ELSO GLOBAL STANDARDS FOR ENDORSED ECMO TRAINING COURSES

ELSO ENDORSEMENT COMMITTEE

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1. Introduction

Since publication of the 2019 Position Paper on Global ECMO Education[1], the literature on ECLS education has expanded more than fourfold. A growing body of work now describes innovative curricula and educational interventions delivered through simulation, in-person teaching, online modules, and other multimedia formats[2]. This expansion has paralleled the worldwide growth of ECMO use in both adult and pediatric populations. Despite this progress, educational practices remain highly variable across ELSO centers[3]. Over the same period, survival and complication rates reported in the ELSO Registry have remained largely stable[4], in part reflecting increasing case complexity and broader clinical diversity. Collectively, these trends reinforce the need for a standardized, consensus-based curriculum and a competency-based assessment framework to promote consistent, high-quality ECMO training worldwide.

ELSO's vision is to make standardized ECMO education globally accessible. To support this goal, ELSO has developed an internationally curated, consensus-driven curriculum that functions as a practical roadmap for institutions establishing new programs or strengthening existing training pathways. The curriculum is intended for all individuals who meet the definition of an ECMO practitioner and for the full interprofessional ECMO team, promoting education that is consistent, evidence-informed, and adaptable to diverse healthcare systems.

Central to this effort is the ELSO Guideline for Training and Continuing Education of ECMO Practitioners[5]. The guideline defines minimum expectations for cognitive knowledge, technical proficiency, and professional behaviors, and it establishes standards for simulation delivery, instructor development, and structured assessment. Grounded in simulation-based medical education (SBME) and adult learning principles, it provides a shared foundation for ECMO education—supporting practitioners and centers in delivering safe, effective care across institutions and regions.

ELSO does not claim to offer the only approach to ECMO education. Training programs will—and should—continue to reflect local resources, staffing models, scopes of practice, and patient populations. ELSO's role is to evaluate what works, continuously improve educational methods, and define a consensus-based standard for ELSO-endorsed training. This standardization is intended to reduce unwarranted variability by specifying clear learning objectives, essential content, and minimum expectations for how training is delivered and assessed.

Accordingly, an ELSO-endorsed ECMO course should be meaningfully comparable regardless of where it is delivered. While implementation may be adapted to local context, participants should encounter consistent curriculum structure, core topics, instructional approaches (including simulation and debriefing practices), and competency-based outcomes. In practical terms, ELSO endorsement signals that learners are expected to achieve the same foundational competencies and that the training experience meets a shared benchmark for rigor, safety, and educational quality across institutions and regions.

2. Addressing Gaps in ECMO Education

Several persistent barriers have hindered the global adoption of competency-based ECMO education:

Diverse Practitioner Backgrounds: ECMO teams are inherently interprofessional, often including nurses, respiratory therapists, perfusionists, intensivists, cardiologists, surgeons, neonatologists, and anesthesiologists. Each discipline enters training with different baseline competencies, scopes of practice, and responsibilities, making standardization and fair assessment challenging.

Limited Instructor Development Pathways: Many centers lack formal, stepwise processes for preparing and credentialing instructors. This includes the absence of defined milestones for teaching performance, simulation facilitation, feedback delivery, and reliable assessment.

Inconsistent Assessment and Certification Practices: Methods for evaluating competency—and the criteria for certifying readiness for independent practice—vary widely across ECMO centers. This inconsistency reduces comparability and limits the portability of training outcomes.

Limitations of Time-Based Training Models: Training programs that rely primarily on duration or case exposure do not consistently ensure competence.

This highlights the need for explicit learning outcomes, structured curricula, and objective, measurable assessments that reflect real-world performance.

3. ELSO Curriculum, Certification, and Global Standardization

To address persistent gaps and reduce unwarranted variability in ECMO education, ELSO has developed internationally curated, consensus-driven curricula for both adult and neonatal/pediatric ECMO practice. These curricula define core knowledge and essential technical skills—including the ability to recognize and manage ECMO emergencies—and specify standardized approaches to assess minimum competence. By integrating best practices in simulation design, debriefing, and adult learning theory, the curricula provide a scalable education model that promotes high standards of care across centers[6].

