

# Graphic Narratives as Interprofessional Teaching Tools

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# Learning Objectives

- **Understand value of Graphic Narratives in Interprofessional medical education**
- How to apply graphic narrative techniques – premedical education (A Tan)
- Access Graphic Narrative educational materials in the BICC: (P Pierce)
- Use Interprofessional Graphic Narratives as teaching tools (M Osborne)
- Identify Graphic Narrative techniques useful in your educational portfolio

# Understand the value of graphic narratives in Interprofessional education

- Graphic Narratives uniquely demonstrate
  - The reaction to bad news; ‘only 5%!!’
  - Multiple feelings experienced simultaneously in an Interprofessional team
  - Moral Distress felt in an Interprofessional team; i.e. ‘we’re torturing him’
  - Methods used to address moral distress; i.e. ‘putting on armor’

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# Future Work

- Colorblind or visually impaired learners
- A complement vs. a replacement for teaching
- For particularly challenging topics to visualize
  - Pathophysiology between multiple organ systems (FUND)
  - Workflow algorithms (e.g. workup of dx)
  - Classification of key points for clerkship
  - Workshops for students to visualize their own diagrams



# **Applications of graphic narrative techniques in premedical education**



# Message vs. Medium

What you remember vs why you remember it!

- Mnemonics
- Case-based learning
- Study guides + PowerPoint slides
- Third party “high yield” websites and materials
- Tutoring sessions

*Are our current tools the best medium to tell a story that students can visualize, recall, and remember?*

# Classic methods of delivering stories in education

## Roadmap

*something to hang your hat on  
big pictures takeaways*

## Clear objectives and summaries

*emphasizes essentials*

## Examples

*cases to prove a point*

## Mini-quiz feedback

*quickly assesses info absorption*

## Consolidation

*An understanding of how new  
information fits into one's overall  
foundation of knowledge*

## Study Guides

GCD 3033

Spring 2012

### Cell Biology Study Guide ECB Chapter 6

#### DNA replication

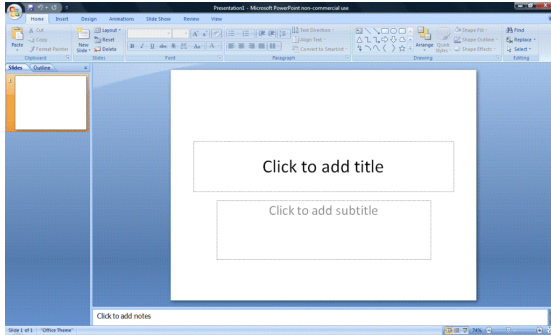
The ability to accurately replicate and repair DNA is critical to life. The mechanism of DNA replication is built into the DNA double helix, with each strand acting as a template to form a new complementary strand. This type of replication is called **semi-conservative**: one strand in each replicated DNA molecule is passed on directly from the original, while the other strand is newly synthesized. Evidence for this model was obtained in the 1950s using heavy and light isotopes of nitrogen in a famous series of experiments by Meselson and Stahl (see "How We Know," page 200).

DNA replication begins at multiple points along a chromosome, at A-T rich sequences called **replication origins**. A short stretch of DNA double helix is unwound at the origins, providing access to **DNA polymerase** and associated factors. A single DNA polymerase molecule catalyzes the addition of thousands of nucleotides to the growing 3' end of a DNA strand, using the hydrolysis of phosphate bonds as energy.

DNA replication proceeds in both directions from replication origins at **replication forks**, which move outward from the origin as the two DNA strands unwind. Because of the inverse polarity of each DNA strand, the replication fork is asymmetrical: DNA synthesis in the 5' to 3' direction moves toward the replication fork on one strand (the **leading strand**) and away from the replication fork on the other strand (the **lagging strand**; see Figure 6-12). Therefore, one new DNA strand is synthesized continuously whereas the other grows discontinuously, through the repeated addition of short segments of DNA called **Okazaki fragments**, each usually less than 1000 nucleotides in length. These fragments are joined to the existing strand by **DNA ligase**.

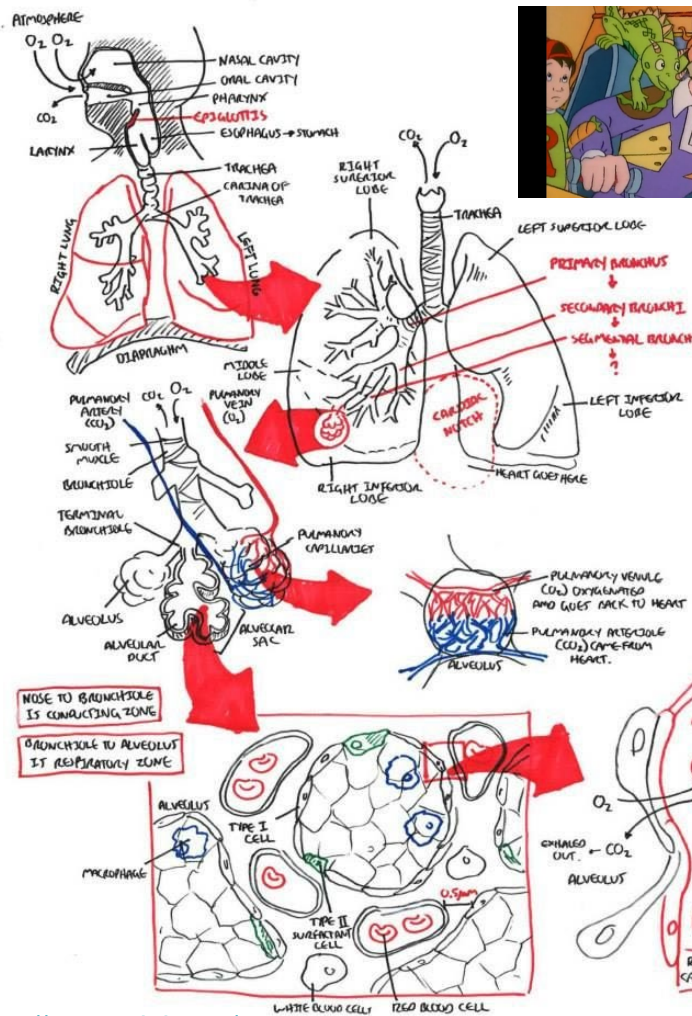
DNA polymerase has an extremely low error rate (~1 error for every  $10^7$  bases), due to its ability to **proofread** for incorrectly incorporated nucleotides. This relies on an exonuclease function of DNA polymerase, which is independent of its 5'-3' polymerase activity. DNA polymerase can immediately sense if it has added an incorrect nucleotide, remove it via this 3'-5' exonuclease activity, and reinsert the proper nucleotide before continuing.

