Perspective: Practical Experience on Building a Radiology Outreach Program for Baltimore City Youth

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Introduction

- **Why?** →
  - ✓ Consequences of persistent socioeconomic and racial/ethnic disparities in US have become increasingly clear over time
  - ✓ Many institutions discussing how to proactively address these issues
  - ✓ Radiologists should seek to attract more underrepresented-in-medicine individuals to the field through outreach to primary education age students (recent JACR editorial)[1]
  - ✓ We offer a practical perspective on our own outreach efforts in Baltimore City, MD
- **What?** → UMB Cure Scholars Program
  - ✓ Launched In 2015 by the University of Maryland, Baltimore
  - ✓ Longitudinal after-school and summer program
  - ✓ Designed to provide mentorship and education for West Baltimore middle and high school students interested in STEM careers
  - ✓ Initially grant-funded through NCI and NIH [2]
  - ✓ To date, the program has eight cohorts of students[3]
  - ✓ Each year, scholars in this program participate in a robust, year-long curriculum, with students participating in one of several offered STEM fields.

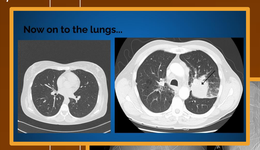
Methods

- **When?** → 2021 - ongoing
- **Who?** → Residents and faculty from Radiology and Nuclear Medicine at UMMC
- **Which?** → Partnered with UMB Cure Program
- **How?** → Deliver 4-5 presentations per year
- **Participants?** → Seventh-grade students enrolled in a year-long anatomy course
- **Procedures?**
  - → The first lectures were focused on public health topics, such as smoking, obesity, diabetes, and COVID, and a general introduction to the field of radiology.
  - → A year-long curriculum was developed to provide imaging correlation with the concepts about which they were learning.

We were fortunate to have the opportunity to partner with a local, established program with a pre-existing curriculum, which is far easier than creating something de novo.

Contacting leadership, such as teachers, principals, or community directors in a given location can be an easy way to start this conversation to gauge interest and learn what might meet students' and educators' needs.

Results



Challenge: Creating Educational Content

Solutions:

- **Coordinating with teachers/ administrators**
  - What is currently being taught in curriculum?
    - Anatomy & Physiology
    - Labs, dissections, etc.
  - Neither too basic nor too advanced for student levels
- **Picking topics of interest**
  - Direct experience of students' friends, relatives, etc.
    - Public health
    - Cancer
    - Gun violence
- **Parallelling program's system-based course structure**
  - Urinary
  - Cardiovascular
  - Nervous
  - Digestive
- **Illustrating concepts of normal anatomy vs pathology**
  - Displaying normal and abnormal images side-by-side
  - Utilizing mix of institutional and publicly available images, e.g. Radiopaedia™
    - Radiographs
    - Fluoroscopy
    - Ultrasound
    - CT
    - MRI
- **Lessons building on themselves**
  - 5-10 minute introduction to modality and anatomical planes →
  - Use this framework to introduce imaging of familiar diagnoses:
    - Diabetes
    - Cholelithiasis
    - Renal calculi
    - Cirrhosis
    - Emphysema
    - COVID-19

Challenge: Finding Volunteers

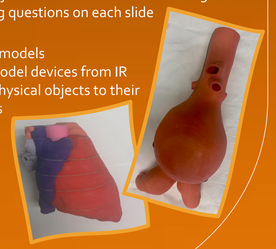
Solutions:

- **Opportunity catering to resident interest**
  - Education
    - Both creating and presenting content
  - Community outreach
- **Team-based teaching approach**
  - Typically 3-4 residents
  - Allows for lower time commitment and increased participation
  - Varying lecture styles → helps maintain student engagement[5]
- **Professional benefits**
  - Unique program feature to highlight during interviews
  - Research opportunities
- **Pre-clinical med student volunteers**
  - Helpful to spread out and sit among students even without prerequisite knowledge to teach
  - Bonding with students
  - Encouraging participation with positive reinforcement
  - Bonus: raising radiology's visibility among med students
- **Seeking volunteers from diverse range of backgrounds**
  - STEM role models from underrepresented backgrounds shown to help increase diversity in medicine[6]

Challenge: Student Participation

Solutions:

- **Well-targeted content**
  - Matching difficulty level they're learning in class
    - Trial and error to home in on proper level
    - Modifying content accordingly for future sessions
      - Longitudinal involvement with program
  - Recognizable images and diagnoses
    - e.g. Penetrating trauma
    - e.g. E-cigarette/vaping use-associated lung injury
    - 3D volume rendered images and coronal reconstructions > less intuitive axial images
- **Breaking up slide content**
  - More Images > Less Text[7]
  - Icebreakers to start each session
    - e.g. Showing examples of recognizable objects and animals to have them guess[8,9]
  - Asking questions on each slide
- **Hands-on**
  - 3D-printed models
  - Teaching model devices from IR
  - Matching physical objects to their radiographs
    - Stents
    - CVL
    - PEG



- **Incorporating movement**
  - Games!
  - Competition!
  - e.g. Jeopardy
    - Sprinting to front of room to correctly identify structure/abnormality

Challenge: Technology-Intensive

Solutions:

- **Cloud-hosted sites**
  - e.g. Google Slides™
  - Allows for mobility/portability
- **Ensuring all technology elements present ahead of time**
  - Internet access
  - Working projector
  - HDMI cable
  - Laptop
- **Optimize ease of viewing projected images**
  - Dim ambient lighting
  - Dark-toned background for slides
  - High-quality images and GIFs
- **Remote learning**
  - First presentation was during COVID-19 pandemic
  - Zoom™
    - Note: significantly improved engagement with move to in-person learning[4]

Discussion

- Radiology is particularly suited for community engagement, because…
  → We can show images to further the understanding of these subjects on a deeper and more visceral level than text-based expositions.
- Our Impression of the Seventh-Grade Students:
  - Promising
  - Enthusiastic
  - Immense talent in learning anatomy and physiology concepts and interpreting radiological images
    - e.g. We found that after only 5-10 minutes of teaching, students were able to identify modality and anatomic planes, which we were then able to build on to teach pathological imaging.
- Takeaways:
  - Most important factors impacting student engagement:
    - content level matching classroom learning so it was not too basic or too technical
    - image-based slides with minimal text[7]
    - asking questions on each slide
  - Show very clear examples of pathology side-by-side with normal anatomy to ensure content is accessible
  - Sites like Google Slides™ and Radiopaedia™ were indispensable
- Radiology Resident Volunteer Experience:
  - Incredibly rewarding
  - Excited to create and present content for students
  - Innovative way for radiologists to serve and engage with their communities
  - Popular opportunity for residents interested in both education and community outreach

Conclusions

Radiologists can create fulfilling outreach programs which help to educate primary education students and encourage them to seek careers in medicine. We hope our practical experience can inspire and aid others in partnering with or designing their own local programs.

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