In parallel, ELSO offers individual certification pathways that enable ECMO practitioners to demonstrate standardized knowledge and competence across patient populations. As defined by 2019 Position Paper[1], an ECMO practitioner is a healthcare professional (nurse, respiratory therapist, perfusionist, physician) who has completed structured education and training to support the clinical management of patients receiving ECMO, including responsibility for patient assessment, circuit management, troubleshooting, and interprofessional communication across disciplines. The ELSO Adult ECMO Certification (E-AEC) provides a formal mechanism for validating expertise in adult ECMO management[7]. Developed through a rigorous, multi-stage process, the E-AEC uses structured NBME-style (National Board of Medical Examiners) assessments to support reliable, cross-disciplinary evaluation of readiness for safe and effective practice. Certification is valid for three years and includes periodic reassessment to sustain proficiency and remain aligned with evolving adult ECMO practice. Similarly, the ELSO Neonatal-Pediatric ECMO Certification (E-NPEC) offers a parallel pathway for practitioners involved in neonatal and pediatric ECMO care. Also developed through a rigorous, multi-stage process, the E-NPEC employs NBME-style assessments to confirm that clinicians across disciplines possess the knowledge and skills required to manage neonatal and pediatric ECMO patients safely and effectively[8]. Valid for three years, the E-NPEC emphasizes ongoing reassessment to maintain competence and support continued professional development.

Taken together, ELSO's curriculum standards, certification pathways, and course endorsement initiatives advance the organization's goal of expanding standardized ECMO education worldwide by establishing a shared framework of learning objectives and minimum competency expectations across disciplines. By integrating competency-based assessment, structured simulation-based curricula, and formal pathways for ongoing instructor development, these programs promote interdisciplinary teamwork, strengthen clinical and technical performance, and emphasize demonstrable skill acquisition over time-based training alone. This approach is supported by evidence that structured, simulation-based ECMO courses paired with

standardized assessment improve participants' knowledge, confidence, and technical capabilities. In addition, these frameworks create a platform for educational research, quality improvement, and scholarship—ultimately reinforcing the safe and effective delivery of ECMO care across diverse healthcare systems.

ELSO Endorsement is the formal process through which ELSO reviews an external ECMO educational activity to determine whether it meets ELSO curricular requirements for certification, adheres to established simulation standards, and aligns with the required course structure and evidence-based educational methods.

4. ELSO Endorsement Framework

4.1 Eligible Organizations for Endorsement

Any ELSO member-center may apply for endorsement consideration.

4.2 Endorsement Levels for ECMO Training Centers

ELSO provides three endorsement pathways; each aligned to a distinct patient population: neonatal/pediatric or adult ECMO. Within each population, institutions may apply for endorsement of either (1) Comprehensive course that includes **Step 1 and Step 2**, (2) a Step 1-only course focused exclusively on didactic curriculum, or (3) a **Step 2–only** course focused exclusively on simulation.

4.3 Step 1 (Didactic): Step 1 is a didactic-only component designed to establish foundational cognitive knowledge aligned with the ELSO Standardized Core Curriculum & ELSO Guidelines for either Adult ECMO or Neonatal/Pediatric ECMO [9,10].

4.4 Step 2 (Simulation): Step 2 is simulation-based training that emphasizes application of knowledge through immersive, high-fidelity ECMO scenarios. Participants complete an ECMO simulation experience that incorporates ELSO's Essential Simulation Scenarios**.**

For Adult ECMO**,** these include drainage insufficiency, air embolism, pump failure, membrane lung failure, and gas failure. For Neonatal/Pediatric ECMO, the required scenarios include the same set plus cannula dislodgement and circuit change. Step 2 is designed to reinforce and assess technical performance, clinical decision-making, communication, and team-based behaviors in a controlled and safe environment and so build a shared knowledge base and then translate that knowledge into safe, effective practice.

