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TITLE

An observational study on the open system endotracheal suctioning practices of critical care nurses

ABSTRACT AND KEY WORDS

Aims and Objectives

The purpose of this study was to investigate open system endotracheal suctioning practices of critical care nurses. Specific objectives were to examine nurses' practices prior to, during and post endotracheal suctioning and to compare nurses' endotracheal suctioning practices with current research recommendations.

Background

Endotracheal suctioning is a potentially harmful procedure that if performed inappropriately or incorrectly may result in life threatening complications for patients. The literature suggests that critical care nurses vary in their suctioning practices, however the evidence is predominantly based on retrospective studies that fail to address how endotracheal suctioning is practiced on a day- to-day basis.

Methods

In March 2005, a structured observational study was conducted using a piloted 20 item observational schedule, on two adult intensive care units to determine how critical care nurses (N=45) perform endotracheal suctioning in their day to day practice and to establish whether current best practice recommendations for endotracheal suctioning are being adhered to.

Results

Findings indicate that participants varied in their endotracheal suctioning practices, did not adhere to best practice suctioning recommendations and consequently provided lower quality endotracheal suctioning treatment than expected. Significant

discrepancies were observed in participant's respiratory assessment techniques, hyper-oxygenation and infection control practices, patient reassurance and the level of negative pressure used to clear secretions.

Conclusions

Findings suggest that critical care nurses do not adhere to best practice recommendations when performing endotracheal suctioning. The results of this study offer an Irish/European perspective on critical care nurses day-to-day suctioning practices.

Relevance to clinical practice

As a matter of urgency institutional policies and guidelines, which are based on current best practice recommendations, need to be developed and/or reviewed and teaching interventions to improve nurses' endotracheal suctioning practices are indicated, particularly in regard to auscultation skills, hyperoxygenation practices, suctioning pressures and infection control measures.

Keywords: Clinical significance, critical care, evidence-based practice, nursing practice, observation.

INTRODUCTION

Background

The ultimate goal of nursing is to provide evidence based care that promotes quality outcomes for patients, families, health care providers and the health care system (Craig and Smyth 2002). While the literature has demonstrated that nurses are increasingly recognising the role research has to play within modern health care (Hundley, Milne, Leighton-Beck, Graham, and Fitzmaurice 2000) it seems that many established nursing practices are not underpinned by sound evidence (Glacken and Chaney 2004). One area of nursing practice that has caused concern is the endotracheal suctioning of intubated patients (Swartz, Noonan and Edwards-Beckett 1996, Thompson 2000, Sole, Byers, Ludy and Ostrow 2003). Endotracheal suctioning (ETS) is an important intervention in caring for patients with an artificial airway (Thompson 2000) and an essential aspect of effective airway management in the critically ill (Wood 1998a). It is an invasive, potentially harmful procedure that, when performed inappropriately or incorrectly can result in serious complications (Celik and Elbas 2000, Paul-Allen and Ostrow 2000). It is important therefore that those carrying out such a procedure are aware of the potential risks and practice in a manner that ensures effectiveness and patient safety.

LITERATURE REVIEW

While ETS is an important intervention when caring for critically ill patients, the practice surrounding ETS can vary widely between institutions and practitioners (Swartz et al 1996, Sole et al. 2003) with much of that practice based on anecdote and routine rather than research (Paul-Allen and Ostrow 2000, Thompson 2000, Day, Farnell, Haynes, Wainwright and Wilson-Barnett 2002a). This may partially have