Unlike RNA polymerase, which functions in transcription, DNA polymerase cannot begin synthesizing a new DNA strand from scratch. Instead, it requires a free 3' end of an existing nucleotide chain. DNA synthesis therefore begins with the synthesis of a ~10 nucleotide RNA strand called a **primer**, by a special RNA polymerase called **primase**. This occurs once at the replication origin on the leading strand, and multiple times on the lagging strand as each Okazaki



## Powerpoint Presentations





# WEEK 3

**CO<sub>2</sub> O<sub>2</sub>**

HEART LUNGS

BLOOD FLOW

↑ CARRYING CAPACITY

**This Week:**

- TV Atherosclerosis + Coronary Artery Disease
- AT Stable Ischaemic Angina
- AT Acute Myocardial Infarction
- TV Ischaemic Heart Disease
- TV Bradyarrhythmias
- TV Tachyarrhythmias
- TV Anti-Arhythmic Drugs
- AT Cardiac Hypertrophy
- AT Valvular Disease I - Mitral
- AT Valvular Disease II - Aortic

## CARDIO-VASCULAR PRINCIPLES

the heart is very demanding **CARDIAC MUSCLE** cannot tolerate ischemic insults!

all we want is adequate O<sub>2</sub> delivery to meet our tissues' metabolic demands!

+ → angina: the clinical sx presenting with central chest pain.

### ISCHEMIA

Inadequate O<sub>2</sub> supply + impaired metabolite removal

↓ **MYOCARDIAL INFARCTION**

follows COAGULATIVE necrosis PATHO PHYSIOLOGY, plus the heart @ risk for future events

### VASCULAR

Arteries are susceptible to atherosclerotic injury which compromises blood flow by blocking the vessel lumen → ischemia of the heart

### ATHEROSCLEROSIS

macrophage → foam cell

artery endothelium

Subendothelial space

### RISK FACTORS

- non-modifiable: age, ethnicity, biological sex (MALE)
- modifiable: smoking, elevated cholesterol, sedentary lifestyle, obesity, insulin resistance, diabetes, etc. in case 12

#### STABLE ANGINA

fixed coronary obstruction

chest pain w/ predictable onset

known trigger stress, physical exertion

relieved w/ nitroglycerin, rest

increasing severity

NO ECG changes / cardiac biomarkers

atheroma

acute events: all plaque rupture

#### UNSTABLE ANGINA

partial, reversible obstruction

chest pain new onset, unpredictable

pain occurs while resting

atypical angina

increasing severity

ECG changes / cardiac biomarkers

subendocardial partial plaque

#### NSTEMI

partial, irreversible obstruction

chest pain "white thrombi" (platelets)

DO NOT GIVE thrombolitics!

ECG changes / cardiac biomarkers

transmural partial plaque

#### STEMI

complete, irreversible obstruction

chest pain red thrombi (fibrin-platelets)

DO NOT GIVE thrombolitics!

ECG changes / cardiac biomarkers

transmural full wall thrombus

DIFFERENTIAL DIAGNOSIS:

- Ischaemic heart disease
- Myocardial infarction
- Dissecting aortic aneurysm
- Dissection
- Dissecting aortic aneurysm
- Dissection
- Dissecting aortic aneurysm
- Dissection
- Dissecting aortic aneurysm
- Dissection

cellular necrosis

atheroma

acute events: all plaque rupture

# Autonomic ADRENERGIC PHARMACOLOGY

DRUGS HAVE

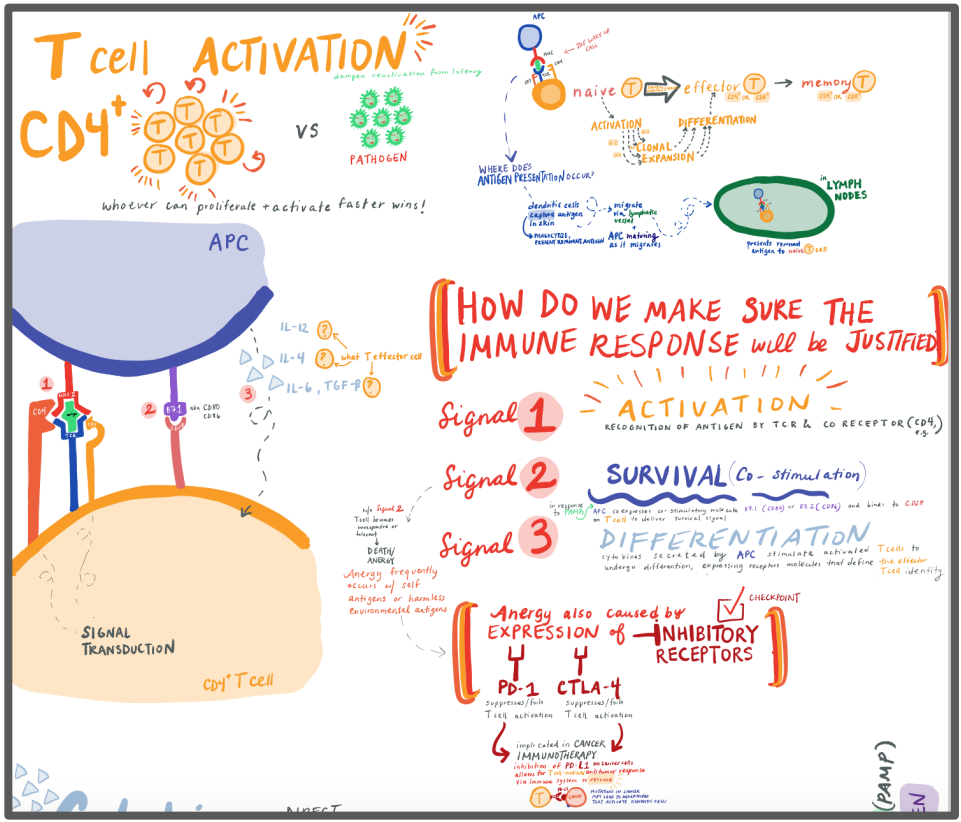


**DIRECT!**  
**SYMPATHOMIMETICS**  
adrenergic agonists



**adrenergic antagonists**

Most important info is largest.



