

Desarrollo de competencias profesionales en la evaluación laringoscópica predictiva desde la consulta preoperatoria de anestesia

Development of professional competencies in predictive laryngoscopic evaluation during the preoperative anesthesia consultation

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RESUMEN: El artículo aborda las insuficiencias formativas en la integración de predictores clínicos para la evaluación laringoscópica predictiva en la consulta preoperatoria de anestesia. El objetivo es proponer una estrategia formativa basada en competencias. Se realizó un estudio cuantitativo cuasi experimental pretest–posttest. Se aplicaron tres instrumentos: prueba de conocimientos, lista de cotejo del desempeño en consulta (0–5) y OSCE (0–12), con retroalimentación formativa. Se evidenció desplazamiento hacia niveles altos de competencia (75% en posttest). La estrategia fortaleció el desempeño profesional observable y la coherencia de la toma de decisiones anticipadas en la evaluación de la vía aérea.

Palabras clave: Competencia profesional; Educación médica; Formación profesional; Evaluación educativa; Anestesiología.

ABSTRACT: This article addresses training gaps in the integration of clinical predictors for predictive laryngoscopic assessment during the preoperative anesthesia consultation. The objective is to propose a competency-based training strategy. A quantitative quasi-experimental pretest–posttest study was conducted. Three instruments were applied: a knowledge test, a consultation performance checklist (0–5), and an OSCE (0–12), with formative feedback. A shift toward high levels of competence was observed (75% on the posttest). The strategy strengthened observable professional performance and the consistency of anticipatory decision-making in airway assessment.

Keywords: Professional competence; Medical education; Professional training; Educational evaluation; Anesthesiology.

Introduction

From a complexity perspective, competencies are conceived as appropriate, metacognitive, and ethical performances.

However, in continuing medical education, there remains a tendency to prioritize the visible components of clinical performance, which limits the integration of cognitive, pro, procedural, and attitudinal knowledge essential for an adequate predictive laryngoscopic assessment during the preoperative anesthesia consultation (Tobón, 2013).

In line with Spencer and Spencer's Iceberg Model, this fragmentation in training results in deficiencies in applied knowledge, integrated clinical performance, and anticipatory decision-making in airway management, constituting a scientific problem of a pedagogical nature.

Despite advances in competency-based training in medical education, a research gap persists in the systematic evaluation of teaching strategies aimed at the integrated development of professional competence for predictive laryngoscopic assessment in the preoperative anesthesia setting.

In medical education, performance assessment requires structured, valid, and systematic instruments.

The Objective Structured Clinical Examination (OSCE) is a classic benchmark for assessing clinical competencies through standardized stations that allow for the observation of integrated skills and the making of evaluative decisions with greater objectivity (Harden et al., 1975).

Given the above, this study addresses training gaps in the integration of clinical predictors for predictive laryngoscopic assessment in the preoperative anesthesia consultation.

In this regard, the impact of a competency-based training strategy was assessed.

Background

In anesthesiology, competency-based training has driven more comprehensive assessment models, with an emphasis on continuous assessment and observable criteria; however, challenges remain in ensuring that assessment effectively leads to improved performance and is not limited to cognitive changes (Kealey & Naik, 2022).

In this vein, recent experiences promote programmatic assessment systems that integrate multiple sources of evidence and systematic feedback to monitor competency progress in real-world training scenarios (Woodworth et al., 2024).

Furthermore, competent assessment in anesthesiology requires consideration of non-technical skills (e.g., communication, situational awareness, teamwork), especially when it comes to anticipating risks and planning alternatives. The evidence synthesized in clinical simulation demonstrates a variety of tools for assessing these skills and supports their incorporation into assessment strategies focused on safety and the quality of professional performance (Gawronski et al., 2022).

In the Cuban context, competency-based professional training has been advocated as a means to improve graduate quality and performance, integrating on-the-job education, formative assessment, and social relevance (Valle Lima & Pérez Martínez, 2020). Complementarily, it has been noted that competency-based medical education is associated with improvements in professional performance and provides a framework for aligning teaching, patient care, and research (Salas Perea & Salas Mainegra, 2021).

