

Message from Editors-in-Chief

Elevating Tracheostomy Care Through Data-Driven Innovation: What Can Education, Evidence-Based Practice, and Quality Improvement Learn from One Another?

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Keywords: tracheostomy, tracheotomy, education, competency, evidence-based practice, quality improvement, implementation science, teamwork, interprofessional collaboration, immersive technology, virtual reality, simulation, nursing, speech language pathology, respiratory therapy

<https://doi.org/10.62905/001c.120500>

Tracheostomy: Official Journal of the Global Tracheostomy Collaborative

Vol. 1, Issue 2, 2024

Abstract

The past decade has witnessed unprecedented progress in tracheostomy care, through communication, dissemination, and implementation of key drivers including interprofessional education, team-based care, standardized protocols, patient and family engagement, and data-driven practice. Improved safety, efficiency, and quality of tracheostomy care reflects contributions from fields of competency-based education, evidence-based practice, and quality improvement. These elements are interconnected, reinforcing one another to enhance patient care. Competency-based interactive education emphasizes active and practical learning through simulations and case studies, which enhance the clinical skills essential for high-quality care. These educational strategies are grounded in clinical research, ensuring that care practices are continually updated and aligned with the latest evidence, thereby bridging the gap between research findings and clinical application. Quality improvement processes such as Plan-Do-Study-Act (PDSA) cycles refine care delivery in real-world settings. Implementation science promotes the uptake of evidence-based practices, ensuring that discoveries translate to improved health outcomes, quality of care, and overall system performance. In each of these domains, patient and family engagement ensures alignment with patient needs and values. The Global Tracheostomy Collaborative leverages this integrated approach through international educational symposia and webinars, comprehensive data analyses, and a learning community that promotes innovative technologies like in situ simulation and augmented and virtual reality. Together, these approaches enhance the learning and application of best practices in tracheostomy care. The continuous, dynamic interaction of education, research, and quality improvement, grounded in patient-centered care, fosters excellence and innovation in care of patients with tracheostomy.

Imagine a world where every patient with a tracheostomy receives the highest standard of care, guided by the latest evidence and the most advanced technologies. This vision for safe, effective tracheostomy care on a global scale is a tangible goal achievable through data-driven efforts that unify education, research, and patient care. Many of the shortfalls that have historically plagued tracheostomy care can be traced to fragmented approaches to care, and many of these problems are related to how health professionals are educated, acculturated, and practice in silos. Competency-Based Education (CBE), evidence-based practice (EBP), and quality improvement (QI) are not standalone pillars but interconnected tools that collectively drive progress. Thus, a multifaceted approach combining these elements is necessary, although the interrelationship between them is often not fully appreciated ([Figure 1](#)). This article considers the interrelationship between these disciplines in tracheostomy care.

COMPETENCY-BASED EDUCATION

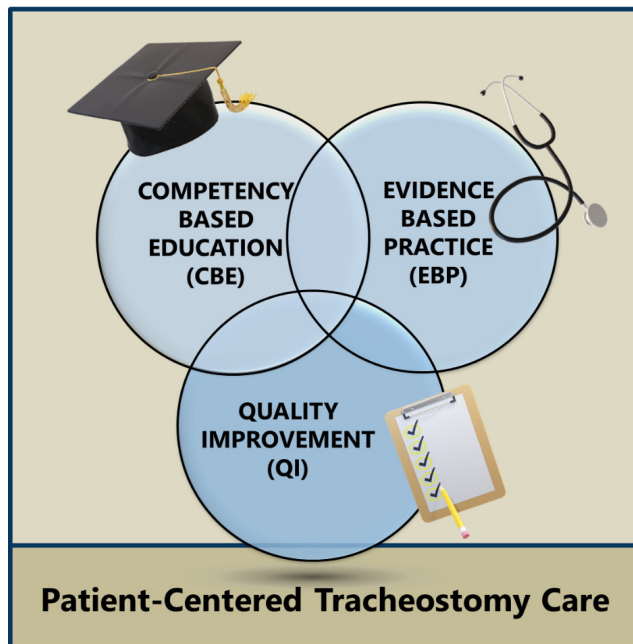
Competency-based education is a dynamic approach to training healthcare professionals involved in tracheostomy care. Unlike traditional didactic methods, this approach emphasizes active learning, critical thinking, and practical application of knowledge. Interactive education fosters an environment where learners engage in simulations, case studies, and problem-solving exercises, which enhance their clinical competencies. The use of standardized and validated tools is allowing for increasing rigor in the assessment of performance. Experience from global webinars has shown that whereas knowledge uptake is highly effective via distance learning, hand-on learning may be necessary for mastery of technical skills.¹

In situ simulation, for instance, is a powerful educational tool that places healthcare professionals in realistic clinical scenarios within their actual work environment. This method not only hones clinical skills but also improves teamwork and communication. By replicating real-life situations, in situ simulation allows for immediate feedback and reflection, facilitating continuous learning

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Figure 1. Venn diagram depicting the interrelationship of competency-based education, evidence-based medicine, and quality improvement in advancing patient-centered tracheostomy care.



and improvement. A distinctive feature of in situ approaches is that they are inherently proactive rather than reactive, allowing for potential sources of adverse events to be addressed before harm occurs.

