

Clinician reasoning and policy evidence underpinning neonatal endotracheal suctioning practices: a qualitative study

Judith Hough

judyhough@hotmail.com

Australian Catholic University <https://orcid.org/0000-0002-4264-9823>

Marilyn van Heerden

Australian Catholic University

Research Article

Keywords: neonatal intensive care, endotracheal suctioning, saline instillation, qualitative research, clinical reasoning

Posted Date: October 6th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11238950/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: The authors declare no competing interests.

Abstract

Background

Endotracheal suctioning is a routine yet high-risk procedure in neonatal intensive care units (NICUs). Despite its widespread use, key aspects of suctioning practice, remain underpinned by limited and inconsistently applied evidence.

Aim

To explore how neonatal clinicians reason about suctioning practices, and to examine the evidence underpinning suctioning policies in Australian and New Zealand NICUs.

Methods

A qualitative focus group with experienced neonatal clinicians was conducted, supported by a cross-jurisdictional analysis of NICU suctioning policies. Data were analysed using thematic analysis informed by hermeneutic phenomenology and cited policy evidence was critically appraised.

Findings:

Clinicians described uncertainty, reliance on experiential judgement, and variable policy credibility in the context of limited neonatal-specific evidence. Policy analysis demonstrated dependence on mixed-population, or outdated studies.

Conclusion

Although data collection occurred in 2015, findings remain relevant given ongoing evidence gaps and contemporary guideline variability. Transparent, evidence-based guidance is needed to support consistent neonatal suctioning practice.

INTRODUCTION

Secretion management is essential for mechanically ventilated neonates, whose immature mucociliary function, smaller airways and higher oxygen demands increase the risk of airway obstruction and hypoxaemia.[1] Endotracheal suctioning remains a core component of airway care in neonatal intensive care units (NICUs) and is one of the most commonly performed procedures undertaken. [2] Although the procedure aims to maintain endotracheal tube (ETT) patency and optimise gas exchange, it is

associated with well-recognised adverse effects, including hypoxaemia, bradycardia, atelectasis, mucosal trauma and haemodynamic instability.[3]

Normal saline instillation (NSI) continues to be used variably as an adjunct to suctioning to thin secretions, induce coughing, increase sputum yield and aid in the mucociliary clearing mechanism.[4] However, numerous adverse effects with the use of normal saline instillations (NSI) have been reported, such as: increased intracranial pressure, bradycardia, tachycardia, hypotension, hypertension, atelectasis, bronchospasm, oxygen desaturation, hypoxaemia, infection, dyspnoea and distress.[5, 6] Despite these reports, clinical findings remain inconsistent, and contemporary practice guidelines continue to emphasise caution, noting the absence of neonatal specific evidence and the ongoing reliance on extrapolated adult or paediatric data in forming recommendations.[7]

As a result, local NICU policies continue to vary, and bedside practice often reflects clinician preference, differing interpretations of evidence and local risk culture rather than uniform standards. Updated respiratory care guidance for neonates, including clinical airway management protocols published between 2020 and 2024, continues to emphasise the assessment-based need for suction but offers limited clarity on the role of NSI, reinforcing the ongoing uncertainty in the field. To date, no new high-quality neonatal trials evaluating saline instillation or suctioning thresholds have been published in the past decade, and recent paediatric research continues to highlight variation in suctioning techniques and a lack of rigorous evaluation across several elements of the procedure. [8]

In this context, clinician reasoning becomes critical. How neonatal clinicians interpret risk, apply existing guidelines and navigate persistent evidence gaps directly influences suctioning practices at the bedside. Qualitative research is well placed to explore these cognitive and contextual processes, particularly in procedures where evidence is weak and beliefs, experience and local policy heavily shape decision-making. This study therefore aimed to explore how neonatal clinicians reason about endotracheal suctioning practices, with a focus on the contested role of saline instillation, and to examine the evidentiary foundations of suctioning policies across Australian and New Zealand NICUs.

METHODS

Study design

A qualitative study design was employed, comprising a clinician focus group and an embedded analysis of neonatal intensive care unit (NICU) suctioning policies. This approach enabled exploration of clinician reasoning and experience alongside an examination of the evidentiary basis informing clinical policy.