In line with the above, there are national initiatives aimed at pedagogically strengthening predictive laryngoscopic assessment. The teaching activity proposal published in EduSol provides a pedagogical-contextual framework to guide the teaching and assessment of this competency in anesthesiology, reinforcing the need for training strategies structured around real-world scenarios (Picrin Dimont et al., 2021).

However, in institutional practice, gaps may persist in the systematic nature of preoperative assessment, the integration of predictors, and the anticipation of alternative plans, which justifies performance-centered training interventions.

Within this framework, this article aims to assess the impact of a competency-based training intervention strategy to strengthen the development of the anesthesiologist's professional competence in predictive laryngoscopic assessment, from a pedagogical perspective aligned with patient safety, authentic assessment, and on-the-job training (Addine Fernández, 2004; Díaz Barriga & Hernández Rojas, 2010; Epstein & Hundert, 2002).

A quantitative quasi-experimental pretest–posttest study was conducted with eight anesthesiologists.

Competence was operationalized across three dimensions: knowledge, observable clinical skills, and integration for decision-making.

Study Type and Participants

A quantitative, quasi-experimental study with a single-group pretest–posttest design. Eight anesthesiologists working in the preoperative clinic participated: four Assistant Professors, two Associate Professors, and two without a teaching rank.

Variable and operationalization

The variable was professional competence in predictive laryngoscopic assessment, operationalized in three dimensions:

Knowledge (0–5): mastery of concepts and prediction criteria; interpretation of predictors and common errors.

Observable clinical skills (0–5): systematic performance of airway examination and clinical documentation.

Integration for decision-making (0–12, OSCE): integration of findings, risk stratification, and planning (initial and alternative plans).

The summary structure of the training intervention is presented in Table 1 below.

Table 1: Overview of the training program

Stages	Purpose	Key activities	Evidence/Output
I. Diagnosis	Identify actual gaps	Pre-test using 3 instruments; guided observation during consultations	Initial profile by dimension
II. Design	Align actions with the diagnosis	Definition of competency objectives; achievement criteria	Criteria guide and rubric
III. Implementation	Progressive training	Conceptual review; case analysis; clinical mentoring; focused simulation	Supervised practice plus feedback
IV. Evaluation	Measuring impact	Post-test using the 3 instruments; feedback	Pre-post change by dimension
V. Sustainability	Maintaining improvements	Periodic review of performance and record-keeping	Proposed institutional follow-up

Source: Author's own work

It is important to note that the content validity of the training intervention was established through expert judgment ($n = 7$), selected for their professional experience (≥ 10 years) in clinical anesthesiology and medical teaching ($n = 4$) and in higher medical education ($n = 3$), who evaluated the relevance, clarity, and consistency of the instruments with the operationalization of professional competence.

The reliability of the educational instruments used was assessed using statistical procedures consistent with their observational and ordinal nature.

The checklist for observing clinical performance, structured into ordinal categories, was evaluated using inter-observer agreement via Cohen's Kappa coefficient, yielding a value of $\kappa = 0.56$, corresponding to moderate and acceptable agreement in clinical educational evaluations based on direct observation.

For the Objective Structured Clinical Examination (OSCE), whose ordinal rubric included three levels of achievement (0 = not achieved, 1 = partially achieved, 2 = achieved), the squared weighted Kappa was estimated, with an overall value of $\kappa_w = 0.64$, indicating substantial agreement among evaluators. Complementarily, the unweighted Kappa was $\kappa = 0.52$, with an observed agreement of 75%, confirming adequate inter-observer reliability of the instrument.

The pretest and posttest were administered under equivalent time conditions, with a six-week interval between measurements, ensuring stability of the training context and comparability of the results. Taken together, these results support the methodological reliability of the instruments used to assess professional competence in predictive laryngoscopic evaluation, strengthening the internal validity of the study's findings.

