ORIGINAL ARTICLE

Preparedness of aesthetic medicine professionals for emergency scenarios: The SIMED–AGORÀ cross-sectional study

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ABSTRACT

Background: Emergency management in aesthetic medicine is a fundamental component of patient safety. Despite the increasing demand for outpatient aesthetic procedures, the literature provides limited evidence on the actual preparedness of aesthetic physicians in managing acute medical emergencies not directly related to procedures[1]. This study aimed to evaluate the knowledge and competence level of aesthetic medicine professionals in handling emergencies and urgent-care scenarios, with the goal of identifying potential areas for educational improvement.

Methods: A 22-item questionnaire (7 demographic and 15 clinical questions) was developed within the SIMED–AGORÀ project. Fifty-six aesthetic physicians participated. A competence threshold of 12/15 (80%) correct answers was predefined. Data were analyzed using STATA 18 software; comparisons between professional areas were performed with one-way ANOVA followed by Tukey's post-hoc test, and categorical variables were analyzed using χ^2 tests.

Results: The mean age of participants was 35.8 years (SD 7.4), and 42.8% had completed a postgraduate master's in aesthetic medicine. Eighty-nine percent had attended BLSD courses, and 30% had completed ACLS training. The mean total score was 10.6 (SD 2.5). Physicians with ACLS training were significantly more likely to reach the competence threshold (OR 3.6; 95% CI 1.2–11.8; $p = 0.03$). Significant differences emerged among professional areas ($F(5,50)=10.62$; $p < 0.001$), with higher scores in the emergency–urgent-care group. Overall, 80.4% expressed interest in specific training on emergencies in the aesthetic-medicine setting.

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Conclusions: Aesthetic physicians demonstrated satisfactory basic competence, but important gaps persist in pharmacologic management and systemic emergency response. Integrating specific intermediate training modules—bridging BLSD and ACLS—could improve preparedness and enhance both safety and quality of care in aesthetic medicine.

Key words: training, emergency, patient safety, aesthetic medicine, BLSD, ACLS

Introduction

The management of emergencies in aesthetic medicine remains a crucial issue with multiple implications for both patients and practitioners[1]. Within this context, three types of emergencies can occur in an aesthetic medicine clinic during routine activity.

The first type refers to emergencies directly related to the procedure1–3, considered treatment-site adverse events for which dedicated management protocols already exist and specific training is typically provided[4,5]. The second involves systemic reactions or events affecting organs distant from the site of injection or treatment, which may occur even when substances are globally safe[4-6]. Finally, the third category concerns emergencies unrelated to the aesthetic procedure itself but occurring while the patient is present in the office[7–9]. These events may occur at any time, even before treatment begins, and current evidence regarding the preparedness of aesthetic practitioners and the incidence of such episodes in clinics remains incomplete.

In analogous outpatient disciplines, such as dermatology or dentistry, professionals are often insufficiently prepared to manage medical emergencies[10]. For example, dentists have developed guidelines to address emergencies occurring in the dental office[11]. Establishing comparable frameworks in aesthetic medicine is equally important[12,13] to ensure the highest level of safety for patients and practitioners. Serious events such as cardiac arrest require rapid intervention[14] to ensure patient survival, however there persists a lack of competence in managing these scenarios across healthcare professions[15–17].

Improving emergency-care competencies is also desirable considering the structural challenges currently faced by emergency networks[18], where the contribution of all healthcare professionals will be essential to alleviate pressure on the system.

Continuous professional education plays an essential role in aesthetic medicine[19], where workshops and focused training sessions are widespread and contribute to sharing procedures and innovations. In Italy, there is no official university specialization in aesthetic medicine; instead, education is delivered through private or postgraduate schools offering variable curricula. Consequently, professionals come from highly heterogeneous backgrounds[20], which impacts their emergency preparedness.

The aim of this study was to assess the competencies of aesthetic physicians in managing different types of medical emergencies relevant to aesthetic practice, focusing primarily on systemic and urgent conditions not directly related to procedures (third category). Given the lack of standardized assessment tools in this field, this study provides an exploratory evaluation of knowledge and preparedness.

