Consensus among Physiotherapists in the United Kingdom on the Use of Normal Saline Instillation Prior to Endotracheal Suction: A Delphi Study

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ABSTRACT

Purpose: To investigate whether physiotherapists consider normal saline instillation (NSI) useful before endotracheal suctioning and, if so, when.

Methods: Sixty-eight respiratory physiotherapists recruited from the United Kingdom's Association of Chartered Physiotherapists in Respiratory Care agreed to participate in a Delphi study. Clinicians' opinion of when NSI should be used was established and developed into statements. Level of agreement with each statement was collated through three rounds of a questionnaire. Clinicians' experiences were also reported.

Results: From the 52 responses to the third questionnaire, there was consensus that respiratory physiotherapists in the United Kingdom would use NSI when sputum retention is a problem, particularly when treatment options are limited (96%) and when sputum is obstructing the airway (92%). They agreed that non-bronchoscopic bronchoalveolar lavage can be used to resolve persistent atelectasis (70%). They would not use NSI for a test treatment during initial assessment without evidence of retained secretions (94%), when secretions are copious but can be cleared by alternative physiotherapy techniques (96%), to enhance a cough unless very strong evidence indicates retained secretions (81%), or to compensate for inadequate suction technique (90%).

Conclusion: This study provides clinicians' views about when NSI could be used.

Key Words: Delphi study, intensive care, physiotherapy, saline, suction

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RÉSUMÉ

Objectif : Déterminer si les physiothérapeutes considèrent l'instillation d'une solution saline isotonique (SSI) utile avant l'aspiration endotrachéale et, si oui, dans quelles circonstances.

Méthodologie : Soixante-huit physiothérapeutes respiratoires de l'Association of Chartered Physiotherapists in Respiratory Care au Royaume-Uni ont accepté de participer à une étude Delphi. L'opinion des cliniciens quant aux circonstances se prêtant à l'instillation d'une SSI fut établie suivis du développement d'affirmations basé sur celles-ci. Le consensus recueilli par chacune des affirmations a été déterminé au terme de trois tours d'enquête. Les expériences vécues par les cliniciens ont aussi été prises en compte.

Résultats : Selon les 52 réponses obtenues au 3^e tour, les physiothérapeutes respiratoires du Royaume-Uni s'accordent pour dire qu'ils recourent à l'instillation d'une SSI lorsque la rétention de mucus pose problème, particulièrement lorsque les solutions thérapeutiques sont limitées (96 %) et lorsque les mucosités encombrant les voies respiratoires (92 %). Ils s'entendent aussi sur le fait qu'un lavage bronchoalvéolaire à l'aveugle peut résoudre une atelectasie persistante (70 %). Ils ne procéderaient toutefois pas à l'instillation d'une SSI dans les cas suivants : comme traitement d'essai lors d'une évaluation initiale sans la présence évidente de sécrétions (94 %) ; lorsque ces dernières sont abondantes, mais peuvent être éliminées à l'aide d'autres techniques de physiothérapie (96%) ; pour améliorer la toux, à moins de signes vraiment manifestes de la présence de sécrétions tenaces (81 %) ; ou pour suppléer à une technique d'aspiration inadéquate (90 %).

Conclusion : Cette étude a permis de connaître l'opinion des cliniciens quant aux indications de l'instillation d'une SSI.

Mots clés : aspiration, étude Delphi, physiothérapie, saline, soins intensifs

The study was undertaken as part of an MSc in Respiratory Physiotherapy at Sheffield Hallam University. The author is now a lecturer in physiotherapy at The Robert Gordon University, Aberdeen.

Ethical approval was received from Sheffield Hallam University, Sheffield, England.

There are no competing interests to disclose for this submission.

