



Enhancing post-graduate education: an investigation into the efficacy of 3D-printed hand models for optimizing retention of procedural skills

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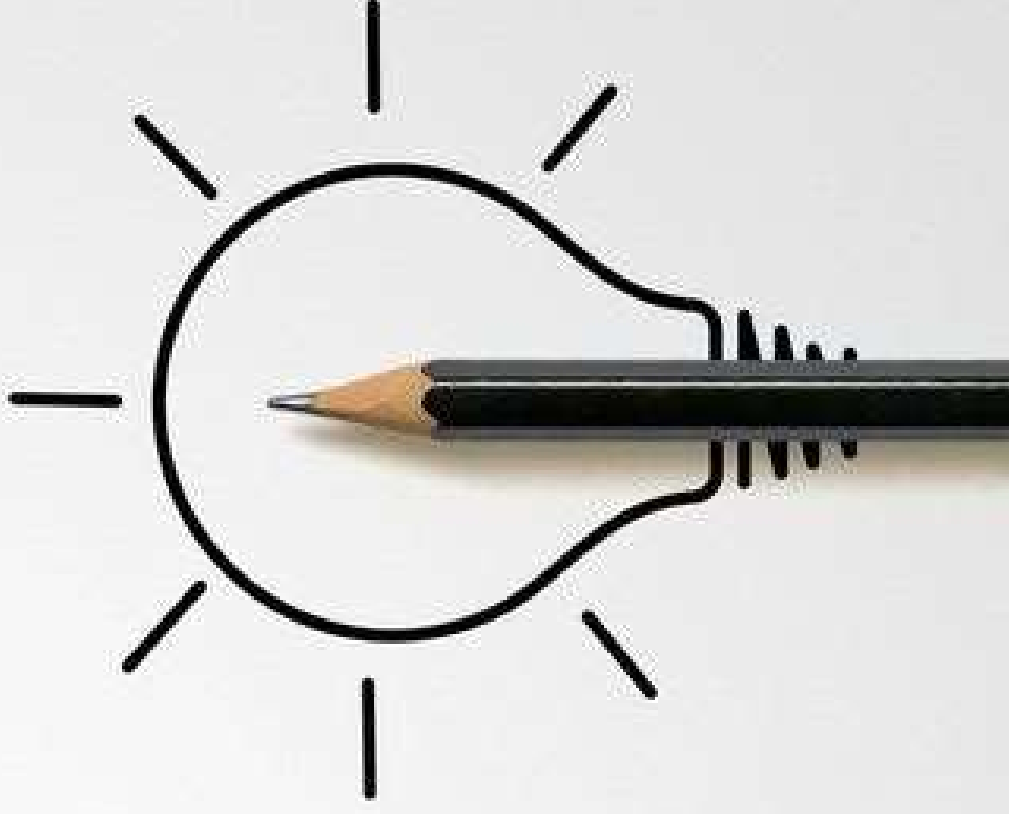
Disclosures

- No financial disclosures



Learning Objectives

- Discuss the use of simulation in health care
- Review the effectiveness of a novel 3D hand model
- Understand the effect of refresher sessions on long-term retention



Audience Poll

I have participated in a simulation scenario.

- A. True
- B. False



Audience Poll

How early can skills decline after a simulation intervention?

- A. 1 year
- B. 2 months
- C. 6 months
- D. 3 weeks



Simulation in Health Care

- Simulation-based education (SBE)
 - Standard of postgraduate training
 - Enhances traditional didactic learning
 - Addresses limitations of clinical practice
- Standardized debriefing
 - Deliberative practice
 - Individualized feedback
- Retention
 - Positive effect on immediate retention
 - Decline in skills as early as 2-3 months



Study Objectives

- **Primary:** Investigate the retention of bedside hand procedure skills following simulation with a 3D novel hand model
- **Secondary:** Use of a 3D hand model for improving comfortability of skills



