Effectiveness Of Educational Intervention On Knowledge Regarding Tracheostomy Care Among Staff Nurses: A Comprehensive Review

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Abstract: Nurses have a critical role in tracheostomy care. By its very nature, it is a technical procedure, requiring expertise to manage the safety and patency of the patient's airway, and avoid complications. Nurses support patients with tracheostomies whilst in the care and emergency setting. Yet studies indicate widely differing levels of knowledge, predominantly as a result of lack of training and absence of established educational programmes. This review synthesizes results from national and international studies to explore the efficacy of various types of educational interventions including structured teaching programs, workshops, simulations, and online modules in enhancing staff nurses' knowledge and skill level when performing tracheostomy care. The evidence base indicates that use of these educational techniques will greatly enhance both theoretical knowledge, clinical confidence and adherence to the principles of evidence based practice. Though such practises can yield very favorable short-term results, long-term knowledge retention, the lack of standardised training protocols and that information is not shared as widely - including through advanced digital media like virtual and augmented reality - are providing reasons for concern. This review highlights significant research areas of concern, future directions, and potential implications for nursing education and policy.

Keywords: Tracheostomy, Education, Training, Simulation, Knowledge

INTRODUCTION

A tracheostomy is a routine emergency/critical care procedure, which may also be employed for long-term respiratory care. What's That Hole in Your Neck For? It is the process of making a hole (opening) in your trachea to assist with breathing, minimize airway resistance and for ease of management of the airway. During this phase staff nurses play a vital role in postoperative care including suctioning, changing tubes, stomal hygiene, and managing emergencies. Neglect in the care of a tracheostomy can result in various serious problems, including obstruction (plugging) of the tube, infections, accidental dislodgement and hypoxia. Although tracheostomy care is considered essential, the studies we found reported variable nurses' knowledge because of the absence or disorganized training, varying guidelines among institutions, and limited practising for complex airway handling. Educational strategies (eg, simulation workshop, structured teaching and e-learning) have been identified as possible tools to fill these knowledge gaps. The purpose of this review is to

summarize existing evidence on the effectiveness of these interventions on staff nurses' knowledge and skill development.

METHODS

This narrative review systematically searched for relevant literature in databases such as PubMed, CINAHL, Scopus, Google Scholar and ResearchGate. Search words were tracheostomy care, nursing education, knowledge enhancement/training/knowledge raising/instruction, staff nurses, simulation training and educational intervention. Literature from 2010 to 2024 was incorporated.

Factors such as peer-reviewed journals, research on staff nurses, educational interventions and English-language publications were considered in deciding the inclusion criteria. Studies with no defined methodology, paediatric-only tracheotomy studies, conference papers and opinions were excluded.

The 42 studies were included. Extraction details were aimed study design, size of the sample, type of intervention, outcome measurements and scores on knowledge improvement. The categories were integrated to explore the effectiveness of various educational methods.

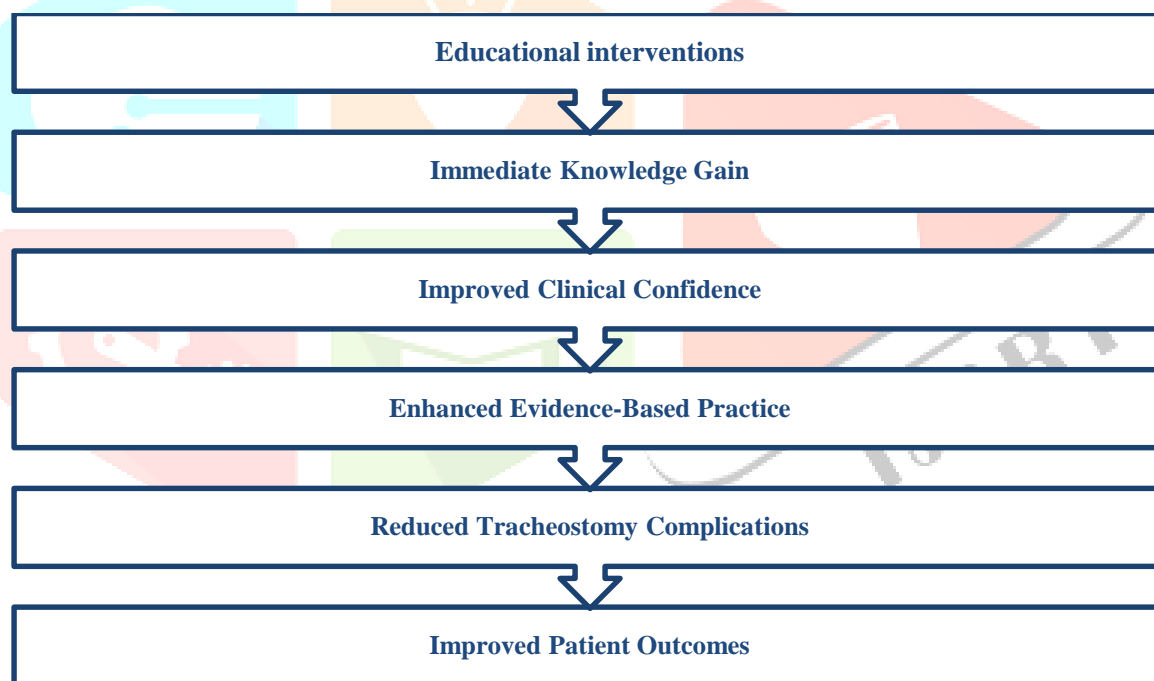*Figure 1. Conceptual Framework of Educational Interventions*