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INTRODUCTION

Normal saline instillation (NSI) is the process of instilling saline directly down a patient's endotracheal (ET) or tracheostomy tube prior to endotracheal suction. A syringe at the mouth of the ET/tracheostomy tube can be used, or, alternatively, a sterile vial of saline can be connected to the designated port on a closed suction system and saline washed down the catheter. The proposed advantages of NSI are loosening of thick secretions, enhanced cough, increased secretion mobilization and clearance, dilution of secretions, and lubrication of the suction catheter.¹ Of these, only enhanced secretion clearance has been investigated and supported.^{2,3}

Studies investigating the effect of NSI on outcomes such as oxygen saturation, oxygen consumption, and risk of infection suggest that it may be detrimental.⁴⁻⁹ These studies, however, focused on samples in which a sputum problem was unlikely because of the brief period the subjects were likely to have been ventilated.^{4-6,9} Some studies also had methodological flaws and lacked adequate detail, calling into question the validity and reliability of their results. Ackerman⁴ and Ackerman and Mick⁵ failed to detail whether pre-oxygenation, advised by authors such as Oh and Seo,¹⁰ was undertaken before suction. This lack of detail with respect to suction procedure leads to questions about the authors' reported reduction in saturations, as this could be due to variations in practice (pre-oxygenation or not) rather than to NSI. Hagler and Traver stated that NSI is an infection risk but did not consider that some bacteria washed off an ET/tracheostomy tube by NSI are likely to be removed by the subsequent suction procedure.⁷ Study results may also be statistically but not clinically significant. For example, a 2% drop in saturations could be a drop from 100% to 98%.^{7,8} Such limitations result in low-quality evidence that is of limited clinical value.

Surveys have indicated that NSI has been used extensively with patients requiring suction;¹¹⁻¹³ 39% of physiotherapists and 43% of respiratory therapists in Canada have reported using it routinely, and 46% and 51% respectively have reported using it sometimes.¹⁴ Despite this, two groups have recommended *banning* NSI.^{15,16} However, this recommendation is based on a misrepresentation of the work of Ackerman and Mick, who actually suggested that *routine* use of NSI is not supported.⁵ Canadian guidelines produced by Brooks et al.¹⁷ indicate that there is currently no evidence to support or refute the use of NSI; more recently, Celik and Kanan have reiterated the view that NSI should not be used routinely,¹⁸ suggesting that NSI should be used only when it is needed and when the patient's response to it has been established.

Within the United Kingdom, anecdotal reports have indicated that some hospitals incorporated the complete

ban of NSI in their nursing suction protocols, based on reviews reported in nursing literature, and that physiotherapists, despite being autonomous practitioners, are being encouraged to comply.^{15,16} This is particularly pertinent if it is considered that sputum retention, one of the key reasons for using NSI,¹ could itself be detrimental to oxygenation. It is possible that the potential of ultimately improving oxygenation by removing secretions with NSI could reduce the importance of any possible detrimental effects. If secretions cannot be removed with other physiotherapy techniques, the ban on NSI could potentially be detrimental to patient care. Given this contradiction in recommendations, it is important to establish whether physiotherapists believe that NSI should be used and, if so, under what circumstances. Sackett et al. believe that clinicians' experience can contribute to informing evidence-based practice if research is lacking.¹⁹ Therefore, clinicians' expert opinion can provide evidence for physiotherapists' practice regarding the use of NSI, albeit at a lower level than the evidence produced by randomized controlled trials,¹⁹ and can also provide direction for further studies to establish whether NSI has a role prior to suctioning.

The purpose of this study was to identify whether physiotherapists working in intensive care environments consider NSI to be useful and, if so, in what situations. Their views and experiences can provide an alternative source of evidence.

METHOD

Design

The study employed the Delphi technique, which has been identified as useful in contexts of contradictory evidence.²⁰ (p. 243-4) This technique gathers the ideas and attitudes of a number of professionals with relevant experience via postal questionnaires, using open-ended questions, and enables participants to give detailed and honest answers, independent of the responses of others. Responses to questions are analyzed and distilled into a follow-up questionnaire in which respondents rank their level of agreement with specific statements. This second-stage questionnaire enables respondents to see how others answered (in a non-attributable way), and then to alter their responses and provide clarification. This process is repeated until consensus is achieved.²¹ (p. 407)

Participants

In 2003, a sample of physiotherapists from the Association of Chartered Physiotherapists in Respiratory Care (ACPRC), a special-interest group for UK physiotherapists, was identified by the membership secretary using the following inclusion criteria: (a) an expressed interest in critical care or preference of working area

and (b) willingness to be contacted for research. Exclusion criteria were interest only in chronic pulmonary care or unwillingness to be contacted for research. Respondents' level of expertise was clarified during the study.

