

Background / Rationale / Need

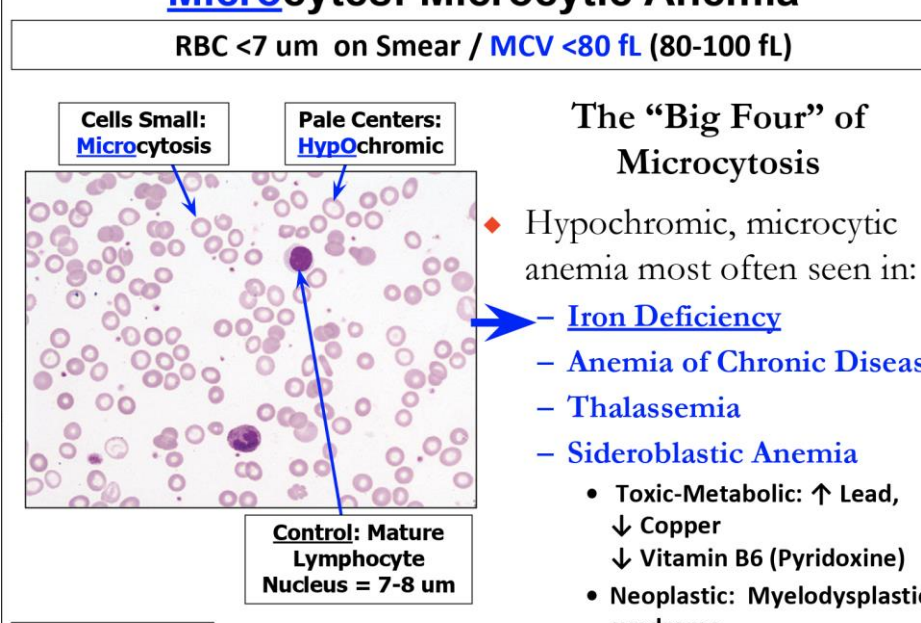
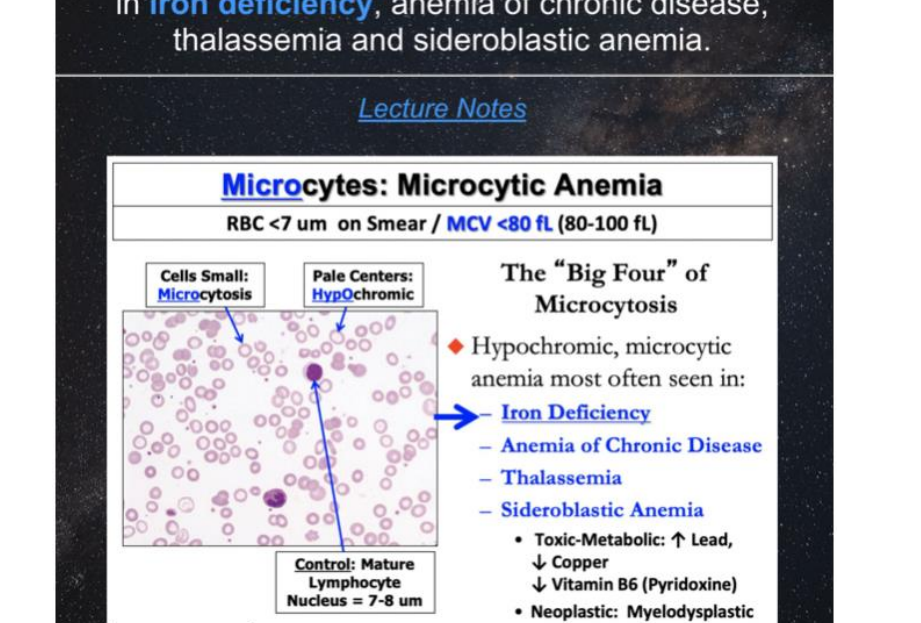
- Successful completion of medical education requires the retention of large amounts of information.
- Although there are many strategies, spaced repetition has been shown to lead to long-term retention.
- Students utilizing spaced repetition as a study technique have a variety of options.
- One common method to implement this technique is Anki, a free, open-source flashcard application.
- Several pre-made Anki decks have been constructed by students utilizing various source material, including First Aid, Pathoma, and Sketchy Medical, and compiled by a national group of students into the "AnKing deck" which is freely shared.
- While non-Brody, pre-made decks offer a comprehensive review of content, they do not align with course learning objectives.
- During the BSOM Pathology course, most students use (1) Pathoma, a combined online video / textbook product and (2) PowerPoint review files (with separate "Quick Hits" and review question formats) to review and reinforce important concepts and content .
- A subdeck of AnKing includes cards focused on Pathoma content
- A Brody School of Medicine student initiative previously constructed an Anki deck based on extensive pathology course review materials.
- Given the large number of individual (85) and lack of searchability, students found that the PowerPoint files were unwieldy for longitudinal study during the second year of medical school and during dedicated Step 1 preparation.
- We hypothesized that combining the existing Brody Pathology Anki Deck with the AnKing Pathoma subdeck would provide students with in-depth option which would cover Brody course content and Pathoma content.

