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RESEARCH

CONSTRUCTION, VALIDATION, AND USABILITY EVALUATION OF THE E-BOOK: INVASIVE BLOOD PRESSURE MEASUREMENT

CONSTRUÇÃO, VALIDAÇÃO E AVALIAÇÃO DA USABILIDADE DO E-BOOK: MEDIDA DA PRESSÃO ARTERIAL INVASIVA

CONSTRUCCIÓN, VALIDACIÓN Y EVALUACIÓN DE LA USABILIDAD DEL LIBRO ELECTRÓNICO: MEDICIÓN INVASIVA DE LA PRESIÓN ARTERIAL

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ABSTRACT

Objective: to describe the construction, validation, and usability evaluation of an e-book on invasive blood pressure measurement, aimed at professionals working in Intensive Care Units. **Methods:** this is a methodological study developed in three stages: content construction, based on a narrative literature review; content and face validation, carried out by 15 experts who assessed the criteria of comprehensiveness, relevance, clarity, and presentation; and usability analysis, conducted with 31 healthcare professionals. The study was carried out between August 2023 and August 2025, with approval from the Research Ethics Committee. **Results:** the final product consisted of an e-book comprising 10 chapters and 67 pages, with illustrations that facilitated comprehension. The validation process resulted in an overall Content Validity Index of 0.92, indicating a high level of agreement among evaluators regarding the assessed aspects. Regarding usability evaluation, application of the System Usability Scale yielded a mean score of 88.5, corresponding to the highest classification level and indicating high usability and acceptability. **Conclusion:** the e-book demonstrated content and face validity, as well as high usability, positioning it as a potentially useful educational technology for consultation by intensive care professionals.
Keywords: Education, Nursing; Hemodynamic Monitoring; Arterial Pressure; Blood Pressure Determination; Educational Technology; Books; Intensive Care Units.

RESUMO

Objetivo*: descrever a construção, validação e avaliação da usabilidade de um e-book sobre a mensuração da pressão arterial invasiva, direcionado a profissionais atuantes em Unidades de Terapia Intensiva.* ***Métodos:*** *trata-se de um estudo metodológico desenvolvido em três etapas: construção do conteúdo, baseada em revisão narrativa da literatura; validação do conteúdo e da aparência, realizada por 15 especialistas que avaliaram os critérios de abrangência, pertinência, clareza e apresentação; e análise da usabilidade, conduzida com 31 profissionais de saúde. A pesquisa foi realizada entre agosto de 2023 e agosto de 2025, com aprovação do Comitê de Ética.* ***Resultados:*** *o produto final consistiu em um e-book composto por 10 capítulos e 67 páginas, com ilustrações que facilitaram a compreensão. O processo de validação resultou em índice de validade de conteúdo global de 0,92, indicando elevado nível de concordância entre os avaliadores quanto às etapas avaliadas. Em relação à avaliação de usabilidade, a aplicação da System Usability Scale apresentou escore médio de 88,5, o que corresponde à classificação máxima, indicando alta usabilidade e aceitabilidade.* ***Conclusão:*** *o e-book demonstrou validade de conteúdo e aparência, bem como elevada usabilidade, configurando-se como tecnologia educacional potencialmente útil para consulta por profissionais em terapia intensiva.*
Palavras-chave*: Educação em Enfermagem; Monitorização Hemodinâmica; Pressão Arterial; Determinação da Pressão Arterial; Tecnologia Educacional; Livros; Unidades de Terapia Intensiva.*

RESUMEN

Objective*: describir la construcción, validación y evaluación de la usabilidad de un e-book sobre la medición de la presión arterial invasiva, dirigido a profesionales que laboran en Unidades de Cuidados Intensivos.* ***Métodos:*** *se trata de un estudio metodológico desarrollado en tres etapas: la construcción del contenido, basada en una revisión narrativa de la literatura; la validación del contenido y la apariencia, realizada por 15 especialistas que evaluaron los criterios de amplitud, pertinencia, claridad y presentación; y el análisis de usabilidad, llevado a cabo con 31 profesionales de la salud. La investigación se realizó entre agosto de 2023 y agosto de 2025, con aprobación del Comité de Ética.* ***Resultados:*** *el producto final consistió en un e-book compuesto por 10 capítulos y 67 páginas, con ilustraciones que facilitaron la comprensión. El proceso de validación arrojó un índice de validez de contenido global de 0.92, lo que indica un alto nivel de concordancia entre los evaluadores en las etapas evaluadas. Respecto a la evaluación de usabilidad, la aplicación de la System Usability Scale obtuvo una puntuación media de 88.5, correspondiente a la clasificación máxima, lo que indica alta usabilidad y aceptabilidad.* ***Conclusión:*** *el e-book demostró validez de contenido y apariencia, así como alta usabilidad, constituyéndose como una tecnología educativa potencialmente útil para la consulta de profesionales en terapia intensiva.*
Palabras clave: *Educación en Enfermería; Monitorización Hemodinamica; Presión Arterial; Determinación de la Presión Sanguínea; Tecnologia Educacional; Libros; Unidades de Cuidados Intensivos.*