Ethical approval was received from Sheffield Hallam University, Sheffield, England. Questionnaires and all data were coded to reassure respondents that information would be non-attributable and anonymous. Response to the initial questionnaire implied consent, and participants were not contacted for future rounds unless a contact detail sheet was returned.

Five physiotherapists from Ninewells Hospital, Dundee, Scotland, pilot-tested the questionnaires for readability and comprehensibility of instructions and statements. These clinicians had all worked in intensive care for at least 4 months but were not members of the ACPRC and were not currently working in intensive care. Only minor amendments (e.g., moving words in sentences to enhance readability) were required.

Intervention

First Round of Inquiry

An initial questionnaire (Figure 1) was sent to 86 physiotherapists identified following the format identified by Bowling.^{21 (p. 407)} A deadline for responses was set for 2 weeks after the postal date, at which time reminder

letters giving a further week for responses was provided. This procedure was standard for each round of inquiry.

This questionnaire requested information about participants' clinical experience and their views relating to the use of NSI. Responses as to whether or not NSI would be used influenced the direction of the second round of inquiry. Comments from open-ended questions were collated and categories developed. Statements were placed into the categories by the author and a research assistant working independently. Where there was disagreement between the placement of categories, the author and research assistant gave their reasons for placement; these were then discussed until agreement was reached. A third person was identified to review any disputed statements, but in fact this was not required, as the two researchers reached agreement after initial discussions.

Second Round of Inquiry

Clinicians were asked to identify how likely they were to use NSI in situations identified from Round 1 (Figure 2). They could state that NSI would be "key" in a given situation, that it might be useful, or that it would never be used. Participants were encouraged to provide additional comments (e.g., justification, exceptions, and objective markers). In addition, they were asked to report situations in which they had used NSI and the effects they had observed. These reports were subjective in

This questionnaire is aimed at identifying what indications physiotherapists use to determine the use of NSI prior to endotracheal suction and the reasoning behind these decisions.

1. Physiotherapy Grade:
2. How frequently do you work on intensive care (please circle the appropriate answer):
Daily Weekly Monthly Other (please specify)
3. Please tick the box next to the statement that applies to your clinical practice:
 - (a) I would never consider instilling normal saline prior to suctioning an intubated patient ☐
 - (b) I would consider instilling normal saline prior to suctioning an intubated patient in certain situations ☐

If you answered (a) to question 3 please go on to question 4 otherwise please continue with question 5.

4. When would you consider utilising normal saline instillation prior to endotracheal suction?
.....
.....
5. Please give reasons for your answers to question 4 or question 3a if you never use NSI.
.....
.....

Figure 1 Initial questionnaire

The following is a list of situations where normal saline instillation (NSI) may be considered by clinicians.

Please rank each situation as: **Key (essential) or**

Useful at times or

Would never use

To rank each option place a tick in the appropriate box.

An additional comments box has been provided should you wish to provide additional information such as your justification, exceptions, objective markers used and any further comments. (If you require more space please continue overleaf but clearly identify which situation your comments relate to.)

<i>Situation</i>	<i>Key</i>	<i>Useful at times</i>	<i>Never use</i>	<i>Comments (justification, exceptions, objective markers)</i>
Unable/difficult to clear secretions with suction alone				
When suction has been inadequately performed				
Unable to clear with manual techniques and/or MHI and suction				
Secretions are thick				
Secretions are tenacious/sticky				
Secretions are copious				
Secretions are bloody				
Secretions are occluding/partially occluding airway				
Difficulty encountered passing the catheter down the airway				
To ensure the airway is patent				
To stimulate a cough				
When cough reflex is poor and secretions are present – use to trigger a stronger/more effective cough				
Assessment suggests sputum retention but min/nil cleared on suction				
Assessment suggests sputum retention, respiratory status is being compromised but min/nil cleared on suction				
Signs of ‘plugging off’				
Airway pressure increasing but no bronchospasm and/or barotrauma is evident				
Persistent sputum retention with previous good response to NSI				
Where humidification has been inadequate				
When patient is dehydrated				
When secretions are coating/sticking to the outside of the suction catheter				
Non-bronchoscopic broncho-alveolar lavage (for atelectasis)				
Inhalation burn injuries				
For test MHI/suction during initial assessment if other assessment techniques indicate chest unproductive, to double check				

