International Emergency Nursing 75 (2024) 101490

Contents lists available at ScienceDirect

International Emergency Nursing

journal homepage: www.elsevier.com/locate/aaen

Design and construct of an assessment tool for the handover of critical patient the in urgent care and emergency setting

Ruth Tortosa-Alted [a,b], Marta Berenguer-Poblet [b,e], Silvia Reverté-Villarroya [b,e,*], José Fernández-Sáez [b,c], Ferran Roche-Campo [a], Montserrat Alcoverro-Faneca [d], Rebeca Ferré-Felipo [a,b], Immaculada Lleixà-Benet [a,b], Estrella Martínez-Segura [a,b]

[a] Hospital de Tortosa Verge de la Cinta, Catalan Health Institute, Pere Virgili Health Research Institute, Carretera Esplanetes, 14, 43500 Tortosa, Spain
[b] Nursing Department, Campus Terres de l'Ebre, Universitat Rovira i Virgili, Avenue Remolins, 13-15, 43500 Tortosa, Spain
[c] Terres de l'Ebre Research Suport Unit, Fundació Institut Universitari per a la recerca a l'Atenció Primària de Salut Jordi Gol i Gurina (IDIAPJGol), Tortosa, Spain
[d] System of Medical Emergencies, Carrer Pablo Iglesias, 101-115, 08908 L'Hospitalet de Llobregat, Spain
[e] Research Group on Advanced Nursing (CARING)—161, Universitat Rovira I Virgili, 43002 Tarragona, Spain

ARTICLE INFO

Keywords:
Emergency medical services
Patient handover
Prehospital emergency care
Psychometrics
Surveys and questionnaires

ABSTRACT

Objectives: To design and construct an assessment tool for the handover of critical patients in the urgent care and emergency setting.
Research methodology: This metric and descriptive study comprised two phases in accordance with the Clinical practice guidelines for A Reporting Tool for Adapted Guidelines in Health Care: The RIGHT-Ad@pt Checklist. In the first phase, the identification and selection of items related to the handover of critical patients were performed by consensus of a group of experts. The second phase consisted of two stages. In the first stage, the items were selected by applying the e-Delphi technique across two assessment rounds and in the second stage, the items were subjected a pilot test in a real critical patient handover scenario. Professionals from different disciplines and work areas (hospital and prehospital) caring for critically ill patients in the urgency and emergency setting participated in each of the phases.
Results: A total of 58 critical patient care, and urgent and emergency care professionals participated in the design and construction of the assessment tool. The initial list consisted of 14 categories and 57 items, which were reduced to 28 items grouped into five categories after the intervention of the participants. The content validity index (CVI) of the instrument was 0.966.
Conclusions: This study describes an assessment tool developed in Spanish-language designed to assess the handover of critical patients in the urgent care and emergency setting. This tool has a high CVI, and is the only currently available tool that consider all of the dimensions and characteristics of the handover process.
Implications for clinical practice: The assessment tool developed in this study could enable critical care professionals in their clinical practice to work in a systematic way, universalizing the handover of critically ill patients in the urgent care and emergency setting through scientifically proven guidelines.

1. Introduction

Handover is the process during which the responsibility for a patient's care is transferred from one health care provider to another [1]. Handover in the urgent care and emergency setting occurs when two levels of care for critically ill patients join, and requires the accurate transfer of information that ensures optimal subsequent care of the patient [2–6]. Handover is considered a concern among leading patient safety groups as communication problems account for 60 % of the sentinel events reported to the Joint Commission, in addition to causing an increase in the expense and hospital stay [1,4–7]. It is important to note that due to the characteristics of urgent and emergency care, the

* Corresponding author at: Nursing Department, Campus Terres de l'Ebre, Universitat Rovira i Virgili, Avenue Remolins, 13-15, 43500 Tortosa, Spain.
E-mail addresses: rtortosa.ebre.ics@gencat.cat (R. Tortosa-Alted), marta.berenguer@urv.cat (M. Berenguer-Poblet), silvia.reverte@urv.cat (S. Reverté-Villarroya), jfernandezsa.ebre.ics@gencat.cat (J. Fernández-Sáez), froche.ebre.ics@gencat.cat (F. Roche-Campo), montserratalcoverro@gencat.cat (M. Alcoverro-Faneca), rferref.ebre.ics@gencat.cat (R. Ferré-Felipo), imlleixa.ebre.ics@gencat.cat (I. Lleixà-Benet), esmartinez.ebre.ics@gencat.cat (E. Martínez-Segura).

https://doi.org/10.1016/j.ienj.2024.101490
Received 13 August 2023; Received in revised form 22 June 2024; Accepted 6 July 2024
Available online 13 July 2024
1755-599X/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

handover practice may be vulnerable to error [7]. Furthermore, as there are different levels of care for critically ill patients, the handover is the only chance for professionals to exchange information [8], which may aggravate communication issues among healthcare professionals in the field. To mitigate this reality, The World Health Organization (WHO) promoted the World Alliance for Patient Safety in 2005 [9], in which six areas of action were identified, with one of them being communication during patient handover [10,11].

