

Expertise

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For this project, the goal is to expand student capacity for learning and retention of surgery. Metrics of success will include the end of course exam at 8 weeks and the end of year national board exam at 9 months.

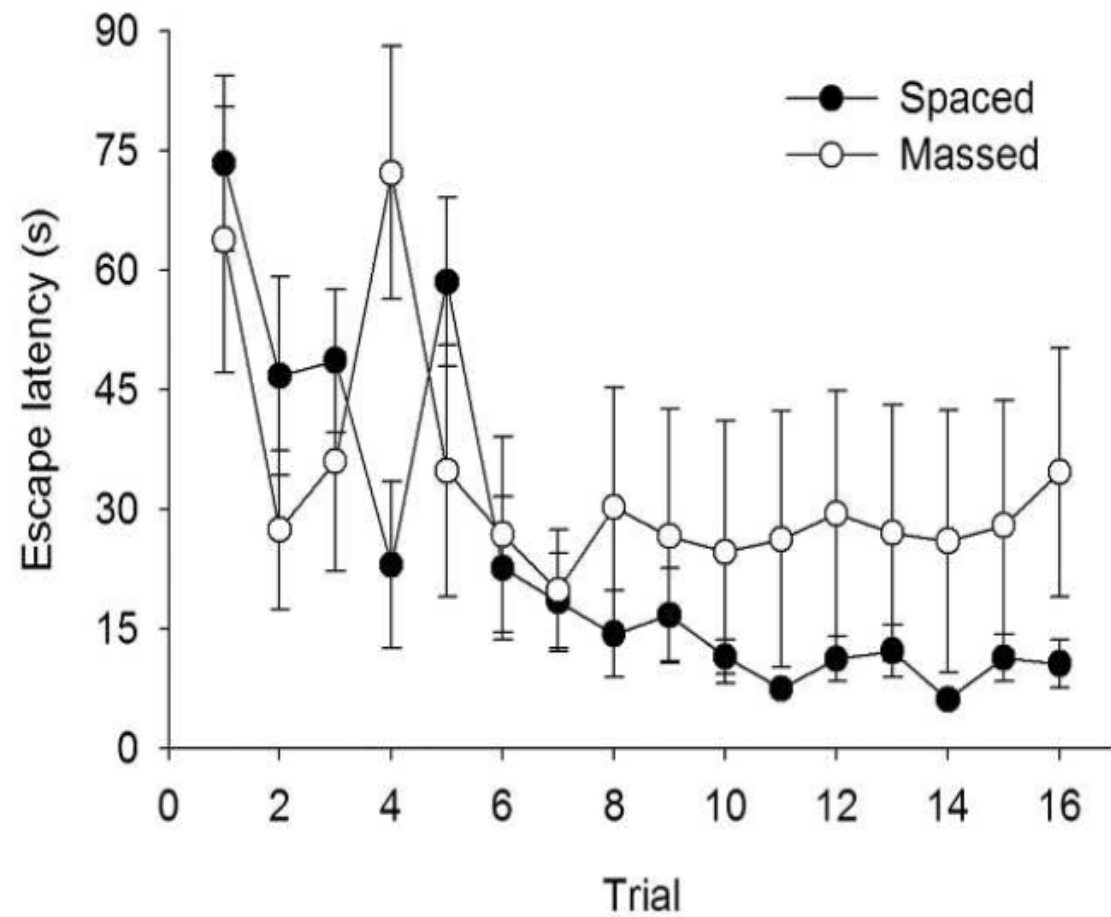
Project idea

App Goal: To send daily short-read content to student phones which students may read in 5-10 minutes while in between cases or waiting for rounds or in other short down times. This content will have the format of a 700-850 word document with figures and or tables which encapsulate a critical tenant of surgery. The content ends with 2-3 multiple choice questions. Questions would be provided repetitively to maximize retention.

'Student, you do not study to pass the test. You study to prepare for the day when you are the only thing between a patient and the grave.'

- Mark Reid

What is spaced learning?



