

# A survey of suctioning practices among physical therapists, respiratory therapists and nurses

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**D Brooks, S Solway, I Graham, L Downes, M Carter. A survey of suctioning practices among physical therapists, respiratory therapists and nurses. Can Respir J 1999;6(6):513-520.**

**OBJECTIVE:** To assess the current tracheal and oropharyngeal suctioning practice variability within and among the professions of physical therapy, respiratory therapy and nursing.

**DESIGN:** A mail survey of physical therapists, respiratory therapists and registered nurses who perform suctioning. The survey instrument consisted of questions about professional characteristics, clinical suctioning practice and sociodemographics.

**SETTING:** The survey was restricted to professionals practising within the province of Ontario.

**PARTICIPANTS:** Random samples (n=448) were drawn from membership of the regulatory boards of all three professions.

**MAIN RESULTS:** Fifty-eight per cent of respondents returned completed questionnaires. There was large variation in reports of gloving procedure (eg, double clean: 26% for physical therapists, 5% for respiratory therapists, 55% for registered nurses, P<0.0001) and technique of catheter use (sterile, inline or clean, P<0.01). There was also discrepancy in the techniques used to minimize harmful effects, ie, pre-lubrication with gel (83% for physical therapists, 54% for respiratory therapists, 17% for registered nurses, P<0.0001), use

of hyperinflation (12% of physical therapists, 25% of respiratory therapists, 39% of registered nurses never hyperinflate) and use of instillation (7% of physical therapists, 0% of respiratory therapists, 19% of registered nurses never instill). However, there was agreement about the routine application of hyperoxygenation (74% or more) and there was almost perfect agreement (99% or more) within and across the three professions that secretion removal was the main indication for suctioning.

**CONCLUSIONS:** The results of this study indicate a wide variation in suctioning techniques among physical therapists, respiratory therapists and registered nurses. Comparisons among professions revealed inconsistencies in some areas, such as the use of in-line catheters, gloving procedures, pre-lubrication and hyperinflation.

**Key Words:** Nursing; Physical therapy; Respiratory therapy; Suction; Survey

## Enquête sur les pratiques d'aspiration parmi les physiothérapeutes, les inhalothérapeutes et les infirmières

**OBJECTIF :** Évaluer la variabilité des pratiques courantes d'aspiration trachéale et oropharyngée chez et entre les professions de physiothérapeute, d'inhalothérapeute et d'infirmière.

**MODÈLE :** Enquête postale menée auprès de physiothérapeutes,

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d'inhalothérapeutes et d'infirmières membres de l'ordre qui pratiquent des aspirations. L'instrument utilisé pour l'enquête se composait de questions relatives aux caractéristiques professionnelles, aux pratiques cliniques d'aspiration et à des données sociodémographiques.

**CONTEXTE** : L'enquête était limitée aux professionnels pratiquant dans la province de l'Ontario.

**PARTICIPANTS** : Des échantillons aléatoires (n = 448) ont été tirés parmi les membres des ordres des trois professions.

**PRINCIPAUX RÉSULTATS** : Cinquante-huit pour cent des répondants ont retourné les questionnaires complétés. Il y avait une variation importante dans les réponses concernant la façon de se gantier (par exemple, deux gants propres : 26 % pour les physiothérapeutes, 5 % pour les inhalothérapeutes et 55 % pour les infirmières inscrites au tableau de l'ordre,  $p < 0,0001$ ) et dans la technique relative à l'utilisation des cathéters (stérile, à demeure ou propre,  $p < 0,01$ ). On a aussi noté une différence dans les techniques utilisées pour minimiser les effets effractifs, c'est-à-dire, une prélubrification avec du gel (83 % pour les physiothérapeutes, 54 % pour les in-

halothérapeutes, 17 % pour les infirmières inscrites au tableau de l'ordre des infirmières,  $p < 0,0001$ ), le recours à l'hyperinflation (12 % des physiothérapeutes, 25 % des inhalothérapeutes et 39 % des infirmières n'appliquent jamais cette méthode) et l'instillation (7 % des physiothérapeutes, 0 % des inhalothérapeutes et 19 % des infirmières inscrites au tableau de l'ordre n'ont jamais recours à l'instillation). Toutefois, 74 % et plus des répondants étaient d'accord relativement à l'hyperoxygénation systématique (74 % et plus) et presque la totalité des répondants (99 % et plus) dans et entre les trois professions considéraient que le retrait des sécrétions était la principale indication de l'aspiration.