This work forms part of the broader SIMED (Società Italiana di Medicina e Divulgazione Scientifica) project[12], which seeks to evaluate preparedness and guide the development of targeted educational programs to strengthen emergency management in aesthetic medicine.

Materials and Methods

To collect data regarding the knowledge of emergency scenarios, a specific questionnaire on emergency management in aesthetic medicine was developed. The questionnaire scenarios were defined by GS (Basic Life Support and Defibrillation – BLSD – and Advanced

Cardiovascular Life Support – ACLS – instructor) and LS (aesthetic medicine physician) to establish a structure consistent with the objectives of the SIMED association[12].

A total of 22 questions were defined, divided into Section A with seven questions concerning demographic and educational elements, followed by Section B with fifteen questions addressing clinical scenarios. Since the questionnaire concerned patient safety, a score of 12 correct answers out of 15 (80%) was defined as the minimum satisfactory competence threshold, in line with commonly adopted standards in life-support training programs. The complete questionnaire (File S1), included in the supplementary materials, was created as a Microsoft Teams form, and made available for completion through a QR code.

During the "Agorà - International Congress of Aesthetic Medicine", held from October 9 to 11, 2025, in Milan, the "Emergency Lab" project was presented, dedicated to BLSD and airway-management training. A specific session was included among the congress activities, together with a dedicated practical area that all congress participants could freely access to perform hands-on practice. Before engaging in the training scenarios, participants were invited to complete the questionnaire by scanning the QR code. The purpose of the study was clearly explained to participants, and informed consent was recorded by the instructors. The responses to the questionnaire were extracted in Excel format and subsequently analyzed.

During the simulation, participants had the opportunity to perform BLSD maneuvers using Automated External Defibrillator (AED) and to practice airway management with a Guedel cannula and bag-valve-mask ventilation. Access to the simulation area was voluntary, and throughout the congress the training stations were continuously supervised by certified BLSD and ACLS instructors.

Statistical analysis

Data analysis was performed using STATA version 18 (StataCorp LLC, College Station, TX, USA). Continuous variables are presented as mean ± standard deviation (SD), while categorical variables are reported as absolute numbers (N) and percentages (%). Normality assumptions were met for the main continuous variables. One-way analysis of variance (ANOVA) with Tukey's post-hoc test was used to evaluate differences between means for continuous variables, whereas categorical variables were compared using the χ^2 test.

In addition to hypothesis testing, we quantified the magnitude of between-group differences using partial eta squared (η^2p) and omega squared (ω^2) for the omnibus ANOVA and reported odds ratios with 95% confidence intervals for categorical contrasts. When appropriate for comparability, Cohen's f was derived from η^2p. These additions complement p-values and enhance the practical interpretability of findings in line with STROBE recommendations.

Results

Over the three days of the event, approximately 80 aesthetic physicians were approached, and 56 completed the questionnaire in its entirety. Of these, 36 (64.3 %) were female and 20 (35.7 %) male, with a mean age of 35.8 years (SD 7.4). Among the respondents, 24 (42.8 %) had completed a postgraduate master's in aesthetic medicine, while the remainder were still in training. Forty-five participants (80.4 %) expressed interest in attending a specific course on the management of medical emergencies in the aesthetic-medicine setting.

Participants' medical background, training attendance, and mean knowledge scores according to area of practice are summarized in Table 1.

One-way ANOVA revealed significant differences in mean scores among professional areas ($F(5, 50)=10.62$, $p < 0.001$). Tukey's post-hoc test showed that the emergency–urgent-care area scored significantly higher than the clinical (medical) area ($p < 0.001$) and general practitioners ($p < 0.05$). The clinical area also reported lower scores compared with the "none /in training" group ($p < 0.01$). The corresponding effect was large (partial $\eta^2 = 0.52$; $\omega^2 = 0.46$; Cohen's $f = 1.03$), indicating that professional area explains a substantial share of variance in knowledge scores.

The association between professional area and attendance at BLSD or ACLS courses was analyzed

Table 1. Medical specialties, training attendance, and mean scores.