Methods

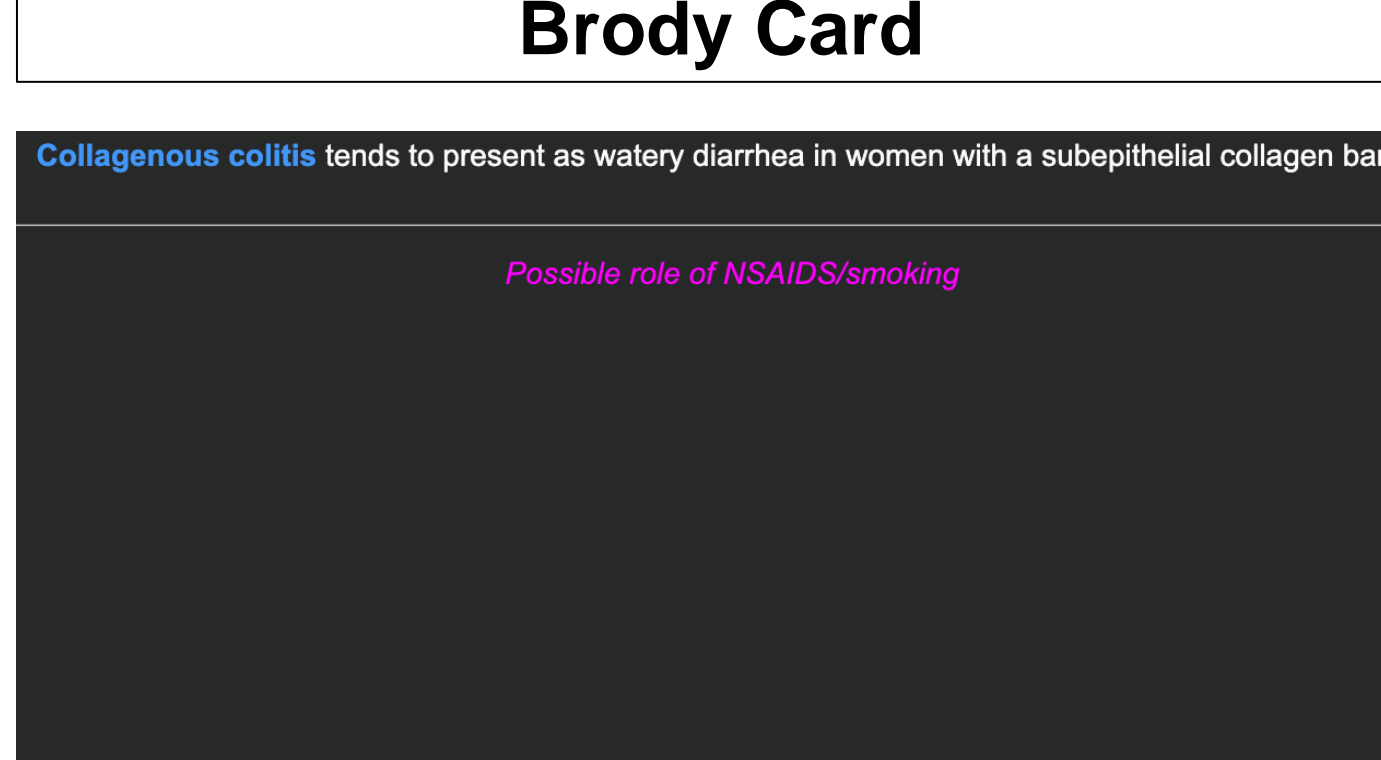
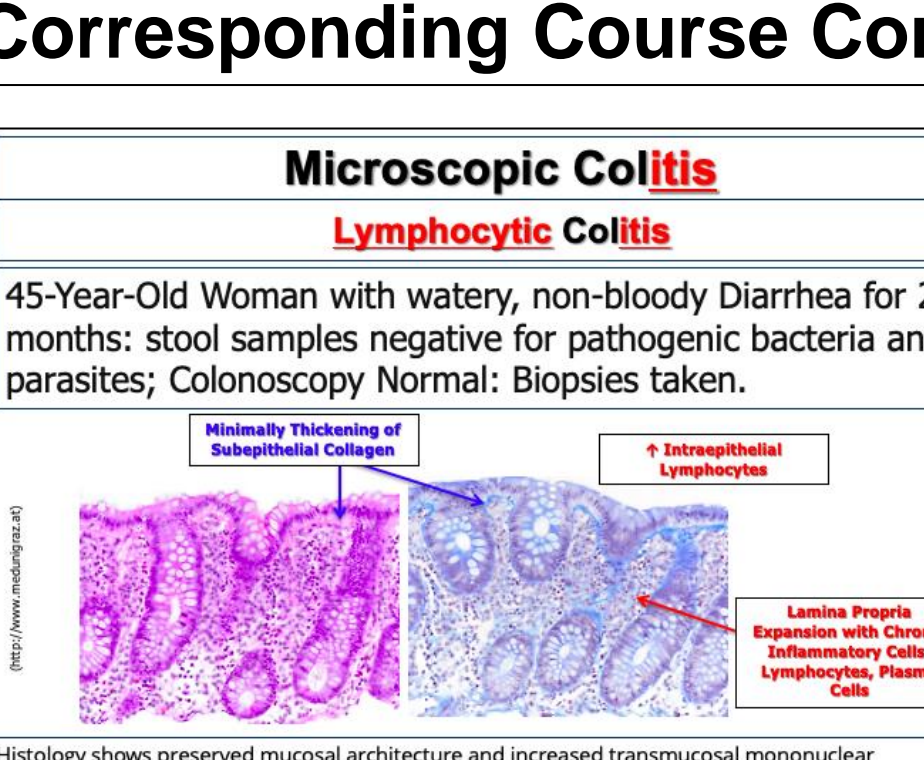
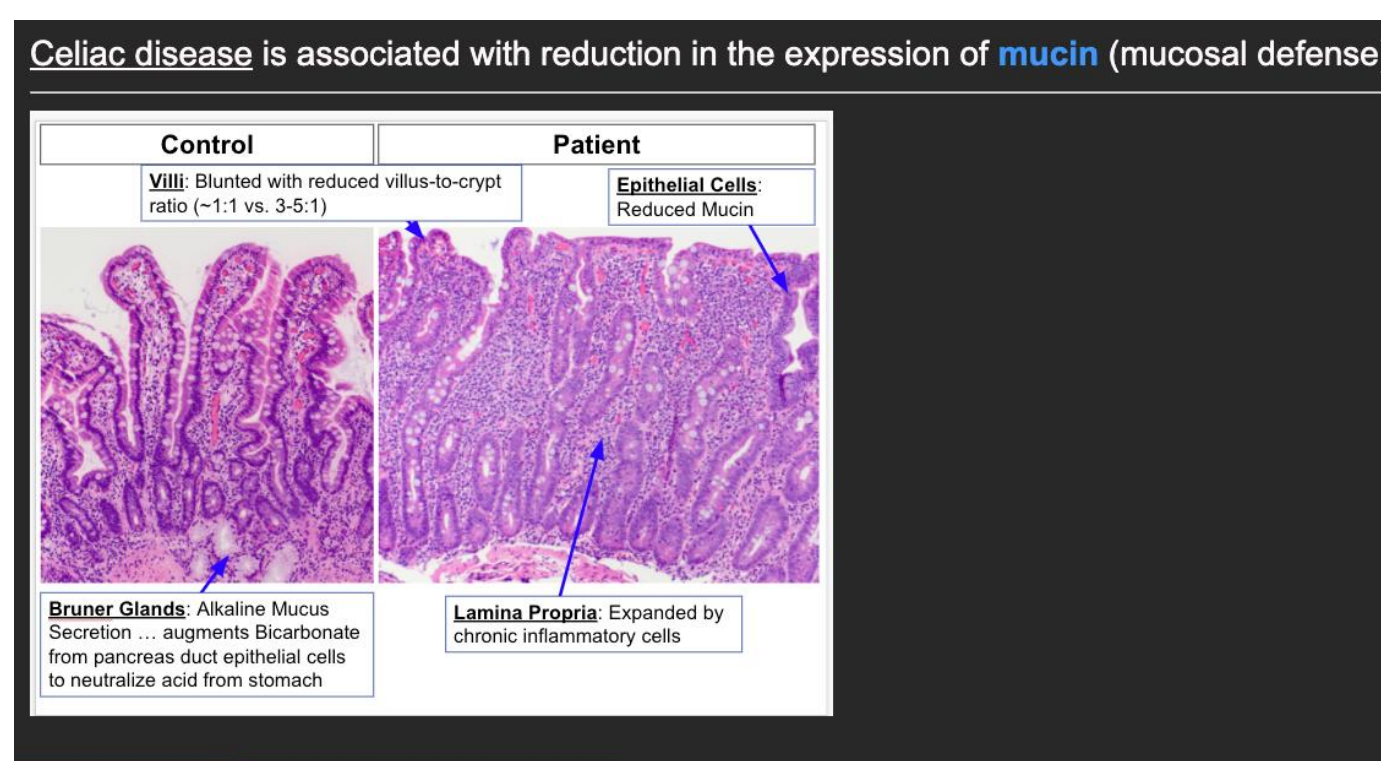
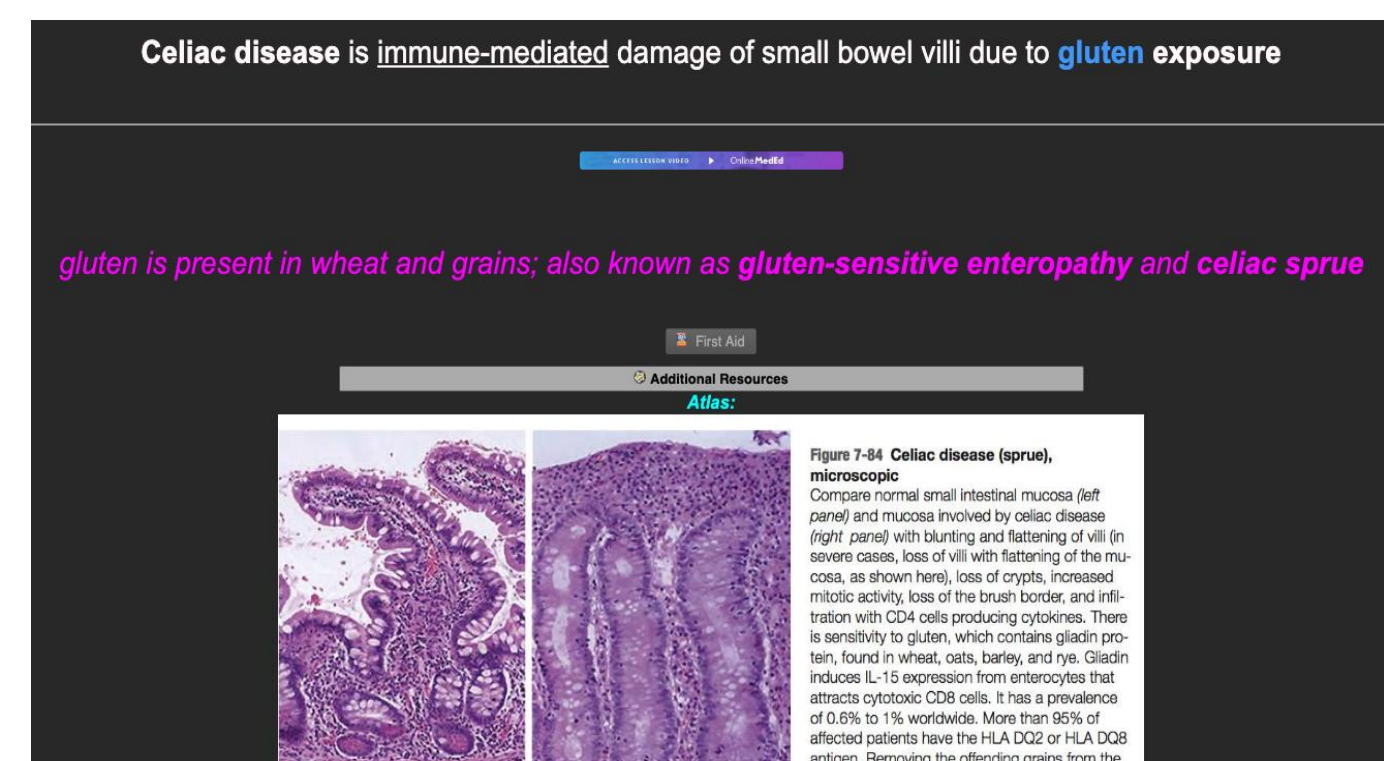
- To increase the utility of Anki for medical student education in the Brody pathology course, where most students use Pathoma, we developed a hybrid Anki deck that combined the Brody pathology Anki deck with pre-made cards from the AnKing Pathoma deck.
- Students were surveyed to evaluate the effectiveness of the combined deck using a SurveyMonkey.com survey.
- A literature search was conducted using PubMed.gov, Scholar.Google.com, and Google.com using key words Anki, medical education, and spaced repetition.