**CONCLUSIONS** : Les résultats de cette étude démontrent des variations importantes dans les techniques d'aspiration parmi les physiothérapeutes, les inhalothérapeutes et les infirmières inscrites à l'ordre. Des comparaisons effectuées parmi les professions ont révélé des incohérences dans l'application de certaines techniques, par exemple, l'utilisation de cathéters à demeure, les façons de se gantier, la prélubrification et l'hyperinflation.

**S**uctioning refers to clearing secretions of the trachea or pharynx either through a natural orifice or artificial airway via insertion of a catheter and application of negative pressure (1). Although it is a common and necessary technique used by nurses, physical therapists and respiratory therapists, there is a lack of consensus on several aspects of this procedure such as clinical indications, method of application and supplemental proceedings that maximize the effectiveness of suctioning and minimize harmful effects ('augmentation' techniques) (2,3).

A review of the literature revealed no studies on variations in suctioning practice in the adult population but several studies in the neonatal and pediatric populations (2-6). Of the five studies found, four papers used survey methodology (2-6) and one used an observational approach (4). None of the studies examined the variability of suctioning among the three disciplines of physical therapy, respiratory therapy and nursing. Although one study (5) surveyed nurses and physical therapists to determine their knowledge level of the theory and practice of nasopharyngeal suctioning, the authors did not examine the responses by professional groups separately. Three studies (3,4,6) have examined suctioning practices among nurses and one study included only physical therapists (2).

All five studies concluded that significant variation existed around the practice of nasopharyngeal and/or tracheal suctioning in the neonatal and pediatric populations (2-6). A lack of consensus existed with respect to oxygen delivery, gloving procedure, suction type, amount of pressure, number of catheter insertions, indications for suctioning and the use of augmentation techniques such as hyperoxygenation, hyperventilation, hyperinflation, adapter and irrigant use. The sample sizes of the studies ranged from 24 to 203 subjects.

One potential source of variation in practice is the large and conflicting body of literature on the methods of application of suctioning. A search of the literature revealed over 200 articles dealing specifically with the effectiveness of different suctioning procedures in children and adults. In addition, although several review articles have been published by the different professional groups on this topic, the recommendations from these articles are not consistent (7-11).

We undertook a written mail survey of physical therapists, respiratory therapists and registered nurses who perform suctioning in the province of Ontario in the adult and/or pediatric populations. The overall objective was to describe the suctioning practices of Ontario physical therapists, respiratory therapists and registered nurses. In comparison with previous studies, we set out to survey a larger sample that was inclusive of the main disciplines that perform suctioning. This investigation of suctioning practice was part of an interdisciplinary clinical practice guideline initiative on tracheal and oropharyngeal suctioning.

## MATERIALS AND METHODS

**Sample**: Using a computerized random number function, random samples were drawn from the membership lists of the College of Physiotherapists of Ontario (specifically, from members who stated that their specialty area was cardiorespiratory, n=150), the College of Respiratory Therapists of Ontario (specifically from members that stated that they performed suctioning as part of their practice, n=150) and the College of Nurses of Ontario (specifically, from registered nurses, n=148). Because this study was exploratory and descriptive in nature, and information on the expected differences among professional groups was unknown, sample size calculations were not performed. The sample size was determined on the basis of available funding from the three colleges and convenience.

**Study design**: Ethics approval was obtained from the Research Ethics Committee of the Loeb Research Institute at the Ottawa Civic Hospital, Ottawa, Ontario.

