



Empowering Respiratory Leaders: Building Research Literacy for Enhanced Patient Care

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Learning Objectives

- ▶ Review the *Importance* of research as a core competency for leaders in Healthcare.
 - ▶ Summarize *Key Terminology*.
 - ▶ Review *Research Design Hierarchy*.
 - ▶ Review Fundamentals of Conducting Research.
 - ▶ Describe Strategies for *searching the literature*.
 - ▶ Understand how to *identify, interpret and utilize* existing research literature.
 - ▶ Identify some *hallmark research* which has helped shape Respiratory Care.
 - ▶ Describe where more work needs to be done.
 - ▶ Provide *additional resources*.
- 

Importance of Research to Healthcare Leadership

- ▶ Dictates *how/why we practice* and provides a *foundation* for future practice.
- ▶ Helps ensure *safe(er), more efficient and effective* practice
- ▶ Evaluating basic scientific reports is a *core competency* for:
 - *Educators*: Must identify, summarize and present evidence
 - *Leaders & Administrators*: Ensure validity of policy and procedures
- ▶ Without the ability to locate, interpret and apply research evidence, **stagnation occurs**.
 - Healthcare is highly dynamic so staying abreast is essential to advance our profession.

American College of Healthcare Executives (ACHE).... Core Competencies Include:

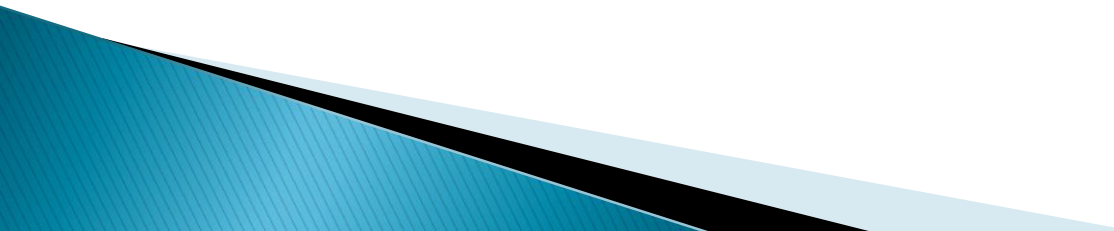
- ▶ **ACHE Core Competencies Include:**
 - Evidence-based management practice
 - Data collection, measurement and analysis tools and techniques
 - Data analysis, including manipulation, understanding of and
 - ability to explain data
 - ▶ **These skills are essential for:**
 - Guiding Clinical Practice & Policies
 - Information & Risk Management
 - Quality Improvement
- Source: ACHE Healthcare Executive Competencies Assessment Tool–by the American College of Healthcare Executives (2025)

Words of Wisdom!

- ▶You can manage or lead what you can't measure... and you can't measure accurately nor interpret what you don't understand...



Consider This Actual Example

- ▶ An attending physician wanted all of his patients to extubated to HFNC...because he read an article about a European study where low-medium risk patients had better outcomes...
 - ▶ Closer examination of the study revealed that the patient categorized as “low-medium” risk were actually high-risk many with two significant co-morbidities (e.g, COPD & CHF).
 - ▶ The RT Director was able to review the study, point out these issues and convince the physician to only extubate higher risk patients to HFNC.
 - ▶ This avoided unnecessary burden being placed on the RT staff and better adherence to evidence-based practice.
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What is Research?

Investigation or experimentation aimed at the *discovery and interpretation* of facts, *revision or confirmation of accepted theories*, or practical *application of such new or revised theories* or laws...



Key Terminology

- ▶ **Hypothesis:** The statement which researchers are testing
- ▶ **Sample:** A portion of a population participating in the study
- ▶ **Subjects or Participants:** Individuals/patients being studied
- ▶ **Intervention:** Any clinical maneuver offered to study participants that may have an effect
- ▶ **Confounder:** When something other than the intervention causes the effect
 - Examples of confounders include observed associations between coffee drinking and heart attack (confounded by smoking) and the association between income and health status (confounded by access to care)
- ▶ **Blinding (Single/Double):** Hiding whether subjects are receiving the intervention or the placebo.
- ▶ **Control Group** (Traditional treatment) versus **Experimental Group** (intervention being tested)