Participants and recruitment

An information letter about the focus group was sent to all clinicians attending the 2015 Perinatal Society of Australia and New Zealand Annual Scientific Meeting. Clinicians with experience in neonatal

intensive care and involvement in airway management were purposively recruited from attendees. This sampling strategy was selected to ensure representation from experienced neonatal clinicians across disciplines and jurisdictions.

Data collection

Written informed consent was obtained from all participants. The discussion was moderated by a member of the research team using open-ended prompts exploring suctioning practices, clinical decision-making, and the use of saline instillation. The session was audio-recorded and transcribed verbatim. Data collection continued until no new concepts were emerging, indicating sufficient depth for thematic analysis. A single focus group was selected as an appropriate qualitative method given the exploratory aim of the study, the expertise of the participants, and the concentrated nature of the topic. Expert sampling and high information power supported depth over breadth, and the discussion generated rich, clinically grounded insights that align with accepted qualitative standards for policy–practice investigations.

Analytical approach

Focus group data were analysed using thematic analysis informed by hermeneutic phenomenology.[9] This approach supported interpretation of participants’ experiences and meanings as situated within their clinical and organisational contexts.[10] Analysis followed an iterative, cyclical process of reading, coding, and theme development, moving between individual statements and the broader narrative until coherent themes were identified.

Policy document analysis

Following the focus group, suctioning policies were requested from all Level III NICUs across Australia and New Zealand. Policy documents were reviewed to identify recommendations relating to endotracheal suctioning and saline use, and the references cited in support of these recommendations. The cited literature was critically appraised using the Centre for Evidence-Based Medicine framework to examine study design, population relevance, methodological quality, and applicability to neonatal practice. Although the policy component was geographically bounded, it provides a coherent case study of policy development in neonatal practices and reflects the same reliance on low-level or extrapolated evidence seen internationally.

Rigour and reflexivity

Credibility was supported through purposive recruitment of experienced clinicians, multidisciplinary representation, and systematic analytic procedures. The multidisciplinary research team brought clinical

and academic expertise in neonatal respiratory care, which informed interpretation of findings. Findings are presented with sufficient contextual detail to support transferability to similar NICU settings.

Ethical considerations

In accordance with the Declaration of Helsinki, ethical approval was granted by the relevant Human Research Ethics Committee (Application number: 201500034E). All participants provided informed consent and were de-identified in transcripts and reporting.

RESULTS

Participants

Nine clinicians participated in the focus group: one neonatologist, two physiotherapists, and six neonatal nurses. Participants had extensive neonatal intensive care experience across tertiary units. This multidisciplinary composition enabled exploration of suctioning practices from complementary clinical perspectives. Participant characteristics are summarised in Table 1.

Table 1
Participants qualifications and level of experience

Participant	Role	Qualification	Years of Experience	Publications
1	Neonatal Nurse	Bachelor of Nursing	9	0
2	Neonatal & Paediatric Physiotherapist	Bachelor of Physiotherapy	15	2
3	Neonatal Clinical Nurse Consultant/Specialist	Masters of Science in Medicine (Research)	17	6
4	Registered Nurse Midwife	Masters in Health Science Education PhD	30	40
5	Neonatal Physiotherapist Senior Lecturer	Bachelor of Physiotherapy PhD	20	15
6	Neonatal Nurse Clinical Academic Fellow	Bachelor of Nursing (Hons) PhD	20	16
7	Neonatologist	Fellow of the Royal Australasian College of Physicians PhD	18	3
8	Neonatal Nurse	Bachelor of Nursing Master of Philosophy Graduate Certificate in Neonatal Intensive Care Nursing	28	1
9	Neonatal Nurse	Masters of Maternal/Child Health and Neonatal Nursing	9	0

Overview of themes

Six interrelated themes were generated through thematic analysis. Collectively, these themes describe how clinicians navigate neonatal endotracheal suctioning in the context of limited and inconsistent evidence, variable policy guidance, and differing levels of clinical experience. Saline instillation emerged as a focal example through which broader uncertainties in suctioning practice were articulated.