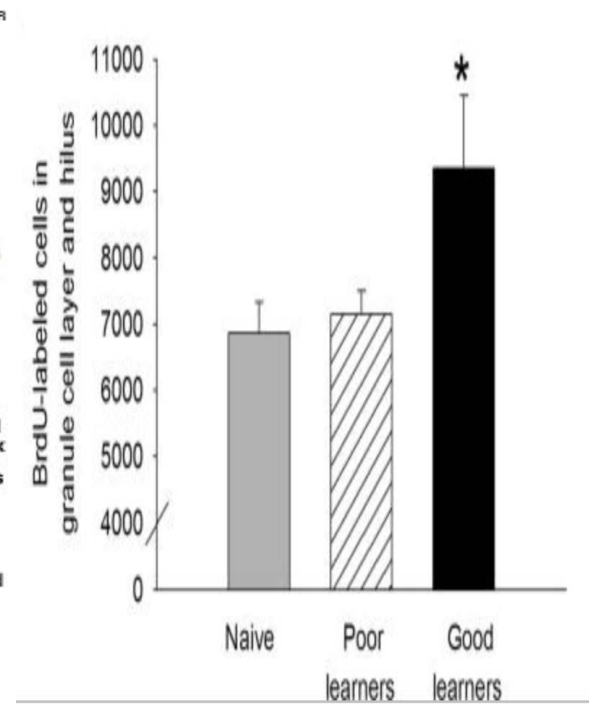
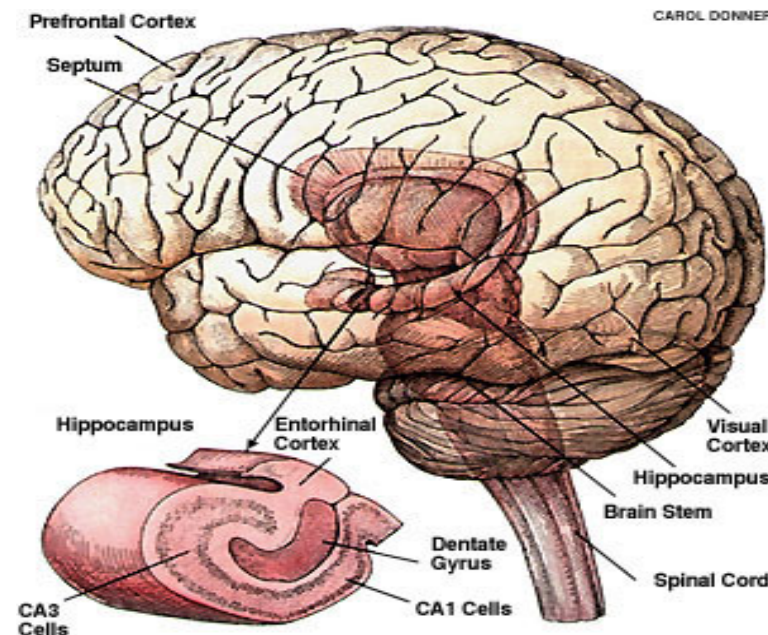
Sisti et al, Learning & Memory 2007.

Research

Neurogenesis and the spacing effect: Learning over time enhances memory and the survival of new neurons

Helene M. Sisti, Arnold L. Glass, and Tracey J. Shors¹

Department of Psychology and Center for Collaborative Neuroscience, Rutgers University



Current Solution: Surgical “Bytes”

- 700-1000 words-long
- sent to students on their phones every day, ideally twice per day on a specific topic
- Can be read during busy day quickly
- High quality textbook excerpt fortified with real literature on a topic, not a watered down version
- 2-3 questions on content for applied learning
- Questions can be repeated for spaced learning