been influenced by a paucity of research evidence to guide practitioners in the care of a patient with an endotracheal tube (Thompson 2000). The last decade has seen a steady increase in the body of literature relating to how and when ETS should be performed (Glass and Grap 1995, Wainwright and Gould 1996, Wood 1998a, Thompson 2000, Day et al. 2002a, Moore 2003). Much of this evidence is in the form of succinct literature reviews (Wood 1998a, Day, Farnell and Wilson-Barnett 2002) and systematic reviews (Thompson 2000) enabling practitioners to quickly and easily determine current research recommendations irrespective of their ability to interpret research findings. Nonetheless there is still some disparity in regard to what exactly constitutes best ETS practice (Swartz et al 1996) owing largely to a dearth of quality research on ETS techniques. While Thompson, (2000) in a systematic review of the literature, isolated aspects of the ETS procedure that are generally accepted as being the most important, a lack of homogeneity and methodological flaws in some of the studies (Thompson 2000) resulted in thirteen non-prescriptive recommendations for practice. Conversely the more conventional literature reviews (Wood 1998, Day et al. 2002, Moore 2003), which are generally regarded as being less rigorous than systematic reviews (Dickson 2003), explicitly describe how ETS should be performed but overlook the quality of the evidence from which they originate. Notwithstanding the lack of rigorous research concerning ETS practice it is generally accepted that the ETS techniques, when used inappropriately or incorrectly can have deleterious effects on patients (Wood 1998a, Celik and Elbas 2000, Paul-Allen and Ostrow 2000). It is important therefore to establish how critical care nurses perform ETS and establish how it compares to current best practice recommendations.

Critical Care Nurses' ETS Practices

A study conducted by Swartz et al. (1996) used a quantitative, descriptive design using a survey method to examine 'national' suctioning practices on eighty paediatric intensive care units across the United States. Results indicated that suctioning techniques among critical care nurses varied and were based on a combination of nursing judgment and ward routine. Paul-Allen and Ostrow (2000) report similar findings in a quantitative descriptive study which aimed to identify the closed system ETS practices of 241 randomly selected critical care nurses. One hundred and twenty nurses (50%) responded to a mailed questionnaire. Findings indicated variations in nurses' suctioning techniques. While the results of both studies suggest that critical care nurses vary in their ETS practices, the 'ex-post facto' focus of the studies may not necessarily be an accurate reflection of nurses' day-to-day practice. Carter (1996) cited in Cormack and Benton (1996) suggests that subjects' written responses to questionnaire items about how they carry out a procedure may bear little resemblance to how they actually perform it.

Day et al. (2002a) triangulated observation, interview and questionnaire methods to explore nurses' theoretical knowledge and practical competence in ETS. Using a convenience sampling technique twenty-eight critical care nurses were recruited from three critical care ward areas in a large teaching hospital in the UK. Results indicated that many nurses failed to demonstrate an acceptable level of theoretical knowledge and competence in practice and that there was no significant relationship between nurses' theoretical knowledge and observed practice. Furthermore many nurses were unaware of recommended practice and some demonstrated potentially unsafe practice. These findings are supported in the literature (Celik and Elbas 2000) and have considerable implications for the safety of critically ill patients.

The observational element of Day et al's (2002) study ensures a more accurate reflection of what happens in practice than the descriptive retrospective studies discussed earlier (Swartz et al 1996, Paul-Allen and Ostrow 2000). This view is supported in the literature, which suggests that observational methods provide data on the realities of current practice from a first hand perspective (Zeitz 2005). Day et al's (2002a) findings are therefore very significant as they support previous research that identified wide variations in nurses ETS practices (Swartz et al 1996, Paul-Allen and Ostrow 2000) and that nurses are inclined to rely on personal experience and ward routine to inform practice over any other source (Sole et al. 2003).

Summary of the Literature

The literature search identified a paucity of empirical evidence relating to how well ETS is performed the clinical area. The literature that does exist raises concerns about the standard of ETS practice among nurses (Paul Allen and Ostrow 2000, Day et al. 2002a). This evidence is predominantly American and based on descriptive, retrospective studies that focus on closed suctioning systems (Swartz et al 1996, Paul-Allen and Ostrow 2000, Sole et al 2003). While such studies are important for describing and documenting aspects of ETS practice they have one primary limitation. Participants may have a tendency to misrepresent attitudes or traits by giving answers that are consistent with prevailing social views (Polit, Beck and Hungler 2001). Few observational studies addressing nurses ETS practices are identifiable in the literature (Day et al 2002a, McKillop 2004) with only one assessing how actual nursing practice compared to recommended practice (Day et al 2002a).

The inconclusive literature relating to nurses real ETS practices indicates the urgent need for more observational studies in this area. It is only by distinguishing between real and perceived ETS practice that the degree of deviance, if any, from what the literature has established as being general best practice, can be accurately established.