Comprehensive courses that include both Step 1 and Step 2 are generally conducted over 3–5 days or consist of at least 12 hours of didactic instruction (Step 1) and 9 hours of simulation-based training (Step 2). Provision of pre-course online educational materials is strongly encouraged to support readiness and optimize learning across both instructional modalities.

Together, these endorsement options allow programs to align their courses with ELSO standards while addressing the distinct learning needs of adult and neonatal/pediatric ECMO practitioners.

5. Simulation Standards for ELSO-Endorsed Courses

5.1 Goals of ECMO Simulation

The overarching goals of ECMO simulation training are to ensure timely and appropriate ECMO initiation and effective ongoing management, strengthen team performance during circuit emergencies, reduce preventable complications and unnecessary resource utilization, and improve patient-centered outcomes (including ICU length of stay)—thereby supporting the clinical effectiveness and long-term sustainability of ECMO programs. In addition, standardized simulation provides measurable performance data that can be leveraged for continuous quality improvement, enabling centers to refine training, systems, and team behaviors over time. Before immersive simulation, a water drill should be completed. This preparatory session should include system components, priming/de-airing, circuit integrity checks, and basic pump operation.

5.2 Simulation Structure and Sequence

Immersive simulation in ELSO-endorsed courses follows a structured sequence:

1. **Briefing:** Learners are oriented to the scenario and objectives; roles are clarified; equipment is reviewed; and psychological safety is established (e.g., through a safety contract). This step explicitly links the simulation to prior didactic content.
2. **Simulation:** Participants manage realistic ECMO emergencies and clinical challenges in a high-fidelity environment, integrating cognitive knowledge with technical execution and team behaviors. Facilitators support learning while allowing participants to independently navigate tasks and decisions. To maintain focus, **one primary learning objective per scenario is strongly recommended**, with clear critical action points.
3. **Debriefing:** After each scenario, a structured debrief enables learners to reflect, analyze key actions and decisions, and receive targeted, actionable feedback. This phase reinforces core concepts and strengthens communication, teamwork, and crisis resource management. To promote consistency and psychological safety, we recommend designating a single lead debriefer (or one primary debriefer per scenario) and maintaining a respectful, psychologically safe environment throughout.

4. **Consolidation / Summary:** At the end of the scenario (or simulation session), instructors should synthesize key learning points and explicitly revisit the stated objectives, highlighting how they were addressed. Unresolved questions should be placed in a "parking lot" for follow-up after the session.

5.3 Competency Evaluation

The experience should conclude with structured assessment to consolidate learning, evaluate competency attainment, and—when applicable—support certification-related evaluation.

An ECMO Simulation Course is a Step 2–only offering that meets ELSO standards for immersive, high-fidelity simulation with a minimum of 9 hours of simulation-focused instruction.

Participation requires prior completion of a didactic ECMO training experience (Step 1)**.** Endorsed sites are responsible for verifying completion of the required didactic training before learners attend the simulation course; this could be fulfillment of an ELSO foundations course.

6. Endorsement Process Steps

6.1 Overview of Process

Step 1: Application Submission
The endorsement process begins when the institution formally applies. This should be done approximately 4 to 6 months before the planned educational activity. An application fee is required at the time of submission.

Step 2: Initial Meeting
ELSO arranges an initial meeting with the course director(s) to discuss logistics. This meeting ensures that both the institution and ELSO are aligned on expectations and requirements.

Step 3: Survey Agreement
A formal survey contract is provided to the center and site surveyor, outlining expectations and the commitment to pay all associated site survey fees.

Step 4: Preparation Meeting with Surveyor
This meeting occurs 1 to 2 months before the on-site evaluation. The surveyor reviews lecture slides and/or simulation scenarios at least 2 months prior to the course.

Step 5: On-Site Survey
The assigned surveyor visits the site during the actual course. The surveyor assesses the educational content, training practices, and adherence to ELSO standards.

Step 6: Committee Review and Decision
The surveyor presents their findings to the ELSO Endorsement Committee. Recommendations and feedback are typically provided to the host site within 30 days of the activity.