Theme 1: Unclear policy origins and contested credibility

Participants expressed uncertainty regarding how local suctioning policies were developed and questioned their evidentiary foundations. Several clinicians believed policies were driven primarily by accreditation requirements or historical precedent rather than neonatal-specific research. Saline instillation was frequently cited as an example where policy recommendations were perceived to be inconsistent with clinicians' understanding of physiology or bedside experience.

Participants reported hearing anecdotal claims that saline was harmful to ciliary function or lung tissue; however, they were unable to identify neonatal evidence supporting these assertions. This contributed to reduced confidence in policies and a perception that recommendations were precautionary rather than evidence-based. Importantly, this concern was corroborated by the embedded policy review undertaken in this study, which demonstrated substantial variability in suctioning recommendations across 16 NICUs and frequent reliance on low-level, outdated, or non-neonatal evidence to justify restrictions on saline use. A summary of the suctioning policies and their cited references is presented in Table 2. A detailed critical appraisal of the studies cited in neonatal intensive care unit suctioning policies to inform saline instillation practice is provided in Supplementary Table S1.

Table 2

Hospital policy recommendations on the use of saline with suctioning in Neonatal Intensive Care Units and the references supporting the policy recommendations. * non-existent references

Location	Hospital	Saline policy	References Cited
ACT	Canberra Hospital	Not used routinely, only for tenacious secretions	None provided
NSW	Nepean	Not used routinely Can use 0.3mL of normal saline for tenacious secretions	Gardner & Shirland 2009
	Westmead	Not used routinely	Gardner & Shirland 2009 Ackerman 1993 Ackerman 1998 Bostick 1987 John Xavier 2012* Rathnayake 2018*
	Royal Hospital for Women	Not used routinely	None provided
	John Hunter	Not used routinely	Morrow & Argent 2008
NT	Darwin	Not used routinely (Instillation into the trachea can cause epithelial damage)	Auckland District Health Board 2014 King Edward Memorial Hospital guidelines 2011 Royal Children's Hospital guidelines 2012
QLD	Mater Mother's Hospital	Not used routinely	Branson 2007 Gray 1990
	Royal Brisbane Women's Hospital	Not used routinely 0.25mL of 0.9% saline can be used to loosen secretions if needed	Raymond 1995 Ackerman 1990

Location	Hospital	Saline policy	References Cited
SA	Flinder's	Routine with open suction Not routinely recommended for closed suction (0.1-0.2mL/kg) of 0.9% saline if used	McCormack 2003 Beeram 1992 Demers 1973 Sievers & Adams 2000* Mary L. Puchalski 2007*
	Women and Children's Hospital	No saline at all	Gardner & Shirland 2009 Kaleidoscope - New South Wales Health 2009 Royal Children's Hospital 2009
TAS	Hobart	Routine use not recommended, only considered after individual assessment	Bostick 1987 Ackerman 1990 Hanley 1978 Hodge 1991 Auckland District Health board 2007
VIC	Royal Children's Hospital	Not used routinely	McCormack 2003 Beeram 1992 Demers 1973 Isea 1993 Reynolds 1990
	Mercy	Not recommended	Gardner & Shirland 2009 Shorten 1991 Tolles 1990 Ackerman 1996
	Royal Women's Hospital	Not routinely used unless thick, tenacious secretions	McCormack 2003 Demers 1972 Reynolds 1990 Akgul 2002

Location	Hospital	Saline policy	References Cited
WA	King Edward Memorial Hospital	Not used routinely 0.25mL-0.5mL normal saline can be instilled for tenacious secretions prior to suctioning	Beeram 1992
NZ	Christchurch	Not routinely used unless thick, tenacious secretions on individual assessment	Newborn Services Clinical Guidelines (no references)

It feels like the policy says 'don't use saline' because that's what everyone else says, not because anyone can actually show you neonatal data.

Theme 2: Experience as the primary driver of practice

Clinical experience was identified as the key factor guiding suctioning decisions, particularly in complex or borderline situations. Participants described learning when and how to suction, and whether to consider saline, through years of observation and trial rather than formal education or guideline instruction.

Experienced clinicians reported tailoring suctioning to the individual infant, weighing secretion burden, lung mechanics, and tolerance of previous suction events. In contrast, less experienced staff were perceived to rely more heavily on rigid protocols, often resulting in more frequent or routine suctioning.