THE STUDY

Aims

The purpose of the study was to investigate open system endotracheal suctioning practices of critical care nurses. Specific objectives were to:

1. examine critical care nurses' practices prior to, during and post ETS
2. compare nurses' ETS practices with current research recommendations

Based on the evidence it is hypothesised that critical care nurses' do not adhere to best practice recommendations when performing endotracheal suctioning.

Design

A non-participant structured observational design was used for this study to gain insight into what is happening in practice. Structured observational studies involve the collection of data that specify the behaviours or events selected for observation and are conducted in participants' natural environments (Polit et al 2001). While and Roberts (1994) suggest that direct observation is potentially a more comprehensive method to ascertain how nurses perform in real situations and to identify differences, if any, in practice

Sample and Setting

The study took place in March 2005 on two adult intensive care units in Ireland. At the time of the study the general unit (GICU) had 9 beds with the facility to ventilate patients in all beds at any one time. The cardiac unit (CICU) had 6 beds and could facilitate the mechanical ventilation of six patients. GICU employed 53 full time equivalent nurses and CICU employed 34. Nurses were generally allocated to only one patient per shift. The targeted population of interest were critical care nurses, as they predominantly perform ETS, while the sampling unit was the ETS event itself. Event sampling was deemed the most appropriate method of observation because of the erratic nature of the ETS procedure. By means of quota sampling a total of 45 individual ETS events were observed, whereby each nurse performed only one event. Quota sampling is procedurally similar to convenience sampling however the researcher can guide the selection of subjects so that the sample includes an appropriate number of cases from each stratum (Polit et al 2001), the strata in this instance being GITU nurses and CICU nurses. The sample size (n=45) (51%) to be a representative sample of a combined total of 87 nurses (GITU 53, CITU 34) working on both ICU's and compares favourably to previous observational studies addressing ETS wherein sample sizes ranged from n=9 (Blackwood 1998) to n=28 (Day et al 2002a) observations. Inclusion and exclusion criteria were maintained.

Inclusion Criteria

- Full time ICU staff members
- Nurses with a minimum of 1 year ICU experience on the study ICUs

Participants were required to fulfil the above inclusion criteria to be considered eligible for the study. This can be justified by the argument that an experienced ICU

nurse from a different ICU, who has recently been appointed may work from a different practice/knowledge base depending on the ICU he/she comes from.
Equally nurses who have minimal ICU experience may not have acquired/developed a satisfactory practice/knowledge base from which to work.

Data Collection

Data were collected using a 20-item structured observational schedule (appendix 1) adapted from a previously validated survey tool (McKillop 2004) which was constructed to reflect the observable behaviours associated with best practice suctioning of adults with an artificial airway (Thompson 2000). Aspects of ETS practice that were not specified in McKillop's (2004) observational schedule but implied in Thompson's (2000) systematic review and established elsewhere as best practice recommendations (Day et al 2002, Wood 1998) were added to the instrument on the recommendation of experts in critical care nursing. The observational schedule was piloted to identify practical or local problems that might potentially affect the research process. No changes were made to the instrument based on the pilot study.

All items on the observational schedule were weighted with the digits 0 and 1, or 0 and 2 respectively. The higher weighting (2) constituted adherence to best ETS practice as recommended by Thompson (2000) following a systematic review of the literature. The lower weighting (1) represented adherence to what is marginally accepted as constituting best ETS practice as they emanate from traditional literature reviews (Day et al. 2002, Moore 2003). The weighting of 0 represented non adherence to either of the above. High observation scores represented closer adherence to recommended best practice.

Validity and Reliability

The observational schedule was distributed for appraisal to a range of experts in critical care nursing including a university lecturer in critical care nursing, two senior nursing intensive care practitioners and the researcher who developed the original instrument. During the pilot study the observational schedule was tested for inter-rater reliability using a second observer and no significant discrepancies were identified.

Ethical Considerations

Ethical approval to conduct the study was secured from the appropriate ethics committee and all participants were informed that their participation was voluntary and that their right to withdraw from the study would be respected at all times. Measures to ensure confidentiality and anonymity were implemented.