Study Design

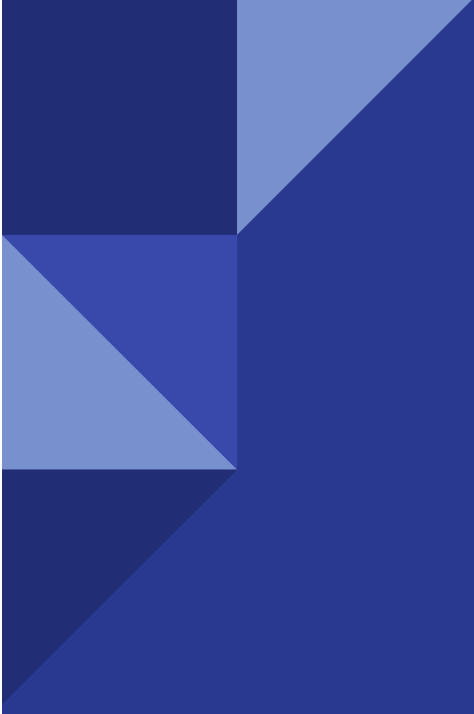
- Single-center prospective observational pilot study
- White Plains Hospital in White Plains, NY
- Surgery and Emergency Medicine PAs, NPs, and Physicians



Novel 3D Hand Model

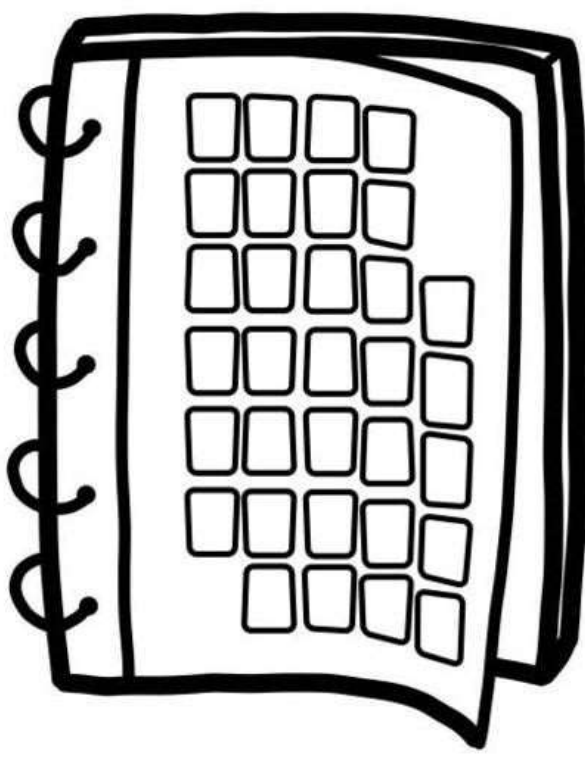


Methods



Methods

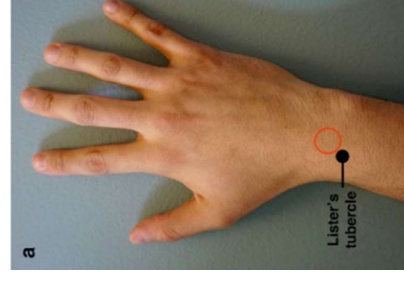
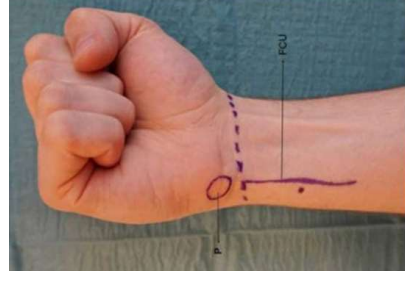
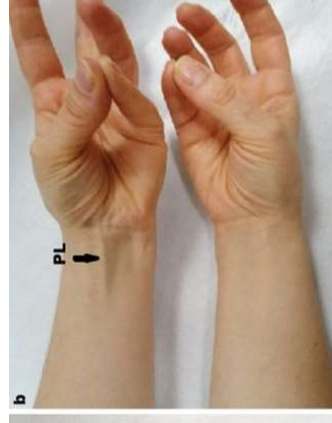
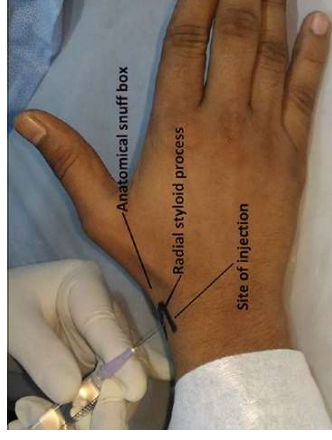