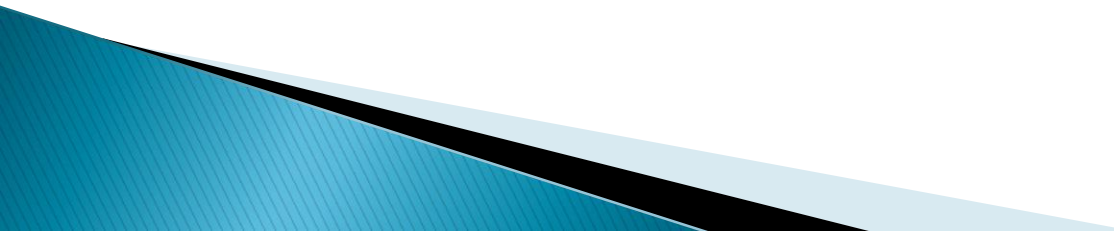
Still More Terminology

- ▶ **Power Analysis:** The min. number of subjects needed to demonstrate an effect (difference) in research
- ▶ **P-Value:** the likelihood that a particular finding or observed difference is due to chance. $P=0.05$ or less.
- ▶ **Randomization:** How subjects in an experiment are allocated to receive or not receive the interventions.
- ▶ **Bias:** Intentional versus unintentional prejudice in favor of one finding versus another.
- ▶ **Peer-Reviewed or Refereed Journals:** Journals for which articles/manuscripts must first be reviewed by “experts” before being accepted for publication.
 - RC Journal (refereed) versus AARC Times

Types of Variables

- ▶ ***Independent Variables:*** Factors being tested and manipulated by the researcher(s).
 - Extubation of Low-flow O2 versus HFNC
 - Lower Tidal Volume
 - Inhaled Nitric Oxide
 - Training with/without simulation
- ▶ ***Dependent Variables:*** Outcomes being assessed to determine the effect of the Ind. Variables
 - Mortality
 - LOS
 - Increased knowledge, better practice and outcomes
- ▶ **Attribute Variables:** “Attributes” of the subjects
 - Gender, Geography, Income, etc.

The Institutional Review Board (IRB)

- ▶ The oversight body charged with *protecting humans subjects in research*.
 - ▶ All hospital systems and academic centers conducting research involving human's must have an IRB.
 - ▶ All research must be submitted to, and **approved by**, the appropriate IRB, **before beginning** the project.
 - ▶ IRB approval is required for grant applications and journal submissions.
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The Research Team



▶ Principle Investigator(PI)

- Project leader
- Usually devised the concept of hypothesis
- Oversees IRB Submission
- First (corresponding) author on any manuscript

▶ Co-Investigator(s)

- Assist the PI
 - Writing the protocol/proposal
 - IRB Submission
 - Implementing the plan
- Statistician

▶ Other Study Personnel

- Help recruit subjects
- Obtain informed consent
- Help execute the intervention (e.g., adjust vent settings)

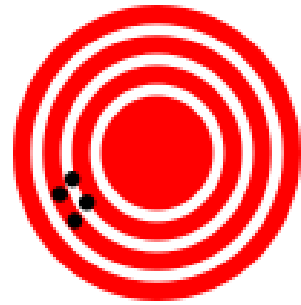
▶ Participants/Subjects (or their medical records): Those who are being studied.

Informed Consent



- ▶ Subjects in research must first consent to participation.
- ▶ Subjects/participants must be informed as to :
 - Why the study is being done
 - Hazards
 - Benefits
 - Any compensation
- ▶ Special circumstances may warrant a waiver of consent.
 - Retrospective record review.
 - Survey research.
 - Very low risk studies
- ▶ A copy of the signed and witnessed consent must be kept on file by the research team.

Types of Validity



- ▶ **Internal validity** reflects the author's and reviewer's confidence that study design, implementation, and data analysis have minimized or eliminated bias and that the findings are representative of the true association between exposure and outcome.
- ▶ **External validity** of research design deals with the degree to which findings are able to be generalized to other groups or populations

Types of Bias--Examples

- ▶ ***Biases Weaken Validity***
- ▶ ***Bias*** is defined as any tendency which prevents unprejudiced consideration of a question and interferes with validity.
- ▶ ***Common Types of Biases:***
 - ***Selection bias*** – refers to samples taken for research which do not reflect the rest of the population accurately,
 - ***Measurement bias*** – includes using instruments and research methods which will effect the overall results or are not ideal for the type of research
 - ***Funding bias*** – can also occur in organizations who have issued a research report or organizations funding the research.
 - ***Reporting Bias*** – is where an error is made in the way that the results are disseminated in the literature.



