 75% of participants returned to their usual place of residence after their ED presentation.

The average ED PREM completion time for online participants was 10 minutes (±8). Of the 295 online survey participants, 179 (60.7%) completed the ED PREM within 5-days post-recruitment, and 276 (93.6%) completed the ED PREM within 12-days post-recruitment. There were 131 (30.8%) non-responders to the online survey, with 16 (12.2%) participants starting but not completing the ED PREM online.

Item reduction results

Online Resource 1 (Appendix) provides the results of individual item-level descriptive analysis. All items demonstrated significant Kolmogorov-Smirnov goodness-of-fit results, indicating non-normal item response distributions. Missing data ranged between 0.3-0.6% for 6 items. Seven postal participants had missing data as individuals completing the ED PREM online and via telephone were required to answer each item to progress through the survey. Each of these participants only had missing data for 1 item. All items exhibited ceiling effects ranging between 34.4% (item 31: *I was informed about how long I might have to wait when I first arrived to the ED*) and 79.7% (item 27: *The ED was clean*).

Table 1. Self-reported characteristics of patient participants responding to the ED PREM (n=349)

Characteristic	Online participants		Postal participants		Telephone participants		All participants	
	295 (69.1%)		**23 (56.1%)**		**31 (73.8%)**		**349 (68.4%)**	
	Median (25th – 75th percentiles)		Median (25th – 75th percentiles)		Median (25th – 75th percentiles)		Median (25th – 75th percentiles)	
Age (years)	43 (30 – 56)		76 (69 – 81)		58 (42 – 74)		45 (31 – 61)	
ED presentations in the past 12-months[a]	1 (1 – 2)		2 (1 – 4)		0 (0 – 2)		1 (1 – 2)	
Length of ED stay (hours)	5 (3 – 7)		6 (3 – 8)		5.5 (4 – 8)		5 (3 – 7)	
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Women	159	53.9%	13	56.5%	9	29%	181	51.9%
Men	130	44.1%	10	43.5%	22	71%	162	46.4%
Gender non-binary	5	1.7%	0	0%	0	0%	5	1.4%
Other	1	0.3%	0	0%	0	0%	1	0.3%
Highest level completed education								
Less than Year 12	61	20.7%	13	56.5%	13	41.9%	87	24.9%
Year 12 or equivalent[b]	61	20.7%	4	17.4%	7	22.6%	72	20.6%
Certificate (I-IV)	89	30.1%	4	17.4%	2	6.4%	95	27.2%
Bachelor's degree	38	12.9%	1	4.4%	3	9.7%	42	12.0%
Postgraduate degree[c]	40	13.6%	1	4.4%	1	3.2%	42	12.0%
Other	6	2.0%	0	0%	5	16.1%	11	3.2%
Primary language spoken at home								
English	244	82.7%	23	100%	27	87.1%	294	84.2%
Non-English speaking	51	17.3%	0	0%	4	12.9%	55	15.8%
Aboriginal/Torres Strait Islander status								
Identified as Aboriginal/ Torres Strait Islander	10	3.4%	2	9.1%	0	0%	12	3.5%
Did not identify as Aboriginal/ Torres Strait Islander	285	96.6%	20	90.9%	31	100%	336	96.5%
Mode of arrival to ED								
Transported by ambulance	39	13.2%	5	21.7%	4	12.9%	48	13.8%
Transported themself	72	24.4%	6	26.1%	6	19.4%	84	24.1%
Transported by friend/ family/carer	187	62.4%	11	47.8%	17	54.8%	212	60.7%
Other	0	0%	1	4.4%	4	12.9%	5	1.4%
Discharge destination								
Usual place of residence	227	77.0%	19	82.6%	22	71.0%	268	76.8%
Another location in the same hospital (e.g., admitted)	64	21.7%	3	13.0%	8	25.8%	75	21.5%
Another location in a different hospital	0	0%	0	0%	1	3.2%	1	0.3%
Other location outside of a hospital	4	1.4%	1	4.4%	0	0%	5	1.4%

[a]Excluding the current presentation; [b]Equivalent to Year 12 in Australia includes TAFE (Technical and Further Education); [c]Postgraduate degrees include Graduate Diploma, Graduate Certificate, Master's degree, and PhD; ED = Emergency Department

Online Resource 2 (Appendix) provides the ED PREM inter-item correlation matrix and corrected item-total correlations. Item 27 (*The ED was clean*) demonstrated poor correlations (<0.30) with items 28, 31-35. Item 27 and 28 (*The temperature in the ED was comfortable*) demonstrated corrected item-total correlations <0.50. Both items were removed before factor analysis.