Step 7: Endorsement Agreement
If the program meets all standards, an endorsement agreement is finalized. The institution is then formally recognized as an ELSO-endorsed ECMO training program and receives a license to use the ELSO brand for three years.

6.2 Application and Review Steps

1. **Review requirements and attest to compliance.** Before submitting an endorsement application, the center must review all endorsement requirements and sign an attestation confirming agreement with the application terms.
2. **Pay the application fee.** An application fee is due at submission. Fees are country specific. For courses held in the United States, the fee is **$2,100 USD**. Country-specific pricing outside the U.S. is available on the ELSO website.
3. **Plan for review time.** Once submitted, allow **10–15 business days** (Monday–Friday, excluding holidays) for review of application materials.
4. **Submit well in advance.** Applications should be submitted **4–6 months** before the educational activity to allow adequate time for course review and site survey coordination.
5. **Initial logistics discussion.** After the application is reviewed, the ELSO Endorsement Committee will contact the listed course director to schedule an initial endorsement logistics discussion.
6. **Address identified gaps.** If the review identifies barriers to endorsement, the committee will provide recommendations to support course adjustments.
7. **Exceptions require approval.** Any exceptions to course requirements may be considered only with formal authorization from the Endorsement Committee.
8. **Compliance is not endorsement.** Once materials are accepted, the initial logistics discussion is complete, and the curriculum has been reviewed. However, **use of the ELSO logo** or any language implying endorsement/compliance in advertising is prohibited at this stage.
9. **Site survey contract.** Prior to the site survey, the center will receive a site survey contract outlining responsibility for all associated site survey fees.

10. **Endorsement is granted only after successful site survey and contract execution.** The course may be branded as ELSO-endorsed only after completion of a successful site survey and execution of the endorsement contract.
11. **Advertising materials are reviewed.** All advertising is reviewed as part of the process and must clearly specify course topic and population focus (adult vs neonatal/pediatric), target audience, learning objectives, ECMO pump type(s) used, and course language.

6.3 Site Survey

1. **On-site observation.** A surveyor appointed by the ELSO Endorsement Committee will visit the site during a live course offering.
2. **Surveyor selection.** Surveyors are typically selected from the local ELSO chapter to align with language and regional context, unless a conflict of interest exists or availability/language considerations require an alternative.
3. **Standardized evaluation.** Surveyors receive guidance from the committee to evaluate and report criteria in a standardized manner.
4. **Independence requirements.** Surveyor(s) must not be part of the course faculty and must have no financial or professional involvement with the course.
5. **Pre-course review of materials.** At least **two months** before the course, surveyor(s) review lecture slide sets and simulation scenarios to confirm completeness, learner appropriateness, and alignment with ELSO guidance. Suggested modifications are provided to the course director at least one month prior. Revised slides/scenarios must be approved at least two weeks before the course.
6. **Checklist-based scoring.** Surveyor(s) use a standardized checklist to review and score course elements.
7. **Post-course recommendations.** After course completion and receipt of course evaluations, surveyor(s) review findings with the Endorsement Committee and provide a final endorsement recommendation.
8. **Timeline for feedback.** Survey findings and recommendations are provided to the host site within 30 days of educational activity.
9. **Pathway if not granted.** If endorsement is not initially granted, the committee will provide a defined pathway for the host site to pursue endorsement.
10. **Endorsement level is specified.** At the time of endorsement, the committee will specify whether the course meets **Step 1 (Didactic)** requirements for certification (E-AEC/E-NPEC), **Step 2 (Simulation)** requirements, or **both**. The endorsed level (step number and description) must be clearly disclosed in all subsequent course advertisements.
11. **Endorsement license and brand use.** After successful completion of the site survey, the center will receive an endorsement license defining the terms for using the ELSO brand and logo. **The ELSO endorsement logo and endorsement language may not be used until the contract is executed.**

6.4 Endorsement Cycle

1. **Term.** Endorsement is granted for three years from the date the endorsement contract is signed.
2. **Course listing encouraged.** During the endorsement term, centers are encouraged to submit course details to ELSO so courses can be listed on the ELSO website and visible to the broader ECMO community.
3. **Re-endorsement.** After three years, centers may reapply. If there are no substantive changes in leadership, content, or delivery, a re-endorsement processing fee will apply.
4. **Major changes may require full review.** If there are significant changes in leadership, content, or course delivery, the center may be required to complete a full application process and may be subject to full survey and application fees for an on-site review.