This study was a cross-sectional, self-administered mail survey. It was implemented using a modified Dillman's *Total Design Method for Mail Surveys* (12). A questionnaire was developed and pilot tested (see section on Instrument). All potential respondents and surveys were coded with an identification number to avoid repeat mailings to those who had already responded. The questionnaire was sent to the sample of physical therapists, respiratory therapists and registered nurses with a covering letter that stated the purpose of the project, a statement of confidentiality and contact infor-

mation if the respondent required assistance or had any questions concerning the project. The letter was signed by the Acting Registrar of the College of Physiotherapists of Ontario, the Registrar of the College of Respiratory Therapists of Ontario and the Executive Director of the College of Nurses of Ontario.

Three weeks following the first mailing, each nonrespondent received a reminder card. Three weeks later, nonrespondents received a second copy of the questionnaire.

**Instrument:** The questionnaire was six pages long and consisted of 82 items eliciting information about professional, practice setting and sociodemographic characteristics, suctioning activities and clinical practice, and attitudes toward clinical practice guidelines (survey available from the authors and the editor of the *Canadian Respiratory Journal*). The present paper contains data related to suctioning activities and clinical practice.

Representatives from the College of Physiotherapists of Ontario developed the survey instrument based on the literature, input from clinicians, and experts in respirology and survey design. Representatives from the College of Respiratory Therapists of Ontario and the College of Nurses of Ontario reviewed and revised the questions to reflect differences in professional orientations and preferences. The instrument was then pilot tested to assess its understandability and ease of completion (including skip patterns), as well as the length of time required to complete the survey. Twenty-three physical therapists attending a national physical therapy conference completed the questionnaire and provided feedback on clarity, wording and content. Their comments were collated and the questionnaire was appropriately modified. The data from these completed questionnaires were not included in the analysis. Pilot testing revealed that the questionnaire required 20 to 30 mins to complete. Individuals involved in pilot testing were excluded from the random sampling. All professional groups completed the same questionnaire.

**Statistical analysis:** Questionnaire responses were coded and entered into a computer data file by a data entry firm. Analysis was undertaken with the Statistical Package for Social Sciences (SPSS V6.1, SPSS Inc, Chicago). A descriptive summary and frequency analysis of the data on all questions were performed. Where appropriate, means and SDs were reported. Differences between professional groups were assessed by conducting  $\chi^2$  analysis for categorical data and by ANOVA for continuous data.

## RESULTS

**Response rate and demographics of respondents:** In total, 297 questionnaires were returned (66% return rate overall, 76% for physical therapists, 65% for respiratory therapists and 57% for registered nurses). A total of 10 questionnaires were returned by individuals who were ineligible for the study (ie, retired: one physical therapist, three respiratory therapists, six registered nurses). Of those eligible, 252 surveys were complete (ie, more than 75% of questions were answered) providing an overall response rate of 58%. The response rates by discipline were as follows: 64% (n=96) for

**TABLE 1**  
Number and percentage of respondents of the mail survey concerning suctioning practices for each work setting

Work setting	Physical therapists count (%)	Respiratory therapists count (%)	Registered nurses count (%)
Community hospital	59 (63)	56 (69)	52 (75)
Tertiary hospital	22 (24)	17 (21)	11 (16)
Other	12 (13)	8 (10)	6 (9)

*Missing responses: three for physical therapists, four for respiratory therapists and two for registered nurses*

physical therapists, 58% (n=85) for respiratory therapists and 50% (n=71) for registered nurses. The majority of the respondents (84%) were female (90% of physical therapists, 67% of respiratory therapists, 99% of registered nurses,  $P<0.001$ ).

Most of the respondents worked in community hospitals. The specific percentages by profession are reported in Table 1. A large number of respondents (76%) had teaching responsibilities (81% for physical therapists, 81% for respiratory therapists and 66% for registered nurses,  $P=0.045$ ). However, a much lower percentage (25%) were involved in research (23% for physical therapists, 20% for respiratory therapists and 33% for registered nurses,  $P=0.16$ ).