Recently, some authors have shown the lack of consensus in carrying out the handover, justified by the existence of heterogeneous literature and substantial practical variability [12,13]. Likewise, even though numerous handover evaluation tools have been reported in the literature, there is a lack of reliable and experienced instruments [14]. A systematic review published in 2017 (Davis et al., 2017) identified all the handover assessment tools available in the literature from 2008 to 2015. Of the 32 instruments analysed, only one, the dINAMO checklist [15], refers to the evaluation of handover in emergencies but does not have a validated version to date. In 2021 another systematic review [14] identified three validated tools for handover in the urgent care and emergency setting [16–18] and presented certain deficiencies in their methodological quality and psycho-metric properties. Therefore, the literature provides few validated assessment tools for the handover of critical patients in the urgent care and emergency setting. Despite being a subject of great interest and concern for critical care professionals as well as national and international organizations, efforts to universalize the process have not yet been consolidated and the handover of critical patients in the urgent care and emergency setting remains in an incipient phase.

Thus, we aimed to update and deepen the research on the handover of critical patients through the creation and validation of a robust assessment tool, which can help to end the ambiguity and reach a theoretical and practical consensus regarding the handover of critical patients in the urgent care and emergency setting.

2. Objectives

To design an assessment tool for the handover of critical patient in the urgent care and emergency setting by and for professionals working in this field.

3. Methods

3.1. Design

This metric and descriptive study had two phases (Fig. 1) in accordance with the Clinical practice guidelines for A Reporting Tool [19] for Adapted Guidelines in Health Care: The RIGHT-Ad@pt Checklist.

In the first phase, the items were selected by a discussion group consisted of experts from different disciplines in the field of urgent care and emergency. The second phase comprised two stages: in the first, a selection of items was obtained by applying the e-Delphi technique, and in the second stage, a pilot test was carried out.

The exclusion criterion was that the professionals chosen in each phase or stage had not participated in any previous phase or stage. Thus, different professionals were included in each of the phases and stages.

3.2. Participants and setting

The participants were comprised of professionals involved in the care of critically ill patients, including health care professionals from the emergency department and intensive care unit (ICU) at the (XXX hospital) and emergency medical technicians from the Emergency Medical System (EMS) of Catalonia [20].

The sample size of the first phase was calculated according to Lynn's recommendations [21], and we selected eight critical care professionals to participate in the discussion group. In the second phase, the sample size was estimated by prioritizing the qualities of the professionals [22], and we included 30 participants in the first stage (e-Delphi) and 20 in the second (pilot test). Both phases included doctors, nurses and technicians from the hospital and pre-hospital environment (Table 1).

3.3. Data collection

The variables collected during the two phases of the study were the sociodemographic (age and gender) and professional (discipline, ward, and years of experience) characteristics of the participants in both phases (Table 1).

3.3.1. First phase

The data collection was distributed in two rounds of evaluation (Fig. 2). In the first round, the experts received a list designed by the principal researcher containing the items and categories identified in the literature through the Google Forms® digital platform. The participants responded whether they were agreed or disagreed with the inclusion of

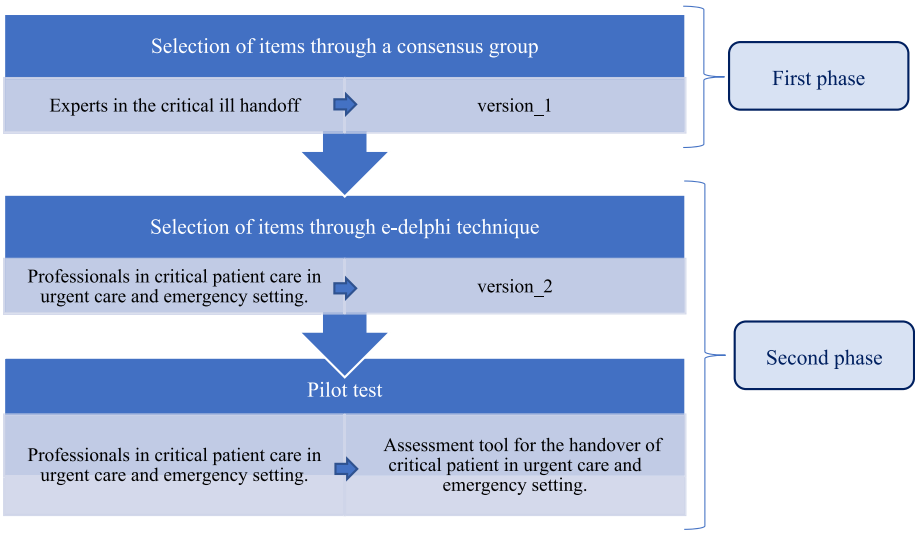


Fig. 1. Design and construct of an assessment tool.

Table 1
Sociodemographic and professionals' data.

