DEVELOPMENT AND VALIDATION OF A MALAY-LANGUAGE ASSESSMENT TOOL FOR ADULT CARDIOPULMONARY RESUSCITATION LITERACY

Amiruddin Junli
Department of Basic Sciences, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus

Siti Nor Ismalina Isa*
Department of Basic Sciences, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus
ismalina@uitm.edu.my

Farrah Shafeera Ibrahim
Department of Basic Sciences, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus

Ajau Danis
Department of Basic Sciences, Faculty of Health Sciences, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus

Mohd Said Nurumal
Department of Critical Care Nursing, Kuliyyah of Nursing, International Islamic University Malaysia

Roslinda Isa
Centre for Nursing Studies, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus

Abstract: Cardiac arrest is a critical emergency requiring immediate cardiopulmonary resuscitation (CPR) for survival. In the Malaysian context, variability in healthcare providers' CPR knowledge, together with the absence of validated Malay-language instruments, poses a significant challenge to the systematic evaluation and monitoring of training effectiveness. This study aimed to develop and validate the 'Adult CPR Literacy Questionnaire' (ACPR-L) for primary healthcare providers. This methodological study involved two phases. Phase I focused on developing 25 items based on national guidelines, followed by content validity assessment by ten experts and face validity evaluation by ten target users. Phase II involved pilot testing the instrument among 43 Assistant Medical Officers, Nurses, and Community Nurses in primary healthcare settings. Data were analysed using validity indices (CVI, FVI) and Cronbach's Alpha. Results demonstrated excellent content validity for relevance (I-CVI = 1.00) and clarity (S-CVI/Ave = 0.99). Face validity indicated high comprehension among users (S-FVI/Ave = 0.98). Pilot testing yielded an acceptable internal consistency with a Cronbach's Alpha of 0.753. One item was removed due to zero variance, resulting in a final 24-item instrument. In conclusion, the ACPR-L is the first valid and reliable Malay-language tool for assessing adult CPR literacy. It is suitable for identifying training needs and guiding curriculum development for Malaysian primary healthcare providers.

Keywords: Adult CPR, Content Validity, CPR Literacy, Primary Healthcare, Questionnaire Validation.

1. Introduction

Cardiac arrest is one of the most critical medical emergencies, occurring when the heart abruptly stops functioning effectively, thereby halting systemic circulation. Immediate initiation of cardiopulmonary resuscitation (CPR) has been globally acknowledged as a decisive factor for survival and neurological recovery, particularly in out-of-hospital cardiac arrest cases (Yasin et al., 2023). CPR consists of chest compressions, often complemented with artificial ventilation, to maintain perfusion and oxygenation until spontaneous cardiac activity is restored (Belay et al., 2024). Despite its life-saving potential, evidence consistently highlights inadequate CPR knowledge and poor skill retention among healthcare personnel, often resulting in delayed interventions such as medication administration and airway

management, which in turn compromise resuscitation success (Brown et al., 2006; Papi et al., 2020). Skill competence is known to diminish rapidly after training, with duration since last exposure and frequency of clinical practice strongly influencing confidence and performance (Chua et al., 2025; Mohamed & Ashaari, 2023; Tomas & Kachekele, 2023).

In Malaysia, findings reveal heterogeneous levels of CPR literacy across healthcare providers. For instance, Chua et al. (2025) reported moderate knowledge among staff nurses at Serdang Hospital, while Mohamed and Ashaari (2023) observed that only 35.2% of nurses in Melaka demonstrated adequate understanding of CPR procedures. In Lahad Datu, noted that just over 60% of nurses, assistant medical officers, and community nurses possessed good knowledge of CPR (Junli, 2023). International studies reflect similar patterns: in Ethiopia, only 55.6% of nurses and medical residents demonstrated sufficient CPR knowledge (Belay et al., 2024), and in Namibia, poor literacy was directly linked to suboptimal nursing practice (Tomas & Kachekele, 2023).

The variability in CPR knowledge across regions underscores the importance of contextually appropriate assessment instruments. While CPR literacy spans theoretical knowledge, psychomotor skills, and adherence to updated resuscitation guidelines (Kalhori et al., 2021). No validated Malay-language instrument currently exists to assess adult CPR literacy among the Malaysian population, particularly among healthcare providers. A validated tool would enable reliable measurement of literacy, guiding training needs assessments and the development of refresher training modules (Mafukata, 2014). This study aims to address this gap by developing and validating a Malay-language Adult CPR Literacy Questionnaire (ACPR-L) for use among the Malaysian population and primary healthcare providers.