Types of Research

- ▶ ***Quantitative:*** Usually involves collecting and converting data into numerical form so that statistical calculations can be done.
 - Is the main focus for today and is by far the most common in respiratory care and medicine.
- ▶ ***Qualitative:*** Often through interviewing or observing, it involves recording, analyzing and attempting to uncover the deeper meaning and significance of human behavior and experience.

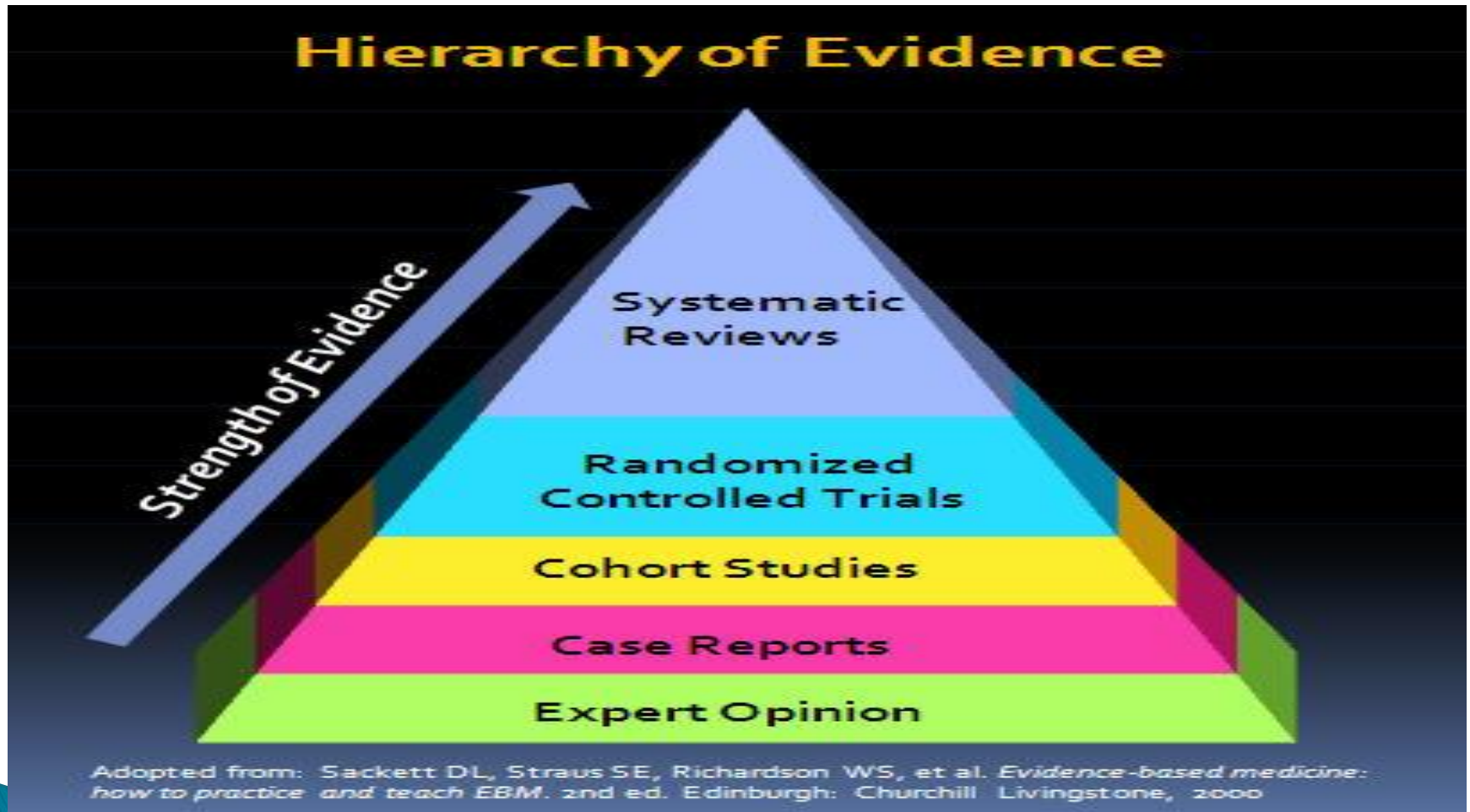
Other Classifications of Research

- ▶ **Prospective:** Looks forward and uses data not yet available, but to be collected as part of the study.
 - Involves recruitment of subjects and watches for outcomes, such as the development of a disease, drug side effects, during the study period
 - Usually have fewer potential sources of bias and confounding than retrospective studies.
 - ▶ **Retrospective:** Looks backwards (historically), as in a chart or medical record reviews. They examine exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study
 - Error due to confounding and bias are more common in retrospective studies than in prospective studies.
 - Researchers are at the mercy of the data and its format.
- 

Types of Quantitative Research

- ▶ **Systematic Review & Meta Analysis**—Combining the results of many (well done, often RCT's) studies.
- ▶ **Randomized Controlled Trials (RCT):**
 - Use of a control and experiential group or arm
 - Blinding – Neither researcher nor subject knows if they are getting the placebo (e.g., sugar pill) or the real intervention
 - Power analysis.
- ▶ **Cohort Studies:** Following a population over many years.
- ▶ **Case Control, Case Series and Case Studies**
 - Case Study= Detailed Analysis of a single subject with the disease or condition
 - Case Series= An analysis of several subjects with the disease or condition