		Panel of experts	First round e-Delphi	Second round e-Delphi	Pilot test
n		8	26	23	20
Age	average score	49.38	41.50	41.87	42.5
	DS	10.09	9.27	9.49	12.64
Gender (%)	Men	50	42.3	43.5	25
	Women	50	57.7	56.5	75
Discipline (%)	Physician	37.5	42.3	39.1	35
	Nurse	50	50	52.2	65
	Technical	12.5	7.7	8.7	0
Ward (%)	ICU	25	38′5	39.1	35
	Urgences	25	34.6	34.8	30
	SEM	50	26.9	26.1	35
Years of experience	average score	17.88	12.73	13.35	12.2
	DS	7.33	8.81	8.65	10.54

Statistical test used: frequency (n), percentage (%), average score, standard derivation (DS).

each of the items in the tool, justifying their response. In addition, they had a free text field in which they could offer suggestions, propose new items, and express comments. After completion, the principal author analysed the responses from the experts and invited them to participate in a second round of assessment to evaluate the list of items and categories identified in the first round. After again considering the responses of the experts, the principal author called them for a consensus meeting. The meeting was virtual using the Microsoft Teams® application and was directed by the principal author with the support of a member of the research team who is an expert in focus group management to guarantee the equitable intervention of all participants. In the meeting, the different points of view were discussed and the version_1 of the instrument was agreed upon (Fig. 2).

3.3.2. *Second phase*

The data collection in the second phase was also distributed in two stages (Fig. 2).

- *First stage:* Version_1 of the tool was subjected to the e-Delphi technique through two rounds of evaluation. In the first round, the

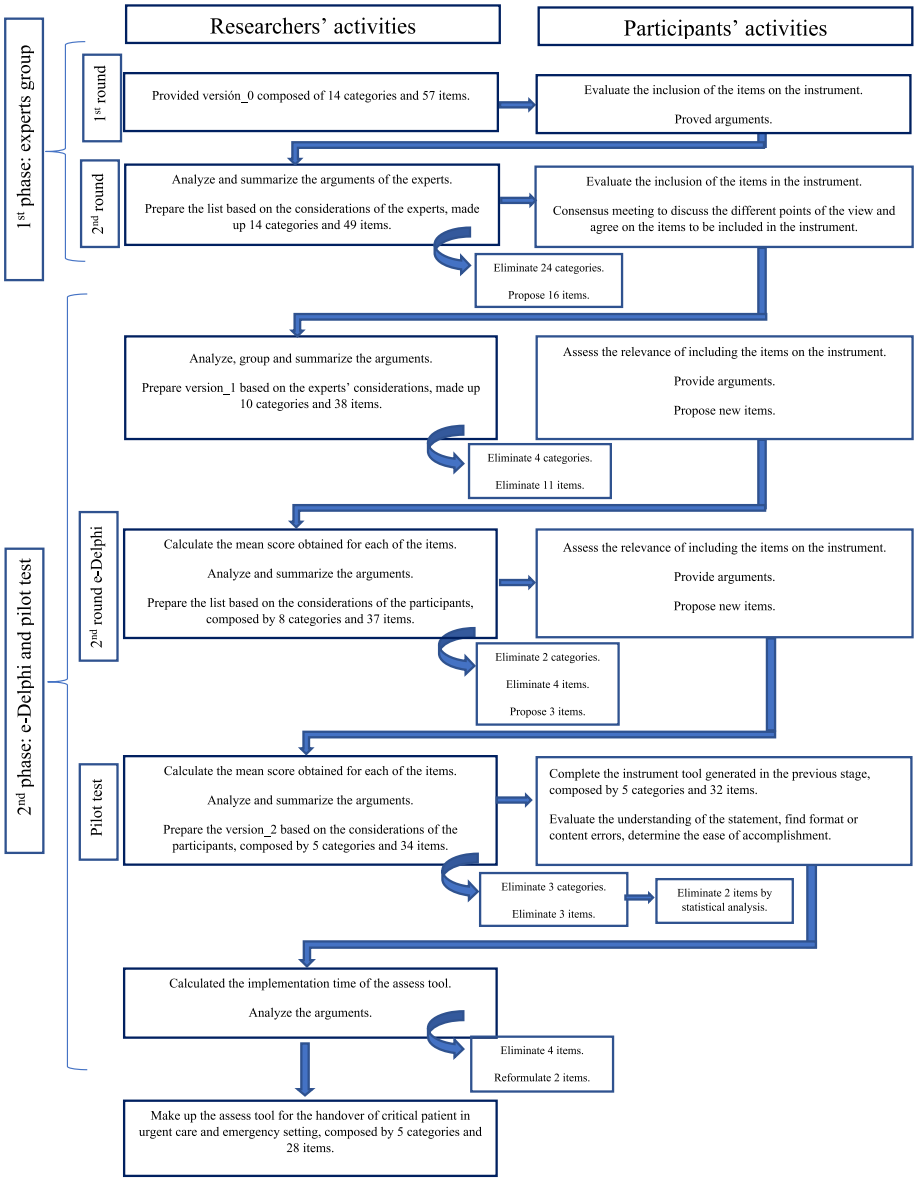


Fig. 2. Instrument development.

participants were contacted by email, given the instructions for the intervention, and provided with a link to the list of items and categories designed with the Google Forms® application. They were required to evaluate the relevance of the included items in the assessment tool for the handover of critical patients using a Likert scale between 1: nothing relevant; and 4: very relevant. For items with scores < 3, they could provide comments, suggestions, or proposals for new items through a free text field.

