(SEVEN STEPS) IN TRANSFORMING PRACTICE: THE EXPANDING ROLE OF MEDICAL PHYSICS IN NEUROSURGERY FOR MOVEMENT DISORDERS

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Caught MedPhys Students Interest!
Caught MedPhys Residents Interest!

LEARNING OBJECTIVES:
1. Understand the needs and priorities of neurosurgeons that medical physicists can meet in image-guided surgery and interventions.
2. Describe the skills, traits, and practices that drive successful medical physics engagement with neurosurgeons in movement disorders.
3. Analyze historical trends in physician practice consolidation and their potential applicability to medical physics. For example, UCSF and Stanford have strong movement disorders programs.
4. Interpret common terms and phrases in movement disorders encountered during the evaluation and treatment within neuromodulation preparation with intraoperative MRI.
5. Discuss the potential impact to medical physics practice and future professional opportunities.

BACKGROUND ON ME

Developing infrastructure and improving logistics for clinical medicine ...

• We have expertise in improving clinical protocols and methodology.
  Collaboration is the cornerstone of our practice strategy for "Clinical translation," which seeks to improve medicine and society by novel technology implementation and appropriate use. To learn more, consider reading the OU Medicine Biannual Publication: Scientist Traverses Disciplines to Meet Needs in Medicine.
SOME RELATED CONCEPTS

Physics for Every Patient, medical physicists can think beyond the QA in the background and try to assist in situations that are more "fluid" in the hospital. In addition, because medical physicists are integrated into the hospital environment, they can have a particular impact on the healthcare milieu via the delivery of their Multiple services and skills. Well-designed, managed, and utilized EHR are particularly important for tumor board management, emergency pandemic response protocols, and even in patient survivorship. Hospitals are complex organizations, with many opportunities to improve these services. Medical physicists, through participation on committees, oversight, and overlap/communication with departments, can serve vital needs in these processes.

ABOUT MULTIPLE SERVICES AND SKILLS

- Intervention
  - Breast Surgery
  - Emergency Medicine
  - Head and Neck Oncology
  - Orthopedic Surgery
  - Cardiovascular Oncology
  - Vascular Medicine

- Internal Medicine
  - Cardiovascular Disease
  - Dermatology
  - Infectious Diseases
  - Hepatology
  - Neurology
  - Nephrology
  - Pulmonary Disease

- Clinical Systems
  - Anesthesiology
  - Endocrinology
  - Genetics
  - Pathology
  - Radiology

Dr. Dee Wu has had projects in 22+ subspecialties in medicine at Sometime over 20 years and still goes to school next.

COMMITTEES FOR AAPM, I SERVE ON:

- AHFDS - Ad hoc Committee to Explore Future Directions in the Science of Physics in Medicine
- MP3C - Medical Physics 3.0 Committee
- W3MPH3D - Working Group for MP3.0 Resources Development
- SDAMPSRVY - Society of Directors of Academic Medical Physics Programs on Surveys
- MP1SEC - Smart Expansion Subcommittee (Chair)
OU HEALTH: MY ACADEMIC HOSPITAL

- Academy of Teaching Scholars (Chair of Mentorship and Scholarship)
- Cancer Survivorship Committee
- Adjunct in Computer Science
- Adjunct in Electrical Engineering
- Data Institute for Societal Challenges

SEVEN STEPS - MP3.0 MOVEMENT DISORDERS

1. Fundamentals
2. Context (includes fundamentals)
3. Blending In
4. Communications
5. Understanding Patients First
6. Test/Test/Test
7. Logistics/Supply Chain and Vendors

* (this includes with context – will go over this more in next slide)
1. FUNDAMENTALS

- You are medical physicists so know the ins and outs of the scanners you work on
  - For MRI
    - Pulse Sequences
    - Hardware (such as coils)
    - Advanced Apps
  - Baseline: The weekly, daily QAs. They are the entry point. This is how we get in the door...

MORE ON FUNDAMENTALS WITH CONTEXT

THIS RELATES TO UNDERSTANDING OPERATIONS AT THE SCANNER (WHAT HAPPENS AT SCANNING WITH PATIENTS)

- Trade-offs
- Artifacts
- Pulse Sequence Basics

BOOKS ON MRI FUNDAMENTALS

Clinical Domain Sciences Integration (Collective Language)*

it is helpful to come from a perspective of where does medical training emerge — a portion context working from portion of medical school?