 - Case Control = Comparing subjects who have that condition/disease (the "cases") with patients who do not have the condition/disease but are otherwise similar (the "controls")
- ▶ **Expert Opinion**

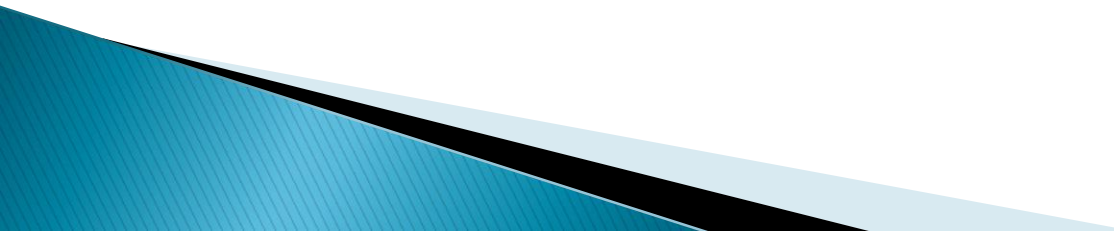
Research (Quantitative) Design Hierarchy



The Gold Standard – Randomized Controlled trials (RCT)

- ▶ ***Randomized:*** Subjects are allocated to receive or not receive one or several clinical interventions.
 - Flip a coin to determine where subjects are allocated.
- ▶ ***Controlled:*** Compares experiential group/arm to control group/arm.
- ▶ ***Blinded:*** Neither the researcher nor the subject know whether they are getting the drug or the placebo.
 - INO Example
- ▶ ***Adequately Powered:*** Enough subjects to demonstrate an effect, or lack thereof from the intervention.
 - Power calculation can/should be done in advance (a-priori) to determine the number of subjects needed.

Realistically, Many of Us Will Not Conduct Research.

- ▶ Rather, we will Review, Evaluate and Utilize research done and published by others.
 - ▶ Use Search engines such as Pubmed, Medline, Good Scholar.
 - ▶ Follow as search strategy:
 - Identify MeSH (Medical Subject Headings) Terms
 - PICO Question
- 

Strategies for Searching the Literature

- ▶ Bibliographic Databases:
 - Pubmed
 - Most Popular—18 Million Citations
 - Boolean Search—Should use MeSH (Medical Subject Headings) Terms
- ▶ Synthesized Databases: Cochrane Collaboration
- ▶ Portals: Cumulative Index to Nursing & Allied Health Lit. (CINAHL)
- ▶ Electronic Journals & Books: Resp. Care Journal
- ▶ Other Internet Resources: Google Scholar

PubMed Search for High-Flow Nasal Cannula

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www.ncbi.nlm.nih.gov/pubmed/?term=high+flow+nasal+cannula

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Sort by Relevance to quickly find articles that most closely match your query.