In the second round of assessment, the participants received the redesigned list again through the same route of administration with the addition of the average score obtained for each of the items, as well as the new items proposed in the previous round. The goal was to determine the agreement or disagreement with the average score achieved for each item. In case of disagreement or for newly incorporated items, the relevance of the items was assessed according to the same method used in the previous round. The participants had to submit the reasons for disagreement in the free text field.

Finally, after analysing the data, items with an adjusted Content Validity Ratio (RVC') ≥ 0.5823 [23] (Table 2) were considered eligible for inclusion in the assessment tool, giving rise to version_2 of the assessment tool for the handover of critical patients in the urgent care and emergency setting.

- *Second stage:* Data collection took place during the application of the pilot test. The professionals involved were personally contacted and given instructions for participation. Their collaboration in this stage was aimed at completing the assessment tool generated in the previous stage by participating as a sender or receiver in a handover of critical patients that took place in the study area. Data collection was facilitated by the creation of a QR code that the principal researcher placed on the door of each box where a handover of these characteristics could take place in the study area, and the participants could scan it with a mobile device or tablet linked directly to the list designed with the Microsoft Forms® platform. The purpose of this stage was to evaluate the understanding of the handover tool, identify format or content errors, determine the ease of completion, and measure the completion time.

Table 2
CVR' results.

Item	Mean score	Agreements	CVR	CVR'	Item inclusion
1	3,60	23	1,0000	1,0000	YES
2	3,53	23	1,0000	1,0000	YES
3	3,58	22	0,9130	0,9565	YES
4	3,30	21	0,8261	0,9130	YES
5	3,37	21	0,8261	0,9130	YES
6	3,87	23	1,0000	1,0000	YES
7	3,74	23	1,0000	1,0000	YES
8	3,74	23	1,0000	1,0000	YES
9	3,53	22	0,9130	0,9565	YES
10	3,48	22	0,9130	0,9565	YES
11	3,70	23	1,0000	1,0000	YES
12	3,54	22	0,9130	0,9565	YES
13	3,44	22	0,9130	0,9565	YES
14	3,40	23	1,0000	1,0000	YES
15	2,75	5	−0,5652	0,2174	NO
16	3,07	20	0,7391	0,8696	YES
17	3,21	22	0,9130	0,9565	YES
18	3,31	21	0,8261	0,9130	YES
19	3,53	23	1,0000	1,0000	YES
20	3,46	22	0,9130	0,9565	YES
21	3,37	22	0,9130	0,9565	YES
22	3,06	20	0,7391	0,8696	YES
23	3,32	22	0,9130	0,9565	YES
24	3,56	23	1,0000	1,0000	YES
25	2,16	2	−0,8261	0,0870	NO
26	3,35	22	0,9130	0,9565	YES
27	3,63	22	0,9130	0,9565	YES
28	3,68	23	1,0000	1,0000	YES
29	3,70	23	1,0000	1,0000	YES
30	3,56	23	1,0000	1,0000	YES
31	3,52	23	1,0000	1,0000	YES
32	3,79	23	1,0000	1,0000	YES
33	3,23	22	0,9130	0,9565	YES
34	3,32	22	0,9130	0,9565	YES
CVI				**0,9660**	

CVR: Content Validity Ratio. CVR': Content Validity Ratio ajusted by Tistan-López 2008. CVI: Content Validity Index.

3.4. Data analysis

A descriptive analysis of all variables included in the study was conducted by calculating the frequency and percentage of all categorical variables (gender, discipline, ward) and the average score and standard deviation (DS) of all quantitative variables (age, years of experience) (Table 1).

For the analysis of content validity in the first stage of the second phase, the Lawshe Model (1975) modified by Tristán (2008) was used [23]. We calculated the CVR' for each of the items and the content validity index (CVI) for the global scale (Table 2). We considered that the participants agreed with the inclusion of an item in the assessment tool when they scored 3 or 4 and disagreed when the score was 1 or 2.

In the pilot test, we calculated the mode, median and interquartile range for the evaluation of the satisfaction item in the handover. To assess the time spent in completing the questionnaire, we calculated the median and interquartile range.

3.5. Ethical approval

This study was approved by the medicines Research Ethics Committee (CEIm) of the Pere iVirgili Health Research Institute (Ref. CEIM:098/2019).

4. Results

4.1. First phase

Eight experts were included in the discussion group, with a mean 17.88 ± 7.33 years of experience in the care of critically ill patients or urgent and emergency care. Among them, there were four men and four women, and 50 % of the experts belonged to the hospital cluster, while the other 50 % belonged to the prehospital group (Table 1).

Version_0 of the assessment tool for critical patient was developed after the identification of possible items in the literature and consisted of 57 items grouped into 14 categories: preparation [24], identification [24–26], content/information [6,24–27], information quality [28,29], environment/infrastructure [6,24,26,27], clinical judgment [26,27], interaction and support [26,27,29], professionalism [26–28], family [24,26], responsibility [6], satisfaction [26,27], team awareness [6], culture [6] and conclusion [24,25]. After the evaluation, the eight experts decided to include 33 of the 57 items from the initial list and the remaining 24 were excluded. In addition, they proposed 16 new items to be included in the design of the assessment tool. The resulting list of items was once again reevaluated by the group of experts through a new consensus technique in which 11 items and four categories were eliminated, including preparation [24], environment/infrastructure [6,24,26,27], clinical judgment [26,27], and responsibility [6], giving rise to version_1 consisting of 38 items distributed in 10 categories (Fig. 2).