Area	N (%)	BLSD N (%)	ACLS N (%)	M Score (SD)
Surgical area	14 (25.0)	13 (93)	5 (36)	10.3 (2.1)
Medical area	5 (8.9)	5 (100)	1 (20)	7.8 (3.6)
Emergency-urgent care area	6 (10.7)	6 (100)	6 (100)	13.0 (2.1)
Service area	9 (16.1)	8 (89)	4 (44)	10.8 (1.9)
General practitioners	11 (19.6)	11 (100)	0 (0)	9.6 (2.5)
None / In training	11 (19.6)	7 (64)	1 (9)	11.8 (1.8)
Total	56 (100)	50 (89)	17 (30)	10.6 (2.5)

Table 2. Percentage of correct answers for each question.

Question	Correct answers (n)	% Correct
Cardiac arrest (ACLS): recommended IV/IO adrenaline dose in an adult cardiac arrest	38	67.9%
Cardiac arrest – shockable rhythms: which two rhythms are shockable according to ACLS?	35	62.5%
During adult CPR, what is the correct compression-to-ventilation ratio?	49	87.5%
In asystole, which of the following drugs is indicated together with CPR?	44	78.6%
Acute severe asthma: what is the first-line treatment in the emergency setting?	32	57.1%
Anaphylaxis: what is the first-line treatment?	51	91.1%
Mild allergic reactions (urticaria without respiratory or hemodynamic compromise): what drug is generally sufficient as initial treatment?	52	92.9%
Epileptic seizure – convulsive status epilepticus: what is the first-choice drug?	43	76.8%
Ischemic stroke – IV thrombolysis window: what is the standard time window for IV alteplase?	35	62.5%
In identifying a stroke, the "S" in the FAST acronym stands for:	41	73.2%
In ischemic stroke, what is the target systolic blood pressure?	11	19.6%
A patient with confirmed STEMI should:	45	80.4%
Reference systolic pressure value to define a "hypertensive crisis":	29	51.8%
Recommended IV dose of atropine in symptomatic bradycardia:	38	67.9%
In the "Primary Assessment," which evaluation is performed first?	51	91.1%

using the chi-square test of independence. For BLSD training, differences between areas were not statistically significant ($\chi^2(5)=10.39$, $p = 0.065$). Conversely, for ACLS training, a significant association was found ($\chi^2(5)=22.20$, $p < 0.001$), indicating a non-homogeneous distribution among the various specialties.

The distribution of correct responses for each questionnaire item is reported in Table 2.

Using a score of 12 as the competence threshold, participants who had completed ACLS training were more likely to reach or exceed this value (OR 3.6; 95 % CI 1.2–11.8; $p = 0.03$) compared with those without ACLS certification. This estimate reflects a moderate-to-large association in practical terms, with a wide yet informative 95% CI consistent with the sample size. Age and sex were not statistically associated with achieving a higher score (age OR 2.6; 95 % CI 0.80–8.9; $p = 0.1$; sex OR 0.84; 95 % CI 0.27–2.63; $p = 0.77$).

The distribution of participants according to the competence threshold (< 12 vs ≥ 12) differed significantly among professional areas, as shown in Table 3.

Table 3. Professional area and competence threshold.

Area	n <12	n ³12	% <12	% ³12
Surgical area	11	3	78.6%	21.4%
Medical area	4	1	80.0%	20.0%
Emergency-urgent care area	1	5	16.7%	83.3%
Service area	7	2	77.8%	22.2%
General practitioners	9	2	81.8%	18.2%
None / In training	3	8	27.3%	72.7%

The contingency table showed that most participants in the surgical (11/14, 78.6 %), clinical-medical (4/5, 80 %), service (7/9, 77.8 %), and general-practice (9/11, 81.8 %) areas had scores < 12, whereas the emergency–urgent-care group (5/6, 83.3 %) and the "none / in training" group (8/11, 72.7 %) mainly achieved ≥ 12. Pearson's chi-square test indicated a statistically significant difference in the distribution across areas ($\chi^2 = 21.6$, df = 5, $p < 0.001$), confirming that the variable < 12 / ≥ 12 was not independent of the professional area. Consistent with the omnibus effect, these patterns reflect specialty-specific exposure to emergency algorithms and reinforce the rationale for targeted education.