The field of competency-based education is entering a renaissance amid the proliferation of innovative technologies and opportunities for distance learning. Optimal performance in tracheostomy care has historically required years of experience, with patients and professionals reporting considerable unease in tracheostomy care²⁻⁴; however, new innovations hold the promise of accelerating this timeline, teaching at scale, and improving outcomes. Among the emerging digital innovations are progress in immersive technologies.

Digital innovation and immersive technologies include tools such as virtual reality (VR), extended reality (XR), and augmented reality (AR). These technologies offer opportunities for healthcare professionals to refine their skills in both routine and emergency tracheostomy care scenarios. VR and XR environments can simulate high-stress situations like tracheostomy bleeding, occlusion, or dislodgement, allowing medical staff to practice their response in a risk-free setting. This immersive training helps clinicians develop quick, effective decision-making skills and procedural accuracy without the dire consequences of real-life emergencies.

Augmented reality enhances real-time care by overlaying digital information onto the physical world, guiding clinicians through complex procedures or troubleshooting during critical events. For instance, AR can provide step-by-step visual guidance directly in the clinician's field of view during a tracheostomy tube change or urgent care for a blocked tube, ensuring adherence to best practices and enhancing patient safety. These technologies not only improve individual competency but also foster a collaborative learning environment where entire healthcare teams can synchronize their efforts, resulting in a more cohesive response during tracheostomy emergencies. As these tools are adopted healthcare facilities can elevate the standard of care, reduce the incidence of complications, and enhance both patient and professional confidence in managing tracheostomy care.

CLINICAL RESEARCH AND EVIDENCE-BASED PRACTICE

Clinical investigation plays a crucial role in advancing the field of tracheostomy care, providing the empirical foundation necessary for refining techniques, protocols, and patient outcomes. Through rigorous research methodologies such as randomized trials, cohort studies, and case-control studies, investigators can evaluate the efficacy of different tracheostomy procedures, compare traditional and innovative care practices, and identify potential risks and benefits. These studies are instrumental in uncovering evidence-based practices that can reduce complications such as infections, wound breakdown or erosion, blockages, and accidental dislodgements in tracheostomy care.^{5,6} Clinical research fosters the development of innovative technologies, materials, and practices that can enhance patient comfort and safety. By continuously integrating the latest research findings into clinical guidelines, the tracheostomy care community can ensure that practices not only reflect the current state of knowledge but also adapt to new challenges and opportunities, improving quality of life and outcomes for patients with tracheostomies. Evidence-based practice thus bridges the gap between what is known from research and practiced in clinical settings.

EBP emphasizes the integration of the best available evidence with clinical expertise and patient values. This approach ensures that current and robust research findings inform clinical decisions in tracheostomy care. The practice of EBP often involves combining findings from systematic reviews, meta-analyses, and high-level evidence to develop guidelines and best practices. Research demonstrating the efficacy of certain interventions over others had lead to changes in practices that improve patient outcomes, as evident in adoption of standardized decannulation protocols, team-based care, or prevention of accidental dislodgement⁷⁻⁹

QUALITY IMPROVEMENT

Quality improvement focuses on enhancing healthcare processes to achieve better patient outcomes. QI methodologies, such as Plan-Do-Study-Act (PDSA) cycles, help identify inefficiencies, test changes, and implement effective solutions. QI initiatives often address systemic issues that impede the delivery of high-quality care. QI projects may streamline processes to reduce wait times, improve patient safety, or enhance the reliability of care delivery. These efforts ensure that evidence-based practices are consistently implemented, thereby closing the knowing-doing gap. QI also allows for identification of practical barriers to care and fosters a culture of continuous improvement, where healthcare teams regularly evaluate and refine their practices.^{10,11}

Quality improvement (QI) in tracheostomy care enhances patient outcomes and standardizing care processes across healthcare settings. Hospital-level QI initiatives often focus on developing and implementing protocol-driven care pathways that standardize the management of tracheostomies, aiming to reduce variability in care and minimize complications. These initiatives frequently involve interprofessional teams—including surgeons, nurses, respiratory therapists, and speech-language pathologists—who collaborate to refine clinical protocols and educational materials based on the latest evidence and best practices. Furthermore, extending these efforts to multi-hospital initiatives can significantly amplify their impact. Using an implementation framework, significant improvements have been realized in reducing mortality, adverse events, length of stay and quality of life outcomes including time to one-way valve placement, oral intake, and improved mental health.¹²

