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Medical Education ISP

NG Tube and Catheter Manikin Simulation: An expansion of practical curriculum

Final Report

Rationale

This medical education project sought to expand practical training at UCSD, School of Medicine. Specifically, this was envisioned through creation of novel nasogastric intubation and urinary catheterization curriculum. Prior to the conception of this project, UCSD employed a wide range of simulated procedures for instructional use during the pre-clinical and clinical years: endotracheal intubation, central lines, arterial lines, etc. Anecdotally, these sessions were helpful for familiarization with the equipment and procedures that I would commonly encounter on the wards during my third and fourth years. Using these ideas as a framework, I planned to develop sessions to cover additional topics that I encountered in my clinical rotations but not in the classroom. Foley catheterization and nasogastric intubation were specifically chosen as they are both extremely common procedures. Also, a wide range of specialties either perform these procedures or manage patients in the post-procedural period, making this a worthwhile curriculum for a majority of students. In addition, there is no "standardized" clinical experience for medical students. Students take the same required rotations, but breadth and depth of clinical exposure varies widely based on patient volume and population. A standardized procedural curriculum would, at minimum, offer consistency across the medical student class.

A mixture of simulation and didactic curriculum was selected as the medium of instruction. Numerous previous studies have illustrated efficacy of simulation curriculum in procedural learning, including nasogastric intubation and urinary catheterization. In addition, a succinct, accessible online procedural guide was planned in order to provide a reference for students extending beyond the in-person session.

Project Objectives

The main objective of this project is the creation of novel nasogastric intubation and urinary catheterization curriculum for UCSD medical students. In order to satisfactorily complete this objective, several minor goals were devised:

- Development of introductory didactics
- Development of simulation curriculum
- Creation of online, accessible procedural guide
- Incorporation of didactic and simulation curriculum into a course at the medical school
- Subjective assessment of curricular efficacy through student surveys and feedback forms

Methods

Initial steps included both didactic and simulation curriculum development. Background, indications, contraindications, anatomical considerations, preparation, procedural steps, and complications were researched for both urinary catheterization and nasogastric intubation. Information from these resources were compiled and synthesized into PowerPoint presentations for use as an introduction preceding the simulation sessions.

Subsequently, online resources were developed utilizing the aforementioned didactic materials. I worked with Wayne Porter and Brian Webb from mededtech to upload and format both text and images for the two procedures. Both procedural theory and steps were covered in these resources. Pictures utilized on these pages were sourced from the public domain.

Concurrently, I worked with Derek Dudek in the simulation center to develop partial task trainers to facilitate simulation. For nasogastric intubation, a task trainer typically used to

simulate endotracheal intubation was utilized. This manikin was fitted with an IV bag filled with "coffee ground emesis" (red, thickened liquid) that communicated with the stomach. The supply line for the "emesis" had a bulb attached in order to simulate reflux and aspiration. In-room suction was requested in order to aspirate the "gastric contents" once gastric intubation was successful.

For urinary catheterization, one male and one female partial task trainer were individually incorporated into full body manikins. Internally, fabricated "bladders" communicated with the task trainer urethra as well as an external bag filled with fabricated "urine." Relative to the female task trainer, the male counterpart contained a longer passage between urethral meatus and bladder to simulate anatomical differences. On testing, urine would only flow into the catheter's lumen once sufficient insertion had occurred.

In order to have this project incorporated into an existing medical school course, I worked with Dr. Preetham Suresh, the ISP chair. He connected me with Dr. Gabriel Wardi, course director of EMED 496c. EMED 496c is a bootcamp that integrates procedural simulation into pre-internship preparatory curriculum. This framework was concordant with the structure and purpose of my course. Additionally, the aforementioned online resource was reviewed by both Dr. Suresh and Dr. Wardi and included on the EMED 496c course website.

In preparation for the practical and didactic session, procedural materials and supplies were requested from and attained by the UCSD simulation center. A procedural expert, Wayne Overly (VA ICU nurse), was recruited for in-person teaching. Pre- and post-session likert scales were developed to assess student's self-report of confidence and competence following the session. An anonymous feedback form was also created in order to improve the session for

future classes. A room was reserved in the simulation center with available space for all 3 manikins, screens for pre-session didactics, and suctioning for gastric aspiration simulation.