Discussion

To our knowledge, this analysis represents one of the first attempts to assess the level of knowledge of Italian aesthetic medicine physicians regarding the management of emergency and urgent-care situations. For this reason, it represents an important step, in our opinion, for collaboration among the various associations operating in this field. Although the sample size was relatively limited, it provides a useful opportunity for preliminary reflection. The study group showed a balanced distribution by sex and age, and—most importantly—a diverse background of previous training. It is worth highlighting that 80.4 % of respondents expressed interest in attending a specific course on the management of emergencies and urgent conditions in aesthetic medicine clinics. This perceived need is fully aligned with the objectives of the Agorà–SIMED project. Such training could emphasize: (i) early recognition and first-line management of anaphylaxis/asthma; (ii) two-person bag-mask ventilation and use of adjuncts; (iii) focused pharmacology applicable in clinics (e.g., IM adrenaline, inhaled β_2-agonists, ASA when indicated); and (iv) structured EMS communication (SBAR, 112 activation). Short scenario-based sessions and micro-simulation are aligned with participants' training preferences and with current practice in analogous outpatient disciplines.

Regarding area of specialization, the one-way ANOVA revealed statistically significant differences among professional groups ($F(5, 50) = 10.62$, $p < 0.001$), indicating that specialty significantly influences overall performance. Tukey's post-hoc analysis showed that physicians in the emergency–urgent-care area achieved significantly higher scores compared to those in the clinical (medical) area ($p < 0.001$) and general practitioners ($p < 0.05$). The clinical area also showed lower scores than the "none / in training" group ($p < 0.01$), while no other inter-area differences reached statistical significance. As anticipated, experience in emergency and urgent-care contexts was associated with a higher level of competence compared with other specialties. Interestingly, participants without a formal specialization—most of whom had graduated recently—also obtained higher average scores. This may reflect the increasing inclusion of emergency-related courses within university curricula in recent years. Beyond the overall effect, item-level analysis revealed domain-specific gaps (Table 2), particularly in acute asthma management (57%), recognition of shockable rhythms (63%), and identification of the stroke thrombolysis window (63%), with the lowest accuracy observed in identifying the target systolic blood pressure in ischemic stroke (20%). These are clinically relevant

competencies for outpatient settings, where early recognition and appropriate first-line actions determine outcomes. The large between-group effect ($\eta^2p \approx 0.52$) indicates that such gaps are not evenly distributed across specialties, supporting the need for discipline-specific learning priorities.

The results also indicate that the participation in BLSD courses was high and generally uniform across professional areas, suggesting a widespread diffusion of this basic competence. Conversely, ACLS course attendance varied significantly by specialty, with higher rates among physicians working in emergency–urgent-care settings and lower rates among general practitioners and clinicians. This likely reflects the differing training and operational needs of these professional contexts, in which advanced cardiac emergency management plays a more or less central role in daily practice. Beyond distributional differences, ACLS training was associated with surpassing the competence threshold (OR = 3.6; 95% CI 1.2–11.8), which aligns with the observed gradient in knowledge and supports integrating selected ACLS concepts—such as rhythm recognition and pharmacologic readiness—into outpatient-appropriate curricula. Nevertheless, as highlighted in Table 2, participants demonstrated several gaps regarding algorithms, particularly in the administration of drugs during cardiac arrest and in the recognition of urgent conditions.

As shown in Table 3, the achievement of the minimum competence threshold (12 points), defined by the working group, differed markedly across professional areas. The higher proportion of scores ≥12 among physicians in the emergency–urgent-care area and those in the "none / in training" category may reflect the specific characteristics of workload, training, or professional experience in these contexts. Conversely, surgical, clinical, and general-practice areas showed a predominance of scores <12, suggesting a different profile with respect to the variable under consideration. These differences emphasize the importance of accounting for professional characteristics when designing targeted interventions or interpreting aggregated data across heterogeneous groups. Future studies should further investigate the determinants of these disparities to optimize training and support strategies tailored to each professional area.