4.2. Second phase

- First stage: The e-Delphi technique was applied in two rounds. In the first round of assessment, 26 professionals from the field of critical patient care, urgencies, and emergencies participated; 42.3 % were men and 57.7 % were women. Additionally, 38.5 % participants

worked in the ICU, 34.6 % in hospital urgencies, and 26.9 % in the EMS, with a mean 12.73 ± 8.81 years of service experience. Nurses represented 50 % of the sample, doctors 42.3 %, and technicians 7.7 % with a mean age of 41.50 ± 9.27 years. In the second round of assessment, there was a loss of three participants, who did not respond to the form, leaving a total of 23 participants (Table 1).

The 26 participants in the first round of evaluation eliminated four items out of the 38 that made up version_1 and two categories, including team awareness [6] and culture [6]. At the same time, they proposed three new items that were not in the initial list, generating a new list made up of 37 items grouped into eight categories (Fig. 2).

In the second round of assessment, after feedback from the 23 participants, three items were excluded, reducing the remaining number of items in the tool to 34. The categories were also reduced to five after the removal of three of them: interaction and support [26,27,29], professionalism [26–28] and satisfaction [26,27], because the items in these categories could be included as items in other dimensions (Fig. 2).

On statistical analysis, a total of 32 items in the list presented a CVR' ≥ 0.5823, thus fulfilling the inclusion criteria for the design of the assessment tool for critically ill patient in the urgent care and emergency setting, according to the Lawshe Model (1975) modified by Tristán [23] for the content validity analysis (Table 2).

Likewise, version_2 of the assessment tool consisted of 32 items grouped into five categories (Fig. 2). The global CVI for the whole tool was 0.9660 (Table 2), and a value > 0.8 indicates that the instrument is suitable for application [21,23].

- Second stage: The pilot test was implemented in which 20 professionals from the field of critical patient care and urgent and emergency care participated; 25 % were men and 75 % were women, and aged 42.5 ± 12.64 years. Among them, 35 % worked in the ICU, 30 % in hospital urgencies, and 35 % in the EMS with a mean 12.2 ± 10.54 years of ward experience. Nurses accounted for 65 % of the sample and doctors 35 %, while no health emergency technician participated (Table 1). Among the participants in the handover of critical patients, 45 % comprised those sending patients and 55 % those receiving patients. The median time spent by the participants to fill out the instrument was 7 min and 45 s with an interquartile range (IQR) of 5 min and 32 s.

After analysing the responses of the participants in the pilot test, four items were eliminated and the wording of two was reformulated to improve their understanding.

Thus, the assessment tool for the handover of critical patients in the urgent care and emergency setting generated in this study consists of 28 items grouped into five categories (Table 3).

5. Discussion

We found several handover assessment tools in the literature [4,5,8,12,15,17,24,25,27–29] but most are generic and lack specificity. In addition, the assessment tools for handovers in urgent and emergency care show deficiencies in the methodological quality and psychometric properties [14,16–18]. Likewise, most handover assessment tools were developed by conducting semi-structured interviews of a focus group based on the literature [12,27,29] and the researchers' own experience [27]. The assessment tool developed in this study measures all the dimensions identified in the literature related to the handover of critically ill patients in the urgent care and emergency settings. Although several handover assessment tools have been reported in the literature, none of them is comprehensive. Only the transfer of information was evaluated in the dINAMO checklist [15] and ISBAR [25]. In the handover evaluation scale (HES) [29], the 14 items of the instrument were distributed into three factors (quality of the information, relevance of the information, and interaction and support). In the transfer of care sign-out

Table 3
Preliminary, unvalidated Spanish-language version and English-language translation of the assessment tool for the handover of critically ill patients in urgent care and emergency settings.