Prior to the session, students were contacted and instructed to view the online resources. Once they arrived for the session, students filled out pre- likert scales for both procedures. I conducted the didactic session which addressed the theoretical background and a summary of the procedural steps. Subsequently, our expert demonstrated proper technique on the manikins. Once both procedures had been demonstrated, students began taking turns attempting catheterization and intubation with guidance and feedback from the procedural expert. Students were also encouraged to offer feedback to fellow classmates once they had simulated the procedure themselves. Participants were allotted enough time to successfully complete simulation of both procedures. Mr. Dudek was present to facilitate safe and effective use of the manikins. Following completion of both procedures, students were asked to complete a post-session survey and feedback form.

Achievements

1. Didactic curriculum was developed, synthesized into a presentation, and uploaded as an online resource: https://meded-portal.ucsd.edu/isp/2018/procref/. See below for selected screenshots from the site.

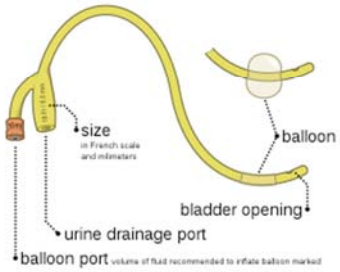
Foley Catheter

- Overview
- Indications
- Contraindications
- Relevant Anatomy
- Preparation
- Insertion
- Complications
- Further Reading & Sources

OVERVIEW

What is a Foley Catheter?

- Thin, sterile tube
- Inserted into the bladder
- Drains urine
- Most common kind of indwelling catheter
- Two lumens: one for urine, one to inflate the balloon
- Once inserted, inflating the balloon keeps the catheter in place
- Named after its designer, Frederic Foley (1929)

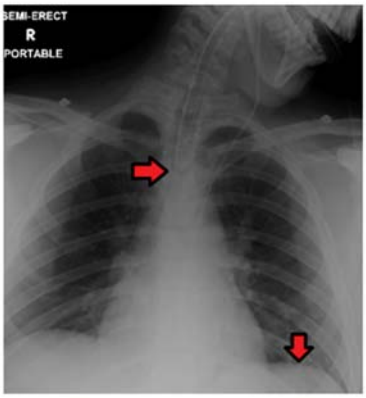


NG/OG Tubes

- Overview
- Indications
- Contraindications
- Preparation
- Insertion
- Checking Placement
- Complications
- Further Reading & Sources

CHECKING PLACEMENT

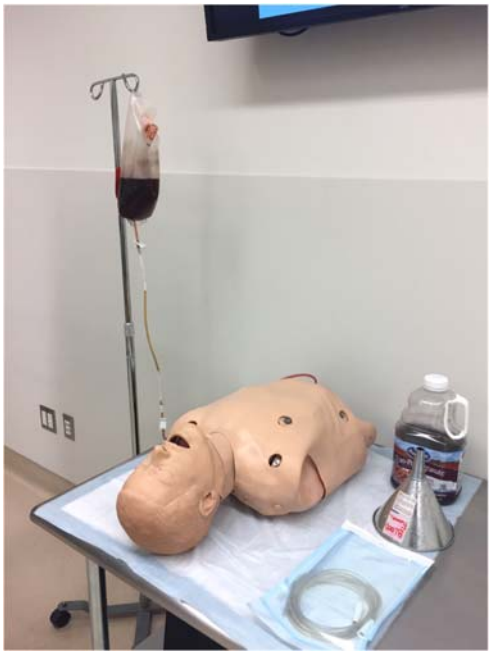
- Extremely important to check placement afterwards
- Hook the tube up to suction, if you get gastric contents it's a good sign
- Can order abdominal or AP chest x-ray to check for placement
- Must have imaging to confirm if administering medications or nutrition
- Look for the tube to travel down the esophagus and to the left (see right)



Patient with NG tube and endotracheal tube both placed correctly. Bottom red arrow points to tip of NG tube, top red arrow to the endotracheal tube.

2. Simulation curriculum was developed through the use of 3 partial task trainers to mimic male and female urinary catheterization and nasogastric intubation with gastric contents. Please see below for pictures of task trainers.