You don't learn when to suction from the policy – you learn it by watching babies over time.

Theme 3: Risk aversion and the impact of inexperience

Participants described a prevailing culture of risk aversion, particularly among junior staff. Fear of adverse events or criticism was perceived to drive defensive practice, including routine suctioning or strict adherence to policy despite clinical cues suggesting suctioning may be unnecessary.

This culture was viewed as reinforcing task-based care rather than critical clinical reasoning. Several participants expressed concern that inexperienced clinicians may suction more frequently than required, potentially increasing the risk of harm. Participants linked this risk-averse approach to limited formal education in suctioning decision-making, particularly during early clinical training.

If you're new, it feels safer to just suction because no one will question you for doing it.

Theme 4: Interpreting suction-related adverse events

Clinicians reported difficulty disentangling adverse events related to suctioning itself from those potentially attributable to saline instillation. Transient desaturation, bradycardia, and haemodynamic changes were described as common during suctioning, regardless of saline use.

Participants generally perceived these events as consequences of airway disruption, loss of lung volume, or vagal stimulation, rather than direct effects of saline. As a result, several clinicians questioned policies that specifically attributed adverse outcomes to saline instillation.

Babies desaturate when you suction – with or without saline. That doesn't mean saline is the cause.

Theme 5: Awareness and appraisal of the evidence

Across disciplines, participants demonstrated limited familiarity with the primary research underpinning suctioning recommendations. Knowledge of the evidence was often indirect, derived from education sessions or policy summaries rather than critical appraisal of original studies.

When discussing the evidence base, clinicians consistently identified a lack of robust neonatal-specific research. Many noted that recommendations appeared to be extrapolated from adult or paediatric populations, which they felt did not adequately account for neonatal physiology.

I don't think anyone could honestly say there's strong neonatal evidence either way.

Theme 6: Research priorities and perceived barriers

Participants identified suctioning practices, including saline use, as important areas for future research. Suggested approaches included multicentre trials, audits following policy changes, and systematic reviews of existing evidence. However, clinicians also highlighted significant barriers to conducting neonatal research, including ethical constraints, large sample size requirements, and limited resources.

Despite these challenges, participants emphasised the need for better evidence to inform practice and reduce reliance on experiential knowledge alone. Across themes, participants consistently described a disconnect between policy directives and the realities of neonatal bedside decision-making.

We all know this needs better evidence – the problem is actually doing the studies.

Summary of findings

The findings demonstrate that neonatal endotracheal suctioning practices are shaped by a complex interaction between policy, experience, and perceived risk. In the absence of strong neonatal-specific evidence, clinicians rely heavily on experiential knowledge and clinical judgement, while policies are often viewed as precautionary and inconsistently evidence-based. Saline instillation exemplifies this broader uncertainty.

DISCUSSION

This study explored how neonatal clinicians reason about endotracheal suctioning practices and how local policies are interpreted and enacted in the context of limited neonatal specific evidence, using saline instillation as a focal example. The findings demonstrate a persistent tension between precaution driven policy directives and bedside clinical judgement. Clinicians described navigating uncertainty

through experiential knowledge, risk perception, and contextual interpretation rather than through consistent application of evidence-based guidance. These dynamics help explain why variation in suctioning practice persists across neonatal intensive care units despite the presence of formal policies.

Contemporary relevance of the findings

Although data collection occurred in 2015, the findings remain highly relevant. Contemporary neonatal respiratory care guidance continues to characterise endotracheal suctioning as a high-risk intervention requiring careful clinical assessment yet offers limited neonatal-specific evidence to inform key procedural decisions, including the use of saline instillation. Recent clinical practice guidelines continue to emphasise caution while acknowledging the reliance on extrapolated adult or paediatric data. Importantly, no high-quality neonatal trials evaluating saline instillation during suctioning have been published in the past decade, and guideline variability remains evident internationally. This confirms that the evidence gaps and uncertainties articulated by clinicians in this study remain unresolved.