In light of these findings, BLSD knowledge alone may be insufficient for the appropriate management of emergencies in aesthetic medicine clinics. ACLS courses, which include a greater focus on airway management, rhythm recognition, and the use of manual defibrillators, represent an advanced level of training not typically feasible in an outpatient aesthetic setting. However, regarding the pharmacologic management of cardiac arrest and events such as anaphylactic shock, ACLS content remains highly valuable. Therefore, integrating selected ACLS competencies into BLSD training could form the basis of an intermediate course, incorporating elements derived from advanced algorithms and focusing on drugs and procedures applicable to the outpatient practice.

Such an approach may be of particular interest to aesthetic practitioners, as each patient presents an individual risk profile for developing emergency or urgent events[21,22]. These risks and comorbidities must be carefully assessed and balanced during pre-procedural evaluation and medical history collection. Even within our study population, physicians showed varying baseline knowledge on emergency management, in line with findings from other research[23].

Moreover, simulation-based education is becoming increasingly common in aesthetic medicine[24,25], bringing training methodologies closer to the structured, algorithm-driven models used in emergency disciplines. This evolution represents a major change in mindset: aesthetic physicians typically follow individualized, patient-centered therapeutic pathways, whereas emergency management requires a standardized, rapid, and protocol-based approach. For this reason, integrating and developing dedicated emergency courses—potentially within aesthetic medicine postgraduate training programs—appears essential, as also requested by the participants in our analysis and consistent with recent literature[12].

The impact of emergency training on patient safety has already been widely demonstrated[26], and its importance extends to outpatient settings[27,28]. Finally, training for aesthetic medicine professionals should also address emerging urgent conditions, such as intra-arterial filler embolism (AISA) or local-anesthetic systemic toxicity (LAST)[29,30]. Competence in managing urgent and emergency events in general may play a

crucial role in responding effectively to these situations as well.

This analysis presents certain limitations. Participants who chose to complete the questionnaire may have had a pre-existing interest in emergency care and, consequently, higher competence levels. Furthermore, the convenience sampling method limits the representativeness of the aesthetic physician population as a whole. Nonetheless, given the scarcity of data on this topic, we believe that this study constitutes an important initial step in bringing attention to the issue of emergency preparedness within aesthetic medicine. These preliminary findings, combined with the proposed Emergency Readiness Index framework, delineate a clear pathway for methodological refinement and educational evaluation in the next phases of the SIMED-Agorà project.

Conclusions

In line with the objective of our study, we assessed the competence of aesthetic medicine physicians in the management of emergency situations. Overall, participants demonstrated a moderate level of preparedness, with a mean score of 10.6 out of 15. Physicians who had completed ACLS training were significantly more likely to reach the predefined competence threshold compared to those with only BLSD training, suggesting that advanced life-support knowledge may substantially improve emergency preparedness in outpatient aesthetic settings. Broader training and knowledge extending beyond basic BLSD were shown to be useful in improving the ability to manage urgent scenarios that may occur in the outpatient practice. We observed that neither age nor gender appeared to influence competence levels. Most participants expressed a strong interest in receiving specific training on the management of in-office emergencies, confirming the relevance and educational need for structured emergency preparedness within aesthetic medicine.

AI-Assisted Tools Disclosure: AI-assisted tools were used exclusively for language refinement and grammar improvements. No part of the scientific content, data analysis, interpretation of results, or generation of original ideas was produced by AI.

The authors retain full responsibility for the integrity and accuracy of the manuscript.

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Conflict of Interest: The authors declare that they have no commercial or financial conflicts of interest related to the content of this work. Giuseppe Stirparo declares his qualification as a BLSD and ACLS instructor; however, this professional role did not influence the study design, data analysis, or interpretation of results.

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Supplementary File

File S1. The complete questionnaire was created as a Microsoft Teams form and made available for completion through a QR code.