By pooling data and sharing experiences across institutions, quality improvement initiatives can identify shared challenges and successful strategies, leading to the development of more comprehensive and effective care guidelines. Guided implementation projects, such as those spearheaded by the Global Tracheostomy

Collaborative, leverage the collective expertise and data from multiple centers to implement evidence-based interventions. The continuous cycle of testing, feedback, and refinement inherent in these QI projects helps ensure that tracheostomy care is both safe and highly effective, leading to better health outcomes and higher standards of care at both the hospital and multi-hospital levels.

HOW CAN EDUCATION, RESEARCH, AND QUALITY IMPROVEMENT CONTRIBUTE TO IMPROVING TRACHEOSTOMY CARE

Despite advancements in procedural techniques and technology, lack of standardized education and protocols across institutions have led to significant disparities in care quality.^{1,13,14} These gaps not only compromise patient safety but also affect the confidence and efficiency of our healthcare professionals. The heterogeneity in educational experiences and competencies can result in preventable complications, increased healthcare costs, and prolonged hospital stays.¹³ Evidence-based practice is the foundation of current health care and is particularly important in tracheostomy care requiring high technical skills and interdisciplinary coordination.^{15,16} Research highlights the necessity for routine updates in clinical guidelines that incorporate the latest evidence into practice.¹⁷ However, a substantial lag often exists between the emergence of new evidence and its application in clinical settings.¹⁸

This disparity calls for a candid evaluation of the current state of tracheostomy education and competency each of our organizations or settings.¹⁹ Are emerging research and best practices systematically integrated into training and patient care protocols? Do leaders prioritize professional development? Are resources allocated efficiently to support ongoing education and training? All healthcare settings have opportunities to improve the conditions for education, research, and practice. Moreover, the interdisciplinary nature of tracheostomy care requires effective communication and collaboration among surgeons, nurses, respiratory therapists, speech therapists, and other allied health professionals.^{4,5,20,21} Enhancing competency across these disciplines through standardized interdisciplinary training programs can significantly improve patient care outcomes.^{1,22,23}

Whereas Evidence-Based Practice focuses on “*doing the right things*” based on research evidence, QI emphasizes “*doing things right*” through local processes. Taken together, these approaches can guide the ideal of “doing the right things the right way.”²⁴ Competency-based education and staff training hardwire these practices into patient care. For example, an evidence-based lens might support the use of interprofessional teams in tracheostomy care, while quality improvement efforts would provide the implementation knowledge necessary to make that care happen and desired outcomes are achieved.

Healthcare professionals have an opportunity to lead in tracheostomy care through keeping abreast of evolving best practices for tracheostomy care and advocating for the time, resources, and infrastructure necessary to ensure team members are proficient in the latest techniques. The Global Tracheostomy Collaborative provides platforms for sharing innovative educational tools and training modules, which can support best practices.²⁵⁻²⁷ We invite readers share best practices and successful stories that can be shared globally.²⁸ [Table 1](#) offers recommendations for addressing challenges in tracheostomy education. Championing interprofessional collaboration in education and competency-based standards can enhance the quality of life for patients and improve safety.²⁹

PATIENT AND FAMILY ENGAGEMENT

Engaging patients and families in their care processes ensures that healthcare practices align with their values, preferences, and needs. This engagement can take various forms, such as involving patients in decision-making, soliciting feedback on care experi-

ences, and incorporating patient-reported outcomes into quality improvement initiatives. The Global Tracheostomy Collaborative (GTC) exemplifies this approach by hosting family forums where patients and their families can share their experiences and provide input on care practices. These forums not only empower patients and families but also provide valuable insights that drive improvements in care delivery.

Driving progress toward better tracheostomy care requires the involvement of all relevant stakeholders. The need for such collaboration across disciplines was acutely apparent at the height of the COVID-19 pandemic, as patients and professionals navigated the uncharted in tracheostomy care.^{21,30,31} Although the pandemic has subsided, the need for collaborative efforts has never been greater. The GTC’s multipronged approach illustrates the importance of stakeholder engagement. By capturing and reporting patient data in a clinical database, organizing international meetings and webinars with patient and family spotlights, and publishing scholarly articles with patient and family contributors, the GTC fosters a global community of practice dedicated to improving tracheostomy care. Participation of patients and families ensures that care improvements are patient-centered.