6.5 Appeals Process

1. **Right to appeal.** If a site is not granted endorsement and disagrees with the decision and recommendations, it may request reconsideration by submitting a written appeal statement to the ELSO Endorsement Committee within 30 days of the committee's decision.

7. Benefits of Endorsement: A Standardized ECMO Curriculum Delivered Consistently Worldwide

ELSO has developed a rigorous ECMO practitioner curriculum that integrates didactic instruction with hands-on, scenario-based learning. Minimum learning objectives were established through multiple Delphi rounds conducted by an expert panel representing all five ELSO chapters and the full range of ECMO disciplines. This collaborative, consensus-driven process produced a clearly defined standardized curriculum that can be disseminated internationally through a centralized endorsement process.

Endorsement ensures that defined educational standards are met consistently and sustained over time. By verifying adherence to ELSO requirements—including curricular content, simulation standards, and course structure—endorsement provides assurance to participants while expanding access to high-quality ECMO training through geographically distributed centers and flexible scheduling.

By establishing a universal curriculum and minimum training standards, endorsement also supports formal ECMO certification pathways, including the ELSO Adult ECMO Certification (E-AEC) and the ELSO Neonatal and Pediatric ECMO Certification (E-NPEC). This model is analogous to the American Heart Association's BLS and ACLS programs, where training and assessment are delivered locally but standardized through centralized requirements—enabling broad availability without compromising consistency.

Course providers benefit directly from endorsement. ELSO review helps confirm that curricula are complete, current, and aligned with best practices, while identifying opportunities to strengthen educational design and delivery. Standardized course evaluations make feedback comparable across programs and provide actionable insights for course directors. In addition, the ELSO endorsement designation signals credibility and quality to prospective participants, supporting course visibility and enrollment.

Learners also gain meaningful advantages. Through the ELSO learning management system (ELSO Academy), completed courses are recorded in a centralized account, with secure storage of certificates and training documentation. These records remain accessible for credentialing and privileging processes and support longitudinal professional development, including progression toward E-AEC and E-NPEC certification. In this way, endorsement promotes convenience, recognition, and continuity—helping practitioners to track training, demonstrate competence, and advance their careers.

8. Industry Relationships

To support constructive relationships with industry while complying with local continuing education and accreditation requirements, ELSO recommends the following:

- **Full transparency is required.** Sponsorship is permitted; however, all financial and in-kind (non-monetary) support must be disclosed clearly and in a timely manner.
- **Mandatory conflict-of-interest disclosure.** All faculty must submit conflict-of-interest (COI) disclosures for the overall program and disclose relevant relationships within individual presentations, as required by applicable CME/CE standards.
- **Educational independence must be preserved.** The course director is solely responsible for program content and faculty selection. Industry partners must have no role in determining topics, selecting speakers, or influencing educational materials.
- **No promotion within the educational activity.** Industry may not advertise, market products, or otherwise participate in the educational component (e.g., the CME/CE portion). Industry engagement is permitted only outside the educational space.

- **Sponsors may be acknowledged with clear separation from educational content.** Sponsor recognition is permitted on the final page of the program booklet and/or on a separate sponsor page/tab on the course website. All promotional content must be clearly separated from, and visually distinguishable from, the scientific and educational components of the program.

9. Course Leadership Roles and Faculty Requirements

9.1 Course Director(s): Responsibilities and Requirements

The course director (or co-directors) is the primary leader responsible for the planning, organization, delivery, and overall educational integrity of an ELSO-endorsed ECMO course. To ensure appropriate expertise and credibility, the director should be an active ELSO member—and should have a minimum of five years of direct ECMO clinical experience. In exceptional circumstances, a waiver of this requirement may be considered with approval from the ELSO Endorsement Committee.