Data Analysis

Descriptive statistics included frequency ratings and percentages for nominal level data. A one-sample t-test was used to test the null hypothesis and compare participants' ETS practices to ideal ETS best practice recommendations. Analysis was performed using the Statistical Package for the Social Scientists (SPSS, version 9.0) software.

Quality of Treatment

For the purpose of assessing how individual participants' performances and subsequently a group's performance compared to recommended best practice, a variable representing 'recommended best practice' had to be developed. This was

developed by calculating the sum of the highest possible scores for each observation, which was established as being 35. Each of the 20 items on the schedule was weighted with zero and one, or zero and two depending on the strength of supporting evidence for that particular aspect of ETS. The number 35 therefore represented perfect adherence to best practice recommendations, or ideal treatment. The higher a participant's/group's observational score the closer the participant/group adhered to best practice recommendations. Similarly the lower a participant's/group's score the less likely was adherence to best practice recommendations. This additional variable was subsequently termed 'quality of treatment'. For the purpose of analysis the variable was further divided into the four sub-scales that described the different aspects of the quality of treatment: practices prior to suctioning, infection control practices, the suctioning event and post suctioning practices.

RESULTS

In accordance with the observational schedule the results were divided into five sections: practices prior to suctioning, infection control practices, the suctioning event, post suctioning practices and quality of treatment.

Practices Prior to Suctioning (Table 1)

When assessing the need for ETS, only two (12%) CICU and four (14%) GICU participants auscultated the patient's chest. All CICU participants communicated in some form to patients about the imminent procedure however eight (28%) GICU participants failed to communicate in any form. Similarly a greater number of CICU participants were observed to perform hyper-oxygenation on patients prior to ETS (n=16, 94%) compared to the GICU group (n=22, 79%).

Infection Control Practices (Table 2)

In relation to wearing gloves and an apron during the ETS procedure there was no difference between the two groups as both were fully compliant with practice recommendations. Disparities in practices were noted however in relation to hand washing prior to the procedure, maintaining the sterility of the suction catheter until its insertion into the airway and wearing goggles. Only nine (31%) GICU participants washed their hands before performing ETS in contrast to 11 (65%) from CICU. Ten (59%) CICU and eight (29%) GICU participants failed to maintain the sterility of the suction catheter prior to its insertion into the patient's airway. Only two (12%) CICU, participants and one (3%) GICU participant wore goggles during the ETS procedure.

The Suctioning Event (Table 3)

Both groups complied fully with best practice recommendations in relation to suctioning time and application of pressure, however all participants in both groups also exceeded the recommended suctioning pressures of between 80 and 150mmHg. Seven (40%) of the CICU group and eight (28%) of the GICU group selected a catheter than was larger than the recommended size for suctioning and six (21%) GICU participants required more than the maximum number of recommended suction passes.

Post Suctioning Practices (Table 4)

Two (12%) participants from CICU and seven (24%) from GICU failed to provide post ETS hyper-oxygenation. Only one (6%) CICU participant and two (7%) GICU participants auscultated the patients' chest to evaluate the effectiveness of the ETS procedure. The main differences between groups were in relation to hand washing

and providing reassurance with four (23%) CICU participants failing to wash their hands after the ETS procedure in comparison to 11 (38%) GICU participants. Patients were reassured by 15 (88%) CICU participants in contrast to 11 (38%) from GICU.

Quality of Treatment (Table 5)

Using a frequency distribution, the average treatment quality across both groups was calculated to be 22.62 (SD= 3.10). Quality of treatment scores ranged from 14 - 30. Within the sub-scales, the highest average score was found in Post Suctioning Practices (Mean= 6.47, SD=1.53) and the lowest average score was found in Infection Control Measures (Mean= 4.67, SD=1.17). A symmetric distribution was identified in the variable 'treatment quality' and its subscales (Fig. 1).

Testing the null hypothesis

To compare participants' ETS practices with best practice recommendations a one-sample t-test was conducted which compared the treatment quality observed with the ideal treatment quality score (Table 6). The test identified significant differences between quality of treatment and its subscales (representing the combined ETS practices on both units) and the perfect score (representing recommended best practice). In all categories, the quality of treatment observed was significantly lower than the quality of treatment required ($p=0.01$). This indicates that our study's sample group only partially adhered to best practice recommendations when performing ETS and so rejects the null hypothesis.

