Improving Anatomical Knowledge Retention in Medical Students entering the Surgery and Obstetrics and Gynecology Clinical Rotations by Nesting Interactive Modules

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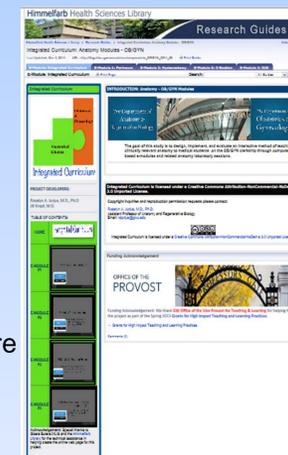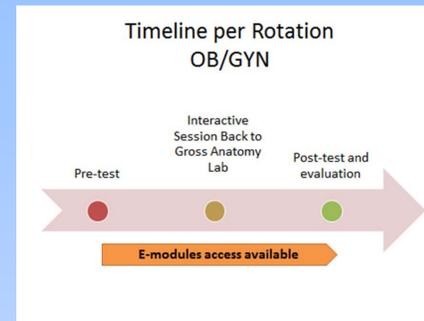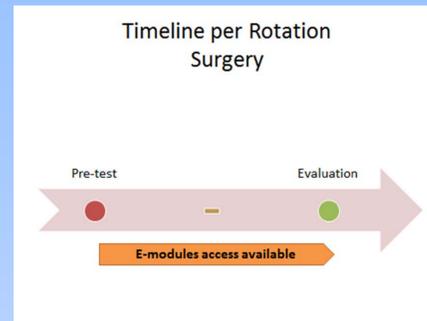
Introduction

- There is a two year gap between learning anatomy and applying it clinically

- Clinicians feel that the current anatomical education of medical students is inadequate

- Students do not feel confident in their anatomy knowledge and have difficulty transferring it from the classroom to the clinic

- Previous data from our own institution quantified this knowledge deficit, specifically for the surgery and obstetrics/gynecology (ob/gyn) clinical rotations

- Suggestions for improvement include vertical integration or nesting, so that relevant topics are revisited from Year I to Year IV

- Using principles of adult learning and instructional design, a series of interactive e-modules were created to review clinical anatomy in areas students were found to be weakest

- The goal of this study is to evaluate the impact of this newly designed method of teaching clinically relevant anatomy to medical students on surgical rotations

- The surgery curriculum will implement and evaluate the use of interactive e-modules. The ob/gyn curriculum will combine the use of interactive e-modules and hands-on anatomy laboratory sessions

Methods

- Institutional Review Board approved protocol:
  - MSIIIs at GWUMC (N=189)
  - 20-25 question exam: 15-10 MCQs and 5-10 image labeling
  - Exam had basic science and clinical input
- These questions were compared against those from the relevant anatomy exams during their first year (t-tests with corrections)
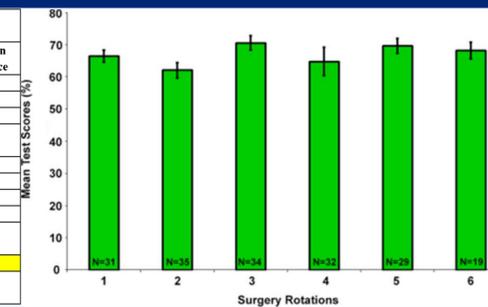- Based on this knowledge gap, e-modules were created to review relevant clinical anatomy

Information Sheet | Pre-Questions MCQ | Learning Objectives | Case | Anatomy Content | Surgery or Clinical Content | Post-Questions MCQ | Survey | References

Methods

- Two methods of vertical integration were created

Timeline per Rotation Surgery

Pre-test — Evaluation

E-modules access available

Timeline per Rotation OB/GYN

Pre-test — Interactive Session Back to Gross Anatomy Lab — Post-test and evaluation
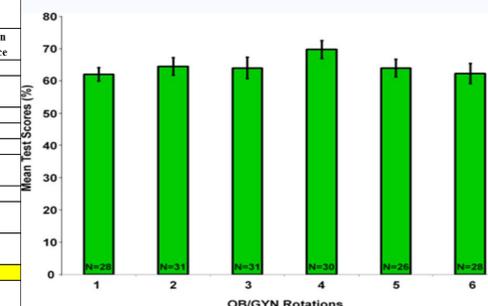
E-modules access available

During the first week of the surgery and ob/gyn clerkships, a link to a secure website containing the modules is distributed to students.