On average, respondents had  $16.3\pm 8.2$  years in practice, with significant differences among the three professions (ANOVA,  $P<0.0001$ ). Registered nurses had more experience ( $23.6\pm 6.1$  years) than physical therapists ( $13.6\pm 8.6$  years) and respiratory therapists ( $11.7\pm 10$  years) (post-tests,  $P<0.001$ ). While over 70% of respondents said that they performed suctioning, this percentage differed by group, with registered nurses performing the least amount of suctioning (71%) compared with 100% of respiratory therapists and 92% of physical therapists ( $P<0.001$ ). Of those who suctioned, the frequency of suctioning differed by group, with 69% of respiratory therapists, 35% of physical therapists and 16% of registered nurses suctioning every shift ( $P<0.001$ ). Years of experience suctioning also differed by group; 100% of registered nurses, 71% of physical therapists and 76% of respiratory therapists had more than five years of experience.

While respondents agreed that all three disciplines performed suctioning in their setting, registered nurses were chosen as the group that executed this procedure most often (82% to 91%). Nevertheless, 50% of all respondents stated that respiratory therapists were typically called for consultation when suctioning expertise was required.

**Indications and contraindications:** When asked about indications for suctioning, all respondents agreed that suctioning was indicated to clear secretions. Eleven per cent of all respondents identified routine suctioning (at specific time intervals) as an indication for this procedure (9% for physical therapists, 14% for respiratory therapists and 7% for registered nurses,  $P=0.34$ ).

The proportion of respondents from each profession reporting any of the contraindications for tracheal suctioning in

**TABLE 2**  
**Number and percentage of respondents who identified the different contraindications to tracheal suctioning in nonintubated and intubated patients**

Contraindication	Physical therapists count (%)	Respiratory therapists count (%)	Registered nurses count (%)	P
Basal skull fracture				
Nonintubated	27 (34)	47 (62)	19 (41)	0.002
Intubated	16 (24)	14 (21)	6 (22)	0.92
Cardiac instability				
Nonintubated	41 (51)	45 (59)	13 (28)	0.004
Intubated	33 (49)	42 (63)	7 (26)	0.005
Unstable intracranial pressure				
Nonintubated	46 (58)	47 (62)	20 (24)	0.13
Intubated	37 (55)	38 (57)	12 (44)	0.54
Patient refusal				
Nonintubated	64 (80)	62 (82)	32 (70)	0.26
Intubated	37 (55)	42 (63)	18 (67)	0.51
Cerebrospinal fluid leak				
Nonintubated	28 (35)	31 (41)	13 (28)	0.34
Intubated	17 (25)	13 (19)	6 (22)	0.71
Vagal sensitivity				
Nonintubated	32 (40)	51 (67)	20 (44)	0.002
Intubated	9 (13)	12 (18)	2 (7)	0.68
Pulmonary edema				
Nonintubated	15 (19)	12 (16)	5 (11)	0.51
Intubated	9 (13)	12 (18)	2 (7)	0.41
Other				
Nonintubated	12 (15)	8 (11)	5 (11)	0.66
Intubated	7 (10)	6 (9)	2 (7)	0.89

Note that percentages add to greater than 100% because respondents made multiple selections

**TABLE 3**  
**Number and percentage of respondents who use the different gloving procedures and different catheter types**

Procedure	Physical therapists count (%)	Respiratory therapists count (%)	Registered nurses count (%)	P
No gloves	3	1	3	
Single glove	38	34	27	0.0065
Clean	16 (42)	12 (35)	20 (74)	
Sterile	22 (58)	22 (65)	7 (26)	
Both hands gloved	77	55	53	<0.0001
Both sterile	7 (9)	7 (13)	6 (11)	
One sterile, one clean	50 (65)	45 (82)	18 (34)	
Both clean	20 (26)	3 (5)	29 (55)	
Oral suction device	69 (76)	79 (93)	55 (80)	0.008
Curved catheter	36 (40)	44 (52)	18 (26)	0.005
Straight catheter	59 (65)	58 (68)	52 (75)	0.36
Calibrated catheter	12 (13)	11 (13)	7 (10)	0.82
Other	11 (12)	13 (15)	4 (6)	0.18

Note that percentages add to greater than 100% because some respondents made multiple selections

nonintubated and intubated patients are shown in Table 2. Only patient refusal was identified as a contraindication to tracheal suctioning of nonintubated and intubated patients by greater than 50% of respondents from each group.