Some Clinical/Medical Fields
- Physiology and Anatomy
- Humans and Molecules
- Pathology and Disease
- Psychological and Social

Some Vocabulary We Used
- High-frequency neuromodulation
- Deep brain stimulation (DBS)
- Neurostimulator
- Pars opercularis (border)
- Subthalamic structures
- Phase-sensitive inversion recovery (PSIR)
- Putamen
- Internal capsule
- Medial gyrus
- White matter tracts

Dee Wu, PhD
2. CONTEXT

- Relationships may develop over the years
- Make yourself useful
- Listen and share (i.e., teach and learn)
- Do the work

CONTEXTS (Relevant to your Institution)

1. Neurosurgery is very hard to get into. They have a rotating set of volunteers (medical students) for research projects. Expectation is very high for neurosurgery; they need publications. They come and go and will have their own projects, but they might be able to work with you if you help them at the same time.

2. Neurosurgeons are very results-oriented!

3. Humble and Smart. (For the kind of work they do, this is my impression of our neurosurgeons and the ones I work with).

4. Our Radiology Technologists are solid, we need to partner with them on getting the best results.
3. BLENDING IN

- Active Listening
- Being a team member
- Realize that there may not be tradition of medical physicists in these procedures, so you might be the first one. Build trust is the first goal.

GOOGLE SEARCH FOR “MOVEMENT DISORDER CENTER & PHYSICS” TERMS

- Dr. Helen Bronte Stewart is the John E. Cahill Family Professor in the Department of Neurology and Neurological Sciences. She is a neurologist, neurophysiologist, and movement disorders specialist, who has used her training in mathematics, engineering, and physics to develop innovative research in the field of movement disorders. Her research has focused on the use of advanced imaging techniques to study movement disorders, and she has contributed to the development of new treatments for these conditions. Dr. Bronte Stewart has been a leader in the field of translational neuroscience, and her work has been instrumental in advancing our understanding of movement disorders.

FELLOWSHIP TRAINED AT UCSF

- Dr. Rosemary Brown is a specialist in movement disorders, with a focus on the use of advanced imaging techniques to study these conditions. She completed her fellowship training at UCSF, where she received advanced training in the use of magnetic resonance imaging and other advanced imaging techniques to study movement disorders. Her work has been instrumental in advancing our understanding of movement disorders, and she has contributed to the development of new treatments for these conditions.
4. COMMUNICATIONS

- When I am able to gain results to inform (positive and/or negative)
- Be a Partner
- Even when delays, explain (we had many, covid, research agreements, IRB testing etc.). You may have to do this work*

* This section also interconnected with logistics (a topic we cover later)

5. UNDERSTANDING PATIENT FIRST

Physics for Every Patient

Medical Physics 3.0 (MP3.0) is an initiative to enact, express, and enhance the full value of physics towards human health that includes practice, administrative, scientific, and educational goals. It also includes exploration of areas beyond radiotherapy and imaging.

6. TEST/TEST/TEST*

- Image quality: We have to help assist with getting this done. We don’t have a research magnet so have to work this in between patients, after hours etc.
- We had to schedule testing even when there was covid concern
- We had to deal with several coil change outs (there is a special coil that needed to be used – neuroflex)

* when permitted, can we do adequate testing, minimizing patient table time and optimize results?
7. LOGISTICS

- Covid Workarounds
- Supply Chain issues
- IRB/Regulatory
- Safety
- Working with Vendors (Clearpoint™, GE™)

RESULT (THIS IS WHAT PHYSICIANS/HOSPITALS WANT)

- Neurosurgery and I are now writing the paper about the details of our collaboration. We also are continuing to set up other collaborations (such as coil development, pulse sequences and other possible procedural improvements).

- Good relations with neurosurgery, radiology technologists can be helpful for radiology and other departments. Their procedures can drive the hospital and has high visibility to the community. (they see med physics and radiology)
CONCLUSION (& TAKEAWAYS)

1. Fundamentals: Being in the Hospital and Relevant.
2. Context (that includes fundamental(s)): Learn the Language.
5. Understanding Patients First: Physics For Every Patient.
6. Test/Test/Test: Do What You Need To Do To Ensure Procedure Has Best Opportunity.

Questions?