Results Phase 1

Compilation by Broad Category	Students in anatomy course		Students prior to Surgery Rotation		Retention Difference
	Number of test items	% Correct	Number of test items	% Correct	
Inguinal Canal	1 MCQ	95.70%	2 MCQs	45.3%	50.4%
Esophageal Varices	1 MCQ	71.90%	1 MCQ	12.8%	59.1%
Vasculature	5 MCQs	93.20%	4 MCQs	53.4%	39.8%
Orientation in Abdominal Cavity	3 MCQs	92.90%	2 MCQs	38.8%	54.1%
Appendix	2 MCQs	82.40%	3 MCQs	86.1%	-3.7%
Colon	1 MCQ	83.20%	1 MCQ	27.7%	55.5%
Lymphatic Drainage	1 MCQ	98.80%	1 MCQ	97.2%	1.6%
Vertebral Landmark	1 MCQ	77.80%	1 MCQ	50.3%	27.5%
Cross Section on CT	N/A	N/A	2 images (5 labels/image)	89.1%	
Mean of matched items		86.9%		51.5%	35.4%
SD		9.4		28.1	
Number of students		185		180	

Mean surgical anatomy quiz grades by rotation number prior to start of clerkship[1]

Compilation by Broad Category	Students in anatomy course		Students prior to OBGYN Rotation		Retention Difference
	Number of test items	% Correct	Number of test items	% Correct	
Pelvic Organs	6 MCQs	72.6%	6 MCQs	46.7%	25.9%
Pelvic Ligaments and Landmarks	3 MCQs	86.0%	3 MCQs	78.1%	7.9%
Location of Fertilization	1 MCQ	96.8%	1 MCQ	71.8%	25.0%
Urogenital Development	2 MCQs	93.5%	1 MCQ	54.0%	39.5%
Cardiac Development	2 MCQs	99.5%	1 MCQ	72.6%	26.9%
Pulmonary Development	1 MCQ	100.0%	1 MCQ	17.8%	82.2%
Pregnancy	1 MCQ	93.0%	1 MCQ	17.8%	75.2%
Pelvic Bone X-ray	N/A	N/A	1 image 5 labels/image	84.0%	
Structure identification of perineal picture	N/A	N/A	1 image 5 labels/image	73.2%	
Mean of matched items		91.6%		51.2%	40.4%
SD		9.6		25.3	
Number of students		185		174	

Mean ob/gyn anatomy quiz grades by rotation number prior to start of clerkship[1]

[1]Jurjus, R. A., Lee, J., Ahle, S., Brown, K. M., Butera, G., Goldman, E. F. and Krapf, J. M. (2014), Anatomical knowledge retention in third-year medical students prior to obstetrics and gynecology and surgery rotations. Anat Sci Ed. doi: 10.1002/ase.1441

Preliminary Results Phase 2

Topics	Pretest % correct scores	Posttest % correct scores
Uterine	50.00%	88.33%
Vasculature	63.20%	77.33%
Peritoneum	86.00%	93.33%
Fallopian Tubes	56.00%	80.00%
Muscles and Ligaments	65.33%	75.56%
Embryology	38.00%	60.00%
Placenta	72.00%	73.33%
Structure ID	65.33%	77.22%
Neuroanatomy	68.00%	86.67%
Histology	4.00%	23.33%
Overall scores *	54.50%	74.80%

*: P<0.0001

Mean ob/gyn anatomy quiz scores by rotation before the clerkship started and after educational intervention consisting of e-modules and hands-on classroom sessions.
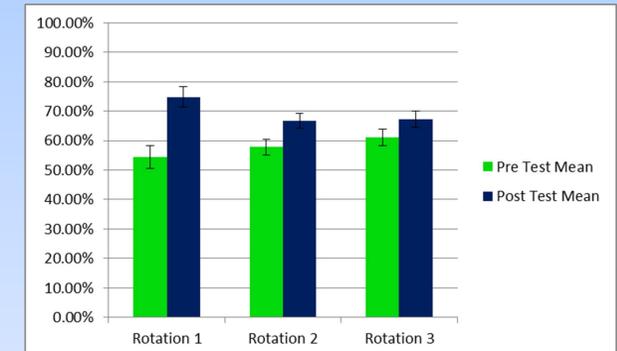
Conclusion

- Retention at our institution is consistent with national averages

- Preliminarily, modules appear to be helping students improve knowledge retention

- Many students find modules effective and useful

- The largest barrier to module use is not having enough time to use the modules

- Future Directions: Multi-centered trial

Acknowledgements