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INTRODUTION

Invasive blood pressure (IBP) measurement is recognized as one of the most accurate methods for continuous assessment of blood pressure in critically ill patients hospitalized in Intensive Care Units (ICUs). Its use is particularly indicated in clinical situations that require the administration of vasoactive agents at high doses or in the presence of significant volumetric alterations, conditions frequently associated with hemodynamic instability. In this context, the invasive technique provides more reliable blood pressure values, supporting clinical decision-making and the safe adjustment of the instituted therapy[1].

This type of invasive monitoring falls within the scope of practice of the nurse working in the ICU, who is responsible for arterial puncture, care of the access route, and manipulation of the monitoring system[2]. The implementation of IBP monitoring requires the nurse to have knowledge regarding the materials necessary for preparing the monitoring system, the patient, and the procedure to be performed. Whenever possible, for patient safety, the Allen or Barbeau test is recommended prior to catheter insertion. In addition, during the procedure, adequate limb extension should be maintained at the time of puncture, strict aseptic technique should be adopted, a flow test should be performed after insertion, and the functional position of the limb should be preserved during measurements. Furthermore, it is essential to ensure device patency throughout its use[1].

The scientific literature highlights gaps in the knowledge of ICU nurses regarding IBP measurement, particularly related to recognition of the waveform morphology that represents the direct IBP measurement, interpretation of waveform alterations displayed on the monitor, the appropriate timing for replacement of the percutaneous catheter and monitoring system, as well as the main complications associated with peripheral arterial catheterization[3]. Corroborating these findings, a national study identified that only 14.7% of the interviewed critical care nurses rated their knowledge of IBP as good or satisfactory[4]. Similarly, the international study conducted by Younis et al.[5] showed that none of the participants demonstrated a level considered excellent with respect to skills and knowledge related to invasive blood pressure measurement. Moreover, evidence indicates that deficits in this domain may negatively impact patient safety, especially in contexts of hemodynamic instability, in which monitoring accuracy is decisive for clinical decision-making[6].

Within this scenario, the relevance of developing educational strategies aimed at improving the technical and scientific competence of these professionals becomes evident, preferably mediated by validated educational technologies aligned with the demands of clinical practice. Among the active methodologies employed for this purpose, gamification, such as the use of Kahoot[7], educational videos[8], and web applications[9] stand out, having demonstrated positive evaluations regarding the teaching of blood pressure measurement. However, to date, there is no record of a technology specifically addressing IBP measurement, revealing a gap in the educational field.

Thus, this study proposed the following research question: "How was an educational technology on invasive blood pressure measurement developed to train critical care nurses?". Accordingly, the objective was to describe the process of construction, content validation, and usability evaluation of the digital e-book on IBP measurement, designed as a consultation tool for invasive blood pressure monitoring during professional practice in ICUs.

METHOD

Study design and timeframe

A This is a methodological study aimed at the construction and validation of an educational health technology, conducted based on theoretical and methodological models described in the literature for construction and validation of educational technologies in nursing[10–12], and structured into three sequential and interdependent steps. The first step consisted of developing the content of educational technology, through a search of the literature related to the topic, followed by systematization of the evidence and textual and visual organization of the material, resulting in the first version of the e-book. The second step involved appearance and content validation, carried out by experts with experience in the field, with the objective of analyzing clarity, relevance, pertinence, and adequacy of the proposed items. Finally, usability evaluation of the instrument was conducted with healthcare professionals working in ICUs. The study was developed between August 2023 and August 2025.

Product construction timeframe

The content construction phase of the instrument took place between September 2023 and August 2024, during which a narrative literature review was conducted based on the themes of the previously selected chapters.