**Suctioning technique:** Responses regarding gloving procedures varied from not using gloves to using two sterile gloves. The percentage of respondents within each profession that used the different gloving procedures is given in Table 3. Double gloving with one glove sterile and one glove clean was the most frequently used procedure by physical

therapists and respiratory therapists, while both gloves clean was the most common procedure followed among registered nurses. Three physical therapists, one respiratory therapists and three registered nurses reported not using gloves.

With respect to catheter use, sterile technique was reported most often (76% for physical therapists, 90% for respiratory therapists and 63% for registered nurses), followed by in-line (53% for physical therapists, 88% for respiratory therapists and 20% for registered nurses) and clean (22% for physical therapists, 22% for respiratory therapists and 15%

for registered nurses). These percentages add to more than 100% because some respondents made multiple selections. The differences in catheter procedures was significantly different among professions ( $P=0.01$ ). Seventy-eight per cent of respondents confirmed re-using catheters during a suctioning episode (78% for physical therapists, 75% for respiratory therapists and 81% for registered nurses,  $P=0.51$ ). An oral suctioning device was the suctioning device most frequently mentioned, and straight catheters were more commonly used than curved catheters by all three professions (Table 3).

The number of times a catheter was inserted during a typical suctioning episode was consistent among the three disciplines (physical therapists  $2.5\pm 0.7$ ; respiratory therapists  $2.3\pm 0.6$ ; registered nurses  $2.2\pm 0.8$  times,  $P=0.07$ ). On average, there was also consistency among the three disciplines in the reported number of seconds per suctioning episode (physical therapists  $10\pm 9$ ; respiratory therapists  $12\pm 13$ ; registered nurses  $9\pm 5$  seconds,  $P=0.23$ ).

When applying suctioning pressure, all three disciplines used intermittent pressure more often than constant pressure (physical therapists 57% versus 32%; respiratory therapists 52% versus 42%; registered nurses 70% versus 25%,  $P=0.31$ ). The remainder of the respondents used a variation of the above two techniques. Similarly, all three professions used intermittent rotation of the catheter more often than constant rotation (physical therapists 64% versus 24%; respiratory therapists 59% versus 33%; registered nurses 54% versus 41%;  $P=0.23$ ). The percentages of respondents who used no rotation were 6% for physical therapists, 7% for respiratory therapists and 2% for registered nurses.

In adults, a pressure of 101 to 120 mmHg was most commonly used compared with 60 to 100 mmHg in children and

**TABLE 4**  
Number of respondents who use the different pressures when suctioning neonates, children and adults

	Neonates	Children	Adults
60 to 100 mmHg			
Physical therapists	12	16	18
Respiratory therapists	51	25	3
Registered nurses	31	15	11
Overall	94	56	32
101 to 120 mm Hg			
Physical therapists	0	5	44
Respiratory therapists	3	23	41
Registered nurses	0	9	25
Overall	3	37	110
121 to 200 mmHg			
Physical therapists	0	0	30
Respiratory therapists	1	2	41
Registered nurses	0	1	17
Overall	1	3	88
More than 200 mm Hg			
Physical therapists	0	0	0
Respiratory therapists	0	0	5
Registered nurses	0	0	2
Overall	0	0	7

neonates (Table 4). With respect to landmarks used for application of suction, there was marked variation in practice within and between professions for both oropharyngeal and endotracheal/tracheal suctioning (Table 5).

**Augmentation techniques:** There was little agreement on the use of catheter prelubrication material, both among and

**TABLE 5**  
Number and percentage of respondents who identified the different landmark used during suctioning via endotracheal/tracheal tube and oropharyngeal suctioning