Visual mnemonics - "activated" state vs inhibited state

A question that stems from curiosity from a "pre-knowledge" state

so you've got  
**CHEST PAIN**  
what's on the differential dx?



### + CLINICAL CLASSIFICATION

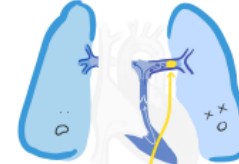
- TYPICAL ANGINA** definite
- 1) SUBSTERNAL CHEST PAIN "if come, gnawing, heavy"
  - 2) PROVOKED BY EXERCISE
  - 3) RELIEVED BY REST/NITROGLYCERIN
- atypical ANGINA** probable
- meets 2 of 3 above CRITERIA
- noncardiac CHEST PAIN**
- meets 1 or less of above CRITERIA



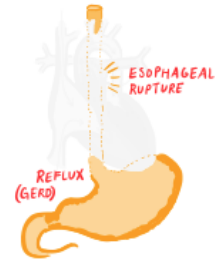
**ENDOCARDITIS**  
often affects valves  
**MYOCARDITIS**



**PERICARDITIS**



**PULMONARY EMBOLISM**



**REFLUX (GERD)**

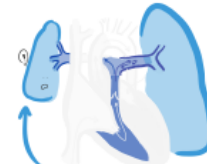
**ESOPHAGEAL RUPTURE**



**AORTIC ANEURYSM**  
can be asymptomatic along aorta



**PERICARDIAL TAMPONADE**



**PNEUMOTHORAX**  
(collapsed lung dist air entering pleural cavity)



**Acute MYOCARDIAL INFARCTION**



**AORTIC DISSECTION**

Use high contrast color to emphasize, light colors to de-emphasize.

Use the same image template to create consistency and identify distinctions between dx.

Annotate graphs to highlight critical points, e.g therapeutic "window"

### Therapeutic WINDOW

ED<sub>50</sub> = dose needed to produce effect in 50% of popn  
 TD<sub>50</sub> = dose needed to produce toxicity in 50% of popn  
 ED<sub>01</sub> = median effective dose  
 TD<sub>01</sub> = median toxic dose

pain relief      gastric irritation  
 50%  
 ED<sub>50</sub>      TD<sub>50</sub>  
 % of patients responding  
 drug concentration

### PHYSICO-CHEMICAL properties of drugs

#### 1) IONIZABLE FXNAL GROUPS

aka physiological relevance of pH/pKa

PH SCALE

1	2	3	4	5	6	7	8	9	10	11	12	13	14
acid													base

BLOOD pH 7.4  
 CSF pH 7.2  
 SMALL INTESTINE pH 6.5  
 SALIVA pH 6.5  
 MUSCLE pH 7.0  
 URINE pH 5.0  
 STOMACH pH 1.5

CHARGED form = more plasma soluble  
 can circulate around body more easily  
 NEUTRAL form = more membrane permeable  
 can enter target cells more easily

EACH ionizable group has an associated pKa.  
 if the pH < pKa, compound will most likely be in protonated form.  
 and vice versa...

pKa = the pH @ which 50% of drug exists in NEUTRAL form and 50% is in CHARGED form.

acids: HO-C(=O)-R (NEUTRAL) ↔ [O-]-C(=O)-R (CHARGED)  
 bases: H-N-R (CHARGED) ↔ N-R (NEUTRAL)

low pH → PROTONATED      pKa      DEPROTONATED → high pH

### ADME

### PHARMACOKINETICS

Route of INTRAVENOUS vs ORAL administration

Dissolution pKa  
 acidic pH of stomach, GI tract  
 GI metabolism  
 permeation of GI membrane into portal vein  
 first pass liver metabolism (metabolism before reaching)

elimination through liver or kidneys  
 permeation of capillary epithelial barriers into target tissue/organ  
 plasma membrane permeation of target cell

exposure @ target

SELECTIVE (most drugs) = selectively prefer a given receptor, but exhibit activity @ >1 receptor site if concentration high enough  
 SPECIFIC = drug has one AND only effect on all biological systems

Henderson-Hasselbalch quantifies how much of each form exists @ a given pH  
 ionizable group pKa = 3.5  

$$pH = pKa - \log \frac{[A^-]}{[HA]}$$

$$3.0 = 3.5 - \log \frac{[A^-]}{[HA]}$$

$$\frac{[A^-]}{[HA]} = \frac{3}{1} \text{ to } 1 \text{ ratio}$$
 (Note: The original image has a typo in the Henderson-Hasselbalch equation, it should be pH = pKa + log([A-]/[HA]).)

Use space to emphasize key comparison

# B L H D WEEK 3



HEMATOLOGY & IMMUNOLOGY

clots (thrombi) [platelets] coagulation cascade

bleeding disorders

- nose bleed
- scraped knee
- bruising (internal hemorrhage)
- gunshot wound



A question that stems from curiosity from a "pre-knowledge" state

WHAT KEEPS US from BLEEDING OUT?

BONUS: visual mnemonic that "activation" comes from cleavage of inert enzyme → active enzyme; a key regulation step



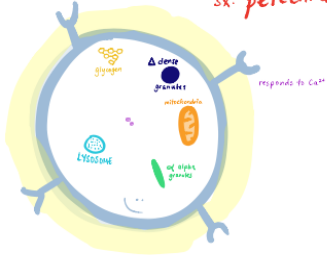
Activating glow

1. PLATELETS  
1° HEMOSTASIS - temporary, dislodged



no nuclei, tiny cytoplasmic fragment, sx: petechiae, mucosal bleeding (gums, epistaxis)

of which white blood cell?



