A Controlled Pilot Study on the Use of Active Learning Techniques during a Multimodal Rheumatology Elective for Medical Residents

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Background

- A shortage of rheumatologists is predicted.
  - the demand for rheumatologists is expected to exceed supply in the coming decades (ACR/Lewin Group workforce study 2005).
- Medical school curriculum and training in rheumatology is inadequate.
  - Email survey of medical schools: 79% required pre-clinical MSK instruction, 24% required a clerkship in MSK medicine (Bernstein 2010).
- There is little data on results of current rheumatology training for medical residents.

Prior Research

- In 2010, we presented results of a year long study - 49 SUNY Downstate interns were randomly assigned to one of two groups for one month.
  - Out-patient rheumatology elective.
  - Alternative subspecialty clinical experiences.
- All interns completed:
  - a pre-test and pre-questionnaire prior to the month.
  - a post-test, post-questionnaire, and clinical skills examination at the end of the month.

Prior Research: Interventions

- All interns - access to Medstudy and copies of a rheumatology textbook (Primer).
- Interns in the rheumatology arm also provided:
  - Video on the musculoskeletal examination.
  - On-line presentations and questions on 12 rheum topics.
  - Rheumatology clinic sessions; average 3 weekly.
  - Arthrocentesis workshop using simulators.

Prior Research: RESULTS

Knowledge

ROSCE

* p<0.0005
Prior Research: Questionnaire Results

<table>
<thead>
<tr>
<th>Confidence in Ability to Treat Arthritis</th>
<th>Confidence in Ability to Treat as a Specialist</th>
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Prior Research: Conclusions

- Conclusions
  - No impact on rheumatology knowledge or clinical skills
  - Significant difference in arthrocentesis, confidence

- Are there areas for improving our interventions?
  - Texts: Medstudy, Primer (passive)
  - Video on musculoskeletal examination (passive)
  - On-line presentations and questions (active?)
  - Rheumatology clinic sessions (potentially active)
  - Arthrocentesis workshop (active)

Experiential Learning Theory (ELT)

- A theory that stresses the core importance of personal experience in the learning process
- ELT defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience"

Kolb’s Learning Style Inventory

- In the early 1970s, David Kolb developed a model of learning based on experiential learning theory.

- In this model, there are two axes:
  - Grasping experience (Perception).
  - Transforming experience (Processing).

- Each axis holds opposite approaches to those parts of learning.
Kolb’s Learning Style Inventory

Initially this model was used to describe learning styles used by the students.

However, Kolb and others have proposed that this model actually represents the actual process in which experience leads to deep understanding and, therefore, knowledge.

Applying Kolb to Rheumatology

While this process can theoretically begin at any point, it is often thought to work "best" when it starts with experience. This can be a new experience, or by activation of the learner’s prior experience.

However, in rheumatology many of our diseases are rare - even in a rheumatology clinic. How can we provide experiences from which a resident can build knowledge?

Purpose

- To develop a rheumatology elective for medical interns based on active learning techniques.
  - Reproducible at other institutions.
  - Improved outcomes on written exams and in application of practical knowledge.

- Outcome measures
  - Results on a multiple choice examination.
  - Objective Structured Clinical Examination (OSCE).

- Methods

  - 40 SUNY Downstate medicine and neurology interns enrolled in the study
    - All completed a 45 question multiple choice pre-test and questionnaire

  - Randomly assigned 24 interns with an ambulatory month to either an ambulatory rheumatology elective or another subspecialty experience
    - All neurology interns were assigned to the control arm
Methods

- All interns given a copy of the Primer on the Rheumatic Diseases
- Interns in the rheum elective were given:
  - 12 case based learning modules
  - 12 quizzes, which were then reviewed with a rheumatology attending
  - Review of the MSK exam using active learning techniques
  - Arthrocentesis/injection workshop with simulators
  - Participation in 3 rheumatology clinics and 1 journal club each week

Active Learning: Arthrocentesis

The use of simulators in teaching arthrocentesis lends itself to Kolb’s experiential learning cycle

1. Demonstration of the procedure with a verbal description - activating prior knowledge, providing a new experience
2. Discussion of the indications, contra-indications - reflecting/thinking
3. Intern performs the procedure while providing a description - practical application
4. Intern uses the procedure in the clinic - active experimentation

Active Learning: Clinical Exam

Our approach to the clinical exam attempted to lead the interns through each stage of Kolb’s cycle

1. Demonstrating the exam with a verbal description - activating prior knowledge, providing a new experience
2. Repeat demonstration of the exam, the intern providing the verbal description - reflecting/thinking
3. Intern performs the exam while providing a description - practical application
4. Intern uses the skill in the clinic - active experimentation

Active Learning: Knowledge

Rheumatology knowledge – most difficult to apply to Kolb’s theory; however we attempted to do so through multiple interventions:

1. Experience - Case based learning modules; Clinical experiences
2. Reflection - 12 quizzes on major rheumatology topics, Self-guided review of Rheumatology text
3. Conceptualization - Review of quizzes with attending, Journal club participation
4. Active Experimentation - Participation in rheumatology clinic

Results: Knowledge Improvement Scores

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<thead>
<tr>
<th></th>
<th>Non Rheum</th>
<th>Rheum</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>50.4</td>
<td>50.7</td>
<td>0.953</td>
</tr>
<tr>
<td>Post Test</td>
<td>71.5</td>
<td>59.8</td>
<td>0.011</td>
</tr>
</tbody>
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11/6/2011
Results: ROSCE

Results: Questionnaire

• No significant differences between the Rheum and Non Rheum Groups for:
  – Change in Enthusiasm for Rheumatology
  – Change in attitude: who should treat arthritis (rheumatologist or primary care physician)

Conclusions

• Interns provided with active learning techniques compared to interns provided with completely passive learning opportunities (e.g., textbook only)
  – showed a significant positive impact on acquisition of knowledge, clinical skills, and arthrocentesis skills
  – were more confident
  – were not any more enthusiastic for the field.

Limitations

• Did the lack of randomization of neurology interns bias the results?
• High drop out rate
• Study at one residency program – is it generalizable?
• No long-term follow-up

Future Directions

• Comparing active learning techniques to traditional passive learning techniques for interns in which both groups are in a rheumatology elective.
  – This year we are including more passive learning opportunities for the nonrheum group
• Track results of the in-service exam and ABIM exams.
References