Structural validity

The KMO=0.965 and significant (<0.0001) Bartlett's test of sphericity indicated that ED PREM response data was suitable for EFA. As the proportion of missing data was negligible, listwise deletion of participants with incomplete responses occurred, leaving a sample of n=342. A 5-factor solution using the *a priori* model specifications was initially generated, explaining ~60% of the model variance. However, items in the 5th factor had factor loadings <0.5 and explained 5.6% of the model variance. Therefore, a 4-factor solution was generated, which explained 55% of the model variance (Table 2).

Table 2. ED PREM rotated factor matrix using Promax rotation and Principal Axis factoring (PAF) (n=342)

ED PREM items	Factor 1	Factor 2	Factor 3	Factor 4	Item communalities
Internal consistency reliability (Cronbach's alpha)[a]	α=0.97	α=0.91	α=0.93	α=0.84	
Percentage variance explained	17.3%	11.2%	14.5%	12.1%	
10. ED care providers were kind in how they treated me.	**0.94**				0.79
9. ED care providers treated me with respect.	**0.87**				0.76
6. ED care providers made me feel like I was no trouble to them.	**0.80**				0.72
8. ED care providers treated me like a person, not a medical condition.	**0.80**				0.73
7. ED care providers gave me the opportunity to talk.	**0.75**				0.64
5. ED care providers supported my decision to present to the ED.	**0.72**				0.63
4. ED care providers took me seriously.	**0.71**				0.75
1. ED care providers were compassionate.	**0.69**				0.64
3. ED care providers listened to me.	**0.63**				0.68
13. ED care providers were thorough in how they cared for me.	**0.62**				0.78
2. ED care providers were reassuring.	**0.58**				0.67
16. I was trusting of ED care providers.	**0.57**				0.76
17. I felt safe in the hands of ED care providers.	**0.52**				0.76
19. ED care providers spoke to me in a way I could understand.	**0.51**				0.60
15. ED care providers worked well together.	0.45				0.68
11. ED care providers were experienced and knew what they were doing.	0.41				0.63
32. I was advised about why I needed to wait to receive care.		**0.84**			0.71
34. ED care providers updated me throughout my ED journey about why I was waiting.		**0.81**			0.72
31. I was informed about how long I might have to wait when I first arrived to the ED.		**0.79**			0.61
33. I received care in good time considering the nature of my condition.		**0.74**			0.73
35. My ED journey progressed in good time considering the nature of my condition.		**0.74**			0.77
12. ED care providers were time efficient in how they cared for me.		0.38			0.60
21. ED care providers informed me of my treatment options.			**0.80**		0.83
20. ED care providers encouraged me to ask questions.			**0.69**		0.74
22. ED care providers involved me in decisions about my treatment as much as I wanted.			**0.69**		0.77
18. ED care providers discussed my care with me.			**0.61**		0.78
14. ED care providers gave me consistent information throughout my ED journey.			0.48		0.72
23. ED care providers kept me informed throughout my ED journey.			0.45		0.75
30. ED care providers did all they could to make my treatment space private.				**0.72**	0.68
29. ED care providers discussed my personal details in a private manner.				**0.69**	0.66
25. I felt comfortable in the ED environment (both physically and emotionally).				**0.51**	0.67
24. I felt physically safe in the ED environment.				0.44	0.59
26. I had access to the things I needed (e.g., toilets, wheelchairs, food and drinks).				0.43	0.40

[a]Calculated including only items with bolded factor loadings; ED = Emergency Department

Items 15 and 11 were not included in factor 1 as they had factor loadings <0.5 and did not fit the factors' conceptual basis of person-centered relationships between patients and care providers. Item 12 was not included in factor 2 as its factor loading was 0.38. Items 14 and 23 were not included in factor 3 as they evidenced factor loadings <0.5 and conceptual overlap with the loading items. Items 24 and 26 were not included in factor 4 due to low factor loadings, conceptual overlap with item 25 (specifically item 24), and low communality (specifically item 26). Thus, the final 4-factor structure comprised 26-items (Online Resource 3, Appendix).