VASOCONSTRICTION

2. COAGULATION  
2° HEMOSTASIS

cascading signal of factors (serine proteases, cofactors) that activate the subsequent factor to initiate wound healing, stop bleeding

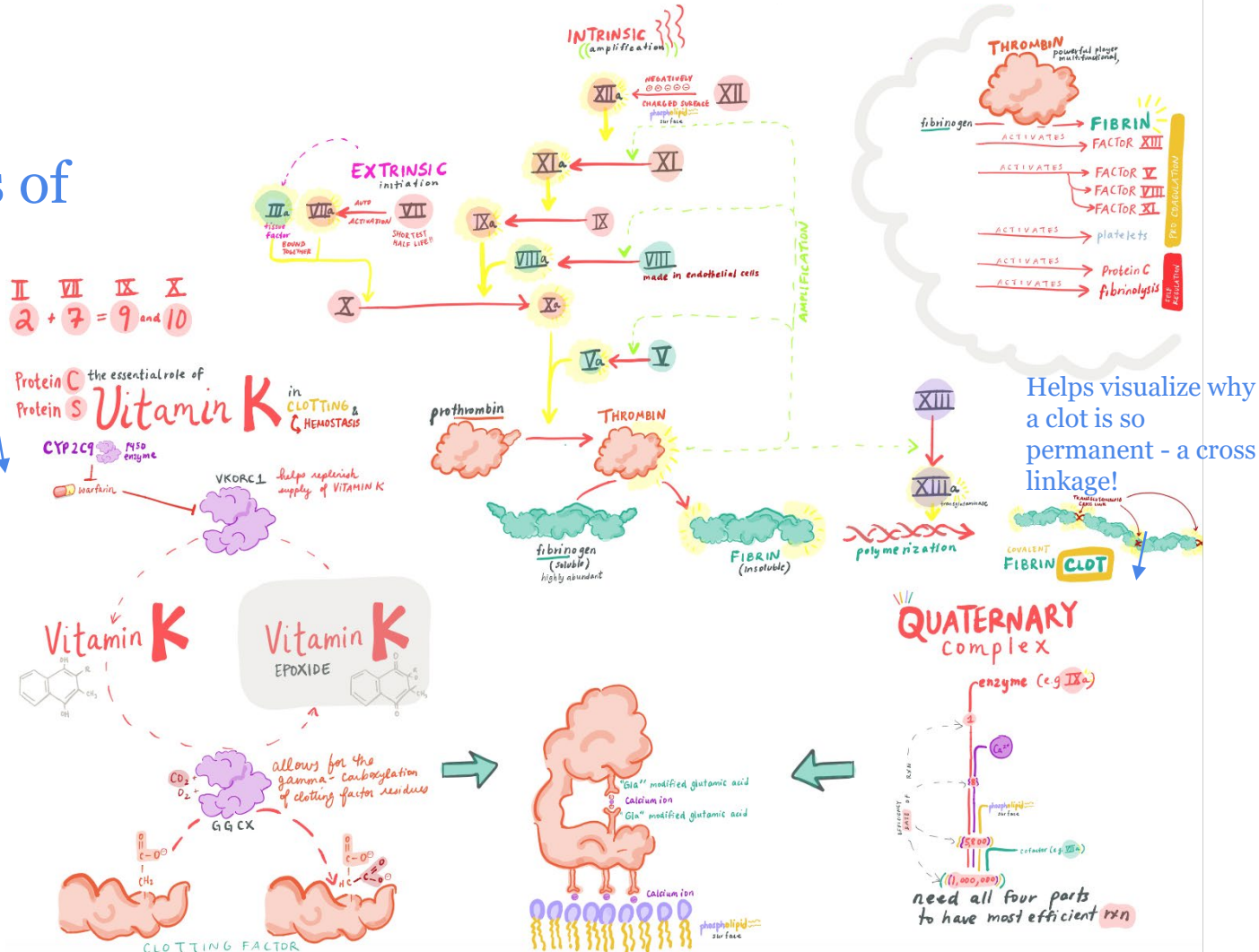
fibrin-based



sx: deep bruising, ecchymoses, bleeding into joints

Use space to emphasize key comparison

# Proximity contextualizes disparate pieces of information

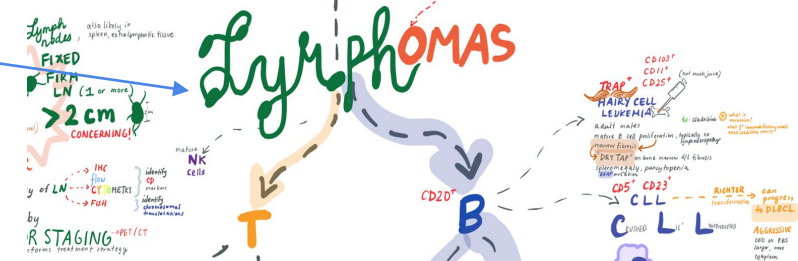


Helps visualize why a clot is so permanent - a cross linkage!

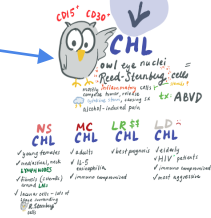


Proximity contextualizes disparate pieces of information: roadmap diagram helps understand prevalence and how to orient and organize hematologic disease

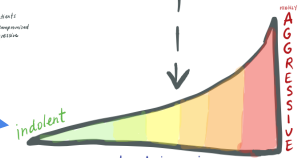
Lymph node visual mnemonic



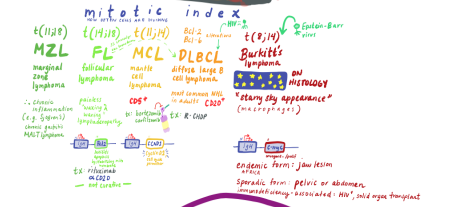
Owl eyes... visual mnemonic



Color coding (green = benign) helps us see that indolence = low rate of cancer cell division



CTURE nph Nodes





Trauma Informed Oregon @tioregon · Nov 21, 2019

It arrived and I can't wait to dive in. #traumainformed #systemchange @DralishaMD. The art already has me hooked!