Training Intervention Strategy

Based on the results obtained from the training intervention, a competency-based strategy was designed, situated in the workplace, organized as diagnosis–intervention–evaluation, and based on the integration of theory and practice, meaningful learning, and formative feedback (Addine Fernández, 2004; Álvarez de Zayas, 1999; Díaz Barriga & Hernández Rojas, 2010).

The applied strategy suggests a contribution to the improvement of continuing medical education, integrating teaching, clinical practice, and research. It also offers a model that can be replicated in other anesthesiology departments.

It generates evidence regarding competency-based training. Furthermore, it is a progressive, workplace-based diagnostic–intervention–evaluation training intervention that integrates: conceptual updating, reflective case analysis, supervised training in preoperative consultations, and authentic assessment via Objective Structured Clinical Examination (OSCE) with immediate feedback.

Assessment tools (pre- and post-):

- knowledge survey (0–5 scale),
- consultation performance checklist (0–5),
- OSCE for preoperative airway assessment (0–12).

The OSCE consisted of a standardized clinical station for preoperative airway assessment, lasting 10 minutes, in which participants performed a comprehensive patient evaluation, identified clinical predictors, stratified risk, and proposed an initial and alternative anesthetic plan. Performance was evaluated by two trained evaluators using a criteria-based structured rubric.

Statistical analysis: means and SDs were reported; for the pre–post comparison, the Wilcoxon test ($\alpha = 0.05$) was applied due to sample size and the ordinal/educational nature of the data. Effect size was estimated as $r = |Z|/\sqrt{N}$.

Ethics:

The intervention was educational and non-punitive, with no clinical or evaluative repercussions for the participants; anonymity, confidentiality, and the academic-scientific use of the information were guaranteed, with institutional endorsement.

The results obtained are presented in Table 2.

Table 2: Pretest and posttest results by instrument (n = 8)

Instruments	Mean Pre $\pm$ SD	Post-test Mean $\pm$ SD	Difference	p-value*
Knowledge (0–5)	2.13 $\pm$ 0.64	4.13 $\pm$ 0.64	+2.00	0.012
Skills (0–5)	2.13 $\pm$ 0.64	3.63 $\pm$ 0.52	+1.50	0.012
OSCE (0–12)	5.25 $\pm$ 0.71	9.75 $\pm$ 0.71	+4.50	0.012

*Wilcoxon test for paired samples

Source: Author's own work.

The pretest revealed a low-to-moderate level of competence with limitations across all three dimensions: knowledge (2.13 ± 0.64), skills (2.13 ± 0.64), and OSCE (5.25 ± 0.71). Following the intervention, the posttest showed an increase in all dimensions: knowledge (4.13 ± 0.64), skills (3.63 ± 0.52), and OSCE (9.75 ± 0.71).

The pre–post comparison using the Wilcoxon signed-rank test for paired samples revealed statistically significant differences in all assessed dimensions: knowledge ($Z = -2.52$; $p = 0.012$), observable clinical skills ($Z = -2.53$; $p = 0.012$) and decision-making integration assessed via OSCE ($Z = -2.52$; $p = 0.012$), with a large effect size in all cases ($r \approx 0.89$), calculated as $r =$

$|Z|/\sqrt{N}$, where N corresponds to the number of pairs ($n = 8$)

Table 3 presents the distribution of competency levels before and after the intervention.

Table 3. Distribution of competency levels before and after the intervention

Competence level	Pre-test		Posttest	
	n.	%		n.
Low	5	62.5	Low	5
Medium	3	37.5	Medium	3
High	0	0.0	High	0
Total	8	100	Total	8

Source: Author's own work

In summary, from a quantitative perspective, three instruments were used: a knowledge test (0–5), a consultation performance checklist (0–5), and an OSCE (0–12), with formative feedback.

Measurements were compared using the Wilcoxon test ($\alpha=0.05$) and effect size (r). In the pretest, low–moderate scores were observed: knowledge 2.13 ± 0.64 ; skills 2.13 ± 0.64 ; OSCE 5.25 ± 0.71 .