A Surgical Byte on Hemorrhagic Shock

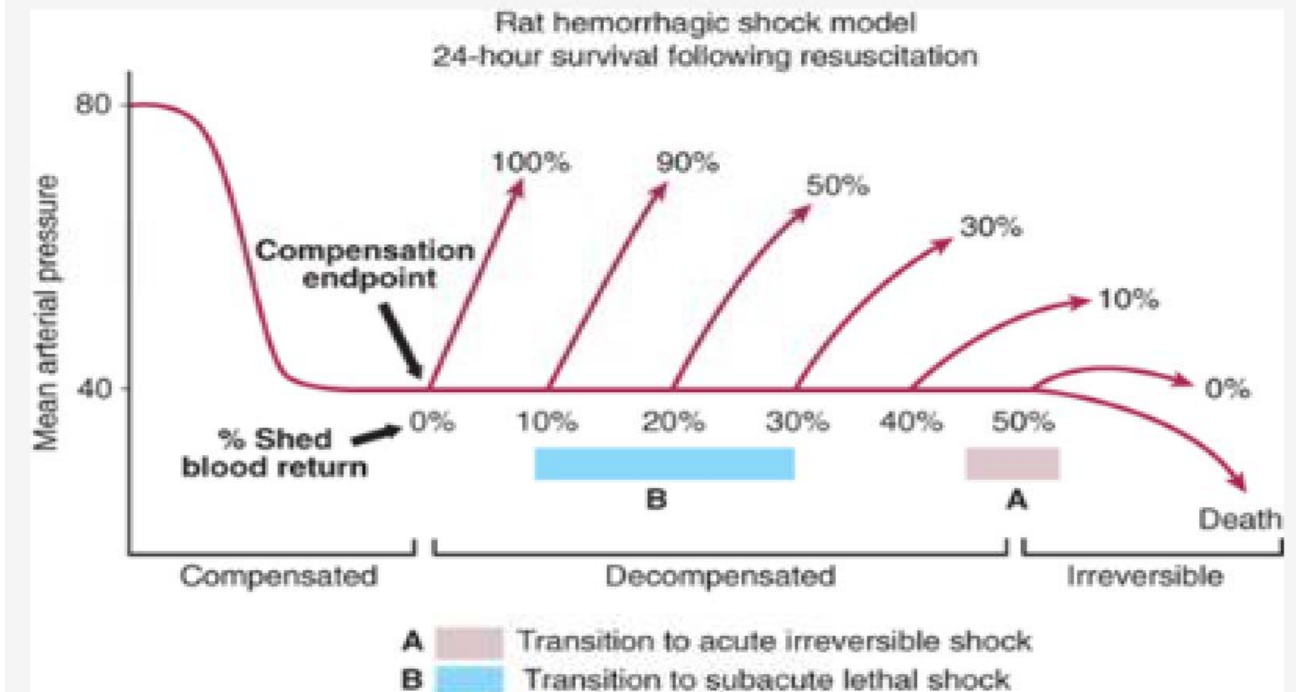
Classification of hemorrhage

	CLASS			
PARAMETER	I	II	III	IV
Blood loss (mL)	<750	750–1500	1500–2000	>2000
Blood loss (%)	<15	15–30	30–40	>40
Heart rate (bpm)	<100	>100	>120	>140
Blood pressure	Normal	Orthostatic	Hypotension	Severe hypotension
CNS symptoms	Normal	Anxious	Confused	Obtunded

bpm = beats per minute; CNS = central nervous system.

FIGURE 5-3.

Rat model of hemorrhagic shock through the phases of compensation, decompensation, and irreversibility. The percentages shown above the curve represent survival rates. (Adapted with permission from Lippincott Williams & Wilkins/Wolters Kluwer Health: Shah NS, Kelly E, Billiar TR, et al. Utility of clinical parameters of tissue oxygenation in a quantitative model of irreversible hemorrhagic shock. *Shock*. 1998;10:343-346. Copyright © 1998.)



Question following content

A 22 year old is extracted from a motor vehicle accident with a Glasgow Coma Scale of 13. He is complaining of abdominal pain and has an obvious open tibia fracture. He has a blood pressure of 100/80, a Pulse of 122, and respirations 20. Your next step is

- A. Head CT Scan
- B. FAST Scan
- C. Intubation
- D. Remove clothing and check for other injuries
- E. Placement of two large bore IVs



WHAT THE STUDENT WILL SEE

CORRECT ANSWER:

Placement of two large bore Ivs

TAKE HOME MESSAGE:

Treatment of a trauma patient begins with ABC's – Airway, Breathing, Circulation. Placement of two large bore Ivs addresses circulatory component of the presentation of hypotension and tachycardia typically associated with Class III hemorrhagic shock.