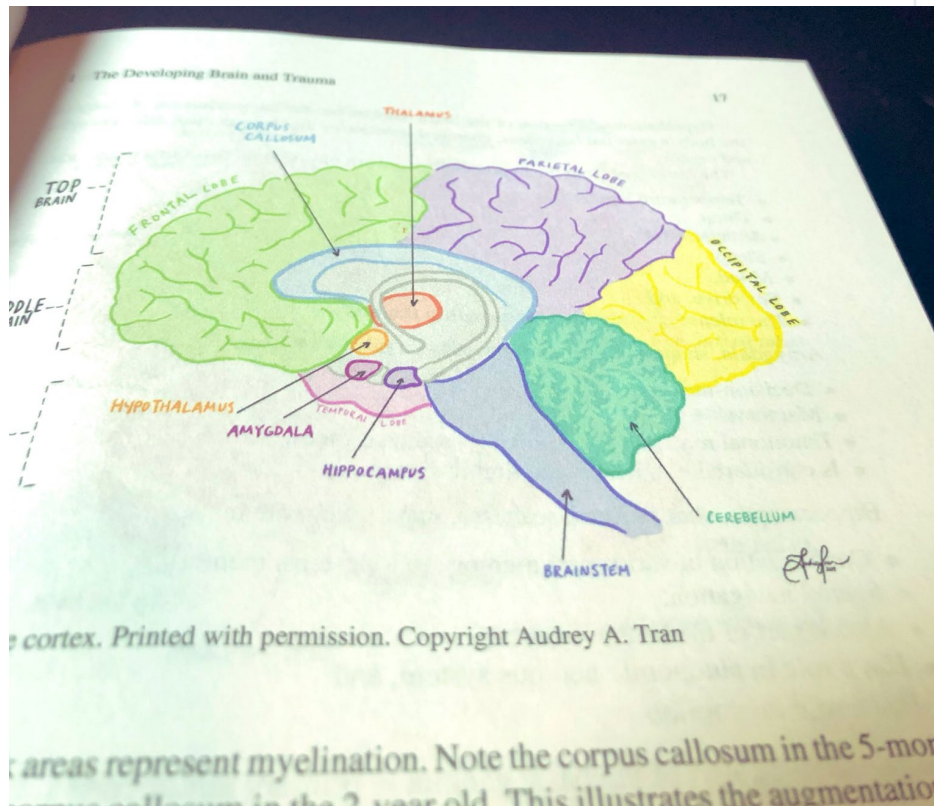


Alisha Moreland-Capua

# Training for Change

Transforming Systems to be Trauma-Informed, Culturally Responsive, and Neuroscientifically Focused

With contributions from Audrey A. Tran







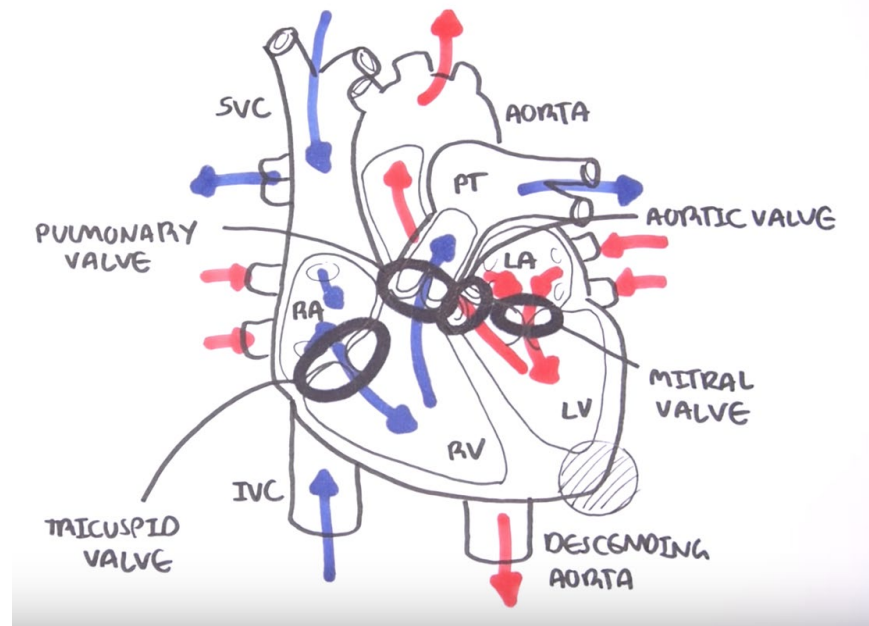
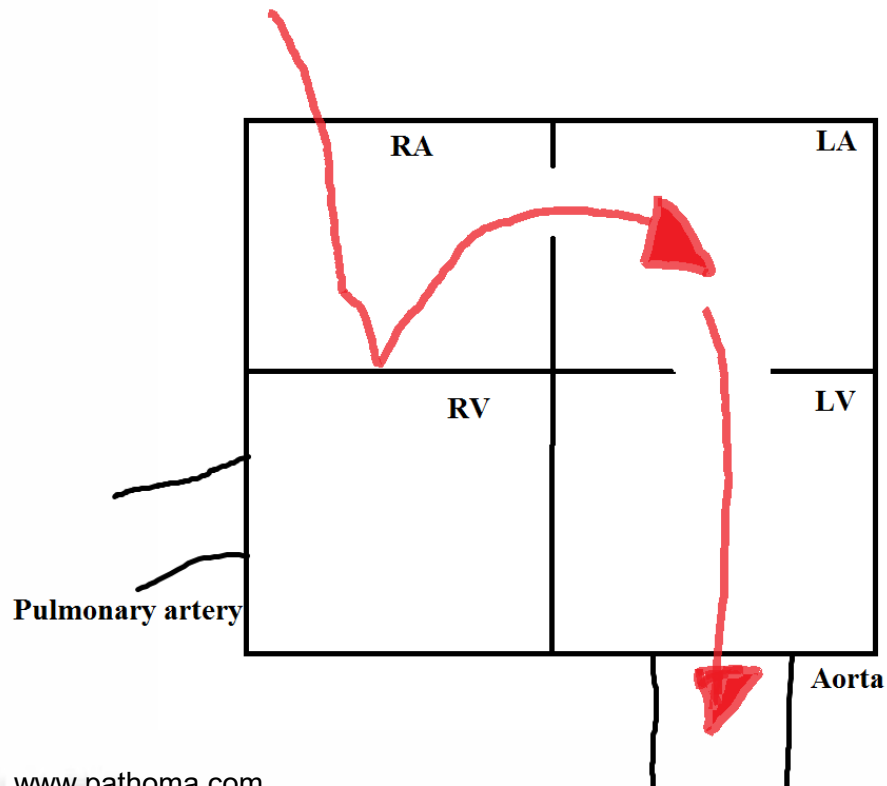
## Benefits of applying graphic narrative to education