Figure 2 Questionnaire: Second round of inquiry

nature but were useful in clarifying the situations summarized in the statements used in the second-round questionnaire.

Responses to Round 2 were tabulated. Additional comments were collated and used to refine the statements, which were divided into four subsections identified from emerging themes: “nature of secretions,” “sputum retention,” “airway and suction issues,” and “other.” Some statements were not about NSI

specifically but about related issues identified by clinicians that were pertinent to overall management of patients.

Third Round of Inquiry

The four subsections identified above formed the third round of inquiry. Participants were asked to indicate their level of agreement with statements related to these subsections on a Likert scale.

Table 1 Grade of Respondents and Frequency of Working on Intensive Care by Round*

Grade of Respondents Grade**	Frequency of Working on Intensive Care						
	% Round 1	% Round 2	% Round 3	Frequency on Intensive Care	% Round 1	% Round 2	% Round 3
Superintendent I, II, III	13.2	13.5	15.4	Daily	76.4	74.4	75
Superintendent IV	4.4	5.1	5.8	3 days/week	5.9	6.8	5.8
Superintendent	1.4	1.7	1.9	2 days/week	2.9	3.4	1.9
Extended Scope Practitioner	1.4	1.7	1.9	Weekly	1.5	1.7	1.9
Clinical Specialist	4.4	5.1	3.8	Monthly	5.9	6.8	5.8
Senior I	69.1	67.6	65.4	1 in 6 weekends	2.9	3.4	3.8
Senior II	5.9	5.1	5.8	As required	4.4	3.4	5.8
Totals	99.8	99.8	100	Totals	99.9	99.9	100

Senior II = general grade usually undertaking six to nine monthly rotations across a variety of clinical areas, usually at least 18 months post-qualification; Senior I = specialist grade, usually at least 4 years qualified and having undertaken Senior II rotations including respiratory care; Clinical Specialist = promoted grade after working in respiratory care at Senior I level for several years; Extended Scope Practitioner = usually promoted after working in respiratory care at Senior I level for several years, undertakes roles outside the scope of normal physiotherapy such as therapeutic bronchoscopy; Superintendent = usually promoted after working in respiratory care at Senior I level for several years, usually has management responsibility and extensive clinical experience (promotion is not automatic on length of experience; applicants are interviewed to demonstrate appropriate knowledge and ability to undertake the post).

*Percentages have been rounded up or down to the nearest 0.1.

**These grades have now been superseded by Band 6 (Senior II), Band 7 (Senior I), and Band 7/8 (grades above Senior I).

This study took place over 6 months, from September 2003 to March 2004. This allowed collation of responses and response time for each round.

Data Analysis

Descriptive statistics were compiled for questions 1–3 of the initial questionnaire and presented as percentages. A frequency chart was compiled for Round 3 results, and percentages of agreement/disagreement were calculated for each statement. Consensus was considered to have been reached if level of agreement or disagreement reached 70% or more for Round 3.

RESULTS

Of the initial 86 physiotherapists identified, 68 returned questionnaires (a 79% response rate). Of these, 62 agreed to participate in future rounds, and 95% ($n=59$) completed Round 2. One additional response was excluded because it was received after the results had been collated. In Round 3, 60 questionnaires were sent out and 52 returned (an 87% response rate). In all, 76% of the initial 68 respondents to Round 1 completed the study.

Ninety-four percent of participants were experienced clinicians, that is, Senior I or above (see Table 1), and 83% worked in intensive care weekly or more often (see Table 1). Table 2 shows the number of respondents at each grade for each round of the study.