	Physical therapists count (%)	Respiratory therapists count (%)	Registered nurses count (%)	P
End of tube or point of gag				
Endotracheal/tracheal tube	7 (8)	11 (13)	15 (25)	0.01
Oropharyngeal suctioning	13 (15)	24 (30)	10 (17)	0.03
Site of congestion				
Endotracheal/tracheal tube	N/A	N/A	N/A	N/A
Oropharyngeal suctioning	26 (29)	31 (39)	21 (35)	0.39
Resistance felt				
Endotracheal/tracheal tube	19 (21)	38 (45)	17 (28)	0.002
Oropharyngeal suctioning	13 (15)	26 (33)	13 (22)	0.02
Resistance felt, withdraw slightly				
Endotracheal/tracheal tube	64 (70)	34 (41)	26 (43)	0.0001
Oropharyngeal suctioning	40 (45)	17 (22)	20 (30)	0.006
To calibrated indicator				
Endotracheal/tracheal tube	4 (4)	12 (14)	5 (8)	0.07
Oropharyngeal suctioning	N/A	N/A	N/A	N/A
Until patient coughs				
Endotracheal/tracheal tube	24 (26)	22 (26)	9 (15)	0.20
Oropharyngeal suctioning	31 (35)	21 (27)	11 (18)	0.08
Other				
Endotracheal/tracheal tube	1 (1)	4 (5)	1 (2)	0.47
Oropharyngeal suctioning	1 (1)	6 (8)	1 (2)	0.05

Note that percentages add to greater than 100% because respondents made multiple selections

**TABLE 6**  
**Number and percentage of respondents who perform hyperoxygenation, hyperinflation and saline instillation while suctioning an intubated patient**

	Physical therapists Count (%)	Respiratory therapists Count (%)	Registered nurses Count (%)	P
Never hyperoxygenate	5 (6)	0	5 (11)	0.06
Routinely hyperoxygenate	59 (74)	67 (81)	34 (77)	0.57
Sometimes hyperoxygenate	14 (17)	10 (12)	5 (11)	0.51
Never hyperinflate	9 (12)	20 (25)	15 (39)	0.005
Routinely hyperinflate	38 (48)	33 (41)	11 (29)	0.16
Sometimes hyperinflate	24 (33)	25 (31)	11 (29)	0.91
Never instill	5 (7)	0	8 (9)	0.002
Routinely instill	30 (39)	36 (43)	10 (24)	0.11
Sometimes instill	35 (46)	43 (51)	21 (50)	0.80

Note that percentages may not add to 100% as some respondents chose 'other' as a response

within professions. Overall, water was used by 52% of the respondents (43% for physical therapists, 42% for respiratory therapists and 71% for registered nurses,  $P=0.02$ ), saline by 58% (65% for physical therapists, 52% for respiratory therapists and 58% for registered nurses,  $P=0.50$ ), gel by 60% (83% for physical therapists, 54% for respiratory therapists and 17% for registered nurses,  $P<0.0001$ ) and no lubrication material by 62% (59% for physical therapists, 63% for respiratory therapists, and 64% for registered nurses,  $P=0.75$ ).

The use of hyperoxygenation was consistent among respondents, with routine application being the selection most commonly made by all three professions (Table 6). In contrast, the application of hyperinflation was highly variable within and among professions (Table 6). Similarly, there was variation in the use of saline during suctioning, but only a small percentage of respondents never used this technique (Table 6).

**On-site policies and instructions on suctioning:** The existence of written institutional policies or practice guidelines regarding suctioning differed by professional group (58% for physical therapists, 92% for respiratory therapists and 81% for registered nurses,  $P<0.0001$ ). These policies specified mainly how to perform suctioning and infectious control procedures. Similarly, the majority of respondents stated that there was opportunity for on-site instruction on how to perform suctioning at their facility (86% for physical therapists, 74% for respiratory therapists and 77% for registered nurses,  $P=0.11$ ). However, despite the opportunity, a much smaller percentage of respondents actually attended these instruction sessions (53% for physical therapists, 35% for respiratory therapists and 60% for registered nurses,  $P=0.008$ ).

## DISCUSSION

The results of this study indicate that there is wide variation in suctioning procedures by physical therapists, respiratory therapists and registered nurses. There were discrepancies in contraindications to suctioning, gloving procedures, catheter use (sterile, in-line or clean), landmark used for application of suction, prelubrication, hyperinflation and instillation. However, there were some areas of consistency with respect to suctioning procedure. There was almost perfect

agreement within and among the three professions that secretion removal was an indication for suctioning and that patient refusal was a contraindication to suctioning. Furthermore, agreement existed about the type of pressure applied (intermittent versus constant), the number of times a catheter is inserted in a typical suctioning episode and the routine use of hyperoxygenation during suctioning.

