AUGMENTING SURGICAL SKILL TRAINING AND RETENTION THROUGH SIMULATION: A LOW ANTERIOR RESECTION MODEL

Jimmie Knight III MD[1], Henry R. Govekar MD[1], Jose Velasco MD[1]
[1]Rush University Medical Center – Department of Surgery

Introduction

Use of surgical staplers is a core skill needed to be an effective surgical resident in the OR. A curriculum was designed to augment resident experience and confidence with a simulation-based end-to-end anastomosis (EEA) in a low anterior resection model. Simulation has proven to be an important tool for surgical resident education and has been shown to increase efficiency for learners.

Methodology

- A needs assessment was conducted amongst residents and attendings to determine the need for a surgical stapler-based curriculum that was reproducible and accessible.
- Web-based cognitive component with independent study (pre-simulation videos), self-confidence questionnaires, and an inanimate low anterior resection model simulation.
- EEA and TA staplers were donated from a device company. Faculty colorectal surgeons determine content and construct validity. Global Operative Assessment of Laparoscopic Skills (GOALS) and procedure specific evaluations (PSE) were created and validated by faculty
- Novice (PGY 1-2), and an intermediate group (PGY 3-5), completed an initial session and a 3-month long-term retention session.
- Wilcoxon signed-rank test was used to evaluate resident confidence

Results

- Fifteen novice residents, eleven intermediate residents, and three attendings (experts) completed the initial curriculum.
- Significant differences existed between experience as a first assistant with use of the TA stapler in bowel resection and the EEA stapler in colon anastomosis ($p < 0.05$)
- From the initial to retention session (Table 2)
  - The intermediate group only saw a significant improvement in overall performance ($p<0.05$).
  - Regarding the PSE, novices scores significantly differed in 3 out of 4 of the TA stapler domains and 3 out of 4 of the EEA domains, as well as completing the simulation with less direction ($p<0.05$). The intermediates scores only significantly differed in 1 out of 4 of the TA stapler domains and none of the EEA stapler domains and overall direction
  - Intermediates reported a significantly higher satisfaction with the simulation and preparedness for clinical practice ($p<0.05$).

	Novice N=15			Intermediate N=11		
Domain	Pre Median [IQR]	Post Median [IQR]	p-value	Pre Median [IQR]	Post Median [IQR]	p-value
Identifying parts of the stapler	1.00 (1.00,3.00)	3.00 (1.00,5.00)	**<0.001**	2.00 (1.00,4.00)	4.00 (3.00,5.00)	**0.007**
Open lumen purse string technique	1.00 (1.00,2.00)	3.00 (2.00,4.00)	**<0.001**	2.00 (1.00,4.00)	4.00 (2.00,5.00)	**0.005**
Placing the anvil and inserting the device for trocar deployment?	1.00 (1.00,2.00)	3.00 (1.00,5.00)	**<0.001**	3.00 (1.00,4.00)	4.00 (2.00,5.00)	**0.012**
Withdrawing the EEA stapler?	1.00 (1.00,2.00)	3.00 (2.00,5.00)	**<0.001**	2.00 (1.00,4.00)	4.00 (2.00,5.00)	**0.013**
Complete the procedure independently?	1.00 (1.00,2.00)	2.00 (1.00,5.00)	**<0.001**	2.00 (1.00,4.00)	4.00 (1.00,5.00)	**0.005**

Table 1. EEA stapler pre and post simulation questionnaire results.

Procedure Specific Evaluation

Steps	1 Unable to complete	2	3 Completed, moderate instruction	4	5 Completed, little to no instruction
TA					
Engagement of retaining pin					
First firing squeeze with proper tissue placement					
Second squeeze to fire stapler					
Transection of tissue with blade and release					
Purse-string					
EEA					
Placing device through anus and piercing distal transection site with trochar (orange band present)					
Close adjusting knob and closing device with proper speed					
Firing and releasing the device					
Safely removing the device with rotation					
Overall Direction*					

*1= "substantial direction", 5= "minimal direction"

	Novice n= 15			Intermediate n=10		
	Pre Median [IQR]	Post Median [IQR]	p-value	Pre Median [IQR]	Post Median [IQR]	p-value
GOALS						
Tissue handling	3.00 (3.00,5.00)	4.00 (2.00,5.00)	0.71	4.00 (3.00,5.00)	4.00 (3.00,5.00)	0.58
Instrument handling	3.00 (3.00,4.00)	4.00 (2.00,5.00)	0.15	4.00 (3.00,5.00)	5.00 (3.00,5.00)	0.10
Suture handling	3.00 (3.00,5.00)	3.00 (3.00,5.00)	0.61	3.50 (3.00,5.00)	4.00 (3.00,5.00)	0.10
Efficiency	3.00 (3.00,4.00)	3.00 (2.00,5.00)	0.35	3.00 (2.00,5.00)	4.50 (3.00,5.00)	0.058
Overall performance	3.00 (3.00,4.00)	3.00 (2.00,5.00)	0.35	3.50 (2.00,5.00)	4.50 (3.00,5.00)	**0.058**
PSE - TA						
Retaining pin	4.00 (2.00,5.00)	4.00 (3.00,5.00)	0.094	4.50 (3.00,5.00)	4.50 (4.00,5.00)	0.57
Tissue placement first squeeze	3.00 (2.00,5.00)	5.00 (3.00,5.00)	**0.042**	4.50 (3.00,5.00)	5.00 (4.00,5.00)	0.095
Fire stapler	3.00 (1.00,5.00)	5.00 (2.00,5.00)	**0.026**	4.00 (1.00,5.00)	5.00 (3.00,5.00)	0.14
Tissue transection and release	3.00 (1.00,5.00)	4.00 (2.00,5.00)	**0.008**	3.50 (1.00,5.00)	5.00 (4.00,5.00)	**0.028**
PSE – Purse string	3.00 (2.00,5.00)	4.00 (3.00,5.00)	0.44	5.00 (2.00,5.00)	4.50 (4.00,5.00)	0.55
PSE – EEA						
Trochar piercing	3.00 (2.00,5.00)	4.00 (3.00,5.00)	**0.044**	4.50 (2.00,5.00)	5.00 (3.00,5.00)	0.41
Closing device	3.00 (2.00,5.00)	4.00 (3.00,5.00)	**0.006**	4.50 (1.00,5.00)	5.00 (3.00,5.00)	0.27
Fire and release	3.00 (2.00,5.00)	4.00 (2.00,5.00)	0.078	4.00 (1.00,5.00)	5.00 (3.00,5.00)	0.40
Safely remove	3.00 (2.00,5.00)	4.00 (2.00,5.00)	**0.025**	4.50 (1.00,5.00)	5.00 (3.00,5.00)	0.35
Overall direction	3.00 (2.00,4.00)	4.00 (3.00,5.00)	**0.006**	4.00 (1.00,5.00)	5.00 (3.00,5.00)	**0.18**

Table 2. GOALS and PSE median scores for novice and intermediate participants that participated in the LAR model simulation

Conclusion

- Both novice and intermediate groups showed a statistically significant improvement in confidence, overall performance, and ability to complete the procedure independently.
- A LAR model provides trainees with early exposure to commonly used staplers in a simulated environment that will possibly increase resident preparedness for the operating room.
- We believe this curriculum should be considered for implementation in surgical education.

Acknowledgements

- Rush University Medical Center Department of Surgery
- Institutional Review Board at Rush University Medical Center