2. Methodology

2.1 *Study Design and Setting*

This research was undertaken in two sequential phases. Phase I encompassed the development of the ACPR-L questionnaire and its evaluation for both content validity (CV) and face validity (FV). Phase II consisted of a pilot study to assess the reliability of the refined instrument. The validation processes in Phase I were carried out between May and June 2025.

2.1.1 Phase I: Development, Content, and Face Validity

The ACPR-L questionnaire was designed to capture literacy of adult CPR protocols, psychomotor competencies, and readiness to respond during emergencies. Item generation was informed by the 2020 Advanced Life Support Guidelines (National Committee on Resuscitation Training, 2022), the Basic Life Support Training Manual for Healthcare Workers (Medical Development Division, 2023), a review of relevant literature, and expert consultation. The instrument consisted of 25 multiple-choice items, each carrying one mark for the correct answer.

Ten experts, including emergency physicians, family medicine specialists, Basic Life Support instructors, and academics, were recruited to evaluate the items for relevance, accuracy, clarity, grammar, and language appropriateness. Subsequently, ten raters drawn from the target population of assistant medical officers, nurses, and community nurses evaluated the instrument for readability and comprehension. This two-tier validation approach was adopted based on recommended practices in health sciences education (Yusoff, 2019b, 2019a).

2.1.2 Phase II: Pilot Testing

The refined ACPR-L questionnaire was piloted among 43 respondents, purposively selected from primary healthcare settings including *klinik kesihatan, klinik desa, klinik komuniti*, and district health offices. Eligibility criteria required participants to be currently practising in relevant healthcare roles, to have attended Basic Life Support training, and to be proficient in Malay. The questionnaire was distributed via Google Forms, and participants were invited via email and WhatsApp. Sample size determination for the pilot was guided by statistical recommendations for estimating Cronbach's alpha (Ariffin, 2022). Data from the pilot study were analysed using IBM SPSS Statistics version 26.0.

2.2 *Ethical Considerations*

This project formed part of a broader initiative to design a CPR refresher training module for healthcare providers. Ethical approval was secured from the National Medical Research Registry (NMRR-ID-25-01810-GNM (IIR)) and the Universiti Teknologi MARA Research Ethics Committee (REC/03/2025(ST/MR/45)).

3. Results

3.1 *Content Validity*

The content validity exercise demonstrated strong agreement among experts regarding the relevance of all 25 items, with each item achieving an I-CVI of 1.00. For clarity, 23 items reached perfect agreement, while two required revisions. Overall, the scale-level content validity indices (S-CVI/Ave and S-CVI/UA) indicated excellent agreement (0.99 and 0.88, respectively) (Yusoff, 2019a). Feedback was primarily related to grammar and precision of wording, which were addressed before the next phase. A detailed summary of the CV study is presented in Table 1.

Table 1: Content Validity Study Summary for Clarity (n=10)

Domain	Item	Expert										Expert in Agreement (n=10)	I-CVI	UA
		1	2	3	4	5	6	7	8	9	10			
Adult CPR Literacy	1	1	1	1	1	1	1	1	1	1	1	10	1	1
	2	1	1	1	1	1	1	1	1	0	1	9	0.9	0
	3	1	1	1	1	1	1	1	1	1	1	10	1	1
	4	1	1	1	1	1	1	1	1	1	1	10	1	1
	5	1	1	1	1	1	1	1	1	1	1	10	1	1
	6	1	1	1	1	1	1	1	1	1	1	10	1	1
	7	1	1	1	1	1	1	1	1	1	1	10	1	1
	8	1	1	1	1	1	1	1	1	1	1	10	1	1
	9	1	1	1	1	1	1	1	1	1	1	10	1	1
	10	1	1	1	1	1	1	1	1	1	1	10	1	1
	11	1	1	1	1	1	1	0	1	1	1	9	0.9	0
	12	1	1	1	1	1	1	1	1	1	1	10	1	1
	13	1	1	1	1	1	1	1	1	1	1	10	1	1
	14	1	1	1	1	1	1	1	1	1	1	10	1	1
	15	1	1	1	1	1	1	1	1	1	1	10	1	1
	16	1	1	1	1	1	1	1	1	1	1	10	1	1
	17	1	1	0	1	1	1	1	1	1	1	10	1	1
	18	1	1	1	1	1	1	1	1	1	1	10	1	1