Prior participation in an ELSO-hosted or ELSO-endorsed course is strongly favored, as it provides familiarity with ELSO standards, guidelines, course structure, and expectations for delivery and assessment[12]. Additionally, it is recommended that someone from the faculty is E-AEC or E-NPEC certified to be able to provide guidance to the learners when questions arise to the process and examination.

Experience in simulation-based education is also desirable, given the central role of immersive simulation in ECMO training and competency assessment. ELSO Instructor Development Workshop - TTT is one of the possibilities within this scope.

Beyond course delivery, directors are expected to support the broader ECMO education community by sharing expertise across institutions and regions. Accordingly:

- Course directors of ELSO-endorsed programs may deliver courses outside their home institution, subject to prior approval.
- Course directors may lead or co-lead courses within their ELSO chapter (e.g., EuroELSO, Asia-Pacific ELSO, LATAM, SWAAC), helping disseminate best practices and promote consistency across endorsed programs.

By meeting these requirements and responsibilities, course directors help ensure high-quality, standardized ECMO education while strengthening collaboration and advancing interprofessional training globally.

9.2 Simulation Faculty: Requirements for ECMO Simulation Instructors

For courses with Step 2 endorsement, simulation faculty should meet core qualifications that support consistent, high-quality instruction.

To ensure the psychological safety of learners and the effectiveness of the debriefing process, at least one faculty member per simulation station must have completed a formal simulation instructor program. A formal simulation instructor program should include structured debriefing training, enabling them to facilitate learning effectively and deliver clear, actionable feedback. Prior participation in an ELSO-hosted or ELSO-endorsed course is strongly preferred, as it familiarizes faculty with ELSO educational standards, course structure, and endorsed simulation practices.

To maintain proficiency and active instructor status, simulation faculty should participate in teaching at least one ECMO course per year, ensuring continued engagement in ECMO education and ongoing development of instructional and debriefing skills. Instructors must be up to date with ELSO guidelines, nomenclature and ideally ELSO foundations content[12].

10. Educational Resources and Course Materials

Access to the ELSO Red Book and/or the ELSO Specialist Training Manual is recommended to support standardized content delivery and independent study**.** E-book vouchers may be available to facilitate learner access to these core resources[11]

11. General Course Format and Multidisciplinary Standards

All didactic and simulation content should be aligned with current ELSO guidelines and supported by appropriate references to ensure instruction is evidence-informed and authoritative. Consistency across endorsed courses reinforces key concepts, supports retention, and reflects core principles of adult learning. Center-specific practices or protocols may be included when relevant; however, they must be clearly identified as local approaches, so learners can appropriately interpret and adapt the information to their own clinical environment.

Because ECMO care is inherently interprofessional, course design should address the learning needs of the full ECMO team—including physicians, nurses, respiratory therapists, nurse practitioners, physician assistants, and perfusionists. Instruction should deliberately engage learners from diverse professional backgrounds, acknowledge differences in baseline experience and scope of practice, and promote collaboration, problem-solving, and application to real-world scenarios. These elements are central to adult learning and are essential for building effective team performance in ECMO care.

12. Best Practices for Course Design

12.1 Overall approach

- **Think "support," not "script."** Slides should reinforce the instructor's message—not replace it.
- **One slide, one message.** Each slide should communicate a single key point or takeaway.
- **Plan before building.** Organize content first (introduction → key points → summary), then translate into slides.

12.2 Content and text

- **Keep it concise.** Use short bullets (aim for the "6×6 rule": ≤6 bullets per slide and ≤6 words per line).
- **Use plain language.** Avoid unnecessary jargon unless it matches the audience's expected level.
- **Emphasize sparingly.** Use bolding or color only to highlight true takeaways, not for decoration.
- **Choose readable typography.** Use sans-serif fonts (e.g., Calibri, Arial, Helvetica) with 24–28 pt body text and 32–44 pt titles.