These themes were defined with the purpose of guiding and delimiting the content to be investigated. The literature review was carried out throughout this period using the Virtual Health Library (VHL), specifically the LILACS and SciELO databases, as well as Google Scholar. For specific terms, descriptors from DeCS/MeSH, Health Sciences Descriptors / BIREME / PAHO / WHO were used, including "Hemodynamic Monitoring", "Intensive Care Units", "Blood Pressure", and "Educational Technology", among others.

The construction of educational technology unfolded in sequential stages. Initially, content planning was conducted, including the definition of topics and the logical organization of information. Subsequently, layout design was performed using the Canva® application, in which pages were created, layouts were selected, and typographies and color palettes were chosen to ensure visual clarity and aesthetic coherence. Thereafter, original illustrations were developed using the Infinite Painter® application, employing digital drawing resources to visually represent the addressed concepts. After finalizing the graphic elements, they were incorporated into the main document, with adjustments to positioning and proportions to achieve better harmonization. Finally, a comprehensive review of the material was carried out, including revisions to text, images, and formatting, until the first version of the e-book was completed and subsequently submitted for validation by experts.

Product validation step

The appearance and content validation stage of the e-book was carried out between May and June 2025, beginning with the selection of the panel of experts through purposive sampling, based on analysis of curricula registered on the Lattes Platform. Inclusion criteria were being a nurse with at least a specialization in Intensive Care and/or holding a master's or doctoral degree and working either in teaching related to critically ill patients or in ICU clinical practice. Professionals without specialization in intensive care and/or those not involved in disciplines related to IBP monitoring were excluded.

Invitations to participate were sent by email, accompanied by an invitation letter containing a link to a questionnaire hosted on Google Forms. In this instrument, participants signed the Free and Informed Consent Form (ICF) and subsequently evaluated the appearance and content of the e-book using an assessment tool that addressed the following aspects: comprehensiveness, clarity, pertinence, and appearance. The instrument was developed by the authors, based on methodological recommendations for content validation, and employed a Likert-type scale with scores ranging from one to four points, according to the criterion assessed. For the clarity domain, for example, the classification was as follows: 1 = not clear; 2 = slightly clear; 3 = quite clear; 4 = very clear.

After receipt of the responses, data were tabulated and subjected to descriptive analysis, taking into consideration suggestions deemed pertinent and feasible for implementation. The period between sending the invitation letter and return of the completed assessment instrument was approximately 45 days. Content validation was performed using the Content Validity Index (CVI), which measures the proportion or percentage of judges who agree on the aspects of the instrument and its items[13,14]. The CVI was calculated by dividing the number of items that received scores of "3" or "4" from the experts by the total number of experts. Items with a CVI ≥ 0.80 were considered valid, whereas items with a CVI < 0.80 were reformulated[13,14].

Conduct of the product usability evaluation

The sample for usability evaluation was selected by convenience and consisted of nurses, nursing technicians, and physicians from the ICU of a University Hospital. Professionals with an active employment relationship in the unit, who were present at the time of data collection and who agreed to participate by signing the Free and Informed Consent Form (ICF), were included. Those who were on leave, vacation, or who did not consent to participate were excluded. Data collection was conducted in person in August 2025, following ICF signature, subsequent handling of the e-book on a tablet (Mi Pad 6 Pro®, Xiaomi), and administration of the System Usability Scale (SUS) to assess product usability[15].

The SUS consists of items rated on a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Calculation of the final score followed the instrument's recommendations: for odd-numbered items (1, 3, 5, 7, and 9), one point is subtracted from the assigned score; for even-numbered items (2, 4, 6, 8, and 10), the assigned score is subtracted from five. The sum of the adjusted scores is multiplied by 2.5, resulting in a single score ranging from 0 to 100[15]. Usability classification followed these parameters: < 20.5 (worst imaginable); 21-38.5 (poor); 39-52.5 (mediocre); 53-73.5 (good); 74-85.5 (excellent); and 86-100 (best imaginable). Internal consistency of the SUS was also analyzed using Cronbach's alpha coefficient, calculated from responses to the

ten items of the instrument, adopting values of α ≥ 0.70 as the criterion for adequacy.

Ethical aspects

The study complied with the legal provisions set forth in National Health Council Resolution no. 466/2012 and was approved by the institution's Research Ethics Committee (CAAE No. 86001524.3.0000.5182; approval opinion report no. 7,402,004).

RESULTS

Construction of educational technology content

The search of the databases yielded more than 6,039 articles related to the topic, based on the selected descriptors. Of these, 500 (8.27%) were evaluated through title and abstract screening. From this subset, 200 (40%) were selected for full-text review, and ultimately only 15 (7.5%) were included in the construction of the material. Analysis demonstrated that these articles satisfactorily covered the topics necessary for the construction of the e-book, making the inclusion of additional studies unnecessary.

