Title: Concept Mapping to Enhance and Assess Knowledge of Endocrine Surgery in General Surgery Residents

Research Team Information:

- **PI Information:** Roy Phitayakorn, Director of Surgery Education Research, Massachusetts General Hospital
  - shouldn’t the PI be the trainee?
- **Faculty Sponsor:** Roy Phitayakorn, Director of Surgery Education Research, Massachusetts General Hospital
- **Additional investigator:** Emil Petrusa, PhD, Educational Research Specialist, Massachusetts General Hospital, Department of Surgery

**RESEARCH NARRATIVE**

**Description of problem to be addressed:** Endocrine surgery is a discrete and clearly-defined part of the core curriculum for general surgery residents, but it is also an area in where scores on the American Board of Surgery In-Training Examination (ABSITE) have been historically low within the Partners general surgery residency programs (unpublished data). We seek to understand how general surgery residents create mental frameworks for endocrine surgery concepts and operations to enhance their learning outcomes using concept mapping techniques.

**Brief literature review:** In today’s highly interconnected and team-dependent healthcare systems, assessment of independent performance in surgical training can be very challenging. Particularly since implementation of duty hour reforms, scores on the American Board of Surgery In-Training Exam (ABSITE) as well as the board certification exam have remained stagnant, or in some cases, declined (Falcone, 2013). The decrease in scores implies that resident physicians need additional structure in how they are taught general surgery concepts, rather than simply more time to study. However, it is not known what type of structure would be optimal to support surgical resident learning. The proposed study would help to answer that question while enhancing the ability of physicians in training to think critically and understand the reasoning that underlies their actions.

Concept mapping is an educational technique that has been used in secondary science education for decades, but whose use has only recently been investigated in medical education (West, 2000). Concept maps can enhance education in four main ways: (i) by promoting meaningful learning; (ii) by providing an additional resource for learning; (iii) by enabling instructors to provide feedback to students; and (iv) by conducting an assessment of learning and performance (Daley, 2010). Scoring systems with validity evidence have also been defined for concept maps in medical education (Srinivasan, 2008). We seek to determine if general surgery residents’ use of concept mapping (both independently and through collaboration) can enhance their knowledge in endocrine surgery, as measured through change in ABSITE scores and comparison to faculty expert concept maps. This study can help us to better understand the types of curricula and learning tools that will be most effective to support learning within the context of a residency training program.

References:  

**Hypothesis:** We hypothesize that use of novel, collaborative concept-mapping software can enhance general surgery residents’ knowledge and critical thinking in endocrine surgery concepts and procedural decision-making, compared to the standard didactic curriculum.
**Population to be studied:** General surgery residents at two academic training programs (Massachusetts General Hospital [MGH] and Brigham and Women's Hospital [BWH]) will be invited to participate.

**Description of intervention/study design:** All general surgery residents at Partners programs (MGH and BWH, approximately 120 individuals) will be invited to enroll in a learning community to enhance medical knowledge in endocrine surgery. Participants will complete a learning styles inventory (approximately 5-10 minutes to complete) and enroll in a curriculum utilizing novel electronic collaborative concept mapping software to enhance understanding of clinical diagnostic pathways in endocrine surgery as well as the performance of endocrine surgery operations. Following completion of the learning styles inventory, residents will receive a link to the concept-mapping software from their program director. Participants will receive a 30-minute training session during regularly scheduled residency teaching curriculum time prior to individual use of the software, but otherwise will be permitted to use the software as they see fit for a period of 6 weeks. After that time, residents at MGH will receive additional education about endocrine surgery topics using expert-constructed concept maps as a learning resource. Residents at BWH will receive standard instruction in endocrine surgery, which consists of three didactic lectures. The study period will be open through the ABSITE exam in late January. Individual and group concept maps constructed from this site will be downloaded as text files by study personnel for de-identification. Following de-identification, the study team will perform correlation analysis about complexity and time interacting with the software, self-reported learning style, and American Board of Surgery In-Training Exam (ABSITE) endocrine surgery sub-section score. Residents will also be invited to participate in focus groups to discuss their use of concept maps as a learning tool, strengths of the technique and potential limitations.

**Description of comparison group (if relevant):** Comparisons will be made between the intervention education group (MGH residents) and the standard education group (BWH residents).

**Outcome variable to be used to determine efficacy of intervention (if relevant):** Efficacy of the concept-mapping intervention will be measured in 5 ways:

1) Concept maps created by residents will be scored using a previously published scoring system in the medical education literature that accounts for structural complexity, map quality, and concept importance. Scores will be compared for each resident longitudinally, between residents in the same PGY level cohort, and between PGY levels. Concept map scores will also be compared to scores from concept maps created by expert endocrine surgeons.

2) The amount of time that residents spend interacting with the concept mapping software will be compared to their concept map scores.

3) Scores on the endocrine surgery sub-section of the ABSITE exam will be compared with the prior year for each resident and between PGY levels of residents. Scores will also be compared between institutions in an attempt to account for bias based on experiences and maturation.

4) Residents’ self-reported learning styles will also be compared to concept map scores and endocrine surgery ABSITE sub-section scores to determine whether performance differences are observed between those with different learning style preferences.

5) Qualitative data about the effectiveness of concept mapping as a learning tool, potential challenges or limitations to its use, and how the approach might be improved will be obtained via focus groups with residents in both arms of the study.

**Power analysis to determine feasibility (if relevant):** A sample size of 32 participants will be necessary to determine a 2-point difference in mean concept map scores or endocrine sub-section scores on the ABSITE for a power of 0.8 and alpha of 0.05.
Timeline:

- July-September 2016: Preparation / IRB approval
- Early October 2016: Residents complete Learning Styles Inventory and are given software access
- October-November 2016: Monitor concept mapping activity
- Mid-November 2016: Endocrine surgery education with concept maps for intervention group residents
- November 2016-January 2017: Monitor concept mapping activity
- February-March 2017: Analyze data and conduct focus groups
- April 2017: Write up and/or present

HIPPA compliant/IRB status: The protocol has been submitted for IRB.

Clarification if needed: The protocol was approved as exempt from review by the Partners IRB.

BUDGET

Budget:

- Concept mapping software licenses: $1500
- Secure cloud storage for study files: $100
- Special data processing for ABSITE scores: $200
- Statistical software: $200
- Focus group participant incentives: $250 for food/beverages x 4 sessions = $1000

TOTAL REQUESTED $3000

Narrative: Concept mapping software licenses will be obtained for all participating residents at MGH and BWH. Using volume and education discount mechanisms, this has been quoted at $1500. For secure data storage purposes, a professional subscription to cloud-based storage service will be obtained. More detailed information will be requested from the American Board of Surgery regarding the endocrine surgery sub-scores on the In-Training Examination, which will require a special data processing fee. Statistical software will be acquired for data analysis. As an incentive to participate in the 4 focus groups that will be held (2 with residents at MGH and 2 at BWH), food and beverages will be provided.

Disclosure of other funding sources: This grant would be sole source of funding.

LETTERS OF SUPPORT

Program Director: Dr. Matthews Nehs  Letter received? yes
Mentor Name: Dr. Roy Phitayakorn  Letter received? yes

OTHER

Did you use the HMS feedback partner opportunity? no

Previous COE involvement: I recently learned about the Centers of Expertise upon my arrival at Partners and am eager to engage with the multiple opportunities presented. Previous COE funding: N/A

Understand all grant requirements and expectation? Yes
Is this your last year in your training program? Yes
Can we post your application on our website if funded? Yes

Any additional comments: Possibly my last year - I may pursue a second research year as part of my fellowship depending on available opportunities