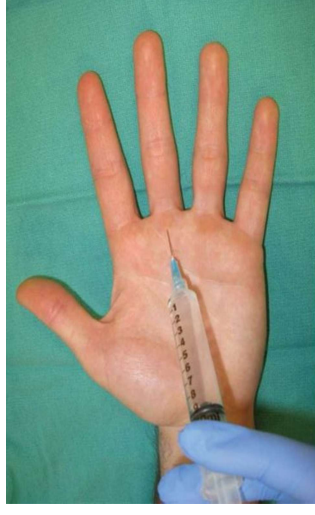
- One study group
- Training sessions at 0, 3, & 6 months
- Surveys
 - Pre-survey
 - Post-session survey



Methods

Procedures

- Digital blocks
 - Dorsal
 - Volar
- Wrist blocks
 - Radial nerve
 - Median nerve
 - Ulnar nerve
- Wrist arthrocentesis
- Nail bed laceration repair



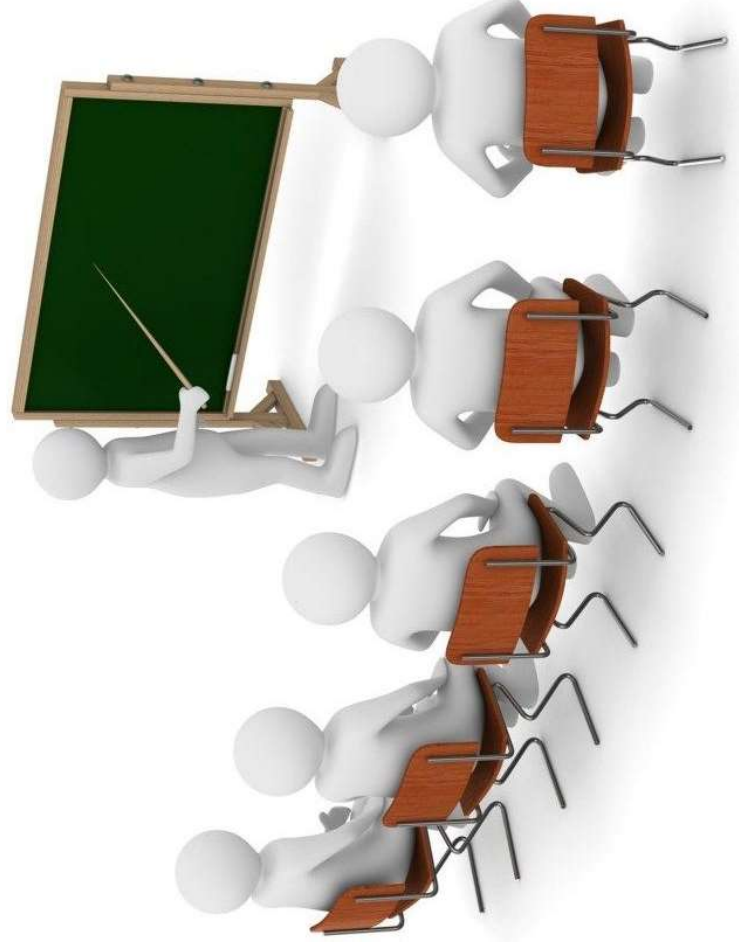
Methods

Session 1

- Initial session
- Didactic education
- Hands-on training with prompting and real-time feedback