Discussion

The findings from this study have raised some interesting issues relating to the current ETS practice of critical care nurses. Best practice ETS recommendations suggest that when performing a respiratory assessment nurses should auscultate the patient's chest to verify the need for ETS (Thompson 2000, Day et al 2002, Wood 1998). Our study's findings show that participants generally failed to do this. Day et al (2002a) reported similar findings in a study of acute and high-dependency ward nurses. Their findings showed that only two nurses were observed to have performed auscultation. Given that the majority of participants failed to auscultate lung sounds prior to ETS it is possible that they were working from a combination of clinical signs that indicated the necessity for ETS, such as noisy breathing or visible secretions in the airway (Thompson 2000). A limitation of observational methods however meant that there was no way of establishing whether participants' decision to perform ETS was informed by such indicators or whether they were working from some other perspective such as unit routine as is suggested in the literature (Swartz et al 1996, Day et al. 2002).

Despite an abundance of evidence on the negative consequences of suctioning induced hypoxemia (Wood 1998, Day et al. 2002, Thompson 2000) seventeen participants still failed to provide hyper-oxygenation / hyperinflation either before and/or after ETS. Day et al. (2002a) reported similar findings, where only 2 out of 10 subjects in their study were observed to provide hyperoxygenation/hyperinflation in practice. Such findings are important as they have direct implications for patient safety and reflect poorly on a vital aspect of nursing care. The fact that the majority of participants performed hyper-oxygenation/hyperinflation does not necessarily imply

that they all did so because it is recommended best practice. The routine practice may have been learned from each other without ever actually understanding the rationale for its use. However, this is merely speculative as is beyond the scope of this observational study.

Nosocomial infections are among the commonest complications affecting hospitalized patients (Burke 2003). Consequently the importance of aseptic technique in suctioning practices and hand washing before and after such procedures is strongly emphasized in the literature (Thompson 2000, Wood 1998, Day et al 2002). Twenty five participants in our study were not observed to wash their hand prior to the ETS procedure. Boyce and Pittet (2003) suggest that nurses do not wash their hands as expected because of the time it takes out of a busy work schedule particularly, in high-demand situations, such as critical-care units, under busy working conditions and at times of overcrowding or understaffing. One study conducted in an intensive-care unit demonstrated that it took nurses an average of 62 seconds to leave a patient's bedside, walk to a sink, wash their hands and return to patient care (Boyce and Pittet 2003). Notably, however, all participants in our study were observed to wear gloves and an apron during ETS. This may suggest a perception among nurses that wearing gloves and using a 'non-touch' aseptic technique when inserting the suction catheter negates the need for frequent hand washing yet the literature clearly suggests that gloves do not replace the need for hand washing (Pratt et al 2001). These findings support earlier studies that report modest and even low levels of adherence to recommended hand-hygiene practices (Thompson 2000, Boyce and Pittet 2003).

Another area of particular concern is the suction pressure used when performing ETS. High negative pressure will cause mucosal trauma, which in turn predisposes the bronchial tree to a higher risk of infection (Wood 1998). Using high negative pressures does not mean that more secretions will be aspirated, therefore limiting pressures to between 80 and 150mmHg is recommended (Day et al. 2002, Thompson 2000, Wood 1998,). Results indicated that all participants used suction pressures outside of the recommend levels for safe practice with suction pressures ranging form 230mmHg to 450mmHg. Participants on GICU generally utilized lower suctioning pressures, ranging from 230mmHg to 380mmHg, but again these still exceeded the recommended pressures for safe practice. Only one participant was observed to check the pressure prior to ETS and subsequently reduced it but this still exceeded the recommended levels. Again these findings suggest support for Day et als (2002a) study that found nurses to be generally unaware of recommended best ETS practice.