In Round 1, question 3 asked clinicians whether or not they would consider using NSI. There was 100% agreement that NSI would be considered in certain situations. Results of Round 2 served only to inform Round 3 and are not presented here. The percentage response for statements relating to nature of secretions, sputum retention, and airway and suction issues are shown in Table 3. Only levels of agreement or disagreement are shown;

Table 2 Participants by Grade and Round

Grade	Round 1	Round 2	Round 3
Superintendent III and above	9	8	8
Superintendent IV	3	3	3
Superintendent	1	1	1
Extended Scope Practitioner	1	1	1
Clinical Specialist	3	3	2
Senior I	47	40	34
Senior II	4	3	3
Totals	68	59	52

levels of “no opinion” were very low—less than 6% for all statements except 3(i) (10%), 10 (12%), and 11(ii) (9%)—and therefore are not reported.

There was 100% agreement that systemic hydration and humidification should be maximized if secretions are thick or tenacious, particularly if they are not clearing with available treatment techniques. All other statements (see Table 3) show a high level of agreement (>70%), indicating consensus for each statement. The use of NSI when secretions are thick or obstructing a bronchus or airway (statements 1, 4, and 5 in Table 3) was supported by the clinicians’ reported experiences (see Box 1).

Although respondents in earlier rounds referred specifically to patients with inhalation burns, a large number of respondents had no experience of or no opinion on this issue (see Figure 3). Statements become progressively more specific with respect to the situations in which NSI can be used, and the level of “no experience” for each statement was constant at 45%. With the “no experience group excluded from the calculation, agreement was reached on NSI use when burn-injured patients have thick/tenacious secretions that are not clearing with other techniques (71% agreement) and “if the secretions are impairing or likely to impair ventilatory status” (75% agreement).

Table 3 Statements Relating to Nature of Secretions, Sputum Retention, and Airway and Suction Issues

Statement	Agree %	Disagree %
Nature of Secretions		
1. If secretions are: thick/tenacious, adversely affecting / likely to affect ventilatory status and available treatment techniques are not clearing them NSI should be incorporated into physiotherapy treatment	98	2
2. NSI should not be utilised when secretions are copious unless they are thick/tenacious and not clearing with appropriate techniques.	96	2
3. (i) If plugs of old blood are sticky/tenacious and not clearing with available techniques NSI should be used. (ii) ... particularly if impairing / likely to impair ventilatory status.	88 92	2 2
Sputum Retention		
4. If on assessment there is clear evidence of secretions but these are not clearing with available treatment techniques and are impacting on / likely to impact on ventilatory status NSI should be incorporated into the treatment unless contra-indicated.	96	4
5. If patient has "plugged off" and available techniques are not clearing the "plug" NSI should be utilised in conjunction with these techniques.	96	4
6. If airway pressure is increasing and thorough assessment indicates this is due to sputum which is not clearing with available techniques then NSI should be utilised.	94	6
7. When humidification and/or systemic hydration has been inadequate and assessment indicates sputum retention which does not clear with available techniques NSI should be used if secretions are likely to be problematical before appropriate humidification/hydration can take effect.	87	10
8. If a good response has been shown with NSI in the past and a patient has persistent sputum retention despite maximal humidification / systemic hydration and current assessment still indicates sputum retention NSI should be utilised again.	96	4
9. NSI should not be used for a test MHI/suction during initial assessment unless there is very strong evidence to indicate retained secretions.	94	2
10. If atelectasis is present, thought to be due to mucous plugging, but not responsive to available techniques a non-bronchoscopic broncho-alveolar lavage utilising NSI can be effective.	70	14
Airway and Suction Issues		
11. (i) If ET/tracheostomy tube is occluded / partially occluded by secretions NSI should be utilised if suction alone has been unsuccessful in clearing the obstruction (ii) ... but the clinician must be aware utilising NSI to clear ET / tracheostomy tube can cause complete airway occlusion, on occasion necessitating re-intubation / tracheostomy tube change.	92 78	6 13
12. (i) If difficulty is encountered passing suction catheter down the ET/tracheostomy tube NSI is only indicated if secretions are considered to be the cause of the obstruction (ii) ... and except in exceptional circumstances, NSI should not be used to ensure the airway is patent (94%, $p < 0.001$).	86 94	14 4
13. NSI is not appropriate if suction has been inadequately performed (i.e., poor technique) unless this has resulted in crusting / partial obstruction of tracheostomy/ET tube	90	8
14. NSI should only be utilised to enhance a cough if secretions are thick/tenacious and are impairing / likely to impair ventilatory status and all available techniques have failed.	81	13
15. If secretions are coating / sticking to the outside of the suction catheter and there is evidence of sputum retention which is not clearing with available interventions NSI should be utilised.	87	12