As factors closely resembled the conceptual model underpinning the ED PREM, descriptive labels aligned with existing domain names.[28] Factor 1, *Person-centered relationships between patients and ED care providers,* describes respectful relationships where the patient is viewed as a person (not a medical condition) with individual needs, values, and preferences. Factor 2, *Receiving timely ED care,* describes patient perceptions of timeliness and the extent to which they were informed about wait times and the progression of their care. Factor 3, *Patient engagement in ED care,* describes a patient's opportunity to be involved and included in their care to the extent they desire. Factor 4, *Privacy and comfort in the ED environment,* describes patient perceptions of privacy and comfort (both physical and emotional) in the ED. This factor name was slightly revised from the domain name used in the conceptual model, as items related to 'safety' no longer feature in this factor.

Internal consistency reliability

Cronbach's alpha for the entire ED PREM was 0.97. Alpha values for each factor are presented in Table 2.

Discriminant validity

Table 3 demonstrates the ED PREMs' discriminant validity using known groups. Women reported significantly poorer experiences across factors 1, 2 and 4, and non-significantly poorer experiences for factor 3 compared to men. Older participants (≥65 years) reported

Table 3. ED PREM discriminant validity

	Factor 1: Person-centered relationships between patients and ED care providers	Factor 2: Receiving timely ED care	Factor 3: Patient engagement in ED care	Factor 4: Privacy and comfort in the ED environment
	Mean (SD)[a] p-value	Mean (SD) p-value	Mean (SD) p-value	Mean (SD) p-value
Participant age				
<65 years (n=276)	4.49 (0.71)	3.62 (1.21)	4.32 (0.92)	4.40 (0.79)
≥65 years (n=71)	4.68 (0.50)	3.73 (1.27)	4.43 (0.77)	4.62 (0.66)
Significance	***0.0443***	*0.4215*	*0.5589*	***0.0093***
Participant gender				
Women (n=181)	4.46 (0.71)	3.48 (1.23)	4.26 (0.95)	4.34 (0.83)
Men (n=162)	4.60 (0.64)	3.83 (1.21)	4.43 (0.83)	4.57 (0.68)
Significance	***0.0292***	***0.0075***	*0.1369*	***0.0084***
Length of ED stay				
≤5 hours (n=191)	4.60 (0.64)	3.84 (1.15)	4.46 (0.80)	4.57 (0.65)
>5 hours (n=157)	4.43 (0.71)	3.41 (1.27)	4.20 (0.98)	4.30 (0.87)
Significance	***0.0045***	***0.0012***	***0.0081***	***0.0026***

[a]Average scores for factors were calculated by summing responses to all items within the factor and dividing by the number of items in the factor; SD = Standard Deviation; ED = Emergency Department

significantly better experiences for factors 1 and 4, and non-significantly better experiences for factors 2 and 3 compared to younger (<65 years) participants. Participants reporting a longer ED length of stay (>5 hours) had significantly poorer experiences across all factors. This difference was most pronounced for factor 2, *Receiving timely ED care*.

Discussion

This study describes the initial psychometric evaluation of the new ED PREM in an Australian ED. The ED PREM is conceptually based on the findings of a systematic mixed studies review,[17] qualitative inquiry,[27] and consensus-based content validation.[28] Structural validity assessment illustrates that the ED PREM is comprised of 4-factors that explain 55% of model variance. The 26-item instrument demonstrates strong internal consistency reliability and discriminant validity. Thus, the ED PREM is both a valid and reliable instrument for capturing patient experiences in the ED. This research addresses an important gap in the literature and patient care, as few valid and reliable PREMs designed for the ED context are available,[20] and none are designed for use in the Australian healthcare context.

Compared to existing measures, the ED PREM emphasizes patient-care provider relationships. Factor 1 captures patient perceptions of respectful treatment by ED care providers; their opportunity to talk, be listened to, and have things explained to them in an understandable way; and feelings of support, reassurance, trust, and safety. This factor embodies the philosophy of person-centered care, which is to *"treat people as individuals; respect their rights as a person; build mutual trust and understanding; and develop therapeutic relationships."*[52] Existing PREMs designed for the ED context emphasize processes of care (e.g., arrival, tests and procedures, and discharge), tending to focus only on whether care providers listened to patients, discussed treatments or concerns with patients, and whether patients had confidence and trust in care providers.[53-55] They also exhibit varying levels of psychometric rigor.[20,56] This is incongruent with previous studies that highlight the importance patients place on relational aspects of care. An ED care providers' ability to meet patient communication needs (both interpersonal and informational) can alleviate their fears and anxieties, and contribute to patient confidence.[18] Moreover, this dialogue can help patients understand the level of responsibility their care providers have in the ED context.[27] Thus, by capturing experiences aligned with person-centered care, the new ED PREM will provide information to support ED care providers to optimize their practices.

