



Mastery Learning for Chest Tube Placement: Application to Surgery and Emergency Medicine Interns

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Introduction

- **Mastery Learning:** deliberate practice and supervised remediation to ensure proficiency in a required skill
- **Mastery Learning superior to traditional learning** for procedural specialties
- **"Skills-level-appropriate mastery" = emphasizes portions that are expected to be mastered at that point in training**
- **Previous study¹:** skills-level-appropriate mastery learning → higher performance, increased confidence compared to a traditional education method for chest tube placement in **4th year medical students**
- **Current study:** skills-level-appropriate mastery learning in general surgery (GS) and emergency medicine (EM) **interns**

Methods

- **Population:** GS and EM interns
- **Elective course for skills-level-appropriate mastery of chest tubes (Figure 1)**
- **Evaluation:** procedure checklist validated by faculty trauma surgeons at MU (Table 1)



Image 1. Set up of procedural pretest on mannequin

Figure 1. Methodology Flow Chart

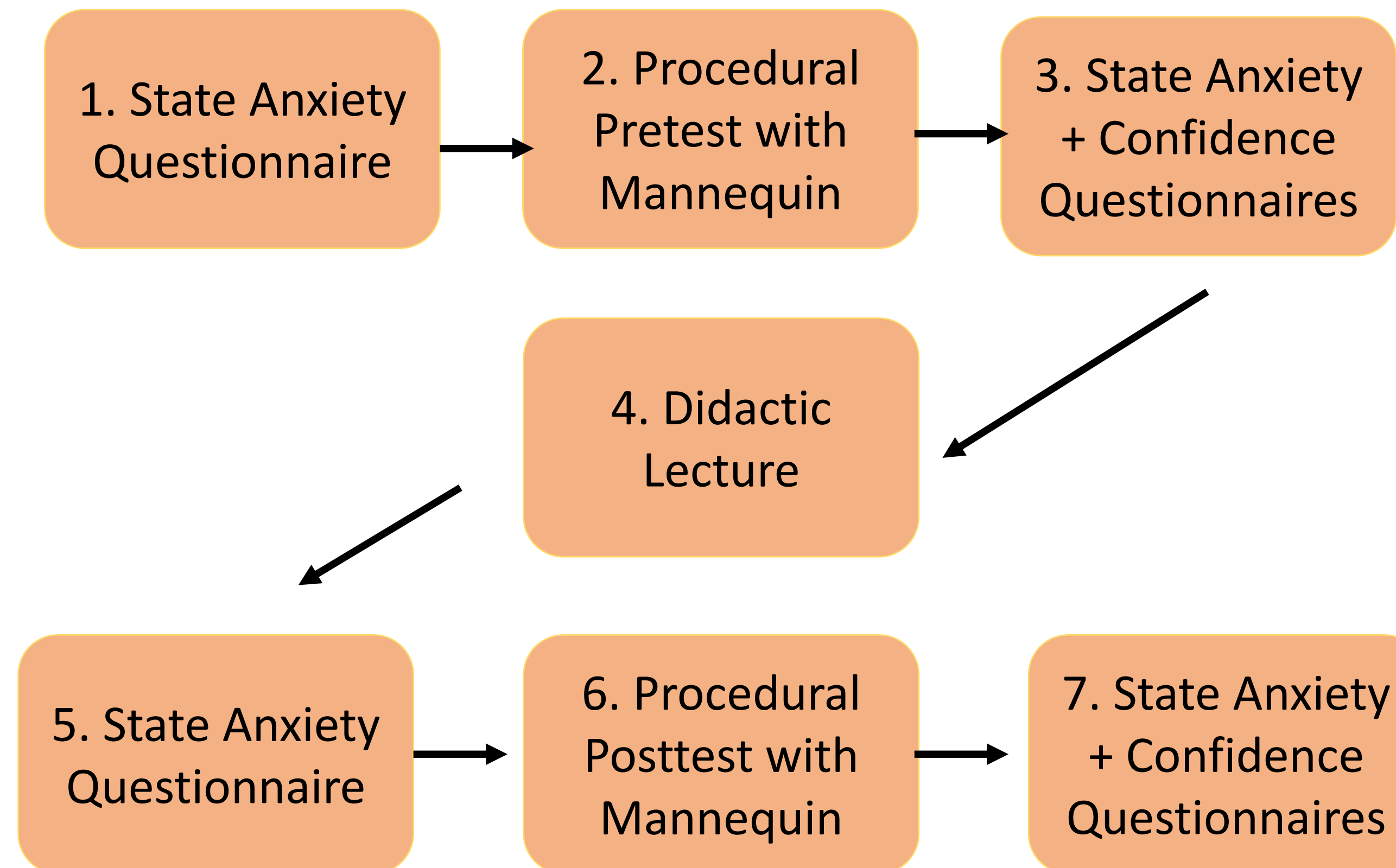


Table 1. Skills-Level-Appropriate Mastery Standard: Steps 1-4 and 14-17 must be completed correctly. Steps 5-13 must be attempted.

Step	Proficiency		
1. Sterile	Not done	Done Incorrectly	Done Correctly
2. Insertion Site	Not done	Done Incorrectly	Done Correctly
3. Prep site	Not done	Done Incorrectly	Done Correctly
4. Drape/orient patient	Not done	Done Incorrectly	Done Correctly
5. Widely anesthetize	Not done	Done Incorrectly	Done Correctly
6. Incision	Not done	Done Incorrectly	Done Correctly
7. Blunt dissection to pleura	Not done	Done Incorrectly	Done Correctly
8. Insert Kelly, open jaws	Not done	Done Incorrectly	Done Correctly
9. Sweep and clear with finger	Not done	Done Incorrectly	Done Correctly
10. Grasp chest tube with Kelly	Not done	Done Incorrectly	Done Correctly
11. Insert chest tube	Not done	Done Incorrectly	Done Correctly
12. Advance tube cephalad	Not done	Done Incorrectly	Done Correctly