Pre-Session Male Foley Trainer with “urine” supply visible.

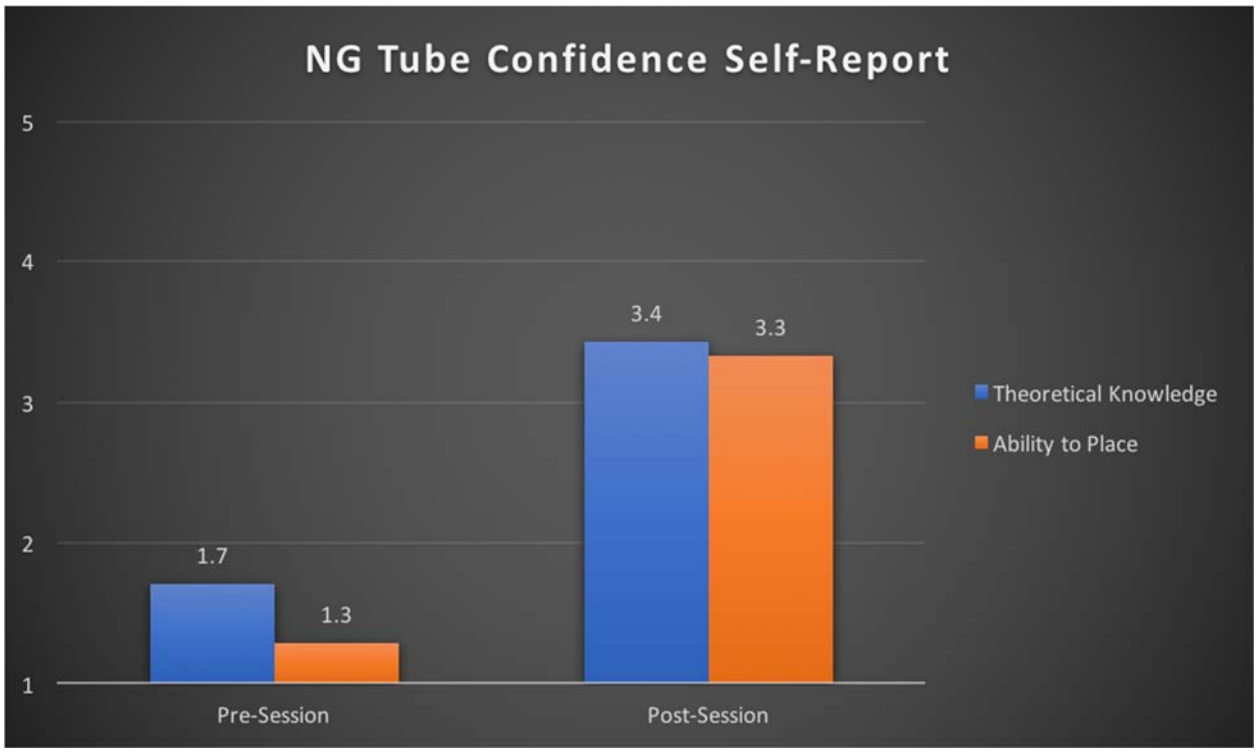


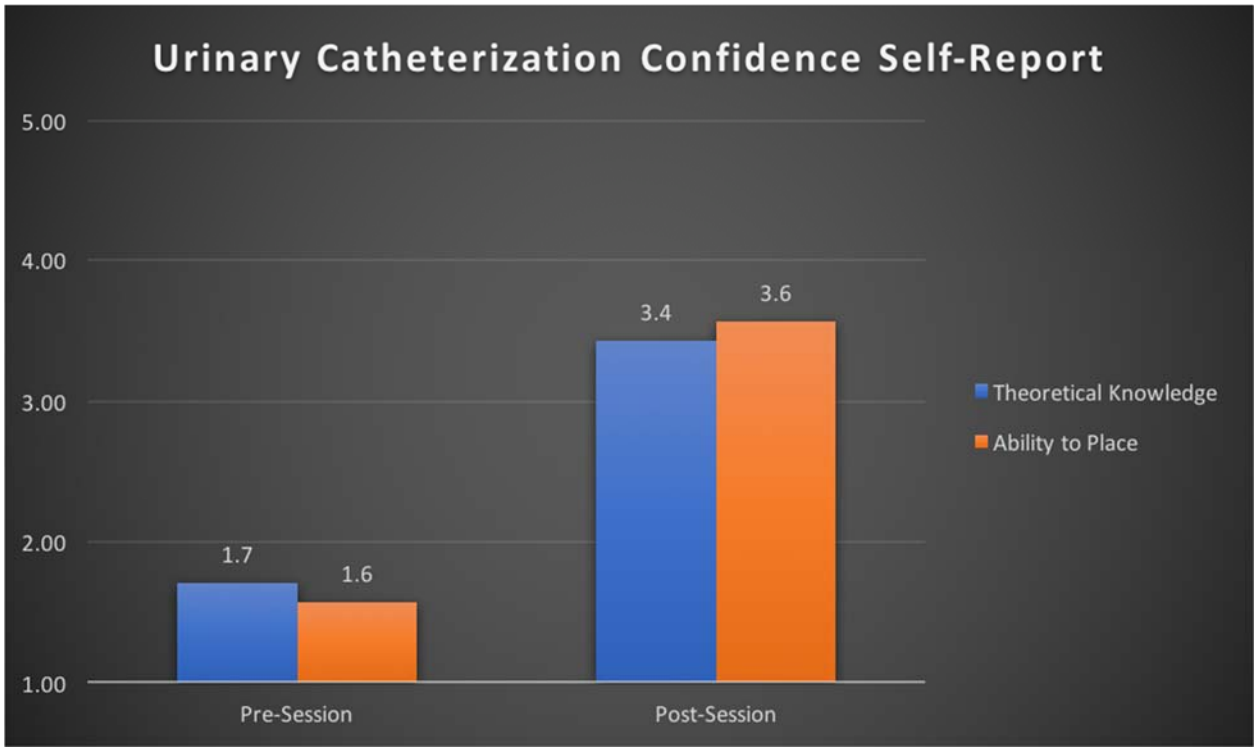
Pre-Session NG tube Trainer with “stomach contents” supply visible.

3. The session was incorporated into an existing medical school course, EMED 496c.
4. Pre- and post- likert scales and a feedback form were developed to assess students' opinions of the course.
5. A procedural expert was recruited for demonstration of the procedures on the day of the session. He has expressed willingness to attend future sessions.
6. The session was conducted for students enrolled in this month's EMED 496c on 03/27 at the UCSD simulation center. The designed didactics were presented to students followed by the simulation curriculum. Our nurse expert demonstrated each procedure in front of the cohort of students. Each student was able to simulate both procedures at least one time. They completed all pre- and post- surveys and feedback forms. Please see below for picture from session

Wayne Overly (VA ICU nurse instructor) pictured with NG manikin

7. On initial review, the completed pre- and post- Likert scales show increases in student's self-report of theoretical knowledge and practical competence after the session. Likert scales were designed with a 5 to 1 scale, higher numerical scores corresponded to more confidence. On self-assessment of theoretical knowledge, average scores improved from 1.6 to 3.3 NG intubation and average scores improved from 1.6 to 3.3 for urinary catheterization. On self-assessment of ability to correctly perform the procedures, average scores improved from 1.6 to 3.7 for NG intubation and 1.4 to 3.4 for urinary catheterization. Confidence scores are charted by procedure below.





In summary, all outlined objectives were achieved over the life of the project. Additionally, student's self-assessment illustrated increased confidence in theoretical knowledge and procedural skills, offering support for the efficacy of the program. Fortunately, the project was well received and Dr. Wardi expressed willingness to incorporate this session as a persistent component of the EMED 496c curriculum.

Acknowledgements:

I would like to thank my ISP chair Dr. Suresh and committee member Dr. Wallace for their excellent guidance and mentorship throughout this project. Dr. Wardi was extremely helpful in the incorporation of my session into his course. Mr. Dudek in the simulation center was crucial for fabrication and use of the partial task trainers. Charles Wayne Porter and Brian

Webb in the mededtech department helped immensely with the creation and upload of the procedural reference guide. I would also like to thank Wayne Overly for his expert teaching on the day of the session. Finally, I would like to thank the students that participated in the pilot of this course for their enthusiasm and feedback.