Item	Item description	Yes	No
	Dimension I: Identification		
1	El profesional emisor se identifica y se presenta al profesional receptor. *The sender identifies and introduces him or herself to the receiving professional.*		
2	El profesional receptor se identifica y se presenta al profesional emisor. *The receiver identifies and introduces him or herself to the sender.*		
3	El profesional emisor presenta al paciente y acompañantes. *The sender introduces the patient and his/her companions.*		
4	El profesional receptor se presenta y recibe al paciente y acompañantes. *The receiver introduces him or herself and receives the patient and his/her companions.*		
5	Se verifica y se confirma la identidad del paciente mediante la identificación activa. *The patient's identify is verified and confirmed through active identification.*		
	Dimension II: Communication		
6	Se comunica el motivo de ingreso o el motivo de activación del servicio de emergencias. *The reason for admission or for activating emergency services is clearly communicated.*		
7	Se comunica los antecedentes más relevantes. *The key aspects of the patient's clinical history are clearly communicated.*		
8	Se comunica las alergias. *All allergies are clearly communicated.*		
9	Se comunica los signos vitales según la valoración ABCDE. *The patient's vital signs are clearly communicated (ABCDE assessment).*		
10	Se comunica el estado clínico del paciente como estable o inestable y el progreso clínico. *The patient's clinical status is reported as either stable or unstable.*		
11	Se comunica los tratamientos y maniobras realizados. *The treatments and maneuvers performed are clearly communicated.*		
12	Se establece las tareas pendientes. *All pending tasks are indicated.*		
13	Se comunica las posibles complicaciones. *Possible complications are clearly communicated.*		
14	Se menciona las pertenencias del paciente y quién se hace responsable del cuidado/almacenaje de éstas. *The patient's personal belongings and the person responsible for them are indicated.*		
	Dimension III: Quality		
17	La transferencia se realiza a pie de cama permitiendo la comprobación visual del paciente. *The handover is performed at the bedside, thus allowing for visual inspection of the patient.*		
18	La transferencia se realiza de forma estructurada mediante un mnemotécnico para la estandarización de la comunicación. *The handover is carried out in a structured manner using a mnemonic device to standardize communication.*		
19	La transferencia tiene lugar en un ambiente silencioso. *The handover is carried out in a quiet setting.*		
20	La transferencia ocurre sin interrupciones ni distracciones. *The handover takes place without interruptions or distractions.*		
21	Existe la oportunidad de preguntar y entablar un diálogo para favorecer una mejor comprensión entre los profesionales. *The professionals involved in the handover have the opportunity to ask questions and speak with each other to ensure a clear understanding.*		
	Dimension IV: Family		
15	Se informa del entorno familiar y social del paciente. *The patient's family and social environment is clearly described.*		

(*continued on next page*)

Table 3 (*continued*)

	Item description	Yes	No
16	Se indica el contacto familiar/persona referente del paciente. *The patient's contact person (family or other) is clearly indicated.*		
22	Los profesionales mantienen informada a la familia sobre el estado de salud del paciente. *The professionals involved in the handover keep the family informed about the patient's health status.*		
23	Los profesionales muestran una actitud respetuosa hacia el paciente, familia y profesionales. *The professionals show a respectful attitude towards the patient, the family, and other professionals.*		
	Dimension V: Conclusion		
24	Se verifica la comprensión de la información transferida. *The professionals check to be sure that the information transferred has been understood.*		
25	El profesional emisor entrega la responsabilidad de cuidado del paciente. *The sender hands over the responsibility for the patient's care.*		
26	El profesional emisor entrega la documentación y registros de la atención al profesional receptor. *The sender hands over the patient's clinical records to the receiving professional.*		
27	El profesional receptor acepta la responsabilidad de cuidado del paciente. *The receiver accepts responsibility for the patient's care.*		
28	Con relación a la satisfacción, la cual implica proporcionar toda la información necesaria para el posterior cuidado del paciente, ¿cómo clasificarías la transferencia? *If satisfaction with the handover process is defined as having received all of the information needed to continue patient care, how satisfied are you with the handover?* 1 2 3 4 5 6 7 8 9 10 Not satisfied at all — Very satisfied		

Spanish-language version of the assessment tool.
English-language translation of the assessment tool.*
**Note that the English-language translation has been made solely for publication purposes. Therefore, the methods and the results of this research are associated with the Spanish-language version of the assessment tool.*
Sender: in the handover process, the professional who transfer responsibility for the patient's care.
Receiver: in the handover process, the professional who receives responsibility for the patient's care.

(TOCS) tool [28], the items were grouped into an objective and subjective checklist that include the evaluation of the quality of communication through synopsis, foresight, and professionalism. In the nurse-to-nurse bed side clinical handover tool [24], the transfer was assessed through the following domains: preparation, information exchange, patient inclusion, safety and environmental scan, and conclusion. Emergency medicine handoff tool [17] has also been developed the through the e-Delphi methodology, but it only includes four domains of the transfer: non-clinical information of the patient, clinical information of the patient, course of the emergency department, and state of the emergency service. Thus, despite the existence of different handover assessment instruments in the literature, only the instrument developed in this study provides a holistic assessment of all the dimensions comprising the process of handover of critically ill patients in the urgent care and emergency setting (Table 4).

Therefore, this instrument could help healthcare professionals in their clinical practice to work in a systematic way, universalizing the handover of critically ill patients in the urgent care and emergency settings through scientifically proven guidelines.

Nevertheless, it is necessary to continue research on this issue, by applying a metric analysis of reliability and validity to guarantee adequate psychometric properties of the assessment tool for the handover of critical patients in the urgent care and emergency settings.

Table 4
Elements evaluated in handover assessment tools.

Handover assessment tool	Characteristic evaluated												
	Identification		Standardization	Communication	Quality of information transferred	Location	Environmental factors	Patient and family participation	Clinical records	Responsibility	Professionalism	Interaction and support	Conclusion
	Patient	Professionals											
dINAMO	x		x	x									
ISBAR	x	x	x	x								x	
HES				x	x						x	x	
TOCS				x							x		
Nurse to nurse bedside clinical handover	x	x	x	x			x	x	x	x		x	x
Emergency medicine handoff tool	x			x		x							
Tool developed in this study	x	x	x	x	x	x	x	x	x	x	x	x	x

6. Limitations

One of the limitations of this study is that we could not compare the assessment tool to another scale that acts as a reference or gold standard due to the heterogeneity of the literature and scarcity of psychometrically adequate tools.