Section A – Demographic data

1. Sex:
   □ Male
   □ Female
2. Age: _____
3. Specialty (main area):
   □ Surgical area
   □ Medical area
   □ Emergency–urgent care area
   □ General practitioner
   □ None / in training
4. Have you attended a BLSD course?
   □ Yes
   □ No
5. Have you attended an ACLS course?
   □ Yes
   □ No
6. Have you completed a postgraduate master's in aesthetic medicine?
   □ Yes
   □ No
7. Would you like to attend a course on the management of medical emergencies?
   □ Yes
   □ No
8. Type of facility
   □ Healthcare facility of medium complexity (outpatient clinic with medical management)
   □ Healthcare facility of high complexity (clinic or hospital facility)
   □ Other
   Please indicate country and region: _____

Section B – Knowledge of emergency and urgent-care management

1. Cardiac arrest (ACLS): What is the recommended IV/IO dose of adrenaline during adult cardiac arrest?
   A) 0.1 mg every 3–5 min
   B) 1 mg every 3–5 min
   C) 0.01 mg/kg
   D) 5 mg single dose
2. Cardiac arrest – shockable rhythms: Which two rhythms are considered shockable according to ACLS?
   A) Asystole and PEA
   B) VF and pulseless VT
   C) VF and PEA
   D) Sinus tachycardia and VF
3. Severe acute asthma: Which treatment is indicated as first line in the emergency department?
   A) Prednisone 25 mg IV
   B) High-dose inhaled β_2-agonists (salbutamol)
   C) Low-flow oxygen only
   D) Ipratropium bromide IV
4. Ischemic stroke – IV thrombolysis window: What is the standard time window for IV alteplase?
   A) 1 hour
   B) 12 hours
   C) 4.5 hours
   D) 24 hours
5. To identify a stroke, the "S" in the acronym FAST stands for:
   A) Sensitivity
   B) Sleepiness
   C) Speech
   D) Sedation
6. In the "Primary Assessment," which evaluation is performed first?
   A) Circulation
   B) Airway
   C) Disability (neurological)
   D) Exposure (physical exam)

7. What is the recommended IV dose of atropine in symptomatic bradycardia?
   A) 0.5 mg IV repeated every 3–5 min
   B) 1 mg/kg every 2 min
   C) 5 mg single dose
   D) 10 µg/kg
8. A patient with confirmed STEMI should:
   A) Be sent independently to any ED
   B) Be transferred by EMS to a PCI-capable center
   C) Immediately receive morphine and nitroglycerin
   D) Wait 24 h for coronary angiography
9. In ischemic stroke, what is the target systolic blood pressure?
   A) < 200 mmHg
   B) < 185 mmHg
   C) < 160 mmHg
   D) < 140 mmHg
10. Anaphylaxis: What is the first-line treatment?
   A) Antihistamine 10 mg IV
   B) Corticosteroid 5 g IV
   C) Adrenaline IM 0.3–0.5 mg (adult)
   D) High-flow oxygen
11. Cardiac arrest: Indicate the compression-to-ventilation ratio for an adult patient.
   A) 15:2
   B) 30:2
   C) 5:1
   D) 25:3
12. Epileptic seizure – convulsive status epilepticus: What is the first-choice drug?
   A) Phenytoin
   B) Benzodiazepine
   C) Ketamine
   D) Propofol
13. Mild allergic reactions (urticaria without respiratory or hemodynamic compromise): Which drug is generally sufficient as initial treatment?
   A) Oral or IV antihistamine
   B) Immediate IM adrenaline
   C) Empirical antibiotic
   D) High-dose corticosteroid as sole therapy
14. Asystole: Which of the following drugs is indicated together with CPR?
   A) Adrenaline
   B) Atropine
   C) Amiodarone
   D) IV magnesium
15. Reference systolic blood-pressure value defining a "hypertensive crisis":
   A) 180 mmHg
   B) 250 mmHg
   C) 200 mmHg
   D) 150 mmHg

Supplementary 2

Table S1. Conceptual framework for an Emergency Readiness Index (ERI). This framework provides a structured bridge between the present findings—focused on knowledge and training—and the broader system components that determine real-world emergency readiness. It also serves as the conceptual foundation for the quantitative ERI planned in future SIMED-Agorà phases.

Dimension	Definition	Possible indicator
Knowledge	Accuracy in emergency-related questionnaire items	Mean score (%) by professionals area (see Table 1)
Training exposure	Completion of certified life-support courses	Proportion with BLSD and ACLS certification (see Table 1)
System preparedness	Availability of emergency equipment, protocols, and drill frequency	Presence/absence in workspace (to be assessed in follow-up)
Overall readiness (ERI)	Integrated interpretation of the above dimensions	Composite 0-100 index (to be developed and validated)