RECOMMENDATIONS FOR EDUCATION, PRACTICE AND RESEARCH

- As a matter of urgency institutional policies and guidelines, which are not based on current best practice recommendations, need to be developed and/or reviewed.
- Teaching interventions to improve nurses' knowledge and competence in the care of patients requiring ETS is indicated particularly with regard to auscultataion skills, hyperoxygenation practices, suctioning pressures and infection control measures.
- The orchestration and implementation of effective educational interventions to change practice may be time consuming. Therefore, in the interim it is

recommended that nurses become familiar with the clinical indicators for ETS and how to perform a simple respiratory assessment on ventilated patients.

- Infection control guidelines need to be reinforced and monitored to ensure compliance.
- A regular audit of ETS practice is recommended to ensure that patient safety is being assured.

This observational study was successful in achieving its objectives, however further observational studies need to be conducted to substantiate the findings. Observation coupled with a form of 'think- aloud' methodology may uncover the reasons behind nurses decisions (in 'Think-aloud' techniques subjects are questioned and asked to 'think aloud' in regard to a particular aspect of their ETS practice). Such methodologies are recognised as a useful source of data collection in observational studies (Yang 2003).

Limitations

Observation, like other methods has its own limitations and ethical implications (Parahoo 1997). One of the main problems is the effect of the 'observer' on the 'observed'. This is referred to as the Hawthorne effect and is an important threat to the validity of observational research, whereby participants' knowledge of being in a study may cause them to change their behaviour (Polit et al 2001). In our study the Hawthorne effect may have resulted in participants rehearsing ETS according to evidence based recommendations prior to the observations. This being the case it could be suggested that participants' practice is normally of a poorer quality than the results of our study suggests.

Given the observational nature of the study, there were a number of aspects of the ETS procedure that could not be assessed. It was not possible to determine participants' reasons for their practice, for example the only observable aspect of patient assessment was the practice of auscultation and even then it could not be determined what was heard and how it was interpreted. This may have resulted in an inaccurate interpretation of some of the data.

The sample size was not assessed for statistical significance. A power analysis would have established accurate sample size requirements for the study and consequently enhanced the representativeness of the findings (Polit et al 2001).

The evidence used to develop the observational tool for this study derived from what might be regarded as the best evidence available at the time of conducting the study however there is still some disparity in regard to what exactly constitutes best practice due to the paucity of empirical research regarding ETS.

Finally while the study was conducted on two different intensive care units, they were both part of the one institution. The findings therefore may not be representative of the general population of ICU nurses and threatens the external validity of the findings. This could have been enhanced by spreading observations over a range of sites, in different geographical locations.

CONCLUSION

This study supports the general finding in the literature that nurses adhere only partially to best practice recommendations in relation to ETS (Day et al 2002a, Celik

and Elbas 2000, Paul-Allen and Ostrow 2000). Under the code of professional practice nurses are obliged to ensure patient safety and expected by the public and their employer to provide high quality, efficient, well executed and appropriate care of individuals (Huber 2000). By failing to adhere to what the literature has established as best ETS practice, nurses fall short of fulfilling any of the above expectations.

Despite an increased uptake in post registration education among critical care nurses and a heightened interest in the expansion of their role, the literature indicates that they remain poor at many of the aspects of care that might be considered basic. Nurses need to continually assess and improve their current practices to guarantee that evidence based practice recommendations are being adhered to and patient safety is being assured. This can only be achieved when nurses become more aware of their professional responsibilities and receive adequate support in practice.

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TABLES

Variable		**Cardiac ICU** (n = 17)	**General ICU** (n= 28)
Patient Assessment	No	15 (88%)	24 (86%)
	Yes	2 (12%)	4 (14%)
Patient Preparation	No	0	8 (28%)
	Yes	17 (100%)	20 (72%)
Pre-Hyperoxygenation /Hyperinflation	Not Given	1 (6%)	6 (21%)
	Given	16 (94%)	22 (79%)
NaCl (Sodium Chloride)	No	17 (100%)	28 (100%)
	Yes	0	0

Table 1 **Practices Prior to Suctioning**

(Cardiac ICU = Cardiac intensive Care Unit, GICU =General Intensive Care Unit, n = sample number)