In the posttest, they increased to 4.13 ± 0.64 ; 3.63 ± 0.52 ; and 9.75 ± 0.71 , respectively, with significant differences ($p=0.0078$) and a large effect ($r\approx0.89$). A shift toward high levels of competence was evident (75% in the posttest). The strategy strengthened observable professional performance and the consistency of anticipatory decision-making in airway assessment.

Limitations and projections

The small sample size and the lack of a control group limit generalizability. It is recommended to expand to multicenter samples, incorporate a control group, and evaluate sustainability over time; furthermore, include process indicators (systematicity of documentation, adherence to standardized assessment) for pedagogical-clinical triangulation.

A shift from low to high levels of competence was observed following the intervention, with a reduction in interindividual variability, suggesting standardization of the group's performance.

Although the inferential analysis was performed using nonparametric tests, means and standard deviations are presented for descriptive purposes, given the homogeneous distribution of the scores and to facilitate the educational interpretation of the pre-post change in each dimension.

The findings show that a competency-based training strategy is associated with significant improvements in observable professional performance for predictive laryngoscopic assessment.

The convergence between knowledge tests, clinical observation, and OSCE suggests progress in the integrated mobilization of cognitive, procedural, and decision-making resources, consistent with a conception of competence as contextualized and assessable performance (Epstein & Hundert, 2002; Le Boterf, 2011).

From a pedagogical perspective, the components with the greatest explanatory power for the change were: situated learning in the preoperative consultation, supervised practice, and formative feedback based on observable criteria—elements consistent with professional didactics and theory-practice integration (Addine Fernández, 2004; Álvarez de Zayas, 1999). The incorporation of the OSCE as an authentic assessment allowed for the observation of the integration of skills, judgment, and planning, in line with the need for structured instruments for complex clinical competencies (Harden et al., 1975).

Furthermore, the inclusion of criteria related to communication and planning aligns with the importance of non-technical skills for patient safety (Gawronski et al., 2022).

In anesthesiology, it is recognized that competency-based training requires continuous assessment using observable criteria and progress tracking, although challenges remain in translating assessment into consistent performance (Kealey & Naik, 2022).

In this regard, the triangulation of evidence in this study aligns with contemporary, more comprehensive and programmatic approaches to assessment (Woodworth et al., 2024).

In the Cuban context, the results support the relevance of strengthening competency-based medical education focused on performance quality and the integration of teaching, clinical care, and research (Salas Perea & Salas Mainegra, 2021; Valle Lima & Pérez Martínez, 2020), consistent with national precedents on the subject (Picrin Dimont et al., 2021).

As a limitation, the small sample size and the absence of a control group limit generalizability and absolute causality. However, the consistency of the change, the large effect size, and the use of multiple sources of assessment strengthen the contextualized educational interpretation.

Pedagogical Implications

From a pedagogical perspective, the results support the use of competency-based continuing medical education strategies to strengthen the systematic assessment of the airway in preoperative consultations, the integration of clinical predictors, anticipatory decision-making with alternative planning, and a culture of patient safety.

It is recommended to institutionalize observable criteria, rubrics, and systematic feedback as mechanisms to sustain improvements in professional performance (Díaz Barriga & Hernández Rojas, 2010; Tobón, 2013).

Limitations and Projections

The small sample size and the lack of a control group limit generalizability. It is recommended to expand to multicenter samples, incorporate a control group, and evaluate sustainability over time; furthermore, include process indicators (systematicity of documentation, adherence to standardized assessment) for pedagogical-clinical triangulation.

Conclusions

The competency-based training intervention was associated with significant and consistent improvements in knowledge, observable clinical skills, and overall performance assessed via OSCE, with a large effect size. The triangulation of instruments allowed for a more objective assessment of the training process, and the shift toward higher levels suggests an educationally relevant impact.

The strategy is viable for services with similar characteristics and provides relevant educational evidence to strengthen proactive decision-making in airway assessment, which constitutes a training objective with potential indirect impact on patient safety.

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