☐ The Effect of High-Flow Nasal Cannula Oxygen Therapy on Mortality and Intubation Rate in Acute Respiratory Failure: A Systematic Review and Meta-Analysis.
Monro-Somerville T, Sim M, Ruddy J, Vilas M, Gillies MA.
Crit Care Med. 2016 Sep 8. [Epub ahead of print]
PMID: 27611978
[Similar articles](#)

☐ Drug delivery interfaces: A way to optimize inhalation therapy in spontaneously breathing children.
Ari A.
World J Clin Pediatr. 2016 Aug 8;5(3):281-7. doi: 10.5409/wjcp.v5.i3.281. eCollection 2016 Aug 8. Review.
PMID: 27610343
[Similar articles](#)

☐ [Clinical application of high flow nasal cannula].
Liu JL.
Zhonghua Jie He He Hu Xi Za Zhi. 2016 Sep;39(9):660-2. doi: 10.3760/cma.j.issn.1001-0939.2016.09.002. Chinese.
No abstract available.
PMID: 27600414
[Similar articles](#)

☐ Effects of heated and humidified high flow gases during high-intensity constant-load exercise on severe COPD patients with ventilatory limitation.
Cirio S, Piran M, Vitacca M, Piaggi G, Ceriana P, Prazzoli M, Paneroni M, Carlucci A.
Respir Med. 2016 Sep;118:128-32. doi: 10.1016/j.rmed.2016.08.004. Epub 2016 Aug 8.
PMID: 27578482
[Similar articles](#)

☐ Application of high-flow nasal cannula in the ED for patients with solid malignancy.
Durey A, Kang S, Paik JH, Han SB, Kim AJ.
Am J Emerg Med. 2016 Jun 6. pii: S0735-6757(16)30248-0. doi: 10.1016/j.ajem.2016.06.033. [Epub ahead of print]
No abstract available.
PMID: 27569746
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☐ Viral bronchiolitis

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Related searches
high flow nasal cannula pediatric
high flow nasal cannula bronchiolitis
high flow nasal cannula oxygen therapy
high flow nasal cannula neonate
humidified high flow nasal cannula

PMC Images search for high flow nasal cannula

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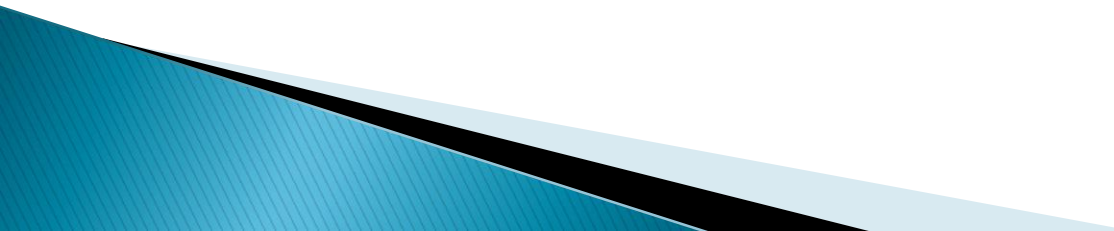
Titles with your search terms
High-Flow Nasal Cannula Versus Bag-Valve-Mask for Preoxygenation [Respir Care. 2016]
High-flow oxygen therapy through nasal cannula: Prospective [Rev Port Pneumol (2006). 2016]
Heated Humidified High-Flow Nasal Cannula for Weaning from Continuous [Neonatology. 2016]
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The Anatomy of a Research/Journal Article

- ▶ **Abstract:** Summary of the Project
- ▶ ***Introduction:***
 - *Statement of Purpose*—what was studied and why.
 - *Review of the Literature.*
 - *Key aims and research questions*
- ▶ ***Materials & Methodology:***
 - Experimental Group & Control Group
 - Inclusion and Exclusion Criteria,
 - Independent variables/Dependent variables
 - Statistical methods
- ▶ ***Results*** (usually numeric in form presented in tables or graphs, often with statistical analysis).
- ▶ ***Discussion/Conclusion***
 - Inferences and/or Conclusions drawn from the results
 - Clinical significance
 - Opportunities for additional research