Variable		**Cardiac ICU** (n = 17)	**General ICU** (n= 28)
Hand Washing	No	6 (35%)	19 (69%)
	Yes	11 (65%)	9 (31%)
Gloves Wearing	No	0	0
	Yes	17 (100%)	28 (100%)
Apron Wearing	No	0	0
	Yes	17 (100%)	17 (100%)
Catheter Sterility	No	10 (59%)	8 (28%)
	Yes	7 (41%)	20 (72%)
Goggles	No	14 (88%)	27 (97%)
	Yes	2 (12%)	1 (3%)

Table 2 **Infection Control Practices**

Variable		**Cardiac ICU** (n = 17)	**General ICU** (n= 28)
Catheter Size	> Half internal diameter of ETT	7 (40%)	8 (28%)
	≤ Half internal diameter of ETT	10 (60%)	20 (72%)
Number of Suctioning Passes	More than two	0	6 (21%)
	Two or less	17 (100%)	22 (79%)
Suction Time	>15 seconds	0	0
	≤15 seconds	17 (100%)	28 (100%)
Suction Pressure	80 – 150 mmHg	0	0
	> 150 mmHg	17 (100%)	28 (100%)
Suction applied during:	Withdrawal	17 (100%)	28 (100%)
	Insertion	0	0

Table 3 **The Suctioning Event**

FACTOR		**Cardiac ICU** (n = 17)	**General ICU** (n= 28)
Oxygen Reconnection	>10 seconds	0	1 (3%)
	<10 seconds	17 (100%)	27 (97%)
Post Suctioning Hyper-oxygenation	No	2 (12%)	7 (24%)
	Yes	15 (88%)	21 (76%)
Post ETS Assessment	No	16 (94%)	26 (93%)
	Yes	1 (6%)	2 (7%)
Patient Reassured	No	2 (12%)	17 (62%)
	Yes	15 (88%)	11 (38%)
Hand Washing Post Suctioning	No	4 (23%)	11 (38%)
	Yes	13 (77%)	17 (62%)
Safety	No	0	0
	Yes	17 (100%)	17 (100%)

Table 4. **Post Suctioning Practices**

	Practices Prior to Suctioning	Infection Control Practices	Suctioning Event	Post Suctioning Practices	Quality of Treatment
N	45.00	45.00	45.00	45.00	45.00
Mean	5.56	4.67	5.93	6.47	22.62
Median	6.00	5.00	6.00	7.00	23.00
Mode	6.00	5.00	7.00	8.00	25.00
Standard Deviation (S.D)	1.27	1.17	1.12	1.53	3.10
Range	6.00	5.00	5.00	6.00	16.00
Minimum	2.00	3.00	2.00	3.00	14.00
Maximum	8.00	8.00	7.00	9.00	30.00

Table 5 **Quality of Treatment**

Variable	Maximum potential score (Representing best practice)	Mean (Actual score)	St. Deviation	T	D.F.
Quality of Treatment	35	22.62	3.10	*-24.63	44
Practices Prior to Suctioning	8	5.56	1.27	*-12.90	44
Infection Control Practices	9	4.67	1.17	*-19.15	44
The Suctioning Event	9	5.93	1.11	*-18.43	44
Post Suctioning Practices	9	6.47	1.53	*-11.10	44

*p<0.01

Table 6 **A Comparison between Current Practice and Best Practice Recommendations**