Explanation of Answer:

The clinical signs of shock may be evidenced by agitation, cool clammy extremities, tachycardia, weak or absent peripheral pulses, and hypotension. Such apparent clinical shock results from at least 25% to 30% loss of the blood volume. However, substantial volumes of blood may be lost before the classic clinical manifestations of shock are evident. Thus, when a patient is significantly tachycardic or hypotensive, this represents both significant blood loss and physiologic decompensation. The clinical and physiologic response to hemorrhage has been classified according to the magnitude of volume loss. Loss of up to 15% of the circulating volume (700–750 mL for a 70-kg patient) may produce little in terms of obvious symptoms, while loss of up to 30% of the circulating volume (1.5 L) may result in mild tachycardia, tachypnea, and anxiety. Hypotension, marked tachycardia (i.e., pulse greater than 110–120 beats per minute [bpm]), and confusion may not be evident until more than 30% of the blood volume has been lost; loss of 40% of circulating volume (2 L) is immediately life threatening and generally requires operative control of bleeding. Young healthy patients with vigorous compensatory mechanisms may tolerate larger volumes of blood loss while manifesting fewer clinical signs despite the presence of significant peripheral hypoperfusion. These patients may maintain a near-normal blood pressure until a precipitous cardiovascular collapse occurs. Elderly patients may be taking medications that either promote bleeding (e.g., [warfarin](#) or [aspirin](#)) or mask the compensatory responses to bleeding (e.g., β -blockers). In addition, atherosclerotic vascular disease, diminishing cardiac compliance with age, inability to elevate heart rate or cardiac contractility in response to hemorrhage, and overall decline in physiologic reserve decrease the elderly patient's ability to tolerate hemorrhage. **Recent data in trauma patients suggest that a systolic blood pressure (SBP) of less than 110 mmHg is a clinically relevant definition of hypotension and hypoperfusion based on an increasing rate of mortality below this pressure.**

For More information on this topic, please click the following links:

WHAT THE STUDENT WILL SEE (continued)