	19	1	1	1	1	1	1	1	1	1	10	1	1
	20	1	1	1	1	1	1	1	1	1	10	1	1
	21	1	1	1	1	1	1	1	1	1	10	1	1
	22	1	1	1	1	1	1	1	1	1	10	1	1
	23	1	0	1	1	1	1	1	1	1	9	0.9	0
	24	1	1	1	1	1	1	1	1	1	10	1	1
	25	1	1	1	1	1	1	1	1	1	10	1	1
Proportion Relevancy		1	0.96	0.96	1	1	1	1	1	0.96	1	**S-CVI/Ave**	**0.99**	
												S-CVI/UA		**0.88**
Average proportion of items used as relevance across 10 expert												**0.99**		

3.2 *Face Validity*

Face validity testing confirmed the clarity and comprehensibility of the revised items. All 25 items achieved an I-FVI of 1.00 for comprehension, with slight adjustments made to two items for clarity. The S-FVI/Ave was 0.98, and the S-FVI/UA was 0.86, exceeding recommended thresholds (Marzuki et al., 2018; Yusoff, 2019b). A summary of the I-FVI and S-FVI calculations for both comprehension and clarity is provided in Table 2.

Table 2: Face Validity Study Summary for Clarity (n=10)

Domain	**Item**	**Expert**										**Expert in Agreement (n=10)**	**I-CVI**	**UA**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**			
Adult CPR Literacy	1	1	1	1	1	1	1	1	1	1	1	10	1	1
	2	1	1	1	1	1	1	1	1	1	1	10	1	1
	3	1	1	1	1	1	1	1	1	1	1	10	1	1
	4	1	1	0	1	1	1	1	1	1	1	9	0.9	0
	5	1	1	1	1	1	1	1	1	1	1	10	1	1
	6	1	1	1	1	1	1	1	1	1	1	10	1	1
	7	1	1	1	1	1	1	1	1	1	1	10	1	1
	8	1	1	1	1	1	1	1	1	1	1	10	1	1
	9	1	1	0	1	1	1	1	1	1	1	9	0.9	0
	10	1	1	1	1	1	1	1	1	1	1	10	1	1
	11	1	1	1	1	1	0	1	1	1	1	9	0.9	0
	12	1	1	1	1	1	1	1	1	1	1	10	1	1
	13	1	1	0	1	1	1	1	1	1	1	9	0.9	0
	14	1	1	1	1	1	1	1	1	1	1	10	1	1
	15	1	1	1	1	1	1	1	1	1	1	10	1	1
	16	1	1	1	1	1	1	1	1	1	1	10	1	1
	17	1	1	1	1	1	1	1	1	1	1	10	1	1
	18	1	1	1	1	1	1	1	1	1	1	10	1	1
	19	1	1	1	1	1	1	1	1	1	1	10	1	1
	20	1	1	1	1	1	1	1	1	1	1	10	1	1
	21	1	1	1	1	1	1	1	1	1	1	10	1	1
	22	1	1	1	1	1	1	1	1	1	1	10	1	1
	23	1	1	1	1	1	1	1	1	1	1	10	1	1
	24	1	1	1	1	1	1	1	1	1	1	10	1	1
	25	1	1	1	1	1	1	1	1	1	1	10	1	1
Proportion Relevancy		1	1	0.88	1	1	0.96	1	1	1	1	**S-CVI/Ave**	**0.98**	
												S-CVI/UA		**0.86**
Average proportion of items used as relevance across 10 experts												**0.98**		

3.3 *Pilot Study*

Pilot testing of the refined questionnaire among 43 respondents yielded a Cronbach's Alpha of 0.753, demonstrating acceptable internal consistency for medical education instruments (Tavakol & Dennick, 2011). The demographic profile of these respondents is detailed in Table 3. One item (K11) was excluded from the final version due to zero variance, resulting in a final instrument of 24 items. Table 4 shows respondents' responses to each item.