Box 1 Clinicians' Reported Experiences

- ICU patient with probable aspiration, widespread crackles on auscultation. Started treatment in left side lying, manual hyperinflation with shakes and suction clearing minimal thick MP secretions $\times 1$ but crackles persisted. Utilised 2–3mls normal saline, manual hyperinflation with shakes and suction repeated clearing 3 MP. Use on 2 further occasions clearing 2 MP. Improved breath sounds. Treatment in right [side] lying cleared MP3 $\times 1$. No further saline required to increase breath sounds.
- Sputum plug in left main bronchus on CXR. Positioning and vibrations and MHI and suction did not improve breath sounds or SaO₂ therefore positioned in left side lying and 5mls NSI. Turned to right side lying and treatment was repeated. Thick plug then copious secretions suctioned. Re-inflation of lung on auscultation, CXR and SaO₂ improved.
- On auscultation patient had decreased air entry right base. On suction preceded by expiratory vibrations very thick secretions on outside of catheter. Positioned in right side lying, 2ml NSI. Repositioned left side lying expiratory vibrations, thick plug secretions cleared, then copious yellow secretions. Air entry much improved.
- Occluded ETT with increased work of breathing, severe drop in saturations, tachycardia and audible secretions. Could not clear with suction, MHI and manual techniques. Cleared by using NSI in addition

MP = mucopurulent; CXR = chest x-ray; MHI = manual hyperinflation; SaO₂ = oxygen saturation; ICU = intensive care unit; ETT = endotracheal tube

DISCUSSION

These results represent the opinions of a relatively small sample of clinicians, but their level of experience and the frequency with which they worked in ICU suggest that they have extensive and relevant experience. Although 16 respondents were lost during the study, the level of experience and frequency of ICU work was

consistent through all three rounds, enhancing the reliability of the results.²² Loss of respondents may indicate response fatigue. While this could be seen as a threat to validity, the high agreement level required for consensus would indicate strong support for the statements and, if achieved, would improve validity.²³

In previous studies, agreement levels between 51% and 80% have been used to indicate consensus.^{22,24}

Figure 3 Statements relating to inhalation burns

The relatively high level of agreement chosen for the present study (70%) improves validity, but it is an arbitrary number. There are wide variations in how the Delphi technique is undertaken, due to lack of universal guidelines, and these variations are mirrored in the ways consensus is demonstrated.²⁵

The participants' agreement that they would use NSI if secretions are thick or tenacious, if secretions are adversely affecting or are likely to adversely affect ventilatory status, and if other available treatment techniques are not clearing the secretions is supported by Schwenker et al.²⁶ This complex statement was developed from specific statements provided by clinicians, who did not differentiate between "thick" and "tenacious" or provide definitions for these terms. A degree of clarification is provided through the clinicians' descriptions of their experiences (see Box 1), which make reference to secretions on the outside of the catheter or occluding the airway and which link to the definition provided by Druding: "secretions are adhering to the ETT or suction catheter, mucous is obstructing the airway."^{27(p.212)} However, unlike Druding, who advocates NSI if a suction catheter is not eliciting an acceptable cough, respondents in this study indicated that this is acceptable only if secretions are likely to cause a problem.²⁷

Many of the statements made by respondents in this study were qualified by "available treatment techniques," a term that was not described or defined. Treatment techniques commonly used in ICU are manual hyperinflation, vibration, shaking, and percussion. Techniques available to physiotherapists, however, are determined by the patient's medical condition, the expertise of the clinician, and the available resources, and will therefore vary among patients.