Policy–practice misalignment

Participants questioned the origins and credibility of local suctioning policies, particularly where recommendations were perceived to be based on historical precedent, accreditation requirements, or extrapolated evidence rather than neonatal-specific research. This finding aligns with broader concerns in neonatal care regarding the translation of low-level or non-neonatal evidence into prescriptive protocols.[1, 11] [12] As a result, many neonatal units internationally rely on locally developed protocols which are informed by adult studies, narrative reviews or historical practice rather than high-quality neonatal trials, reinforcing the relevance of this study's policy critique.[7]

The embedded policy analysis supported these perceptions, demonstrating substantial variability in recommendations and frequent reliance on low-level, outdated, or non-neonatal studies. This misalignment between policy intent and evidentiary strength has important implications for clinician trust, policy adherence, and consistency of care. When policies do not transparently communicate the quality and limits of the evidence underpinning recommendations, they risk being perceived as precautionary mandates rather than clinically reasoned guidance.

Experience, uncertainty, and clinician reasoning

Clinical experience emerged as the primary determinant of suctioning practice. Senior clinicians described nuanced, infant-specific decision making shaped by accumulated bedside experience, whereas less experienced staff were perceived to rely more heavily on rigid protocol adherence. This reliance was often driven by fear of adverse events or criticism, reinforcing a risk-averse culture. Such defensive practice may paradoxically increase exposure to harm through unnecessary or routine suctioning.[13] These findings highlight the importance of supporting clinical reasoning development, particularly for novice clinicians, and ensuring that policies are accompanied by education that explains not only what to do, but why.

Interpreting adverse events

Clinicians in this study differentiated between adverse events caused by suctioning itself, such as airway disruption or loss of lung volume, and those attributable to saline instillation. Recent clinical practice guidelines mirror this distinction by identifying desaturation, bradycardia and derecruitment as suction-related rather than saline-specific events. [7, 14] This experiential understanding contrasts with policy narratives that frame saline instillation as a primary source of harm, underscoring the difficulty of attributing causation within complex procedures. The findings support calls for caution when assigning risk to individual procedural components in the absence of robust neonatal evidence and reinforce the need for policies to clearly articulate evidentiary uncertainty.

Implications

Improving neonatal suctioning practice requires more than restrictive or precautionary policies. Transparent, evidence graded guidance that explicitly acknowledges uncertainty is needed to support consistent and safe clinical decision making. Educational strategies should extend beyond procedural instruction to include interpretation of infant cues, assessment of risk, and understanding of the evidence base and its limitations.

From a policy perspective, structured expert consensus represents a more credible approach than unreferenced or precautionary directives when high quality neonatal evidence is lacking. Systematic mapping of existing evidence, combined with clinician reasoning and experience, provides a robust foundation for consensus-based guideline development.[15]

In this context, the findings of this study directly inform the next phase of work: an international Delphi consensus process to prioritise key suctioning domains, including saline use, and to develop implementable, multidisciplinary guidance aligned with contemporary neonatal intensive care practice.

Strengths and limitations

A key strength of this study is the integration of clinician perspectives with systematic analysis of policy documents, allowing examination of both experiential reasoning and the evidentiary foundations of practice guidance. The multidisciplinary and cross jurisdictional nature of the sample enhanced conceptual depth. Limitations include the use of a single focus group and the absence of member checking; however, the extensive experience of participants and the richness of the data provided substantial information power consistent with the study aims. As with all qualitative research, findings are context dependent and should be interpreted with consideration of local practice environments.

Conclusion

Neonatal endotracheal suctioning practices are shaped by a complex interplay of policy directives, clinician experience, and perceived risk in the context of limited neonatal-specific evidence. This study

demonstrates that, where evidence is weak or inconsistent, clinicians rely heavily on experiential judgement while policies are often experienced as precautionary and variably evidence-based. Although the data were collected in 2015, contemporary guidelines continue to rely on extrapolated evidence, confirming that the uncertainties identified remain unresolved. These findings highlight the need for transparent, evidence-graded, and consensus-informed guidance to support consistent and safe suctioning practices in neonatal intensive care.

CONTRIBUTORS

JH instigated, designed and supervised the study and updated the revised the manuscript for publication. MH conducted the original data collection and contributed to the initial thesis from which this manuscript was developed. All listed authors had access to the data, take responsibility for the integrity and accuracy of the work, and consent to publication.