Graphs

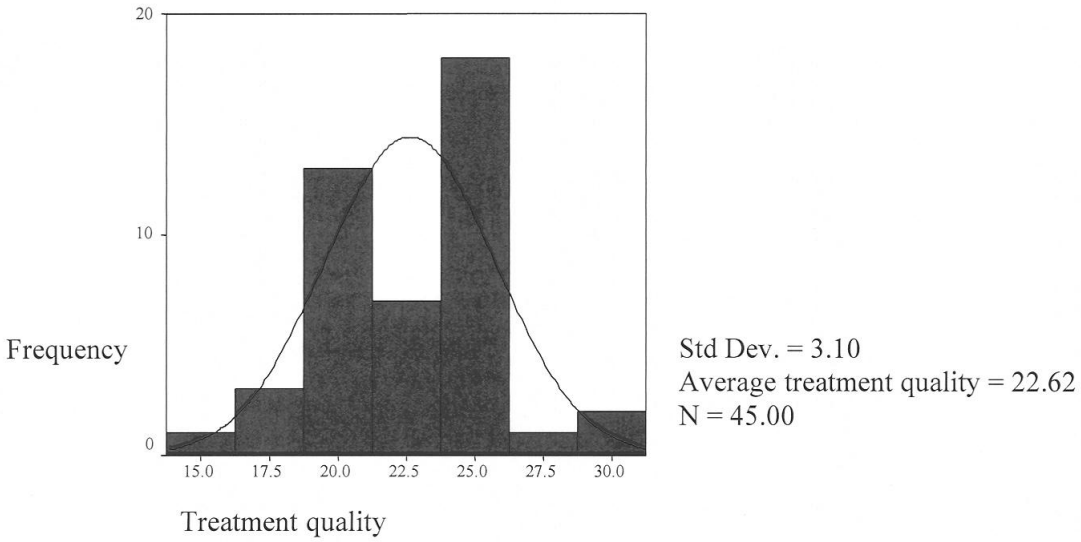

Figure 1 **Quality of Treatment**

Appendix 1

OBSERVATIONAL SCHEDULE

Practices Prior to Suctioning

1: Patient Assessment
Did the nurse auscultate the patients chest before ETS?

0. = No
2 = Yes (Thompson 2000, Day et al 2000, Wood 1998)

2: Patient preparation
Did the nurse explain to/communicate with the patient about the procedure?
0. = No
2. = Yes (Thompson 2000, Day et al 2000, Wood 1998)

3: Pre suctioning hyperoxygenation/ hyperinflation

0. = Not given
2 = Given by means of manual resuscitation bag/ Given by ventilator (Thompson 2000, Day et al. 2000)

4: Sodium Chloride instillation

0 = Yes
2 = No (Thompson 2000,Day et al 2000, Wood 1998)

Infection Control Practices

5: Hands are washed prior to suctioning

0 = No
2 = Yes (Thompson 2000, Wood 1998, Day et al 2000)

6: Gloves are worn

0 = No
2 = Yes **(**Thompson 2000, Day et al 2000, Wood 1998)

7: Apron is worn

0 = No
1 = Yes (Day et al. 2000, Wood 1998)

8: Sterility of suction catheter maintained until inserted into airway

0 = No
2 = Yes (Thompson 2000, Day et al. 2000,Wood 1998)

9: Goggles / face mask worn

0 = No
2 = Yes (Thompson 2000, Day et al. 2000, Wood 1998)

The Suctioning Event

10: Size of suction catheter …… Size of ETT ……..

0 = > Half of the internal diameter of ETT
2 = ≤ Half of the internal diameter of ETT (Thompson 2000, Wood 1998, Day et al 1998)

11: Number of suction passes……

0 = > 2
1 =≤ 2 (Thompson 2000)

12: **Length of time suction applied to airway**

0 = More than 15 secs
2 = Less than 15 secs (Thompson 2000, Day et al.2000, Wood 1998)

13: **Level of suction pressure**

0 = < 80 mmHg / > 150 mmHg
2 = 80 – 150 mmHg (10.6 – 20 Kpa) (Thompson 2000, Day et al 2000)

14: **Position of catheter when suction applied**

0 = suction applied during insertion
2 = suction applied during withdrawal from airway only (Thompson 2000, Day et al 2000)

Post Suctioning Practices

15: Patient reconnected to Oxygen

0 = >10 seconds post suctioning
1 = within 10 seconds post suctioning (Day et al 2000)

16: **Post suctioning hyper-oxygenation/ hyperinflation**

0 = Not given
2 = Given by means of manual resuscitation bag/ventilator
(Thompson 2000, Day et al 2000,Wood 1998)

17: **Post ETS assessment**
Did the nurse auscultate the patients chest?

0 = No
1 = Yes (Day et al 2000)

18: Patient reassured

0 = No
1 = Yes (Day et al 2000)

19: Hands washed post suctioning

0 = No
2 = Yes (Wood 1998, Thompson 2000, Day et al 2000)

20: Used catheter and gloves are disposed of in a manner that prevents contamination from secretions

0 = No
2 = Yes (Thompson 2000)