Only five statements had less than 80% agreement, but these still achieved consensus, since results were above the 70% level required. The first relates to the use of non-bronchoscopic bronchoalveolar lavage (NB-BAL); it shows that this group did not agree that NB-BAL could be used to resolve atelectasis caused by mucous plugging

and unresponsive to other treatment options. However, the number of respondents claiming to have no experience with this technique was high, and when this group was excluded from the calculation, there was agreement that NSI could be useful.

NB-BAL has been used in three studies of paediatric populations; despite minor variations in technique, all three identified successful resolution of refractory atelectasis.^{28–30} No literature was found relating to NB-BAL in adults; however, the development of collateral ventilation, which occurs between childhood and adulthood, could allow saline to pass behind the plug, enhancing the technique's effect in adults. Work by Hanley et al. suggests that this would not be possible, because the saline does not reach beyond the main stem bronchus.³¹ However, their study involved instilling saline via a syringe at the top of the endotracheal tube, a different method from instillation down a narrow-bore tube wedged at the carina, as used in NB-BAL; it is not possible to assume that saline would reach the same point in the lungs. In addition, they reported only seven cases (five dogs and two humans), and generalization from one small, mixed sample should be undertaken with caution.³¹

The next statement that demonstrated significant results with an agreement level below 80% related to the use of NSI to help clear secretions obstructing the airway. Although clinicians agreed that using NSI to clear an ET or tracheostomy tube could result in complete occlusion, necessitating re-intubation, they also agreed that NSI can at times be useful in these situations for clearing the secretions causing the occlusion.

For patients with inhalation burns, agreement was reached only when calculated without the "no experience" group, and then only for situations similar to other patients (i.e., when secretions are thick/tenacious, are not clearing with other techniques, and are impairing or likely to impair ventilatory status). The number of respondents reporting "no experience" for these three statements suggests that only those with experience changed their views as the statements in the questionnaire became more specific.

The level of agreement for inhalation burns may differ from that for sputum retention because some clinicians who reported having no opinion (a proportion that changed across the three statements relating to inhalation burns; see Figure 3) may have based their opinions on theory rather than on clinical experience. There is a lack of literature either supporting or refuting NSI use in the situations identified. However, the progressive and systematic approach described in the clinicians' reported experiences (see Box 1) provides support for aspects such as the use of NSI for retained secretions and mucous plugging causing airway occlusion. This increases the reliability and validity of the results, as these incidents represent specific reported examples of the situations mentioned in the questionnaire.

CONCLUSIONS

The results of the present study document the opinions of a group of specialist respiratory physiotherapists on situations when NSI would be appropriate to use. These situations are as follows: when sputum retention due to thick or tenacious secretions is affecting, or is likely to affect, ventilatory status and “available treatment techniques” are not clearing the secretions; when atelectasis due to mucous plugging occurs and “available techniques” are unable to clear it; and when ETT/tracheostomy obstruction or partial obstruction due to sputum occurs. In addition, the technique of NB-BAL can be used to resolve persistent atelectasis. Conversely, the respondents agreed that NSI should not be used for a test treatment during initial assessment, unless there is very strong evidence to indicate retained secretions, or when secretions are copious but can be cleared by alternative physiotherapy techniques. NSI is also not appropriate to enhance a cough, unless there is very strong evidence to indicate retained secretions, or to compensate for inadequate suction technique.

KEY MESSAGES

What Is Already Known on This Subject

NSI prior to endotracheal suction is used extensively with patients requiring suction, despite limited evidence to support or refute its use and despite conflicting recommendations: avoiding routine use and a complete ban on use to prevent potential detrimental effects. If secretions cannot be removed without NSI, a complete ban could be detrimental to patient care. There is currently no specific information on when NSI should be used.

What This Study Adds

Experienced cardiorespiratory physiotherapists agree that there are situations in which NSI can be used, and also situations in which it should not be used.

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