In its first version, the e-book was structured into nine chapters: Federal Nursing Council (COFEN) resolution; Circulatory system; IBP measurement; Types of invasive hemodynamic monitoring; Invasive monitoring; Catheter maintenance; Nursing care during catheter removal; Vasoactive agents; and Dosage calculation. The definition of these themes was based on the knowledge deficit among nurses regarding IBP measurement identified in a national study[3], as well as on practical experience related to procedure execution and the materials required for its performance, as described in reference works such as *Enfermagem em terapia intensiva: práticas integrativas, cuidados intensivos and Condutas no paciente grave, cuidados críticos em enfermagem: uma abordagem holística,* among others used in the construction of the material. In view of this gap identified in the literature, inclusion of these topics in the e-book was considered relevant. Furthermore, with the aim of expanding nurses' knowledge regarding the use of vasoactive agents and dosage calculation, two specific chapters addressing these contents were developed, even though they are not directly related to the puncture process or maintenance of the IBP access.

The construction, graphic design, and structuring of the technology were carried out using Canva®. Colors were selected to provide objective visualization, in alignment with the addressed theme. The material has dimensions of 210 mm × 297 mm (A4), allowing both physical printing without loss of formatting and consultation via smartphone, tablet, or computer. The first version comprised 61 pages. The illustrations included in the e-book were produced using a tablet and the Infinite Painter digital drawing application, which enabled greater precision and flexibility during the creative process. These illustrations were selected to facilitate comprehension of the text, as were the other images used throughout the material.

Validation of the e-book's appearance and content

This step began with the selection of experts, conducted through a search of the Lattes Platform. A total of

Figure 1 — E-book pages prior to the expert validation process (1st version).

Source: The authors (2026).

5,009 professionals were identified, and after application of the inclusion criteria and analysis of curricula vitae, 172 (3.43%) nurses were considered eligible and invited to participate in the study. Of these, 15 (8.72%) responded to the invitation letter and agreed to participate in the evaluation of the technology developed.

The observed response rate (8.72%) can be considered low and is possibly related to professionals' limited time availability, academic and clinical demands, or outdated contact information on the platform used for the search. Therefore, the possibility of nonresponse bias is acknowledged, as the experts who accepted the invitation may have characteristics different from those who did not respond, which may limit sample representativeness. Nevertheless, it is noteworthy that the participating group demonstrated high academic qualification and extensive experience in the thematic area, providing strong technical and scientific support for the validation process.

Among the participating experts, the mean age was 46.1 (± 7.86) years. Most were female (n = 9; 60%). Eight resided in the Northeast region of Brazil (53.3%), four (26.7%) in the Southeast, and three (20%) in the South. Regarding academic qualifications, 14 (93.4%) held a doctoral degree in Nursing, and 100% had a specialization in intensive care. With respect to professional activity, 12 (80%) were higher education faculty members, and only three (20%) worked in direct patient care in ICUs. After agreeing to participate in the study, the experts signed the ICF and received the evaluation instrument via email, in Google Forms format. A 30-day period was granted for them to review the e-book, complete the evaluation instrument, and return it to the researchers.

For evaluation of the instrument's content and appearance, a validation tool developed by the authors was used, grounded in methodological recommendations for content validation. This tool assesses items in terms of comprehensiveness (content, language, target audience, illustrations), pertinence (alignment with the study proposal), clarity (content understanding), and appearance (images, colors, and layout) of the following aspects: cover; each chapter; e-book objective; adequacy of the proposal; organization; writing style; overall appearance of the material; and motivation to read the e-book.

For content validation, the CVI was used, which assesses the proportion of judges who agree on the aspects and items of the instrument. The CVI was calculated based on items that received scores of "3" or "4" from the experts, divided by the total number of experts. An item was considered valid when I-CVI ≥ 0.80. Items with an I-CVI below this threshold were reformulated, as recommended in the literature[13,14]. Table 1 presents the mean scores for each item evaluated by the experts.

The results showed that most items achieved an I-CVI ≥ 0.80, a value considered adequate in the literature to indicate content validity. Only one item presented an index below the recommended cutoff point (I-CVI = 0.67, related to the appearance of the e-book cover), suggesting the need for revision of its formulation, which was carried out according to the suggestions received. The overall CVI of the instrument was 0.92 (95% CI: 0.78–1.00), indicating a high level of agreement among the experts. These findings corroborate that the developed material presents comprehensiveness, clarity, pertinence, and adequacy in its proposal, and was validated by experts as an appropriate instrument for its intended use.