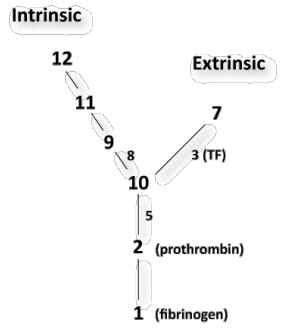
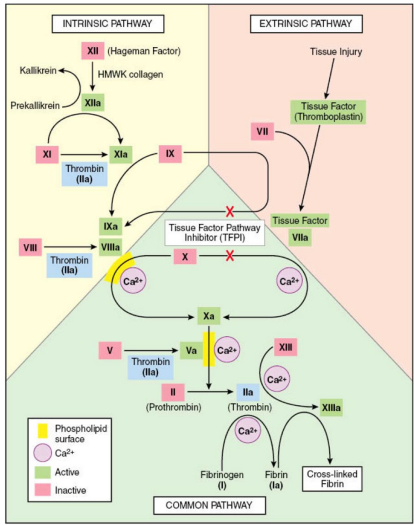
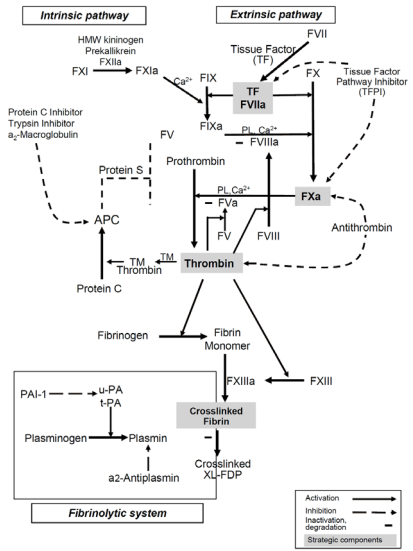
- Can help students understand the full scope of expectations “at a glance”
- Can help students learn through visual recall
- Can help students make key associations that are more “obvious” to seasoned researchers
- Images are more uniquely memorable than tables or study guides
- Particularly attractive and engaging for visual learners

## Drawbacks of applying graphic narrative to education

- Time-consuming
- Takes a certain level of drawing skill

# Simple works: don't have to be an artist, just a communicator





accuracy  
facts  
details  
footnotes

engagement  
readership  
takeaways  
streamlined

# Tradeoff

Simple vs simplistic  
Easy to memorize vs. memorable  
Accuracy vs. relevance  
Detailed vs. disorienting

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# Graphic Medicine at the OHSU Library

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DATE: Feb. 5, 2020 WRITTEN BY: Pam Pierce,  
Digital Scholarship & Repository Librarian

OHSU Librarians,



# Contacting the OHSU Library

- <https://www.ohsu.edu/library>
- [Contact Us](#)
- [library@ohsu.libanswers.com](mailto:library@ohsu.libanswers.com)
- [Schedule an appointment with a librarian](#) at BICC, RLSB or virtually
- 503-494-3460 (Service Desk: M-F, 8am – 6pm)

# Graphic Medicine Resources

LibGuide describing books is available at:  
<http://libguides.ohsu.edu/graphicmedicine/novelsatOHSU>.

**\*Fertility and abortion**

**\*Cancer /Neoplasms**

\*Mental Health

**\*HIV/AIDS**



# Graphic Medicine and Instruction

- Visuospatial and motor skills
- Empathetic problem solvers
- Creativity as a means of getting students connect with material they wouldn't otherwise engage with
- Taking risks and failing





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# Get It For Me Service

(interlibrary loan/document delivery service)

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## Get It For Me FAQ

- What is it?**

OHSU Library's Get It For Me service is the combination of services also known as interlibrary loan and document delivery. The service allows users to request material either owned or not owned within the OHSU Library collection. Get It For Me is a service provided at no charge to OHSU credentialed users (faculty, residents, staff, emeritus and students). If you are a Non-OHSU user and are interested in requesting items through OHSU Library, please visit this [page](#).
- How do I make a request?**

Learn how to make a request [here](#).
- How much does it cost?**

Get It For Me service is provided at no cost to OHSU faculty, residents, staff, emeritus and students.
- How long does it take to receive items?**

PDFs typically arrive within 1-3 business days. Physical items typically arrive within 1-3 weeks depending on availability.
- How do I ask for a rush service?**

After submitting your request, please follow up with an email [libdoc@ohsu.edu](mailto:libdoc@ohsu.edu) or a phone call [503-494-3460](tel:503-494-3460) so that we can expedite it.
- Do I have to enter each request manually?**

While a separate request must be made for each item you need, if you are using a database like [PubMed](#) or Scopus to search for citations, look for the link resolver ["Find It @OHSU Library"](#) button at the top right of your screen. The link resolver 'talks' to our catalog and if it determines that we don't own what you are looking for, you can click on the 'Request via Get It For Me service' link at the bottom of the catalog record and a request will auto-populate for you.
- Are there limitations or restrictions on what I can request?**

We will not fill requests for textbooks and leisure/recreational materials—often those items can