12.3 Design and layout

- **Maintain consistency.** Use a unified theme, color palette, font set, and layout throughout.
- **Use whitespace intentionally.** Avoid crowded slides; allow visual breathing room.
- **Ensure strong contrast.** Dark text on a light background (or the reverse) for easy readability.
- **Minimize animations.** Use subtle, consistent transitions only when they improve clarity.
- **Align elements precisely.** Use gridlines to keep text boxes and images cleanly aligned.

12.4 Visuals and data

- **Prefer visuals over text.** Use diagrams, icons, images, and flowcharts to illustrate concepts.
- **Simplify charts.** Remove nonessential gridlines/labels and focus on the message the data supports.
- **Ensure accessibility.** Make graphs legible and use color choices that remain interpretable for color-blind viewers.
- **Use high-quality images.** Select relevant, high-resolution visuals; avoid cliché stock photos. Use icons/infographics to simplify complex processes.

12.5 Delivery and accessibility

- **Design for projection.** Test slides from the back of the room to confirm readability.
- **Use speaker notes.** Keep details in notes rather than on slides.
- **Build accessible materials.** Maintain strong contrast and include alt text for key visuals when distributing files.
- **Pace appropriately.** Plan for approximately 1–2 minutes per slide, adjusting for complexity and interaction.

13. Evaluation and Continuous Improvement

To assess learning outcomes and support continuous improvement, courses should administer standardized pre- and post-course surveys and evaluation forms. Initial results and feedback should be submitted to ELSO, and follow-up evaluations may be requested periodically by the ELSO Endorsement Committee. This structured feedback loop helps ensure courses remain relevant, effective, and responsive to learner needs.

13.1 Competency verification

Training should end with a formal evaluation process that confirms achievement of defined competencies, reinforces key learning points, and—when applicable—meets the assessment requirements associated with certification pathways.

13.2 Additional Requirements for Lectures and Course Structure

1. Course content must align with ELSO guidelines and include appropriate references.
2. Center-specific practices may be included but must be clearly labeled as local protocols.
3. Materials must address the needs of the full ECMO team (physicians, nurses, respiratory therapists, NPs, PAs, perfusionists).
4. Instruction should actively engage learners and promote collaboration, problem-solving, and application to real-world scenarios.
5. Standardized pre- and post-course evaluations must be administered, with results shared with ELSO for quality assurance.
6. Each lecture should include title slide**,** disclosure slide**,** educational objectives slide and contact information at the end.
7. Lecture blocks should not exceed two hours and should be separated by scheduled breaks.

14. Simulation Format: Structure, Roles and Expectations

Effective ECMO simulation training requires a structured, high-fidelity approach that develops both technical and non-technical competencies essential for safe patient care. Each scenario should have clearly defined learning objectives mapped to cognitive, technical,

and behavioral domains within a script available to all instructors. Scenarios must use a real ECMO pump and circuit, paired with a mannequin, task trainer/physical simulator, or standardized patient to create a realistic and immersive learning environment.
Each simulation room should be staffed by both a simulation expert and an ECMO content expert, maintaining a learner-to-instructor ratio of no more than 3:1. All participants are expected to actively engage in every scenario, including hands-on execution of core technical interventions required to manage ECMO emergencies—regardless of professional background. Required circuit emergencies include air embolism, pump failure, gas failure, membrane lung failure, and drainage insufficiency (and cannula dislodgement and circuit change for Neonatal and Pediatric courses).

Simulation-based training should follow a four-stage educational sequence: briefing, simulation, debriefing, and consolidation. The session begins with a briefing that introduces the scenario, clarifies roles, reviews equipment and expectations, and establishes psychological safety. During the simulation, learners manage a critically ill ECMO patient in real time, integrating technical performance with clinical reasoning, communication, and teamwork under realistic conditions.

A structured debriefing—typically the most important learning phase—guides participants to reflect on performance, analyze key decisions and behaviors, and receive targeted feedback. Debriefing should follow a three-phase framework (description/reaction → analysis/understanding → application/summary) and generally lasts two to four times the length of the scenario itself. The final phase, consolidation, evaluates competency attainment, consolidates lessons learned with teaching points.