Although only one item presented an I-CVI below 0.80, some experts suggested modifications, such as standardization of the font used; inclusion of an initial chapter on advanced nursing practices preceding the chapter on legal support for IBP measurement practice; replacement of English terms and brand names of devices with Portuguese equivalents and product names, respectively; among other suggestions. Consequently, the final version of the e-book comprised 10 chapters and 67 pages. Figure 2 presents a section of the e-book that was revised based on the experts' suggestions.

E-book usability

A total of 31 nursing and medical professionals participated in the system usability evaluation, most of whom were female (n = 25). Participants were selected according to the inclusion criteria, considering those present at the time of data collection and who agreed to participate in the study by signing up for the ICF. Responses to the SUS questionnaire were collected individually and recorded in an electronic spreadsheet, enabling calculation of each participant's score. The SUS consists of 10 items rated on a Likert scale from 1 to 5. Odd-numbered items were adjusted by subtracting 1 from the response, while even-numbered items were adjusted by reversing the scale using the formula 5 − response, as recommended in the literature. The total score for each participant was obtained by summing the adjusted scores and multiplying the result by 2.5, yielding scores ranging from 0 to 100[11], as shown in Table 2.

The usability analysis of the system, based on the SUS, revealed high scores, with individual results ranging from 60 to 100 and a mean SUS score of 88.5 points, classifying it as "best imaginable." Internal consistency of the

Table 1 – Distribution of content validity indices for the items evaluated in the e-book Invasive Blood Pressure Measurement, regarding comprehensiveness, pertinence, clarity, and appearance, and the overall mean for each item. Campina Grande, PB, Brazil, 2025. (n = 15)

Evaluated Items	Comprehensiveness	Pertinence	Clarity	Appearance	Overall Item CVI
Cover of the e-book	0.94	0.94	0.94	0.67	0.87
Chapter 1 – COFEN Resolution	1.00	1.00	1.00	0.87	0.97
Chapter 2 – Circulatory System	1,00	0.94	0.94	0.87	0.94
Chapter 3 – Invasive blood pressure measurement	0.94	0.8	1.00	0.94	0.92
Chapter 4 – Types of invasive hemodynamic monitoring	0.94	0.94	0.94	0.87	0.92
Chapter 5 – Invasive Monitoring	0.94	0.94	0.94	0.87	0.92
Chapter 6 – Catheter maintenance	0.94	1.00	0.94	0.80	0.92
Chapter 7 – Nursing care during catheter removal	0.94	1.00	0.87	0.87	0.92
Chapter 8 – Vasoactive agents	0.94	0.94	0.94	0.80	0.90
Chapter 9 – Dosage calculation	0.94	0.87	0.94	0.87	0.90
Regarding the objective of the e-book, is it appropriate to its proposal?	1.00	0.94	1.00	0.87	0.95
How do you evaluate the organization of the e-book?	1.00	0.94	0.87	0,8	0.90
Regarding the writing style, how do you evaluate it?	0.87	0.94	0.94	0.87	0.90
How do you evaluate the appearance of the e-book (colors, images, and layout)?	0.87	0.94	0.94	0.87	0.90
Regarding motivation to read the e-book, how do you evaluate it?	1.00	0.94	0.94	0.87	0.94

Source: The authors (2026).

Figure 2 — E-book pages after validation (2nd version).

Source: Image provided by the authors.

SUS was assessed using Cronbach's alpha coefficient, yielding α = 0.94, which indicates excellent reliability of the instrument in the analyzed sample. These results suggest that most participants perceived the system as intuitive, efficient, and easy to use.

DISCUSSION

The present study advances the field of educational technologies in nursing by proposing the development, validation, and usability evaluation of an evidence-based e-book aimed at clinical practice in intensive care. Unlike instructional materials produced without a structured methodological pathway, the technology presented

here was developed through a rigorous literature review, analysis of knowledge gaps identified in a national study, and validation by experts, which strengthens its theoretical consistency and professional applicability.

Although more than six thousand studies were initially identified, only 15 fully met the eligibility criteria and encompassed the content necessary for structuring the chapters. This process reflects not only methodological rigor, but also scientific curation guided by thematic relevance and conceptual sufficiency, avoiding redundancy and prioritizing evidence directly related to the practice of IBP monitoring[3]. Such a strategy aligns with national methodological studies that advocate quality, rather than quantity, of evidence as a central criterion in the construction of educational technologies.