Results

Examples of Conversion of Brody Quick Hits to Brody Anki Flashcards

Cloze-Deletion Flashcard		Image Occlusion Flashcard	
Course PowerPoint Slide	Anki Card	Quick Hit Slide	Anki Card
<p>Microcytes: Microcytic Anemia RBC <7 um on Smear / MCV <80 fL (80-100 fL)</p>  <p>The "Big Four" of Microcytosis</p> <ul style="list-style-type: none"> Hypochromic, microcytic anemia most often seen in: <ul style="list-style-type: none"> Iron Deficiency Anemia of Chronic Disease Thalassemia Sideroblastic Anemia Toxic-Metabolic: ↑ Lead, ↓ Copper Vitamin B6 (Pyridoxine) Neoplastic: Myelodysplastic syndrome 	<p>Microcytes: Microcytic Anemia RBC <7 um on Smear / MCV <80 fL (80-100 fL)</p>  <p>The "Big Four" of Microcytosis</p> <ul style="list-style-type: none"> Hypochromic, microcytic anemia most often seen in: <ul style="list-style-type: none"> Iron Deficiency Anemia of Chronic Disease Thalassemia Sideroblastic Anemia Toxic-Metabolic: ↑ Lead, ↓ Copper Vitamin B6 (Pyridoxine) Neoplastic: Myelodysplastic syndrome 	<p>Quick Hits</p> <ul style="list-style-type: none"> Who Am I? Whoell-Jolly Body Increased Production Sickle Cell Anemia Teardrop Cell / Dacrocyte ... as Target 	<p>Quick Hits</p> <ul style="list-style-type: none"> Who Am I? Whoell-Jolly Body Increased Production Sickle Cell Anemia Teardrop Cell / Dacrocyte ... as Target

Examples of AnKing Pathoma Cards Incorporated with Brody Anki Flashcards

Brody Card	AnKing Card	Corresponding Course Content
<p>Collagenous colitis tends to present as watery diarrhea in women with a subepithelial collagen band.</p>  <p>Possible role of NSAIDs/smoking</p>	<p>Microscopic colitis</p> <ul style="list-style-type: none"> Clinical Features: Abdominal pain, weight loss, extraintestinal Triggers: Smoking, medications (NSAIDs, PPIs, SSRIs, statins) Diagnosis: Colonoscopy, histology (increased lamina propria) Management: Remove potential triggers, Anti-inflammatory medications 	<p>Microscopic Colitis Lymphocytic Colitis</p> <p>45-Year-Old Woman with watery, non-bloody Diarrhea for 2.5 months; stool samples negative for pathogenic bacteria and parasites; Colonoscopy Normal; Biopsies taken.</p>  <p>Histology shows preserved mucosal architecture and increased transmucosal mononuclear inflammation within the lamina propria. Underneath the surface epithelium, a minimally thickened collagenous band is seen, measuring between 5 and 10µm (Panel A, HE stain; Panel B, Masson-Trichrome).</p>
<p>Celiac disease is associated with reduction in the expression of muclin (mucosal defense)</p>  <p>Blunted villi, crypt hyperplasia, intraepithelial lymphocytes</p>	<p>Celiac disease is immune-mediated damage of small bowel villi due to gluten exposure</p>  <p>gluten is present in wheat and grains, also known as gluten-sensitive enteropathy and celiac sprue</p>	<p>Quick Hits: Infectious</p> <p>Laboratory Testing</p> <p>Blood Test: Assess for Celiac Disease</p> <ul style="list-style-type: none"> IgA Anti-Tissue Transglutaminase Antibodies IgA Anti-Gliadin Antibodies IgA Anti-Deaminated Gliadin Antibodies IgA Anti-Endomysial Antibodies <p>IgG Levels Normal: IgA Antibody Assays are Valid</p> <p>IgG Antibodies: NOT Pursued ... as less likely Positive</p> <p>Blood Test: Assess for Celiac Disease</p> <ul style="list-style-type: none"> Which Antibody Assessment is Necessary? Most Individuals - IgA Sufficient If Person is IgA Deficient - THEN ... Need to test IgG <p>IgA Quantification</p> <ul style="list-style-type: none"> If patient is IgA deficient -> Test IgG antibodies IgG Anti-Tissue Transglutaminase Antibodies IgG Anti-Gliadin Antibodies IgG Anti-Deaminated Gliadin Antibodies IgG Anti-Endomysial Antibodies