# Learning Objectives

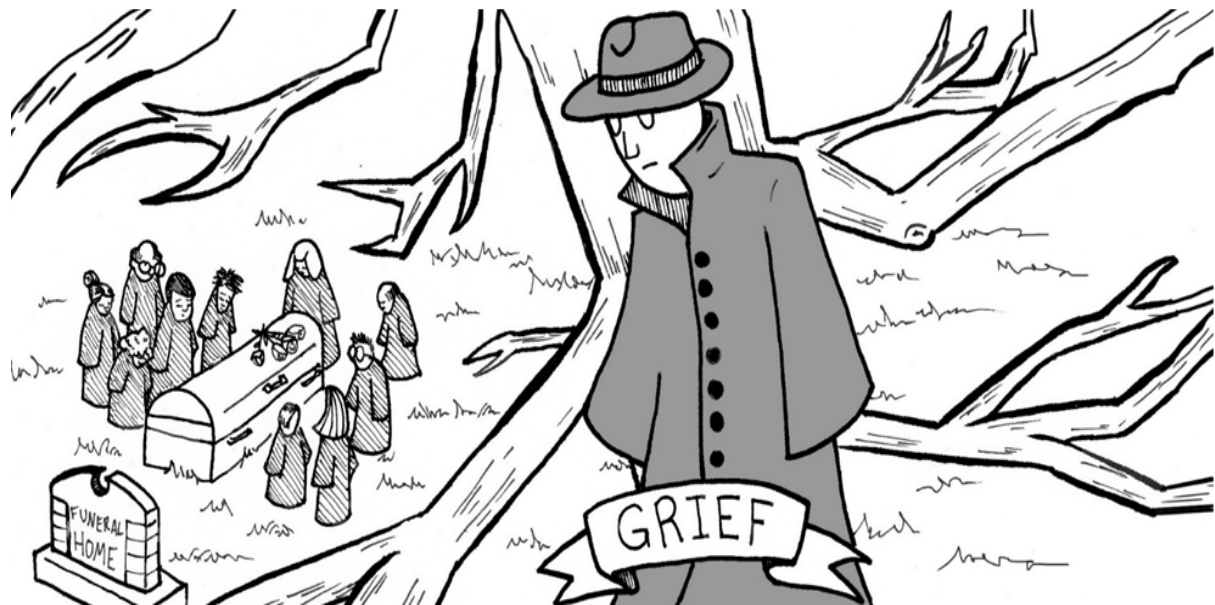
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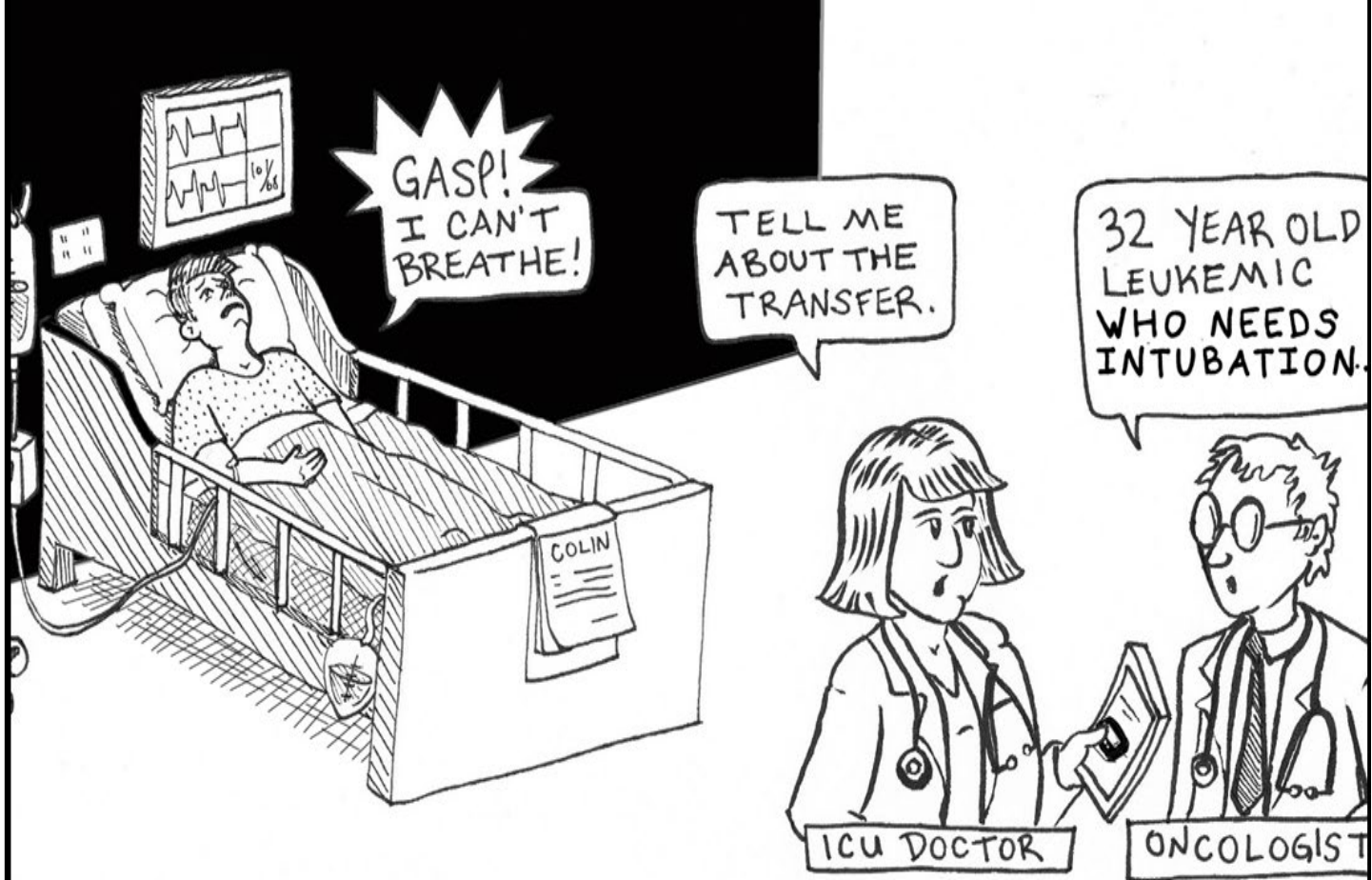
# Graphic narrative of ethics/ futility

'Critical Space' is a published graphic narrative addressing futility in the Intensive Care Unit (ICU)

Discussion topics for interprofessional teaching

- What are the ethical dilemmas?
- Is the care futile?
- How is grief addressed?
- How are decisions made and conveyed to family?
- How is the medical hierarchy conveyed?





