

Improving Dobhoff Tube Insertion by Utilizing the Two-Step X-ray Process

Lindsey Bloom, BSN, RN, SCRNP, CCRN & Dr. Brigit VanGraafeiland, DNP, CPNP, FAAN



JOHNS HOPKINS
SCHOOL of NURSING

Introduction

- Dobhoff nasogastric (NG) tubes are small bore tubes with a guidewire and tungsten weighted tip intended for long-term feeding while inpatient.
- Due to the design of the tube, there is large risk of tube misplacement within the respiratory track for patients who have the Dobhoff tube inserted blindly.³
- Tube misplacements within the lung due to blind placement varies widely from 1.4% to 27%.²

Blind Dobhoff Tube Insertion Complications¹

Lung Abscess	Empyema
Fistula Formation	Aspiration Pneumonia
Pneumothorax	Tension Pneumothorax
Pleural Effusion	Death

- According to the Agency for Healthcare Research and Quality (AHRQ)⁴ iatrogenic pneumothorax is associated with:



Increased length of stay of 4 to 7 days



Excess charges per incident of \$17,000 to \$45,000



1-14% in excess mortality

Background

- From 2015 to 2020, a 500-bed urban community hospital located in the Pacific western area (site A) was plagued with 12 patients who experienced a Dobhoff tube placed blindly within the lung.
- Adverse events included eight patients who had a diagnosis of pneumothorax, two patients who had tension pneumothorax, one patient who had a bronchial laceration that required surgical repair, and one patient who had intrapulmonary feeding.
- There are about 400 Dobhoff NG tubes inserted yearly within the hospital. Of the tubes placed, there were 2 adverse events reported yearly (rate: < 1%).
- Every year, nurses within the telemetry and step-down units insert about 150 Dobhoff NG tubes blindly and check placement via auscultation and occasionally an x-ray following insertion.

Methods

Design: Pre and post-intervention design

Setting: Four telemetry units (cardiac, cardiac interventional, neurology, and surgical) and one step-down unit, which have 30 beds each with a 4:1 and 3:1 patient to nurse ratio.

Sample: 250 male and female telemetry and step-down unit nurses were educated (total employed: 300) via in-person in-service. 6 adult male and female telemetry and step-down patients aged 18 to 100 years of age who had orders for Dobhoff NG tube insertion.

Intervention: Two-step x-ray method, which entails the clinician inserting the Dobhoff NG tube to 35 centimeters (cm), which is at the anatomical position of the carina and taking a chest x-ray image at the bedside utilizing a portable machine. The purpose of the x-ray image at 35 cm is to ensure the tip of the tube is passed the carina and safely not in the lungs.¹ The radiologist will review the first x-ray and report if the tube tip is past the carina. Following the confirmation that the tube tip is within the distal esophagus, the nurse will insert the tube to the final cm destination and take a second x-ray to confirm gastric placement.

Measurement: Self-developed ten question multiple choice knowledge test.

Statistical Analysis: Mann-Whitney U and descriptive statistics.

Purpose & Aims

- Purpose:** To implement the two-step x-ray process for Dobhoff NG tube insertion practice in order to eliminate incorrect tube placement within the lung causing complications such as pneumothorax and increase nurse knowledge of safe tube placement.
- Aim 1:** 90% of nursing staff within the telemetry and step-down units will be educated on the safer insertion technique. Nurses' knowledge to the guideline will increase by 10% and will be assessed using a pre and post-test.
- Aim 2:** The number of pneumothoraxes as an adverse outcome from Dobhoff NG tube insertions will decrease by 100% by utilizing the two-step x-ray protocol.
- Aim 3:** There will not be a significant increase of time delay from the initial x-ray to the last x-ray being read by the radiologist. The mean time delay will be 120 minutes.

Nurse Education In-Service Tool

Dobhoff Nasogastric (NG) Small Bore Tube Insertion Procedure

Background: The Dobhoff NG is a small-bore tube that has a guidewire and a tungsten weighted tip. Due to the design of the tube, the tube is easily inserted in the lung without patient symptoms.