Your Answer , E was correct

Of the 48 students in Rotation 1, 37 have responded

Summary of responses

A – incorrect- 15 respondents

B- incorrect- 3 respondents

C- incorrect- 10 respondents

D- incorrect- 2 respondents

E- correct- 7 respondents

Please go on to question 2

Need for the App: Obstacles To Mastery of Surgery Content



TIME



FATIGUE



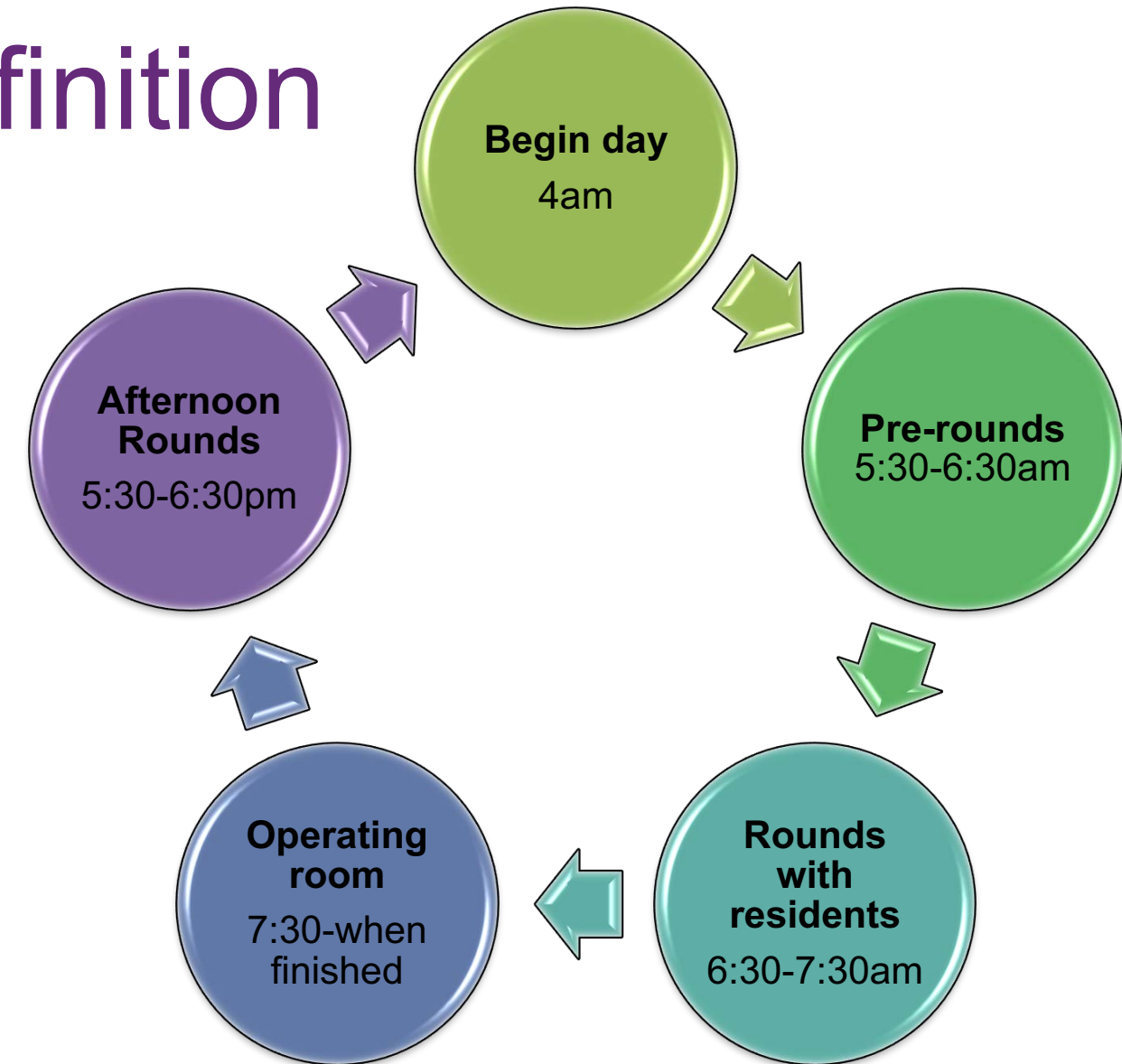
**REVIEW
BOOKS**



**POOR
RETENTION**

Problem Statement and Definition

- Need to capture small pockets (10-15 minutes) of down time during day for quality study content
- *Estimated 1-2 hours of quality time can be harnessed that is otherwise wasted*
- Need to provide high impact, prioritized content to optimize mastery of the topic
- Need long-term retention



Potential App Contributions

High Priority

- User-friendly UI
- Quiz Interface
 - Spaced Repetition
 - For each lesson and a final review
- Searchable Articles
- Links to external & internal sources
- iOS functionality
- Quiz leaderboard to gauge how progress is compared to others
- Audible- can hear content while driving/commuting/at gym
- ability to continue spaced learning program after the course in preparation for boards

Low Priority

- Modifiable text size
- Quiz customizability
 - Track how many days in a row they have kept up with the quizzes
- Considerations for scaling
 - Organizing other specialties within the app
 - Search filters
- Android functionality

Challenges

Keeping students interested

Adherence to spaced repetition –

- 2 contents per day x 49 days x 2-3 questions per content
- Review at every 2 weeks x 3 with 4th review in week 7
- Review every 8 weeks until boards. Questions sent to phone are based on accuracy of prior responses.

Keeping engaged in the app after the clerkship is over

Audience: Third Year (M3) Medical Students



- on surgical clerkship
- approx. 24-30 y/o, highly educated students
- users need a working, general medical knowledge base
- after articles are translated, this app could be used in medical education around the globe



There are 20,000 medical students in the US. Several thousand more are world-wide.

Other relevant Apps

Firecracker

Ankii

Qstream.com