Survey Results

- Survey responses from 74 of 81 students were obtained (85%)
- Likert scale scores of 4 (agree) and 5 (strongly agree) were combined; Other responses were mostly 3 (neutral)
- Use of Brody and Brody-Pathoma Anki Deck 35/74 (47%)
- Of the 35 students who used Anki: Anki Deck as Effective Education Tool for Pathology Study
 - Brody Ani Deck 21/35 (60%)
 - Combined Brody-Pathoma Deck 25/35 (71%)

Comments:

Positives	Areas for Improvement
<ul style="list-style-type: none"> The decks are very well organized! I've been really enjoying using the Brody pathology Anki deck in supplement to my class learning. It has really helped keep me on pace with the course. I don't feel it lacks in any major content components. Class Anki deck is way more helpful for reviewing quick hits Aligns well with curriculum, spaced repetition helps LOVE the Pathoma AnKing Anki decks. They correlate so well to class material. The Anki in Pathology course has all of the quick hits in one place. It is really important for me to be able to find all of my needed materials in one place. 	<ul style="list-style-type: none"> I find going through the QH and RQ ppts just as beneficial as the Brody Anki deck. I do not have time to do the ppts and Brody Anki and Pathoma/AnKing Anki so I do not do the Brody Anki. I honestly prefer [PowerPoint] slides with charts. It is hard to keep up with that many cards. Some of the decks are incredibly large. I realize that this is not necessarily a fixable issue. Pathoma decks in addition to the the supplemental path deck is incredibly time consuming to complete. The quick hit Anki decks are often too long with too many cards to get to everything. If a student would condense them to focus more on pathologies in particular then I think it would be much more helpful.

Literature Search and Expert User Summary

Spaced Repetition

- Spaced repetition, active recall, and the testing effect are identified as three specific components of study skill critical to effective studying in medical school.

How Anki Software Enables Good Study Habits

- Spaced Repetition is the primary purpose of the Anki software.
- Flashcards are a form of active recall and can also be designed to serve as practice questions (testing effect).
- Flashcards are also very useful in preparation for practice tests and utilizing the testing effect in other ways (i.e., Scholar Rx, UWorld).

How Anki Software Organizes Study Materials

- Potential for tagging flashcards by topic makes directed study easier.
- Meta-data search allows quick and easy way to find all flashcards with a specific term.
- Conversion of PowerPoint file-based Quick Hits into Anki Cards allows for searching of content and facilitates review during Step 1 study.
- Number of cards is overwhelming for some students.

Positive and Negative Potential

- Correct use of the Anki software could organize study material and easily allow students to practice studying with spaced repetition. This could benefit recall on examination.
- Anki is a software that requires training to become comfortable using it as a study aid. There are concerns that using Anki software to learn material instead of to study material will have negative outcomes.
- Use of copyrighted material is also a concern.

Conclusions

- The Brody Quick Hits and Brody-Pathoma Anki Decks were used by 35 of 74 students (47%).
- A subset of students preferred to use existing PowerPoint review materials rather than Anki.
- The combined Brody - Pathoma Anki deck is a valuable and effective educational tool for pathology medical student study.
- Combined deck supplemented learning and correlated well with class materials.
- Brody deck consolidated Quick Hits in a single, searchable location rather than in 85 separate PowerPoint files.
- Findings warrant further development of the combined Brody-AnKing Pathoma deck.

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