Notable Studies in Respiratory Care

- ▶ Hallmark–Shaping our Clinical Practice
 - Inhaled Nitric Oxide (INO)
 - Lower VT Mechanical ventilation , NEJM 2000.
 - Oscillatory ventilation in adult may not be efficacious.
 - Non–invasive ventilation
 - Newer Modalities: APRV, HFNC
 - ▶ Research in Administration and Training
 - Administrative Burden in Healthcare & Respiratory Care
 - Simulation in Staff Training
- 

Inhaled Nitric Oxide

- ▶ Morristown Medical Center Participated in the Study
Approx. 30 Years ago
- ▶ Well done Study
 - Randomized
 - Controlled
 - Blinded
 - Powerful (many subjects)
 - Multi-site
- ▶ Findings
 - Approved by FDA only for PPHN, improved long-term outcomes
 - *Chen, et al 2001*: "...iNO therapy produces rapid improvement in oxygenation for 24 hours without short-term side-effects in term infants with PPHN..."
 - Compassionate Use Only for Adults with ARDS: Improved Short-term outcomes (SPO₂, P: F ratio, PAP's), but ***not morality!***
 - *Rounau, et al, 2000*: "...inhaled NO is effective in improving oxygenation in patients with ARDS. The study does not allow us to conclude anything about mortality, which was probably unchanged..."

Lower Tidal Volume Ventilation

- ▶ Mattay, MA, et al, Ventilation with Lower Tidal Volumes as compared with Traditional Tidal Volumes for acute lung injury and Acute respiratory distress syndrome, *NEJM*, 342 (18) 1301–1308, 2000.
- ▶ Multi-center, randomized trial.
 - Control Group: $VT = 12 \text{ mls/kg}$
 - Experimental Group: $VT = 6 \text{ mls/kg}$
- ▶ Trial stopped: After 861 subjects enrolled, interim statistical analysis revealed large “between group” differences
- ▶ 28 Day Mortality: Controls=39.8% vs Exp. 31.0%: P Value = 0.007 (7 in 1000 likelihood that this was due to chance.)



Adult Oscillatory Ventilation

- ▶ Hager, DN, Curr Opin Anaesthesiol. 2012 Feb;25(1):17–23:
 - Although HFOV is theoretically appealing and may improve outcomes in adults with acute respiratory distress syndrome, it **should be reserved for patients failing conventional ventilation until definitive trials are completed.**
- ▶ Nguyen, AP. Et al, Respir Care. 2016 Jun;61(6):791–800:
 - Two recent large multi-center trials of HFOV failed to show **benefits** in this patient population.
- ▶ Sud, S. et al: Cochrane Database Syst Rev. 2016 Apr 4;4:CD004085. Included 10 RCTs (n = 1850)
 - The findings of this systematic review suggest that HFO does not reduce hospital and 30-day mortality due to ARDS; the quality of evidence was very low. Our findings **do not support the use of HFOV as a first-line strategy** in people undergoing mechanical ventilation for ARDS.

Airways Pressure Release Ventilation (APRV)

Strong Support:

- ▶ Jane, SV, et al., Intensive Care Med Exp. 2016 Dec;4(1):11. Systematic Review: Multiple studies demonstrated that APRV stabilizes alveoli and reduces the incidence of ARDS. **APRV has shown great promise as a highly lung-protective ventilation strategy.**

Weak Support:

- ▶ Arshad, Z. et al, J Clin Diagn Res. 2016 Jan;10(1):UD01-2. Case Study: 70 year old first on Conventional Ventilation, then APRV. Results: PaCO₂ decreased to <66mmHg along with an increasing P/F ratio. **APRV is the not recommended as primary mode of ventilation in COPD but in resistant cases it can be helpful...**

No Support:

- ▶ Mireles-Cabodevila E & Kacmarek RM, Respir Care. 2016 Jun;61(6):761-73
Expert Opinion: For APRV to become the primary mode of ventilation for ARDS, it will require development of sound protocols and technological enhancements to ensure its performance and safety.
 - For now, *APRV does have a greater potential for adversely affecting patient outcome than improving it.*
 - Unless definitive data are forthcoming for use of APRV in ARDS, *there is no reason to consider this approach to ventilatory support.*