Although, we considered the participation of all disciplines involved in the handover of critical patients for the construction of the assessment tool, one limitation is that all of them belonged to the same health region (XXX) (–) and may have the same or similar peculiarities. Furthermore, the specific characteristics of the study sample may not be representative of healthcare professionals working with critically ill patients from other settings at a national or international level. In the future, it would be valuable to apply the handover assessment tool developed in this study to other areas of care for critically ill patients. The application of this tool to other areas would reduce or even eliminate the bias related to the limited geographical area in which the tool was assessed in the present study. More data from other studies would further strengthen the findings of the present study.

Another limitation is that this tool has not been validated, which means that we are unable to confirm the utility and reliability of this tool for the evaluation of the handover process in critical patients in urgent care and emergency settings. However, in the near future, we intend to conduct a psychometric analysis to determine the reliability and validity of this tool in those clinical settings.

A final limitation is that this study was based on the Spanish-language version of this tool. Although we have provided an English-language translation, this is only for the purpose of publication. The translation process could have altered some aspects of this tool, such as the emphasis on certain items and even the intended objectives. In this regard, we plan to perform a cross-cultural translation and adaptation of the assessment tool into English, which would then allow us to perform an international validation study and larger, comparative studies.

7. Conclusion

This study describes an assessment tool developed in Spanish-language designed to assess the handover of critical patients in the urgent care and emergency setting. This tool has a high content validity index, which was developed by using the consensus methodology and e-Delphi technique as well as the application of a pilot test to defined participants working in this field. To our knowledge, it is the first tool developed to date top consider all of the key dimensions and characteristics of the handover process.

Role of the funding source

This research was supported by Doctorate School Program Universitat Rovira i Virgili [2021]; Official College of Nurses of Tarragona [2021] and Fundació Doctor Ferran [2021 FFPI21/AE01].

CRediT authorship contribution statement

Ruth Tortosa-Alted: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Marta Berenguer-Poblet:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Conceptualization. **Sílvia Reverté-Villarroya:** Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Conceptualization. **José Fernández-Saez:** Software, Formal analysis. **Ferran Roche-Campo:** Data curation. **Montserrat Alcoverro-Faneca:** Data curation. **Rebeca Ferré-Felipo:** Data curation. **Immaculada Lleixà-Benet:** Data curation. **Estrella Martínez-Segura:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

R.T.A was supported by the Pla de Doctorats Industrial de Recerca i Universitats de la Generalitat de Catalunya [2021 DI 036]. The authors are grateful the Hospital de Tortosa Verge de la Cinta and the Universitat Rovira i Virgili the inclusions of R.T.A. in this program.