The three professions showed some inconsistencies related to the use of sterile, in-line or clean catheters; for example, 20% of registered nurses use in-line catheters, compared with more than 50% of physical therapists and respiratory therapists. There was also variation in gloving procedure (eg, 26% of physical therapists, 5% of respiratory therapists and 55% of registered nurses use two clean gloves). Variation also existed among the professions with respect to the prelubrication material used and the application of hyperinflation during suctioning. Some of the discrepancies may be due to differences in clinical and suctioning experience among professions and work setting. The registered nurses in this survey had at least 10 additional years of experience compared with physical therapists and respiratory therapists. Likewise, a greater percentage of respiratory therapists and registered nurses had written policies or practice guidelines on suctioning at their facility, possibly reflecting that they suctioned more often than physical therapists. In addition, it is possible that the variation may be based on differences in the roles of the professions or the policies in the setting. Another potential source of variation may be related to the differences in the route of suctioning used by the respondents (eg, oropharyngeal versus tracheal).

It is difficult to compare our findings with those of earlier surveys due to differences in the samples (2-6). While we used a random selection process to obtain our sample, none of the earlier investigations mentioned randomization. Most important, previous surveys focused on suctioning practices in the pediatric and/or neonatal populations (2-6), whereas our survey included the adult population. However, our analysis did not allow us to separate suctioning practices in adults and pediatrics and therefore, our conclusions do not relate to specific populations. Finally, this study surveyed the three main professions that perform suctioning, whereas the

majority of previous investigations included only nurses (3,4,6), and none surveyed respiratory therapists.

The response rate from this study was 58%. This is comparable with the response rates obtained by MacMillan (5) (61%), and Tolles and Stone (3) (57%). However, Swartz et al (6) and Young (2) were able to secure response rates of greater than 85%. While, Swartz et al (6) used an incentive that may have resulted in a higher response rate, Young (2) stated that the high response rate in her study may have reflected high motivation and interest of the subjects within the specific population considered (pediatric physical therapists). It is possible that a third or fourth mailing may have secured a higher response rate in this study. Nevertheless, this survey encompassed the largest sample size of all studies.

Our finding that the main indication for suctioning, to clear secretions, is consistent with previous studies (2,3,6). Tolles and Stone (3), and Swartz et al (6) found perfect agreement that secretion quantity was the main factor used to determine the frequency of suctioning. Similarly, Young (2) reported that over 60% of respondents used inability to cough and sputum retention as the primary indications for suctioning. In contrast, although limited to nasopharyngeal suctioning, MacMillan (5) reported that only 36% of respondents considered these same factors (inability to cough and retention of secretions) as indications for suctioning. There are no published studies on indications for suctioning in the adult population and only one study in the pediatric population, specifically for suctioning meconium-free vaginally delivered infants (13). Despite the absence of study, there is a strong physiological rationale for suctioning to clear upper airway secretions.

A very small number of respondents in our study stated that they did not use gloves while suctioning, and the majority reported using two gloves (Table 3). Similarly, MacMillan (5) found that all nurses reported using gloves when suctioning. We also found variation in the use of clean versus sterile gloves. The literature on the effect of the clean versus sterile technique on infection rate is sparse, with no clear benefit for sterility reported by some authors (14).

We found intermittent suction to be used more often than constant, which is in agreement with findings by Swartz et al (6). In contrast, Kerr et al (4) observed that 88% of nurses used continuous negative pressure. This difference may be the result of differences in study design (survey versus observational) or may reflect differences in the population considered. A clear benefit of one type of suctioning over another has not been demonstrated in the literature, but both continuous and intermittent suctioning result in significant damage to the surface of the epithelium (15).