INTEGRATION OF EDUCATION, RESEARCH, AND QUALITY IMPROVEMENT IN *TRACHEOSTOMY JOURNAL*

This issue of tracheostomy journal features studies that demonstrate the interconnectedness of educational innovation, clinical research, and quality improvement. Two of the articles in this issue feature educational interventions. In “Tracheostomy Care Curricula for Pediatric Residents: A Pilot Randomized Trial,” Yang et. al., highlight the path forward in educational strategies, enhancing the proficiency of our next generation of clinicians. This randomized pilot exemplifies the critical importance of adaptive learning environments in healthcare. In “A Simulated Tracheostomy Tube Change Educational Intervention to Promote Competency Among Novice Healthcare Professionals,” Peter et. al., investigate the role of immersive simulation in training, equipping nursing students with the skills and confidence critical for patient care.

Two additional studies investigate quality improvement and clinical research. The study “A New Model of Care for a Tertiary Hospital Multidisciplinary Tracheostomy Review Service” highlights quality improvement efforts that significantly improved patient outcomes. In this study, Priddle et. al., highlight the power of multidisciplinary collaboration and continuous improvement in clinical settings. Another contribution entails clinical investigation into communication for patients receiving ventilatory support. In the article, titled, “Acceptability of and Perceived Barriers and Facilitators to the use of Ventilator Associated Speech Methods in Intensive Care,” Best et. al., explore innovative communication methods that enhance the quality of life for ventilated patients, underscoring the importance of holistic approaches in ICU care.

Each of these articles not only advances our understanding but inspires us to strive for excellence and innovation in tracheostomy care. We hope that the work presented here motivates readers to contribute to this educational community. Whether through research, practice improvement, or sharing experiences, these contributions shape the future of tracheostomy care. For patients with a tracheostomy, the promise of better care lies in the integration of competency-based training, robust clinical research, and a culture of continuous quality improvement. These efforts can inspire change and advance the field of tracheostomy care.

The integration of competency-based education, clinical research, and quality improvement thus creates a robust framework for enhancing tracheostomy care. Competency-based education equips healthcare professionals with the skills and knowledge needed to implement evidence-based practices effectively. Clinical research provides the evidence that informs these practices,

Table 1. Addressing Educational and Competency Challenges in Tracheostomy Care: Definitions and Strategic Action Steps

Challenge	Definition	Action Steps
Lack of Standardized Training	Variability in tracheostomy care training across different healthcare facilities, affecting the uniformity of care.	- Develop and implement standardized training protocols. - Organize workshops and certification programs.
Insufficient Hands-On Experience	Many healthcare providers have limited practical experience with tracheostomy care, affecting confidence and competence.	- Create simulation-based training and practical workshops. - Encourage shadowing and mentoring programs.
Updates in Best Practices	Evolving tracheostomy care techniques and a gap in incorporating new evidence into practice.	- Establish a continuous learning environment with regular updates in training curricula. - Use global tracheostomy collaborative's webinars for dissemination.
Interdisciplinary Coordination	Need for coordinated care among various professionals, which is hindered by variability in training and experience.	- Foster interdisciplinary training sessions. - Implement regular multidisciplinary case reviews and practice drills.
Patient and Family Education	Gaps in providing comprehensive education to patients and families, which can impact home care outcomes.	- Develop comprehensive education programs and support groups. - Utilize digital tools for accessible information and support.
Resource Availability	Disparities in the availability of materials and specialists, especially in under-resourced settings.	- Advocate for equitable resource allocation. - Establish partnerships with suppliers and healthcare facilities.
Cultural and Language Barriers	Challenges in providing care and education due to language differences and cultural diversity.	- Produce educational materials in multiple languages. - Train staff on cultural competence to engage with diverse populations.

while quality improvement ensures that they are executed reliably and efficiently. No single component suffices on its own. Competency-based education without evidence-based guidance risks teaching outdated or ineffective practices. Clinical research without quality improvement may produce valuable evidence that fails to impact patient care due to implementation barriers. Quality improvement without competency-based education and evidence-based research might lead to well-executed but suboptimal practices.

CONCLUSION

Competency-based interactive education, investigative research, and quality improvement are cornerstones of improving tracheostomy care. Their reciprocal interactions ensure that healthcare practices are informed by the best evidence, implemented effectively, and continuously refined. Engaging patients and families, along with enlisting all relevant stakeholders, amplifies these efforts and ensures that care improvements are meaningful and patient-centered. By implementing proven strategies and embracing innovations in technology, healthcare professionals can build

brick-by-brick with patients to advance tracheostomy care and achieve superior health outcomes.

Conflicts of Interests/Disclosures

None

Funding

Center for Immersive Learning and Digital Innovation: A Patient Safety Learning Lab advancing patient safety through design, systems engineering, and health services research, PI: Vinciya Pandian (5R18HS029124)

Submitted: June 25, 2024 EST. Accepted: June 25, 2024 EST. Published: June 30, 2024 EST.

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