Non-invasive Positive Pressure Ventilation

- ▶ Zhu, Wang, Liu, Jia & Jia, Chim Med J, 2013
 - RCT: Acute respiratory failure after cardiac surgery were randomized into NIPPV or Invasive ventilation
 - **NIPPV can reduce the need of re-intubation** and improve clinical outcome as compared with invasive ventilation. Pneumonia and a high APACHE II score >20 might be the independent risk factors of NPPV failure in this group of patients.
- ▶ Bhatti, Ramdass, Cury, et al, Clin Respir J.
 - Retrospective review of 1095 patients who failed NIPPV (Average 10/5)
 - Clinician dependent factors linked to NIPPV failure are;
 - inappropriate indication
 - Lack of adequate titration
 - Overlooked contraindication.
 - **Inappropriate utilization of NIPPV in respiratory failure is associated with higher mortality.**
- ▶ Hori, Isaka, Oonishi, Yabe & Oku, Respiriology, 2016
 - 12 young volunteers and 10 elderly volunteers
 - Rate of inspiration after swallow is increased with BiPAP use irrespective of age. The results suggest that **swallow non-inspiratory flow may trigger inspiratory support in the BiPAP mode, resulting in a risk of aspiration.**

High-Flow Nasal Cannula (HFNC)

Strong Evidence:

- ▶ Wilkinson, Anderson O'Donnell, Cochrane Database, 2016.
 - 15 Randomized or quasi-randomized trials comparing HFNC with other non-invasive forms of respiratory support.
 - HFNC has similar rates of efficacy to other forms of non-invasive respiratory support in preterm infants for preventing treatment failure, death and CLD.
 - Further **adequately powered randomized controlled trials should be undertaken** in preterm infants comparing HFNC with other forms of primary non-invasive support

Moderate Evidence:

- ▶ Nishimura, J Intensive Care, 2015
 - While there have been no big randomized clinical trials, HFNC has been gaining attention as an innovative respiratory support for critically ill patients.
 - Most of the available data has been published in the neonatal field.
 - **Evidence with critically ill adults are poor;**

Weak Evidence:

- ▶ Horio, Takiyara, Niimi, et al, Respir Investig, 2016
 - Case series: 3 cases (all men, age: 69–81 years) of acute exacerbation of interstitial pneumonia (AEIP) that were successfully treated with HFNC,
 - **HFNC might be an effective and well-tolerated therapeutic addition to the management of AEIP.**

HFNC (Cont.)

Recent Evidence:

- ▶ Marjanovic, Couvreur, Lamarre, et al, 2024.
 - Compared with NIV, high flow oxygen was not associated with a higher risk of treatment failure during initial management of patients with acute respiratory failure related to suspected or confirmed AHF.
- ▶ Haciosman, Ergenc, Az, Dogan & Sogut, 2025
 - HFNC was not inferior to NIV in improving arterial blood gas parameters, particularly PaCO₂ in patients with COPD exacerbations, especially those with hypercarbia. Moreover, HFNC at a flow rate of 30 L/min was superior to NIV for reducing PaCO₂ levels at 60 min.
- ▶ Freeman, Vranas, Tuthill & Drake, 2024
 - Propose a standardized approach for HFNC discontinuation focused on "liberation" (similar to spontaneous breathing trials for patients undergoing mechanical ventilation), using a stepwise approach guided by physiology.

Research in Resource Allocation & Efficiency (Heuer, et al, 2016)

Key Point: Excessive administrative duties on clinicians are problematic and should be reduced.

> [J Allied Health](#). 2016 summer;45(2):152-6.

Examining the Phenomenon of the Administrative Burden in Health Care, Allied Health, and Respiratory Care

Albert J Heuer ¹, James S Parrott, Dreina Percival, Robert M Kacmarek

Affiliations + expand

PMID: 27262474

Abstract

Documentation expectations for allied health professional appears to have changed dramatically in the past decade. The purpose of this essay is to discuss the literature related to clinician perceptions of these documentation expectations and changes in the workload attributable to such administrative duties, review the results of a recent pilot project surveying respiratory therapists' perception of documentation, and reflect upon the potential ramifications of excessive documentation. This commentary also discusses some recommendations for the future in terms of the design of documentation systems and the need for additional research to further explore this area.