Consequences of placing a Dobhoff in the lung: Pneumothorax, tension pneumothorax, pleural effusion, lung abscess, aspiration pneumonia, & death.⁴

How to safely place a Dobhoff

- Obtain insert Dobhoff order and 2 portable chest x-ray orders
- Insert Dobhoff to 35cm, which is the length of the carina.
- Obtain an x-ray at 35cm. You must place an order for portable chest x-ray stat, with order details stating "Dobhoff placement at carina."
- Wait for Radiologist report. The report must state Dobhoff tip in distal esophagus. If it states the tube tip is before the carina, advance the Dobhoff 5cm and repeat step 2. If the report states in the left main bronchus or right main bronchus, remove Dobhoff and repeat steps 1-3.
- If radiologist report states Dobhoff tip in distal esophagus, advance Dobhoff to the centimeter length initially measured by nose to ear to xyphoid process (NEX) method.
- Obtain a chest x-ray at final cm placement (55cm-75cm). You must place a 2nd order for portable chest x-ray stat, with order details stating "Dobhoff placement at stomach."
- Wait for Radiologist report. The report must state Dobhoff within stomach. If the Dobhoff needs to be advanced, advance the Dobhoff to specified cm and obtain another x-ray.
- Dobhoffs must have a final placement x-ray prior to feeding or giving medications. Remove guidewire upon final placement x-ray confirming Dobhoff is within stomach.

When can this procedure be performed? During daytime hours only. Dobhoff tube placement should not occur during night shift unless it is emergent.

Once the Dobhoff is placed, what is next? Document the tube within the Drains, Tubes, & Wounds section. Be sure to document that the tube inserted is a Dobhoff tube and not a Nasogastric tube.

Dobhoff, Nasogastric (NG), & Orogastric (OG) Tube Documentation

The nasal/oral tip to lip/nare upon insert and currently are mandatory fields. The purpose of these fields are to ensure the tube has not migrated.

Dobhoff/NG/OG Tube Placement Confirmation

- The method of assessing NG/OG tube placement via auscultation cannot differentiate between tube placement in the stomach or lung/bronchial tree.²
- The method of assessing NG/OG tube placement via assessing the aspirate appearance is not objective because both respiratory and gastrointestinal aspirates may be similar in color and pH, thus the result can be misinterpreted.¹
- The method of assessing NG/OG tube placement by utilizing the colorimetric End Tidal CO₂ device is not reliable because CO₂ can be detected in the esophagus if there is air within the stomach and incorrectly change color.⁴
- Given these unreliable methods to confirm placement, **x-ray confirmation is the gold standard.**
 - It is vital to always complete the two-step x-ray process for all Dobhoff NG tubes and a single x-ray at final cm placement for all large bore NG tubes.
 - The RN must read the radiology report for all NG tubes to confirm that the tube is in the proper position.
- After x-ray confirmation, regularly assessing the initial x-ray radiology report, centimeter marking upon insert, and the current centimeter tube location is essential to detect tube migration.²

NG Tube dwell time

Dobhoff ENRI Tube (Small-Bore)	30 days	Made of Polyurethane
Salem Sump ENRI Tube (Large-Bore)	5 days	Made of Polyvinyl Chloride (PVC)