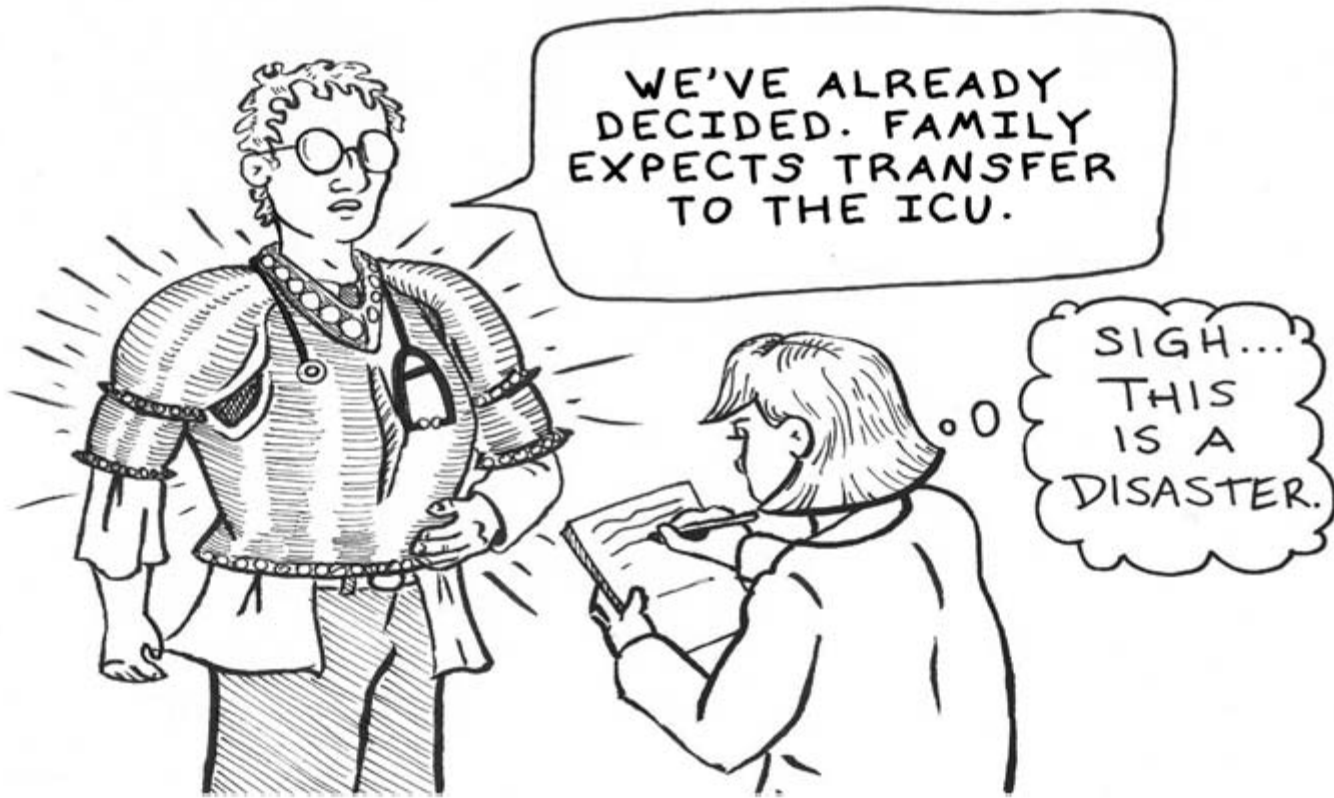
GASP!  
I CAN'T  
BREATHE!

TELL ME  
ABOUT THE  
TRANSFER.

32 YEAR OLD  
LEUKEMIC  
WHO NEEDS  
INTUBATION.

ICU DOCTOR

ONCOLOGIST







PATIENT IS  
STABLE. MONITOR  
CLOSELY OVERNIGHT.

RESIDENT

RN





6AM-MORNING ROUNDS

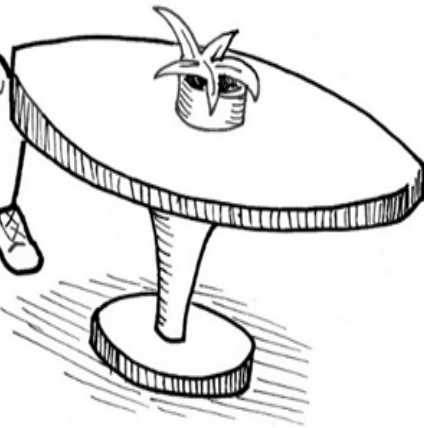


NEUROSURGEON

BRAIN HERNIATION.  
NOTHING SURGICAL  
HERE...

ICU TEAM

SURGERY  
WON'T HELP...



I WORKED IN AN ICU.  
YOU NEED TO GET AN  
MRI, EEG, AND CT SCAN!



WE'VE PULLED HIM  
THROUGH THE ICU  
THREE TIMES!







# Graphic narrative of ethics/ futility

'Critical Space' is a published graphic narrative addressing futility in the Intensive Care Unit (ICU)

## ***Discussion topics for interprofessional teaching***

What are the ethical dilemmas? *Beneficence, autonomy*

- Is the care futile? *It depends on the perspective*
- How is grief addressed? *Grey figures of grief*
- How are decisions made and conveyed to family? *Oncologist, ICU doctor*
- How is the medical hierarchy conveyed? *Armor, moral distress/nursing*

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## **Identify Graphic Narrative techniques in your educational portfolio**

Take several min to talk in small groups – *possible topics*

- Ways graphic narrative techniques could be used in your work
- Challenges to using graphic narrative techniques
- Innovative approaches to using graphic narratives

# In summary

- The use of graphic narratives in education is increasing
- Graphic narratives can be used as
  - study materials
  - Teaching materials
  - Presentations with topics ranging from ethics to clinical medicine
- BICC has materials supporting graphic narratives in education



Thank You