Timeliness refers to the capacity of a healthcare service or system to provide care quickly once a need has been 65ealized.[57] Unlike other instruments, the new ED PREM does not measure timeliness of care in minutes spent waiting to be seen or ED length of stay. Instead, it captures whether a patient was *informed* about why they needed to wait, received updates on their wait time, and how they considered the progression of their care relative to their health condition. These items reflect growing evidence that patients anticipate waiting when they present to the ED, particularly with non-life-threatening injuries or illnesses.[27,58] Many also recognize service-level challenges that can delay their care and treatment (e.g., staffing levels), and when other patients are more in need of immediate care.[27,59] Yet, while several studies have investigated the impact of wait time communication on patient *satisfaction,*[60-62] relatively few consider how this impacts patient *experiences*. The difference being that

patient satisfaction stems from the fulfilment of an individuals' expectations, whereas experiences reflect patient perceptions of 'what' happened during their care encounter, and 'how' it happened.[63] Consequently, patient experiences provide more valuable information for service quality and safety improvement, and performance measurement.[8,63,64] This illustrates an area where there is a need for greater research, and the new ED PREM would be the ideal instrument to evaluate person-centered wait time communication strategies.

When compared to existing measures, factor 3 of the new ED PREM takes further steps towards operationalizing shared decision making (SDM). SDM is defined as *"an approach where clinicians and patients share the best available evidence when faced with the task of making decisions, and where patients are supported to consider options to achieve informed preferences."*[65] SDM has been associated with reductions in unwarranted practice variation and costs, and the optimization of equity,[66-69] inexorably linking it to quality, safety, and value in healthcare. Although patients view SDM as important to their ED experience,[27,70] it is often overlooked in practice due to the busy and interrupted nature of the care environment.[71] Given the contemporary relevance of the new ED PREM, it would be an appropriate instrument to gauge current SDM practices in the ED context.

Additionally, it could be used to measure the patient-level impact of SDM interventions such as the use of decision-aids to support choice of treatment options when more than one option is available.

The ED PREM comprised three items related to the ED environment, including privacy of the treatment space, privacy of personal details, and comfort. Other PREMs designed for the ED context additionally ask about the availability of food and drinks, cleanliness, and temperature in the ED.[21,54,72,73] While these items were included in the initial 35-item ED PREM, they had lower patient-reported relevance and importance compared to items about person-centered relationships, and engagement in ED care..[28] Resultantly, they were removed. Moreover, findings from our earlier qualitative inquiry suggests that environmental aspects of the ED, such as the availability of food and drinks, seem to be of little consequence to some patients.[27] Thus, the relevance of these items may have shifted relative to earlier measures.

Strengths and limitations

A key strength of this research was the person-centered approach to ED PREM administration. This enabled participants to choose how they completed the ED PREM, supporting greater participant inclusion in the study and a high response rate. The large sample size was another strength of this research, exceeding the recommended sample of 245 responses and providing for a valid EFA.[30] Additionally, there was a negligible level of missing data.

However, we acknowledge some limitations. First, COVID-19 meant the recruiting researcher was restricted to certain areas of the ED. Some patient groups (e.g., those who were critically unwell, presenting with mental health problems, and exhibiting COVID-19 symptoms) were ultimately excluded for safety, pragmatic and hospital policy reasons. Second, this was a single site study, potentially limiting the generalizability of the findings. Third, all items exhibited ceiling effects. As the ED PREM was developed through rigorous conceptualization and content validation studies, reflecting best practice instrument development,[6,34,74] this was unlikely due to poor content validity. Finally, all data collected for this study were self-reported, which may be subject to respondent bias. Still, this was the most feasible data collection approach, and did not compromise participant anonymity.

Recommendations

The 4-factor structure of the ED PREM identified in this study needs to be confirmed in different populations. Splitting a large sample into equivalent subsamples for the purposes of EFA followed by confirmatory factor analysis (CFA) would be robust.[75] Given the diverse populations that EDs serve in Australia and internationally, it will be critical that future validation of the ED PREM occurs in different geographical regions (e.g., rural and remote areas, other countries) and populations (e.g., people presenting with mental health problems, culturally and linguistically diverse).