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│       Improved Patient Outcomes      │
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Table 1. Summary of Educational Interventions and Effectiveness

Type of Intervention	Description	Key Outcomes	Knowledge Improvement (%)	Representative Studies
Structured Teaching Programs	Lectures, AV aids, demonstrations	Improved theoretical knowledge	25–60%	Mehta et al. (2021); Sharma & Gupta (2019)
Simulation-Based Learning	High-fidelity mannequins	Enhanced psychomotor skills	30–70%	Lopez (2020); Vijay (2022)
Workshops & Demonstrations	Hands-on supervised practice	Better procedural accuracy	20–50%	Powell (2017); Ahmed (2021)
Digital Learning Modules	Online modules/videos	Improved theoretical knowledge	15–40%	Becker (2020); Thomas (2020)
Blended Learning Models	Simulation + e-learning	Highest effectiveness	40–75%	Watson (2022); Zhang (2021)
Competency-Based Assessment	Checklists, OSCE	Long-term retention	Not reported	Rahman (2019); Kumar (2023)

REVIEW OF LITERATURE – EDUCATIONAL INTERVENTIONS

1. **Systems for structured teaching:**
   A number of methods are popular in nursing education. Includes the use of lecture, audio-visual aids, demonstrations, and skill checklists. etc. I Find that scores of knowledge increase quite a bit after intervention (25-60%) from research. Operated since 1988, these programs cover subjects such as suctioning, stoma care, tube replacement needs in an emergency or infection prevention.

2. **Simulation-Based Learning:**
   The use of mannequins and high fidelity models in simulation allows staff nurses to practice airway management in controlled conditions, between Simulators. According to research, simulation improves psychomotor skills, reduces anxiety and actually helps get procedures right.

3. **Workshops and demonstrations:**
   Workshops are essential for learners who need to gain practical experience. This kind of training is provided by experts with tremendous support from people in the field. Demonstrations help improve practice skills in suctioning, infection prevention, and emergency response.

4. **Digital Learning Modules:**
   Maximum flexibility for learning is provided through Internet-based teaching systems, Video-on-Demand units and web-cast lectures that allow off-site participants to interact with the lecturer in real time. E-learning provides uniform content delivery and just as important it is suitable for locations with fewer resources.

5. **Competency-Based Assessment:**
   A Checklist of Competency helps ensure that knowledge and ability can be maintained in the long term. This check focuses on safety in procedures, clinical accuracy, and institutional protocol compliance.

EXPANDED DISCUSSION

Having tracheostomy care requires continuous training because patient need is complex. The literature shows structured teaching methods can bring immediate improvement in knowledge, but without reinforcements to uphold it. Through simulation-based training, they have found that rather than only learning from case studies help nurses gain a deeper understanding of the medical information involved in clinical practice. A workshop will give trainees practice and hands-on experience, and that will make them feel more secure in their ability to operate.

In the era of COVID-19, digital learning has become more popular, giving rise to scalable and low-cost e-learning opportunities but digital modules alone may not be enough to meet all needs for practical skills. Therefore the combination of simulation and demonstration materials alongside e-learning seems to be the most comprehensive approach.

Many reports examine the difficulty of having a standardized national protocol for doing tracheostomy training, so that training makes it hard to ensure common competence among institutions. Moreover, numerous studies do not carry out long-term knowledge retention surveys or connect staff training outcomes with patient safety measures.

SUMMARY OF OUTCOMES

The studies show that educational interventions help staff nurses learn more, feel more confident in their clinical skills, and do things correctly. Some of the specific outcomes are: - More theoretical and practical knowledge - More confidence in emergencies
- Fewer problems with tracheostomy
- More adherence to practices that are based on evidence - More patient satisfaction and safety
Even with these benefits, there is still a worry about long-term retention, which shows the need for regular refresher courses and on-going professional development.

Existing Research Gaps
Several gaps were found in the reviewed literature:
- No standardized national training protocols for tracheostomy care
- Limited long-term follow-up assessments
- Minimal use of advanced technologies (VR, AR, AI-based training)
- Few multi-center randomized controlled trials
- Limited research in hospitals with fewer resources
- Lack of studies examining links between training outcomes and clinical indicators
Filling these gaps could significantly enhance the quality and safety of tracheostomy care.

Table 2. Research Gaps and Recommendations

Research Gaps	Recommendations
Lack of national training standards	Develop national competency-based protocols
Limited long-term retention data	Conduct 6–12 month follow-up studies
Infrequent integration of VR/AR/AI technologies	Integrate immersive digital tools into training
Few RCTs and multi-center studies	Implement large-scale controlled studies
Scarcity of RCTs or multi-center research	Adopt scalable blended learning modules
Weak linkage between training and patient outcomes	Assess using clinical outcome measures

FUTURE SCOPE
Future research ought to concentrate on the utilization of immersive learning technologies, such as virtual reality and augmented reality, to replicate intricate tracheostomy situations. Setting national standards for nursing skills, creating training programs that bring together people from different fields, and using AI to make learning more personalized can all make nursing education much better. Longitudinal studies evaluating patient outcomes post-training interventions are essential for the formulation of robust evidence-based guidelines.

CONCLUSION

Structured teaching programs, simulation-based training, and blended learning modules are all examples of educational methods that greatly improve staff nurses' knowledge and skills in tracheostomy care. There are still problems with standardization, keeping knowledge for a long time, and getting to advanced training methods. Improving educational systems and adding digital tools can make a big difference in patient safety and the quality of care.

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CONFLICT OF INTEREST:

There is no conflict of interest in this study.

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