Research in Staff Using Simulation to Enhance Staff Training (Heuer, et al 2022)

Key Point: Simulation can be highly effective in staff training!

15239763/

Simulation-Based Training Within Selected Allied Health Professions: An Evidence-Based Systematic Review

Albert Heuer¹, Jared Bienstock, Yingting Zhang

Affiliations + expand

PMID: 35239763

Abstract

Objectives: This systematic review (SR) describes how simulation-based training (SBT) is utilized by selected allied health professions (AHPs).

Data sources: PubMed, CINAHL, Cochrane CENTRAL, Scopus, Web of Science, and Google Scholar were searched from 2010 to 2020.

Review methods: Standard SR methodology was utilized according to PRISMA guidelines. Eligibility criteria included English studies conducted in the United States or Canada. Study designs were somewhat heterogeneous and included quantitative, qualitative, and mixed-methods projects. Populations included selected AHPs that function primarily in an acute care setting, including radiology technologists, respiratory therapists, medical laboratory technologists, perfusionists, radiation therapists, paramedics, emergency medical technicians, physician assistants, physical therapists, and occupational therapists.

Results: 584 articles were initially identified and reviewed, 33 of which met inclusion criteria. Of them, the most common AHPs documented in the literature as using SBT appeared to be paramedics and emergency medical technicians (22 studies) as well as respiratory therapists (6 studies). Almost half of the studies were conducted in a stationary or mobile simulation lab. Most commonly, the simulations involved the use of manikins and simulated patients and could be classified as high-fidelity. Most of the impact of SBT in the AHPs appears to be on either short-term objective measures, such as post-SBT skill improvement, or subjective metrics like enhanced participant confidence. The more sustained impact such as that on intermediate and long-term skill retention in such disciplines seems uncommon, and those related to enhanced patient outcomes were not found.

Conclusions: It appears that SBT can be effectively utilized to enhance subjective measures such as participant confidence, as well as short-term skill enhancement within selected AHPs. However, their impact on more substantive measures such as sustained skill enhancement and patient outcomes remains unclear. In addition, the use of SBT varies greatly throughout allied health practice, and the opportunities for expanded use are significant.

ACTIONS

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More Work to Be Done

- ▶ **Overcoming Inertia: Where to start?**
 - Attend and network at conferences
 - Volunteer to be a co-investigator
 - **Becomes friends with your medical librarian**
- ▶ **Areas to Explore:**
 - Read, review and explore the literature
 - New Models of Ventilation and Respiratory Care
 - Combinations of Interventions
 - Prone positioning and Pul. Vasodilators may have synergistic results
 - Better way to manage and train staff as well as utilize resources
- ▶ **Simple Departmental Strategies:**
 - Research Club
 - Lunch and Learn
- ▶ **Study Design**
 - Become more knowledgeable in locating and interpreting research
 - Partner with those who are more experienced industry leaders
- ▶ **Don't Just Rely on AARC CPG...**Some are quite good, while others are outdated or have been retired.
- ▶ **Best to Rely on Primary Research in PubMed** and other such databases



Selected Resources

- ▶ ACHE Healthcare Executive Competencies Assessment Tool—by the American College of Healthcare Executives, 2025
- ▶ Portney & Watkins, Foundations of Clinical Research, 3rd ed, 2012.
- ▶ Dillman D, Smyth J, Christian L. Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method. Hoboken, NJ: John Wiley & Sons; 2009.
- ▶ Califf RM, McCall J, Harrington RA, Assessing research results in the medical literature: trust but verify. JAMA Intern Med. 2013 Jun 24;173(12):1053–5.
- ▶ Pannucci, CJ & Wilkins, EG, Identifying and Avoiding Bias in Research, Plast Reconstr Surg. 2010 Aug; 126(2): 619–625.
- ▶ Chatburn, R, Fundamentals of Respiratory Care Research, Ch 8, *in* Stoller, Heuer, et al, Egan's Fundamentals of Respiratory Care, 13th ed, 2025.
- ▶ Batavia M., Clinical Research for Health Professionals—A User Friendly Guide, Butterworth–Heinemann, Woburn, MA, 2001.