With respect to the landmarks used for the application of suction pressure, we found a large variation among and within professions (Table 5). Swartz et al (6) reported that 71% of respondents applied suction when they met resistance, whereas 7.5% used a specified insertion distances. MacMillan (5), who examined only nasopharyngeal suctioning, found that 75% of respondents used the stimulation of a cough as a landmark. These variations may be the result of

differences in survey design such as the number of response options provided. The issue of where suctioning should be applied to maximize secretion clearance has not been addressed in the literature.

Regarding the use of augmentation techniques, there was general agreement in support of the use of hyperoxygenation, consistent with findings from previous surveys (3,5). However, variability among respondents was apparent in the application of hyperinflation; reports from the literature are also variable, with Swartz et al (6) reporting between 28% to 49% of respondents hyperinflating and Tolles and Stone (3) reporting a rate of 9.4%. Several studies have demonstrated the beneficial effects of hyperoxygenation during suctioning in adult trauma patients (16), cardiac patients (17) and individuals with chronic obstructive pulmonary disease (18), and the use of preoxygenation in intubated and ventilated infants (19). In contrast, hyperinflation, which can effectively improve oxygenation during suctioning, may have detrimental effects such as an increase in blood pressure in cardiac patients (20).

Our study found some variation in the use of instillation, although the majority of respondents reported instilling at least some of the time. Similarly, Swartz and colleagues (6), and Tolles and Stone (3) reported rates of instillation in the pediatric population at higher than 90%. Studies have described a greater return of secretions with instillation in adults (21,22) but no difference in oxygenation (23).

Our finding of agreement among respondents that physical therapists, respiratory therapists and registered nurses perform suctioning is different from Swartz and colleagues (6). Although they found consensus that nurses and respiratory therapists suction, less than 10% of their respondents indicated that another profession might be involved. This discrepancy may reflect different patient populations (Swartz et al [6] specifically asked who might suction a child in pediatric intensive care unit) and differences between United States and Canada.

The limitations of this study are those inherent in survey research. It is possible that respondents answered according to what they thought the researchers would expect and that the responses were not representative of actual practice (social response bias). However, the accompanying cover letter to the questionnaire package stressed that there was no correct answer and what was required was a description of present practice. In addition, the results of this study are consistent with the variability in practice reported by other authors (3,6). Another concern with this survey is that the respondents may not be representative of the population of interest. Specifically, while 'cardiorespiratory' physical therapists and respiratory therapists who performed suctioning were surveyed, registered nurses were not selected based upon their interest or experience in cardiorespiratory medicine. In addition, we cannot be completely confident that the differences seen between professions was not the result of differences between institutions. It is possible that, within a given institution, physical therapists, nurses and respiratory therapists use the same suctioning procedure. Because we did not

ask the respondents to identify specifically the institution in which they work, we were unable to perform this analysis. An observational study of actual suctioning practices is suggested to substantiate the present findings. Further research is also needed to evaluate the effectiveness of current suctioning practice and to determine the most beneficial or least harmful techniques in different patient populations.

## CONCLUSIONS

Suctioning techniques are variable and may depend on several factors. Despite the variation in responses, comparison among the three professions of physical therapy, respiratory therapy and nursing revealed consistency for many of the questions.

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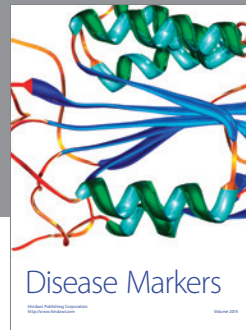
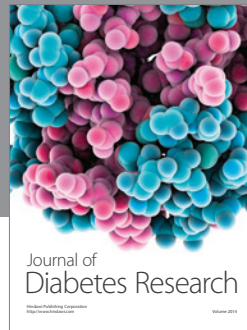
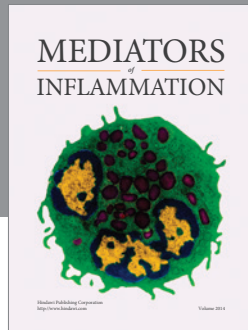
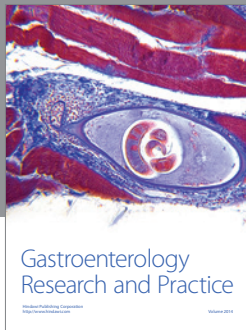
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