Sessions 2 & 3

- Follow up sessions
- Performance of skills followed by individualized feedback



Scoring System

- Procedural rubrics developed based on evidence-based medicine practices
- Validated by a hand surgeon

Initial Session (Prompting)	
Score	Description
0	<ul style="list-style-type: none"> ● Not done or verbalized ● Done or verbalized incorrectly ● Required prompting to initiate task
1	<ul style="list-style-type: none"> ● Done or verbalized partially correct ● Required prompting to adjust technique
2	<ul style="list-style-type: none"> ● Done or verbalized correctly and no prompting required

Follow Up Sessions	
Score	Description
0	<ul style="list-style-type: none"> ● Not done or verbalized ● Done or verbalized incorrectly
1	<ul style="list-style-type: none"> ● Done or verbalized partially correct
2	<ul style="list-style-type: none"> ● Done or verbalized correctly

Results

Session	Participants
1	25
2	23
3	15

Characteristic	N = 25 ¹
Gender	
F	17 (68%)
M	8 (32%)
Age	
26-30	9 (36%)
31-35	7 (28%)
36-40	2 (8%)
41-45	2 (8%)
46-50	1 (4%)
51-55	1 (4%)
56-60	2 (8%)
61-65	0 (0%)
65+	1 (4%)
¹ n (%)	

Characteristic	N = 25 ¹
Provider Type	
MD	3 (12%)
NP	6 (24%)
PA	16 (64%)
Specialty	
ED	4 (16%)
Surgery	21 (84%)
Experience	
0-1y	12 (48%)
1-5y	7 (28%)
6-10y	3 (12%)
11-15y	1 (4%)
>20y	2 (8%)
¹ n (%)	

Dorsal Digital Block			
Session	n	Mean Total Points	Mean Percentage
1	25	22.4	89.3%
2	23	21.2	88.4%
3	15	23.2	96.7%

Volar Digital Block			
Session	n	Mean Total Points	Mean Percentage
1	25	13.3	95.1%
2	23	11.3	80.4%
3	15	13.6	96.9%

Radial Nerve Block			
Session	n	Mean Total Points	Mean Percentage
1	25	14.2	78.9%
2	23	9.8	54.6%
3	15	12.6	70.2%

Median Nerve Block			
Session	n	Mean Total Points	Mean Percentage
1	25	10.8	90.3%
2	23	8.8	73.6%
3	15	11.2	93.5%

Ulnar Nerve Block			
Session	n	Mean Total Points	Mean Percentage
1	25	14.2	88.8%
2	23	11.2	69.8%
3	15	14.9	92.9%

Wrist Aspiration			
Session	n	Mean Total Points	Mean Percentage
1	25	8.2	82.4%
2	23	7.4	73.9%
3	15	8.9	88.6%

Nail Bed Laceration Repair			
Session	n	Mean Total Points	Mean Percentage
1	25	15.6	70.7%
2	23	15.1	68.8%
3	15	18.4	83.4%

Discussion

- Skill retention
 - 3 months: all procedures showed a decline of skills
 - 6 months: 6/7 procedures showed improvement above baseline
- Use of prompting
 - Skills declined once prompting was removed
- Optimal retention test interval
 - Confirmed literature that refresher sessions are needed at 3 months



Limitations

- No baseline session prior to education
- Small sample size
- Lack of follow up
- No control group
- Sole grader



Future steps

- Perform a baseline evaluation prior to didactic education
- Consider adding a control group without a 3 month intervention
- Train additional graders



Conclusion

- SBE provides a safe practice environment to learn
- The use of a novel 3D hand model improved the performance of hand procedures in this study
- Refresher sessions are needed to optimize retention over time



Audience Poll

Simulation training positively affects the immediate retention of skills.

- A. True
- B. False



Audience Poll

Simulation-based education combined with didactic learning is not as effective as traditional learning methods alone.

- A. True
- B. False



Audience Poll

What is the optimal retention test interval?

- A. 1 year
- B. 3 months
- C. 6 months
- D. 1 month



References

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