The high internal consistency reliability (α=0.97) of the ED PREM suggests that there is still some item redundancy. This is most pronounced in factor 1. Thus, future research should aim to reduce item redundancy while maintaining a person-centered focus.

Conclusion

This study presents a new ED PREM developed for and psychometrically evaluated in the Australian ED context. It comprises 4-factors and 26-items. High Cronbach's alpha and discriminant validity using known groups supports the ED PREMs' reliability and validity. Future research should validate the ED PREM in different geographical regions, countries, and populations. Addressing the ED PREMs' item redundancy may produce a more parsimonious instrument. The ED PREM can be used to support patient experience research in the ED and inform person-centered service provision and performance measurement.

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Appendix

Online Resource 1. Individual ED PREM item-level descriptive results (n=349)

Item	Mean±SD	Median (IQR)	Kolmogorov-Smirnov (*D*)	Number of floor responses (%)	Number of ceiling responses (%)
Domain 1: Person-centred relationships between patients and ED care providers					
1. ED care providers were compassionate.	4.4±0.8	5 (1)	0.36*	2 (0.6%)	210 (60.2%)
2. ED care providers were reassuring.	4.3±0.9	5 (1)	0.32*	3 (0.9%)	189 (54.2%)
3. ED care providers listened to me.	4.5±0.8	5 (1)	0.38*	1 (0.3%)	223 (63.9%)
4. ED care providers took me seriously.†	4.5±0.8	5 (1)	0.39*	2 (0.6%)	227 (65.0%)
5. ED care providers supported my decision to present to the ED.†	4.6±0.8	5 (1)	0.42*	3 (0.9%)	248 (71.1%)
6. ED care providers made me feel like I was no trouble to them.	4.5±0.9	5 (1)	0.39*	5 (1.4%)	233 (66.8%)
7. ED care providers gave me the opportunity to talk.	4.6±0.7	5 (1)	0.44*	2 (0.6%)	261 (74.8%)
8. ED care providers treated me like a person, not a medical condition.	4.5±0.9	5 (1)	0.40*	4 (1.2%)	239 (68.5%)
9. ED care providers treated me with respect.	4.7±0.7	5 (0)	0.45*	1 (0.3%)	266 (76.2%)
10. ED care providers were kind in how they treated me.	4.6±0.7	5 (0)	0.45*	1 (0.3%)	262 (75.1%)
Domain 2: Patient confidence in ED care providers					
11. ED care providers were experienced and knew what they were doing.	4.5±0.7	5 (1)	0.39*	0 (0%)	222 (63.6%)
12. ED care providers were time efficient in how they cared for me.	4.2±1.0	5 (1)	0.29*	5 (1.4%)	170 (48.7%)
13. ED care providers were thorough in how they cared for me.	4.5±0.9	5 (1)	0.38*	4 (1.2%)	225 (64.5%)
14. ED care providers gave me consistent information throughout my ED journey.	4.3±1.0	5 (1)	0.34*	4 (1.2%)	199 (57.0%)
15. ED care providers worked well together.†	4.5±0.8	5 (1)	0.39*	1 (0.3%)	224 (64.2%)
16. I was trusting of ED care providers.	4.5±0.9	5 (1)	0.40*	5 (1.4%)	241 (69.1%)
17. I felt safe in the hands of ED care providers.	4.6±0.8	5 (1)	0.43*	4 (1.2%)	255 (73.1%)
Domain 3: Patient engagement in ED care					
18. ED care providers discussed my care with me.‡	4.5±0.8	5 (1)	0.40*	1 (0.3%)	235 (67.3%)
19. ED care providers spoke to me in a way I could understand.	4.7±0.6	5 (0)	0.45*	1 (0.3%)	266 (76.2%)
20. ED care providers encouraged me to ask questions.	4.2±1.0	5 (1)	0.29*	9 (2.6%)	179 (51.3%)
21. ED care providers informed me of my treatment options.	4.4±1.0	5 (1)	0.36*	12 (3.4%)	217 (62.2%)
22. ED care providers involved me in decisions about my treatment as much as I wanted.	4.3±1.0	5 (1)	0.34*	12 (3.4%)	206 (59.0%)
23. ED care providers kept me informed throughout my ED journey.†	4.4±1.0	5 (1)	0.36*	9 (2.6%)	213 (61.0%)

Appendix (cont'd.)