Table 3: Respondents' Demographic Profile (n=43)

Variables	**n (%)**	**Mean (SD)**
Gender		
Male	29 (67.4)	
Female	14 (32.6)	
Age		36.12 (6.730)
Occupation		
Asst. Medical Officer	35 (81.4)	
Staff Nurse	7 (16.3)	
Community Nurse	1 (2.3)	
Service Years		12.19 (6.522)
Workplace		
Health Clinic	30 (69.8)	
Health Office	3 (7.0)	
Others	10 (23.3)	
Education Level		
Certificate	1 (2.3)	
Diploma	23 (53.5)	
Adv. Diploma / Post-Basic Cert.	11 (25.6)	
Bach. Degree	7 (16.3)	
Post-Graduate	1 (2.3)	
Attending Cardiac Arrest Past 12 months?		
No Case	17 (39.5)	
Less than 10 cases	20 (46.5)	
More than 10 cases	6 (14.0)	
Attending BLS Course?		
Yes	42 (97.7)	
No	1 (2.3)	
Years of Attending BLS Courses		
Before 2020	4 (9.3)	
After 2020	39 (90.7)	
Number of BLS Course Attended		
Never	1 (2.3)	
1-5 Times	32 (74.4)	
More than 6 Times	10 (23.3)	
Performing CPR for the Past 12 Months?		
Yes	23 (53.5)	
No	20 (46.5)	
Experiences in the Emergency Department or ICU		
Yes	30 (69.8)	
No	13 (30.2)	
BLS Instructor?		
Yes	12 (27.9)	
No	31 (72.1)	

Table 4: Respondents' Level of Literacy

Item No.	**Question focus**	**Correct, n (%)**	**False, n (%)**
K1	Langkah pertama apabila menemui mangsa dewasa yang tidak sedarkan diri *(First step when finding an unresponsive adult victim)*	40 (93)	3 (7)
K2	Tindakan awal terhadap mangsa henti jantung mengikut algoritma NCORT *(Initial action for a cardiac arrest victim according to the NCORT algorithm)*	30 (69.8)	13 (30.2)

K3	Maksud huruf 'A' dalam Basic Life Support (NCORT) *(Meaning of 'A' in BLS – NCORT)*	42 (97.7)	1 (2.3)
K4	Tindakan apabila pesakit rebah di kaunter triage klinik *(Action when a patient collapses at a clinic triage counter)*	35 (81.4)	8 (18.6)
K5	Kedudukan tangan yang betul semasa CPR dewasa *(Correct hand placement during adult CPR)*	42 (97.7)	1 (2.3)
K6	Kadar tekanan dada yang disyorkan dalam CPR dewasa *(Recommended chest compression rate in adult CPR)*	39 (90.7)	4 (9.3)
K7	Kedalaman tekanan dada yang disyorkan dalam CPR dewasa *(Recommended chest compression depth in adult CPR)*	38 (88.4)	5 (11.6)
K8	Nisbah tekanan dada kepada ventilasi bagi CPR dewasa penyelamat tunggal *(Compression-to-ventilation ratio for adult single rescuer)*	41 (95.3)	2 (4.7)
K9	Teknik tekanan dada yang betul mengikut NCORT *(Correct chest compression technique according to NCORT)*	42 (97.7)	1 (2.3)
K10	Kepentingan membenarkan dada kembali sepenuhnya selepas tekanan *(Importance of allowing full chest recoil)*	32 (74.4)	11 (25.6)
K11	Tindakan seterusnya jika tiada nadi selepas 2 minit CPR *(Next step if no pulse after 2 minutes of CPR)*	43 (100)	0 (0)
K12	Situasi membolehkan CPR dihentikan semasa resusitasi solo *(When to stop CPR during solo resuscitation)*	37 (86)	6 (14)
K13	Keadaan yang memerlukan CPR, kecuali *(Condition requiring CPR, except)*	33 (76.7)	10 (23.3)
K14	Petunjuk CPR dewasa yang tidak berkualiti *(Indicators of poor-quality adult CPR)*	39 (90.7)	4 (9.3)
K15	Urutan penggunaan AED yang betul semasa CPR *(Correct AED usage sequence)*	26 (60.5)	17 (39.5)
K16	Situasi yang memerlukan langkah berjaga-jaga semasa penggunaan AED, kecuali *(Situation requiring caution with AED, except)*	26 (60.5)	17 (39.5)
K17	Tindakan apabila AED mengesan ritma tidak boleh renjatan *(Action if AED detects a non-shockable rhythm)*	36 (83.7)	7 (16.3)
K18	Penempatan pad AED bagi pesakit dengan alat perentak jantung *(AED pad placement in pacemaker patients)*	29 (67.4)	14 (32.6)
K19	Penggunaan AED dalam mangsa lemas *(AED use in a drowning victim)*	37 (86)	6 (14)
K20	Peranti yang meningkatkan kelangsungan hidup dalam CPR dewasa *(Device improving survival in adult CPR)*	39 (90.7)	4 (9.3)
K21	Langkah memastikan CPR berkualiti tinggi, kecuali *(Ensuring high-quality CPR, except)*	26 (60.5)	17 (39.5)
K22	Tindakan terbaik apabila penyelamat kedua tiba *(Best action when a second rescuer arrives)*	34 (79.1)	9 (20.9)
K23	Tindakan yang mengganggu CPR berkualiti tinggi *(Action interrupting high-quality CPR)*	36 (83.7)	7 (16.3)
K24	Rantaian kelangsungan hidup dalam persekitaran klinik, kecuali *(Chain of survival in a clinic setting, except)*	37 (86)	6 (14)
K25	Masa renjatan AED perlu diberikan *(When to deliver an AED shock)*	38 (88.4)	5 (11.6)

