Medical Physics is already MultiDisciplinary, so Multi-Disciplinary Collaborations Should Be Easy!

Benedick A Fraass PhD, FAAPM, FASTRO, FACR

Vice Chair for Research, Professor and Director of Medical Physics
Department of Radiation Oncology
Cedars-Sinai Medical Center
Los Angeles, CA 90048

Medical Physicists

When we describe ourselves, we have only two choices:
1. We are multidisciplinary
   or
2. We are oxymorons
I like to think we are multidisciplinary

Establishing Multi-Disciplinary Collaborations

• Virtually all progress in Rad Onc involves multidisciplinary collaboration
• How do you get multidisciplinary collaborations started?
• Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
• Multidisciplinary collaboration takes work
• Conclusions

Progress in RT

What did it take to get from contours to CT?

<table>
<thead>
<tr>
<th>X-ray tube</th>
<th>Physicist</th>
<th>Coolidge, 1913</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomography</td>
<td>Radiologist</td>
<td>Vallebona, early 1900s</td>
</tr>
<tr>
<td>Radon Transform</td>
<td>Mathematician</td>
<td>Radon, 1917</td>
</tr>
<tr>
<td>The idea: scanning transmitted x-rays, reconstruct image</td>
<td>Neurologist</td>
<td>Oldendorf, 1959</td>
</tr>
<tr>
<td>Algorithms</td>
<td>Particle Physicist</td>
<td>Cormack, 1963-4</td>
</tr>
<tr>
<td>Mini-Computer</td>
<td>Comp. Eng.</td>
<td>DEC, 1984</td>
</tr>
</tbody>
</table>
Establishing Multi-Disciplinary Collaborations

• Virtually all progress in Rad Onc involves multidisciplinary collaboration
• How do you get multidisciplinary collaborations started?
• Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
• Multidisciplinary collaboration takes work
• Conclusions

How do you get started?

1. Go to clinical conferences, keep your ears and mind open
   • Learn what clinical problems are important
   • Understand how the docs (and others) think about the problem
   • Think about what it would take to fix the different issues

How do you get started?

2. Look for opportunities
   • Things that potential collaborators might be interested in
   • and which you (the physicist) are interested in
   • Take advantage of the skills and capabilities that are around you – rather than picking a problem and then looking for people to help

How do you get started?

3. Learn to communicate with the other people
   • Each field uses different words and methods for the same things
   • People trained in different areas think about things quite differently: nurses, physicians, biochemists, administrators, engineers, and even physicists

Laser-Accelerated Protons

Don Umstadter
Tolya Maksimchuk
Kirk Flippo
Teh Lin

High power ultrafast laser pulse on thin film target:

Don Roberts
Mary Davis

Proton Acceleration

University of Michigan Radiation Oncology

High power ultrafast laser pulse on thin film target:

• Protons are accelerated by huge electric field that is created

A. Maksimchuk, S. Gu, K. Flippo, Y. Yu, Bychenkov, D. Umstadter PRL, 84, 4106 (2000)

UM: Litzenberg 03
Laser-Accelerated Protons

Experimental Setup

T³ Laser

• 6 J Energy in Pulse
• 400 fs Pulse Length
• 15 TW Power
• 6 μm Focal Spot
• 15 ExaWatts/cm²

How do you get started?

4. Which thing should you work on?
   • If you pick issues of interest to others in your department, it is easier to justify the effort
   • Issues related to your clinical protocols blur the line between clinical and research effort – which is a good thing. It also makes improvements much easier to take all the way to clinical use

“I’d like a 50-50 research/clinical position”

Here’s what you really want!
How do you get started?

5. All collaborations must be win-win propositions
   • A project which does not interest or help the collaborators will never work well
   • Share control, publications, talks
   • Help people on their projects, they’ll help you with yours

How do you get started?

6. Think through how the project will succeed and eventually make it to patient care
   • Make sure there’s a possible path to success
   • If you don’t know what’s necessary for the project to succeed, it won’t.
   • “Visualize how you might traverse the minefields”

Establishing Multi-Disciplinary Collaborations

• Virtually all progress in Rad Onc involves multidisciplinary collaboration
• How do you get multidisciplinary collaborations started?
• Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
• Multidisciplinary collaboration takes work
• Conclusions

Multidisciplinary Collaborations in RadOnc are Crucial for the Clinic!

SBRT for Locally Advanced Pancreatic CA

SBRT Team:
• Wensha Yang PhD
• Troy Gustafson RTT
• Lola Semaan CMD
• Rich Tuli MD PhD
• Tracey Weaver-Smith (MedSec)
• Robert Reznik MD (resident)
Multidisciplinary Collaborations in RadOnc are Crucial for the Clinic!

SBRT for Locally Advanced Pancreatic CA

SBRT protocol
- Fiducials: with Interventional GI Surgeons, imaging
- CBCT+KV guidance
- Resp. Motion Management
- VMAT guided by CBCT+KV
- Concurrent Chemo
- Simultaneous Integrated Boost
- PET eval. pre- and post-Tx

Simultaneous Integrated Boost: Phys, Dosims, MDs
Pet eval. pre- and post-Tx

Simultaneous Integrated Boost: Phys, Dosims, MDs
PET eval. pre- and post-Tx

Simultaneous Integrated Boost: Phys, Dosims, MDs
PET eval. pre- and post-Tx
Multidisciplinary Collaborations in RadOnc are Crucial for the Clinic!

SBRT for Locally Advanced Pancreatic CA

- SBRT protocol
- Fiducials
- CBCT+KV guidance
- Resp. Motion Management
- VMAT guided by CBCT+KV
- Concurrent Chemo
- Simultaneous Integrated Boost
- PET eval. pre- and post-Tx: NMec

Pre-Tx PET

Post-Tx PET

- Virtually all progress in Rad Onc involves multidisciplinary collaboration
- How do you get multidisciplinary collaborations started?
- Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
- Multidisciplinary collaboration takes work
- Conclusions

Establishing Multi-Disciplinary Collaborations

- It takes numerous meetings + interactions to learn how to communicate
- You need to learn about the other people’s fields – enough so you can propose sensible projects, efforts, methods
- You need to iterate with collaborators until you find the win-win scenario which will lead to productive effort
- There needs to be someone who “shepherds” the interaction and maintains communication

Multi-Disciplinary Collaboration Takes Work!

- Virtually all progress in Rad Onc involves multidisciplinary collaboration
- How do you get multidisciplinary collaborations started?
- Multidisciplinary collaboration is not limited to research, it is necessary for clinical progress too
- Multidisciplinary collaboration takes work
- Conclusions

Establishing Multi-Disciplinary Collaborations

Conclusions

- Multidisciplinary collaboration is a crucial part of much of the progress made in medical physics and radiation oncology
- As a medical physicist, you can do much to prepare the way to make multidisciplinary collaborations easier to start and more likely to be successful
- The goal of such collaborations should be to pull in the expertise needed to make the project successful – and to eventually improve clinical results for patients