Online Resource 1. Individual ED PREM item-level descriptive results (n=349) (cont'd.)

Item	Mean±SD	Median (IQR)	Kolmogorov-Smirnov (*D*)	Number of floor responses (%)	Number of ceiling responses (%)
Domain 4: Safety, comfort, and privacy in the ED					
24. I felt physically safe in the ED environment.	4.6±0.7	5 (1)	0.43*	1 (0.3%)	248 (71.1%)
25. I felt comfortable in the ED environment (both physically and emotionally). †	4.4±0.9	5 (1)	0.37*	4 (1.2%)	215 (61.6%)
26. I had access to the things I needed (e.g., toilets, wheelchairs, food and drinks).	4.3±1.1	5 (1)	0.35*	10 (2.9%)	210 (60.2%)
27. The ED was clean.	4.8±0.5	5 (0)	0.48*	0 (0%)	278 (79.7%)
28. The temperature in the ED was comfortable.	4.2±1.0	5 (2)	0.30*	8 (2.3%)	178 (51.0%)
29. ED care providers discussed my personal details in a private manner.	4.5±0.8	5 (1)	0.40*	5 (1.4%)	242 (69.3%)
30. ED care providers did all they could to make my treatment space private.	4.4±0.9	5 (1)	0.36*	8 (2.3%)	219 (62.8%)
Domain 5: Receiving timely care					
31. I was informed about how long I might have to wait when I first arrived to the ED.	3.2±1.6	3 (3)	0.21*	85 (24.4%)	120 (34.4%)
32. I was advised about why I needed to wait to receive care.	3.4±1.6	4 (3)	0.23*	73 (20.9%)	135 (38.7%)
33. I received care in good time considering the nature of my condition.	4.1±1.2	5 (2)	0.30*	21 (6.0%)	180 (51.6%)
34. ED care providers updated me throughout my ED journey about why I was waiting.	3.5±1.5	4 (3)	0.22*	50 (14.3%)	130 (37.3%)
35. My ED journey progressed in good time considering the nature of my condition.	4.0±1.2	4 (2)	0.27*	23 (6.6%)	167 (47.9%)

†n=348 responses (n=1 missing); ‡n=347 responses (n=2 missing); *p<0.01; SD = Standard Deviation; IQR = Interquartile range; ED = Emergency Department

Appendix (cont'd.)

Online Resource 2. ED PREM item correlation matrix and corrected item-total correlations