Dobhoff NG Tube Documentation Tips

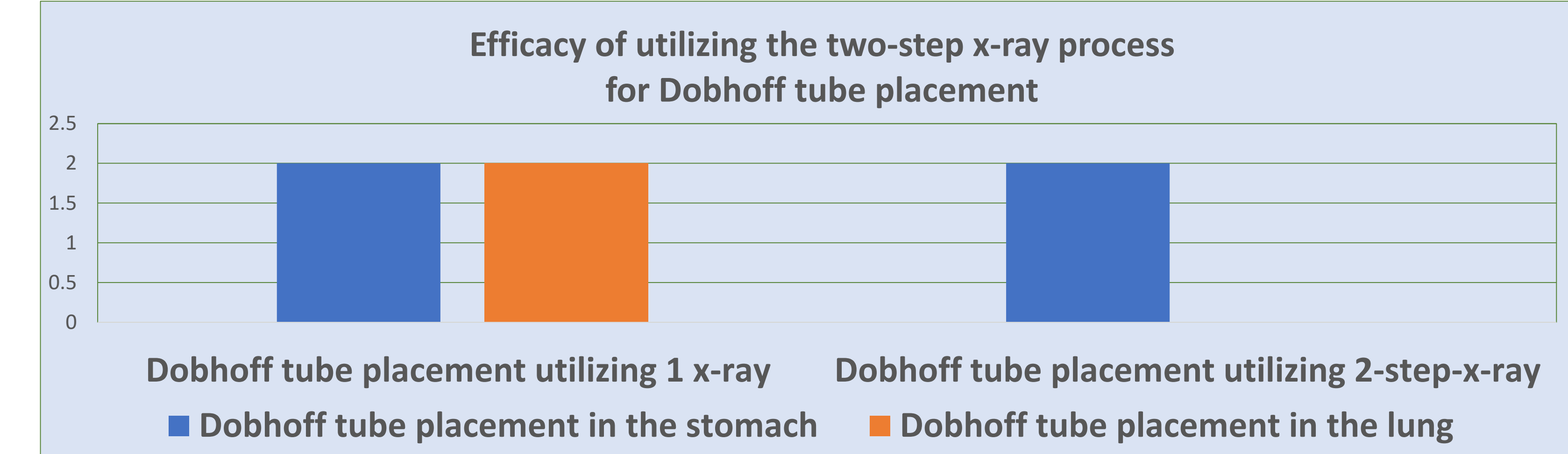
- Document "2-step x-ray" under placement confirmation when performing the 2-step x-ray process for Dobhoff tube insertion.
- Document "lip/nare cm matches with insertion cm" under placement reconfirmed by during assessment on all days following Dobhoff tube insertion.

Results Aim 1

- 44 nurses responded to the pre-survey and 38 nurses responded to the post-survey.
- The nurses who participated in the pre-survey were majority 18 to 49 years old, female, worked day shift, were full-time employees, had an advanced degree in nursing (bachelors, masters, or doctorate), and years of nursing experience ranged from 1 month to 19.9 years.

Pre-Knowledge Test Mean Summary Score	6.29	Post Knowledge Test Mean Summary Score	7.66	P-value: <.001
SD	1.49	SD	1.51	
Median	6	Median	8	

Results Aim 2 & 3



- Of the two tubes that were placed, the total amount minutes the two-step x-ray method took was 31 minutes for one patient and 273 minutes for the second patient.
- The mean of the total number of minutes for x-ray interpretation was 152 minutes. This mean is not an accurate representation due to the sample size of two and the extreme values.
- Both NG tubes that were inserted blindly into the lung did not cause any adverse event for the patients.

Conclusion

- This DNP project successfully utilized a QI approach to show that the two-step x-ray process is a viable option to eliminate lung complications by visualizing Dobhoff NG tube placement during insertion.
- Although outcomes of this project were not statistically significant due to the small patient sample size, findings revealed that when blind tube insertion technique was used, Dobhoff NG tube placement within the lung occurred.
- By utilizing the two-step x-ray method, medical centers can provide safe, prudent care without the purchase of a new device.

Dissemination

- This project was selected to be one of three student podium presentations at the National Association of Clinical Nurse Specialists (NACNS) annual conference in 2021.
- This QI project will also be submitted for podium presentation at the American Association of Critical Care Nurses (AACN) National Teaching Institute (NTI) annual conference in 2022.
- Propagation of this DNP project will be accomplished through sharing the results to site A's twenty sister hospitals.
- The findings of this project may be published within the Gastroenterology Nursing Journal.

References

- Pennsylvania Patient Safety Reporting System Advisory (PA-PSRS). (2006). Confirming feeding tube placement: Old habits die hard. *Pennsylvania Patient Safety Authority*, 3(4), 1-9.
- Sparks, D. A., Chase, D. M., Coughlin, L. M. & Perry, E. (2011). Pulmonary complications of 9,931 narrow-bore nasogastric tubes during blind placement: a critical review. *Journal of Parenteral Enteral Nutrition*, 35(5), 625-629.
- Yardley, I. E., & Donaldson, L. J. (2010). Patient safety matters: reducing the risks of nasogastric tubes. *Journal of Clinical Medicine*, 10(3), 228-230.
- Zhan, C., Smith, M., & Styer, D. (2006). Accidental iatrogenic pneumothorax in hospitalized patients. *Journal of Medical Care*, 44(2), 182-186.