High-quality simulation depends on effective instructor development. Instructors must pair strong ECMO clinical expertise with competence in simulation-based education, functioning as facilitators and debriefers within a psychologically safe learning environment. Facilitators guide participation and ensure alignment with objectives; debriefers lead reflective learning and connect behaviors to clinical outcomes to drive practice change; and simulation technicians manage the operational and technical components (equipment, scenario execution, and fidelity). While facilitation and debriefing roles may overlap, the technical/operator role should remain distinct to preserve simulation quality and keep faculty focus on learning and feedback.

To remain effective, instructors should maintain currency with evolving ECMO best practices, ELSO guidance, and educational methods. Through structured debriefing, adaptive questioning, and deliberate attention to psychological safety, skilled faculty help teams integrate knowledge, improve communication, enhance crisis resource management, and translate simulation

experience into safer clinical care. Investment in instructor development and adherence to standardized simulation practices are essential to achieving consistent, high-quality ECMO education and strengthening outcomes across centers.

15. Key Requirements Summary

1. Use a real ECMO pump and circuit, plus a mannequin, simulator/task trainer, or standardized patient.
2. Each scenario must have clear objectives across cognitive, technical and behavior domains. ONE main learning objective per scenario is strongly recommended with clear critical action points.
3. Staff each room with a simulation expert and an ECMO content expert; maintain a ≤3:1 learner-to-instructor ratio.
4. All learners must participate in all scenarios, emphasizing ECMO emergencies (air embolism, pump failure, gas failure, membrane lung failure, drainage insufficiency).
5. Follow four stages: briefing → simulation → debriefing → consolidation.
    a. Briefing: objectives, roles, equipment, psychological safety
    b. Simulation: active management of realistic ECMO scenarios
    c. Debriefing: structured reflection (description/reaction, analysis/understanding, application/summary), typically **2–4×** scenario length
    d. Consolidation: wrap up process with key takeaways and assess important points that were not completely covered during the debriefing. This should not take more than 1-2 minutes.
6. Goals: appropriate initiation, efficient management, reduced resource use, improved patient outcomes, and cost-effectiveness.
7. Faculty roles:
    a. Facilitators: guide engagement and learning
    b. Debriefers: link actions/behaviors to outcomes; drive reflective learning
    c. Technicians: manage technical execution and fidelity
8. Instructor proficiency and development are critical to standardized education, team competence, and improved outcomes.

16. Continuing Education Credits

All courses should seek to provide continuing education credits (or the regional equivalent).

17. Financial Agreement for Site Survey

The host site is responsible for all expenses associated with the ELSO surveyor(s) site visit. Costs are established by ELSO and typically include the following items per surveyor:

1. Round-trip transportation (economy or premium economy class): up to $750 USD for domestic travel and up to $2,000 USD for international travel
2. Lodging: up to $300 USD per day
3. Meals and incidentals: reimbursed according to GSA per diem tables (approximately $350 USD per day)
4. Surveyor professional fee: up to $500 USD per day

A written agreement (contract) will be issued by ELSO to document the expected survey-related fees and the host site's payment responsibilities prior to the site survey.

18. Exceptions and Waivers

Requests for waivers or exceptions to requirements may be considered on a case-by-case basis but must be authorized by the ELSO Education Chair at the start of the endorsement process.

19. Oversight and Process Review

The ELSO Board of Directors reviews and approves the endorsement process, the use of the ELSO brand, and all related business requirements. The ELSO Endorsement Committee—with representation from all ELSO chapters—is responsible for implementing the endorsement process in accordance with the Board's approved direction.
To ensure the endorsement process remains current, effective, and aligned with evolving ECMO practice, educational standards, and accreditation requirements, ELSO will conduct a formal review and update of the process every 2–3 years. Interim updates may be implemented sooner if significant changes in clinical practice, evidence-based guidance, or regulatory requirements warrant modification. This review cycle helps ensure endorsed courses continue to meet high standards for ECMO education and certification readiness.

20. References

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Endorsement Workgroup

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