4. Discussion

This study developed and validated the Adult CPR Literacy Questionnaire (ACPR-L) as a Malay-language, knowledge-based instrument for assessing adult cardiopulmonary resuscitation literacy among primary healthcare providers. The development process was guided by the National Committee on Resuscitation Training (NCORT) recommendations and strengthened through a structured validation approach involving both subject-matter experts and intended end users. The unanimous agreement on the relevance of items indicates that the questionnaire adequately represents essential domains of adult CPR practice, including procedural sequence, compression quality parameters, and automated external defibrillator (AED) use. In addition, the high face validity indices suggest that the items are clearly understood and linguistically appropriate for routine use in local primary healthcare settings, consistent with recommended practices in instrument development (Beck, 2020; Yusoff, 2019a; Yusoff, 2019b).

The pilot findings demonstrated acceptable internal consistency for a multi-domain knowledge instrument. This level of reliability is appropriate given that the ACPR-L does not aim to measure a

single homogeneous construct, but rather encompasses several interrelated components of adult CPR practice. As highlighted by Tavakol and Dennick (2011), a very high Cronbach's alpha is not necessarily expected or desirable for educational instruments assessing diverse content areas. In the present study, certain items exhibited limited variability due to high correct response rates, reflecting fundamental life-saving knowledge that healthcare providers are generally expected to possess. One item with zero variance was removed to improve item discrimination, while preserving the overall content coverage and alignment with NCORT guidelines.

The use of both expert review and target-user evaluation provides robust validity evidence for the ACPR-L and aligns with established frameworks for content and response process validation in health sciences education (Beck, 2020; Yusoff, 2019a). Rather than maximising internal consistency at the expense of content representativeness, the present study prioritised clinical relevance and guideline fidelity. This approach enhances the instrument's educational and practical utility, particularly for needs assessment and evaluation of refresher training interventions in primary healthcare settings.

The absence of a validated Malay-language instrument to assess adult CPR literacy has previously limited researchers' and policymakers' ability to generate reliable data on training needs and knowledge gaps among healthcare providers. The ACPR-L addresses this gap by offering a contextually appropriate and psychometrically tested tool. Its application may support targeted refresher training programmes, inform curriculum design, and facilitate longitudinal monitoring of CPR literacy, which is particularly important in settings with infrequent exposure to cardiac arrest events (Mafukata, 2014; Tomas & Kachekele, 2023).

Several limitations should be acknowledged. The ACPR-L focuses exclusively on adult CPR and does not extend to paediatric or obstetric resuscitation scenarios. In addition, the pilot study involved a relatively small sample drawn from primary healthcare settings, which may limit generalisability. Nevertheless, the study provides a strong foundation for future work, including validation in larger and more diverse samples, assessment of test–retest reliability, and potential adaptation or translation of the instrument for use in other clinical or linguistic contexts.

5. Conclusion

The ACPR-L questionnaire has demonstrated strong validity and acceptable reliability as a tool for assessing adult CPR literacy in Malay-speaking healthcare providers. Its deployment can help identify knowledge gaps, guide curriculum development, and shape refresher training initiatives. The validated instrument, therefore, represents a significant step towards strengthening resuscitation readiness within Malaysia's healthcare system.

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