13. Suture and tape in place	Not done	Done Incorrectly	Done Correctly
14. Apply dressing to site	Not done	Done Incorrectly	Done Correctly
15. Attach tube, start suction	Not done	Done Incorrectly	Done Correctly
16. Obtain CXR for placement	Not done	Done Incorrectly	Done Correctly
17. Reassess patient	Not done	Done Incorrectly	Done Correctly

References:

1. Liepert AE, et al. Proficiency development for graduating medical students, using skills-level-appropriate mastery learning versus traditional learning for chest tube placement: Assessing anxiety, confidence, and performance. *Surgery*. 2019;165(6):1075-1081. doi:10.1016/j.surg.2019.01.015

Results

- **17 pretest learners → 12 posttest learners (70% completion)**
- **Pretest mastery: 0/17 (0%) → Posttest mastery: 12/12 (100%)**
- **Required remediation: 6/12 (50%)**

Mean Anxiety Scores	<ul style="list-style-type: none"> • Before Pretest: 13.06 • After Pretest: 15.56 • p = 0.0265
Confidence Scores	<ul style="list-style-type: none"> • After Pretest: 15.53 • After Posttest: 16.89 • p = 0.1971
Posttest Anxiety Compared Between Remediation Groups	<ul style="list-style-type: none"> • No remediation: 11.5 • Needed remediation: 16.5 • p = 0.1625

Discussion

- **Fewer interns completed the course than started (30% attrition)**
 - Elective nature of course
 - Competition with clinical responsibilities
- **No learners demonstrated skill-level-appropriate mastery prior to didactic session**
- **100% of course-completers demonstrated skill-level-appropriate mastery after course completion and remediation if needed**
- **Anxiety was significantly higher after the pretest compared to before**
 - Suggests learners realized their knowledge/skill gap
 - Potentially motivated course success
- **Remediation did not influence anxiety or confidence following the posttest, signifying no added stress**

Conclusion

- **The mastery learning method is feasible in achieving skills-level-appropriate mastery of chest tube placement in interns. Future work will include better learner capture.**