	Corrected ITC	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35
Q1	0.76	1.00																																		
Q2	0.80	0.75	1.00																																	
Q3	0.79	0.66	0.72	1.00																																
Q4	0.83	0.71	0.74	0.83	1.00																															
Q5	0.73	0.61	0.63	0.73	0.69	1.00																														
Q6	0.78	0.68	0.67	0.67	0.73	0.67	1.00																													
Q7	0.73	0.61	0.64	0.71	0.68	0.68	0.68	1.00																												
Q8	0.78	0.67	0.65	0.67	0.73	0.68	0.75	0.72	1.00																											
Q9	0.78	0.66	0.67	0.61	0.71	0.61	0.75	0.69	0.74	1.00																										
Q10	0.78	0.69	0.67	0.64	0.72	0.66	0.76	0.68	0.76	0.88	1.00																									
Q11	0.75	0.58	0.62	0.58	0.64	0.62	0.60	0.56	0.63	0.62	0.62	1.00																								
Q12	0.75	0.58	0.62	0.61	0.62	0.53	0.64	0.49	0.57	0.56	0.57	0.57	1.00																							
Q13	0.83	0.65	0.70	0.70	0.74	0.71	0.72	0.67	0.74	0.76	0.75	0.73	0.68	1.00																						
Q14	0.81	0.61	0.69	0.66	0.64	0.56	0.61	0.62	0.63	0.64	0.64	0.65	0.64	0.74	1.00																					
Q15	0.80	0.63	0.63	0.61	0.67	0.61	0.65	0.64	0.65	0.69	0.71	0.68	0.64	0.72	0.71	1.00																				
Q16	0.81	0.68	0.70	0.65	0.73	0.62	0.72	0.63	0.71	0.73	0.71	0.75	0.59	0.75	0.70	0.75	1.00																			
Q17	0.80	0.64	0.65	0.66	0.70	0.65	0.68	0.62	0.70	0.72	0.71	0.78	0.56	0.76	0.70	0.73	0.86	1.00																		
Q18	0.82	0.59	0.65	0.66	0.69	0.60	0.62	0.66	0.68	0.68	0.66	0.72	0.59	0.73	0.77	0.74	0.75	0.77	1.00																	
Q19	0.71	0.59	0.61	0.56	0.64	0.52	0.63	0.58	0.68	0.68	0.68	0.58	0.48	0.69	0.60	0.63	0.65	0.63	0.68	1.00																
Q20	0.78	0.55	0.65	0.62	0.62	0.58	0.58	0.59	0.61	0.59	0.56	0.58	0.62	0.66	0.67	0.66	0.67	0.65	0.73	0.61	1.00															
Q21	0.80	0.54	0.60	0.64	0.66	0.59	0.60	0.57	0.61	0.64	0.60	0.67	0.61	0.72	0.72	0.69	0.73	0.74	0.80	0.65	0.79	1.00														
Q22	0.80	0.60	0.65	0.68	0.69	0.65	0.63	0.61	0.66	0.64	0.62	0.62	0.59	0.72	0.70	0.67	0.70	0.69	0.75	0.66	0.79	0.83	1.00													
Q23	0.84	0.63	0.70	0.69	0.72	0.65	0.62	0.61	0.66	0.62	0.65	0.62	0.65	0.70	0.79	0.69	0.69	0.70	0.74	0.64	0.72	0.76	0.73	1.00												
Q24	0.69	0.53	0.54	0.55	0.62	0.52	0.58	0.57	0.62	0.60	0.59	0.60	0.49	0.65	0.56	0.59	0.63	0.62	0.62	0.54	0.49	0.54	0.51	0.56	1.00											
Q25	0.76	0.58	0.54	0.58	0.65	0.52	0.60	0.53	0.60	0.60	0.62	0.59	0.58	0.66	0.64	0.63	0.65	0.65	0.64	0.55	0.57	0.62	0.58	0.62	0.77	1.00										
Q26	0.56	0.39	0.42	0.45	0.42	0.31	0.44	0.38	0.44	0.38	0.36	0.40	0.43	0.40	0.49	0.42	0.39	0.40	0.43	0.37	0.50	0.44	0.44	0.49	0.37	0.52	1.00									
Q27	0.46	0.33	0.35	0.36	0.43	0.32	0.39	0.38	0.43	0.43	0.43	0.40	0.29	0.43	0.34	0.40	0.43	0.45	0.42	0.33	0.35	0.34	0.36	0.32	0.51	0.45	0.40	1.00								
Q28	0.49	0.43	0.44	0.37	0.40	0.31	0.35	0.34	0.33	0.31	0.34	0.33	0.44	0.35	0.40	0.30	0.35	0.31	0.36	0.31	0.34	0.35	0.37	0.42	0.27	0.38	0.32	0.24	1.00							
Q29	0.68	0.52	0.55	0.51	0.58	0.47	0.51	0.50	0.52	0.50	0.49	0.53	0.51	0.56	0.57	0.55	0.55	0.57	0.55	0.53	0.56	0.57	0.57	0.64	0.52	0.55	0.51	0.38	0.39	1.00						
Q30	0.68	0.52	0.56	0.51	0.56	0.49	0.52	0.50	0.48	0.52	0.52	0.54	0.51	0.59	0.56	0.54	0.57	0.56	0.53	0.52	0.59	0.55	0.56	0.62	0.53	0.60	0.51	0.35	0.35	0.77	1.00					
Q31	0.58	0.43	0.44	0.39	0.40	0.32	0.36	0.32	0.35	0.34	0.36	0.37	0.47	0.38	0.45	0.40	0.36	0.35	0.42	0.29	0.47	0.40	0.40	0.48	0.34	0.45	0.39	0.22	0.37	0.37	0.36	1.00				
Q32	0.64	0.45	0.47	0.49	0.49	0.41	0.43	0.38	0.42	0.39	0.40	0.42	0.52	0.45	0.47	0.43	0.41	0.42	0.45	0.35	0.52	0.45	0.46	0.50	0.39	0.47	0.40	0.27	0.34	0.40	0.40	0.79	1.00			
Q33	0.70	0.49	0.51	0.50	0.53	0.49	0.52	0.44	0.48	0.47	0.46	0.48	0.61	0.52	0.52	0.53	0.50	0.48	0.50	0.40	0.50	0.54	0.50	0.60	0.47	0.52	0.39	0.24	0.50	0.48	0.47	0.57	0.62	1.00		
Q34	0.68	0.47	0.51	0.53	0.52	0.45	0.49	0.41	0.47	0.45	0.45	0.43	0.58	0.50	0.55	0.49	0.45	0.44	0.49	0.36	0.51	0.48	0.48	0.55	0.44	0.50	0.41	0.26	0.39	0.39	0.41	0.66	0.76	0.70	1.00	
Q35	0.74	0.53	0.59	0.55	0.56	0.52	0.53	0.48	0.51	0.51	0.50	0.47	0.65	0.54	0.56	0.56	0.49	0.50	0.51	0.44	0.53	0.52	0.51	0.63	0.49	0.56	0.41	0.27	0.51	0.51	0.50	0.57	0.63	0.69	0.73	1.00