The use of accessible graphic resources, enabled by the layout software employed, allowed us to produce a visually appealing e-book adaptable to different reading formats (print or digital), thereby expanding its reach and applicability. These visual characteristics were also positively evaluated by the experts during the validation step, although some suggestions for adjustments were noted.

The overall CVI of approximately 0.92 indicates a high degree of agreement among experts regarding the relevance, comprehensiveness, and adequacy of the e-book content. This result is similar to findings reported in other national methodological studies that developed and validated educational technologies in nursing, such as those by Ribeiro et al.[16] and Salbego et al.[17], which also identified high levels of expert agreement during content validation. These findings reinforce the importance of expert evaluation as a methodological strategy to enhance educational technologies intended for healthcare practice.

However, the identification of items with lower agreement, especially those related to textual clarity and visual organization of the material, underscores that the validation process should not be understood merely as a confirmatory step, but rather as an opportunity to refine the developed technology. In this regard, the recommendations provided by the experts, such as adjustments in typographic standardization, reorganization of chapters, and revision of technical terminology, contributed to improving the educational material, supporting the perspective advocated by Salbego et al.[17] that participatory validation is an essential step in strengthening the quality and applicability of educational technologies in nursing.

Despite the highlighted contributions, certain limitations must be critically considered. The experts' response rate was low, which may introduce nonresponse bias and limit the representativeness of the judgments. Additionally, usability evaluation was conducted within a specific institutional context, restricting the generalizability of the findings. It should also be noted that the study did not include an assessment of clinical effectiveness, preventing inference regarding the direct impact of the e-book on care outcomes or professional behavioral change.

Nonetheless, the findings indicate an important contribution to clinical practice by providing a systematized, validated, and highly usable resource addressing IBP monitoring and vasoactive agents, a topic recognized as a gap in professional knowledge. In the educational field, technology may serve as a complementary resource in intensive care disciplines, fostering meaningful and self-instructional learning. For research, future studies are needed to evaluate longitudinal impact, knowledge retention, and potential effects on patient safety indicators, thereby expanding understanding of the effectiveness of educational technologies in nursing.

Table 2 – Mean individual score of the System Usability Scale applied to the usability of the e-book. Campina Grande, PB, Brazil 2025. (n = 31)

Participants	SUS score	Participants	SUS score
1	100	17	97,5
2	100	18	97,5
3	95	19	65
4	100	20	85
5	97,5	21	62,5
6	100	22	60
7	100	23	100
8	97,5	24	97,5
9	100	25	87,5
10	80	26	77,5
11	100	27	87,5
12	97,5	28	85
13	75	29	82,5
14	60	30	67,5
15	95	31	95
16	100		

Source: The authors (2026).

Figure 3 — Synthesis of the methodological steps of the study.

Study Step	Participants	Inclusion Criteria	Exclusion Criteria	ICF	Notes
Literature Review	Scientific articles	Studies available in full text related to the themes of the chapters	Duplicate studies, out of scope, or without access to the full text	Not applicable	Resulted in 15 selected articles
Construction of the e-book	Researchers	Evidence-based literature	Not applicable	Not applicable	Chapter structuring and didactic organization
Content and apperance validation	15 experts	Being a nurse with at least a specialization in ICU and/or holding a master's or doctoral degree who teaches about critically ill patients or works in ICU clinical care	Professionals who did not have a specialization in the field of intensive care and/or who did not teach courses addressing the topic of invasive blood pressure measurement	Obtained electronically	Evaluation usingn structured instrument by the researchers
Usability evaluation	31 healthcare professionals	Professionals with an active employment relationship in the unit, who were present at the time of data collection and who agreed to participate in the study	Professionals who were on leave, vacation, or who did not consent to participate in the study	Signed in person	Administration of the SUS

Source: The authors (2026).

FINAL CONSIDERATIONS

The present study enabled the construction, validation, and usability evaluation of an e-book on invasive blood pressure monitoring, aimed at healthcare professionals working in ICUs. Within the investigated context, the technology demonstrated satisfactory evidence of content and appearance validity, as well as high usability among participants, indicating its potential for use as an educational resource to support clinical practice and knowledge updating on the topic. However, the findings should be interpreted with caution, given that the study was conducted in a single institutional setting with a limited sample size. Therefore, future studies are recommended to investigate the application of this technology in different care and educational contexts, as well as to evaluate its effectiveness in improving professional performance and outcomes related to patient safety.

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