Declarations

CONSENT FOR PUBLICATION

All listed authors consent to publication.

CONFLICT OF INTEREST

There are no competing interests to declare.

ETHICAL APPROVAL

Ethical approval for this study was granted by Human Research Ethics Committee (HREC) on 16/03/2015. Application number: 201500034E.

COREQ REPORTING STATEMENT

This study is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ).

Study design:

A qualitative design using a single focus group was employed, appropriate to the exploratory aim and focused nature of the research question. Participants were purposively sampled based on neonatal intensive care experience and involvement in airway management. Data collection used open-ended

prompts, audio recording, and verbatim transcription. Data collection continued until sufficient information power was achieved for thematic analysis.

FUNDING

No funding was obtained for this study.

ACKNOWLEDGMENTS

We thank all staff from participating neonatal intensive care units who provided copies of their local suctioning policies, the focus group participants for their valuable insights, and Lyn Sinclair for facilitating data collection at the Annual Scientific Meeting.

DATA AVAILABILITY

Data is available on reasonable request.

References

1. Gardner DL, Shirland L (2009) Evidence-based guideline for suctioning the intubated neonate and infant. (Neonat Netw) 1999; 18(1): 51 5 (65 ref) 28: 281–302
2. Copnell B, Fergusson D (1995) Endotracheal suctioning: time-worn ritual or timely intervention? (Am J Crit Care) 1995; 4(2): 100 5 (23 ref) 4: 100–105
3. Gillies D, Spence K (2011) Deep versus shallow suction of endotracheal tubes in ventilated neonates and young infants. Cochrane Database Syst Rev: CD003309
4. Morrow BM, Argent AC (2008) A comprehensive review of pediatric endotracheal suctioning: Effects, indications, and clinical practice. Pediatr Crit Care Med 9:465–477
5. Shorten DR, Byrne PJ, Jones RL (1991) Infant responses to saline instillations and endotracheal suctioning. J Obstet Gynecol Neonatal Nurs 20:464–469
6. Paratz JD, Stockton KA (2009) Efficacy and safety of normal saline instillation: a systematic review. Physiotherapy 95:241–250
7. Blakeman TC, Scott JB, Yoder MA, Capellari E, Strickland SL (2022) AARC Clinical Practice Guidelines: Artificial Airway Suctioning. Respir Care 67:258–271
8. Schults JA, Cooke M, Long D, Schibler A, Ware RS, Charles K, Irwin A, Mitchell ML (2021) Normal saline and lung recruitment with paediatric endotracheal suction (NARES): A pilot, factorial, randomised controlled trial. Aust Crit Care 34:530–538
9. Ajjawi R, Higgs J (2007) Using Hermeneutic Phenomenology to Investigate How Experienced Practitioners Learn to Communicate Clinical Reasoning. qualitative Rep 12:612–638

10. Jeffrey JE, Foster NE (2012) A Qualitative Investigation of Physical Therapists' Experiences and Feelings of Managing Patients With Nonspecific Low Back Pain. *Phys Ther* 92:266–278
11. Leddy R, Wilkinson JM (2015) Endotracheal suctioning practices of nurses and respiratory therapists: How well do they align with clinical practice guidelines? *Can J Respir Ther* 51:60–64
12. Hough JL, Barton J, Jardine LA (2021) A quality appraisal using the AGREE II instrument of endotracheal tube suction guidelines in neonatal intensive care units. *Aust Crit Care* 34:524–529
13. Ayhan H, Tastan S, Iyigun E, Akamca Y, Arikan E, Sevim Z (2015) Normal saline instillation before endotracheal suctioning: What does the evidence say? What do the nurses think? Multimethod study. *J Crit Care* 30:762–767
14. Chegondi M, Francis T, Lin WC, Naqvi S, Raszynski A, Totapally BR (2018) Effects of Closed Endotracheal Suctioning on Systemic and Cerebral Oxygenation and Hemodynamics in Children. *Pediatr Crit Care Med* 19:e23–e30
15. Waggoner J, Carline JD, Durning SJ (2016) Is There a Consensus on Consensus Methodology? Descriptions and Recommendations for Future Consensus Research. *Acad Med* 91:663–668

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryTableS120260320.docx](#)