References

[1] Shook JE, Chun TH, Conners GP, Conway EE, Dudley NC, Fuchs SM, et al. Handoffs: transitions of care for children in the emergency department. Pediatrics 2016;138. https://doi.org/10.1542/peds.2016-2680.
[2] Sanjuan-Quiles Á, Hernández-Ramón MDP, Juliá-Sanchis R, García-Aracil N, Castejón-De La Encina ME, Perpiñá-Galvañ J. Handover of patients from prehospital emergency services to emergency departments: a qualitative analysis based on experiences of nurses. J Nurs Care Qual 2019;34:169–74. https://doi.org/10.1097/NCQ.0000000000000351.
[3] Wong MC, Yee KC, Turner P. Exploring socio-technical insights for safe nursing handover. Stud Health Technol Inform 2017;241:43–8. https://doi.org/10.3233/978-1-61499-794-8-43.
[4] Kessler C, Shakeel F, Gene Hern H, Jones JS, Comes J, Kulstad C, et al. An algorithm for transition of care in the emergency department. Acad Emerg Med 2013;20:605–10. https://doi.org/10.1111/acem.12153.
[5] Randell R, Wilson S, Woodward P, Galliers J. The ConStratO model of handover: a tool to support technology design and evaluation. Behav Inform Technol 2011;30:489–98. https://doi.org/10.1080/0144929X.2010.547220.
[6] Siemsen IMD, Madsen MD, Pedersen LF, Michaelsen L, Pedersen AV, Østergaard D, et al. Factors that impact on the safety of patient handovers: an interview study. Scand J Public Health 2012;40:439–48. https://doi.org/10.1177/1403494812453889.
[7] VanGraafeiland B, Foronda C, Vanderwagen S, Allan L, Bernier M, Fishe J, et al. Improving the handover and transport of critically ill pediatric patients. J Clin Nurs 2019;28:56–65. https://doi.org/10.1111/jocn.14627.
[8] Bakon S, Millichamp T. Optimising the emergency to ward handover process: a mixed methods study. Australas Emerg Nurs J 2017;20:147–52. https://doi.org/10.1016/j.aenj.2017.10.001.
[9] World Health Organization. Alianza mundial para la seguridad del paciente. La investigación en seguridad del paciente, 4; 2008.
[10] World Health Organization. La OMS lanza "Nueve soluciones para la seguridad del paciente" a fin de salvar vidas y evitar daños; 2007.
[11] World Health Organization. Centro Colaborador de la OMS sobre Soluciones para la Seguridad del Paciente. Preámbulo a las soluciones para la seguridad del paciente, 1; 2007.
[12] Manser T, Foster S, Gisin S, Jaeckel D, Ummenhofer W. Assessing the quality of patient handoffs at care transitions. Qual Saf Health Care 2010;19:1–5. https://doi.org/10.1136/qshc.2009.038430.
[13] Zakrison TL, Rosenbloom B, McFarlan A, Jovicic A, Soklaridis S, Allen C, et al. Lost information during the handover of critically injured trauma patients: a mixed-methods study. BMJ Qual Saf 2016;25:929–36. https://doi.org/10.1136/bmjqs-2014-003903.
[14] Tortosa-Alted R, Martínez-Segura E, Berenguer-Poblet M, Reverté-Villarroya S. Handover of critical patients in urgent care and emergency settings: a systematic review of validated assessment tools. J Clin Med 2021;10. https://doi.org/10.3390/jcm10245736.
[15] Rüdiger-Stürchler M, Keller DI, Bingisser R, Rüdiger-Stürchler M, Keller DI, Bingisser R. Emergency physician intershift handover -can a dINAMO checklist speed it up and improve quality? Emergency physician intershift handover – can a dINAMO checklist speed it up and improve quality? Swiss Med Wkly 2010;140. doi: 10.4414/smw.2010.13085.
[16] Sochet AA, Ryan KS, Miller W, Bartlett JL, Nakagawa TA, Bingham L. A longitudinal and sustainability assessment of pediatric interfacility transport handover standardization. Pediatr Qual Saf 2018;3:e118. https://doi.org/10.1097/pq9.0000000000000118.
[17] Alrajhi K, Alsaawi A. Developing an emergency medicine handoff tool: an electronic Delphi approach. Int J Emerg Med 2019;12. https://doi.org/10.1186/s12245-019-0249-4.
[18] Young JQ, John M, Thakker K, Friedman K, Sugarman R, Sewell JL, et al. Evidence for validity for the Cognitive Load Inventory for Handoffs. Med Educ 2021;55:222–32. https://doi.org/10.1111/medu.14292.
[19] Chen Y, Yang K, Marušić A, Qaseem A, Meerpohl JJ, Flottorp S, et al. A reporting tool for practice guidelines in health care: the RIGHT statement. Ann Intern Med 2017;166:128–32. https://doi.org/10.7326/M16-1565.

[20] Servei Català de la Salut, Generalitat de Catalunya. Regió Sanitària Terres de l'Ebre 2024. https://catsalut.gencat.cat/ca/coneix-catsalut/catsalut-territori/terres-ebre/.
[21] Lynn R. Determination and quantification of content validity. Nurs Res 1986;35:382–5.
[22] Thangaratinam S, Redman CW. The Delphi technique. Obstet Gynaecol 2005;7:120–5. https://doi.org/10.1576/toag.7.2.120.27071.
[23] Tristán-López A. Modificación al modelo de Lawshe para el dictamen cuantitativo de la validez de contenido de un instrumento objetivo. Avances En Medición 2008;6:37–48.
[24] Redley B, Waugh R. Mixed methods evaluation of a quality improvement and audit tool for nurse-to-nurse bedside clinical handover in ward settings. Appl Nurs Res 2018;40:80–9. https://doi.org/10.1016/j.apnr.2017.12.013.
[25] Dojmi Di Delupis F, Pisanelli P, Di Luccio G, Kennedy M, Tellini S, Nenci N, et al. Communication during handover in the pre-hospital/hospital interface in Italy: from evaluation to implementation of multidisciplinary training through high-fidelity simulation. Intern Emerg Med 2014;9:575–82. https://doi.org/10.1007/s11739-013-1040-9.
[26] Tortosa-Alted R, Reverté-Villarroya S, Martínez-Segura E, López-Pablo C, Berenguer-Poblet M. Emergency handover of critical patients. A systematic review. Int Emerg Nurs 2021;56. https://doi.org/10.1016/j.ienj.2021.100997.
[27] Horwitz LI, Rand D, Staisiunas P, Van Ness PH, Araujo B, Banerjee SS, et al. Development of a handoff evaluation tool for shift-to-shift physician handoffs: the Handoff CEX. J Hosp Med 2013;8:191–200. https://doi.org/10.1002/jhm.2023.
[28] Festekjian A, Mody AP, Chang TP, Ziv N, Nager AL, Angeles Festekjian L, et al. Novel transfer of care sign-out assessment tool in a pediatric emergency department. Acad Pediatr 2018;18:86–93.
[29] Bergs J, Lambrechts F, Mulleneers I, Lenaerts K, Hauquier C, Proesmans G, et al. A tailored intervention to improving the quality of intrahospital nursing handover. Int Emerg Nurs 2017;36:7–15. https://doi.org/10.1016/j.ienj.2017.07.005.