*Color-coding represents how items were originally grouped according to the 5 domains of the conceptual model that the ED PREM was based on

Appendix (cont'd.)

Online Resource 3. 26-item ED PREM

Emergency Department Patient-Reported Experience Measure (ED PREM)

Please consider **ONLY** your single most recent experience in the Emergency Department.
Please ***put one tick in a box for each item*** to indicate the response that best represents your single most recent experience in the Emergency Department.
****An ED care provider is anyone that provided care to you in the Emergency Department. This may include any combination of doctors, nurses, physiotherapists, orthopaedic surgeons etc.****

Item	Response categories				
Person-centred relationships between patients and ED care providers	**Never**	**Rarely**	**Sometimes**	**Very often**	
1. ED care providers were kind in how they treated me.	☐	☐	☐	☐	☐
2. ED care providers treated me with respect.	☐	☐	☐	☐	☐
3. ED care providers made me feel like I was no trouble to them.	☐	☐	☐	☐	☐
4. ED care providers treated me like a person, not a medical condition.	☐	☐	☐	☐	☐
5. ED care providers gave me the opportunity to talk.	☐	☐	☐	☐	☐
6. ED care providers supported my decision to present to the ED.	☐	☐	☐	☐	☐
7. ED care providers took me seriously.	☐	☐	☐	☐	☐
8. ED care providers were compassionate.	☐	☐	☐	☐	☐
9. ED care providers listened to me.	☐	☐	☐	☐	☐
10. ED care providers were thorough in how they cared for me.	☐	☐	☐	☐	☐
11. ED care providers were reassuring.	☐	☐	☐	☐	☐
12. I was trusting of ED care providers.	☐	☐	☐	☐	☐
13. I felt safe in the hands of ED care providers.	☐	☐	☐	☐	☐
14. ED care providers spoke to me in a way I could understand.	☐	☐	☐	☐	☐
Receiving timely ED care	**Never**	**Rarely**	**Sometimes**	**Very often**	**Always**
15. I was advised about why I needed to wait to receive care.	☐	☐	☐	☐	☐
16. ED care providers updated me throughout my ED journey about why I was waiting.	☐	☐	☐	☐	☐
17. I was informed about how long I might have to wait when I first arrived to the ED.	☐	☐	☐	☐	☐
18. I received care in good time considering the nature of my condition.	☐	☐	☐	☐	☐
19. My ED journey progressed in good time considering the nature of my condition.	☐	☐	☐	☐	☐
Patient engagement in ED care	**Never**	**Rarely**	**Sometimes**	**Very often**	**Always**
20. ED care providers informed me of my treatment options.	☐	☐	☐	☐	☐
21. ED care providers encouraged me to ask questions.	☐	☐	☐	☐	☐
22. ED care providers involved me in decisions about my treatment as much as I wanted.	☐	☐	☐	☐	☐
23. ED care providers discussed my care with me.	☐	☐	☐	☐	☐
Privacy and comfort in the ED environment	**Never**	**Rarely**	**Sometimes**	**Very often**	**Always**
24. ED care providers did all they could to make my treatment space private.	☐	☐	☐	☐	☐
25. ED care providers discussed my personal details in a private manner.	☐	☐	☐	☐	☐
26. I felt comfortable in the ED environment (both physically and emotionally).	☐	☐	☐	☐	☐