Imaging in Physical Therapy...
From Classroom to Clinical Practice
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Imaging in PT Practice:
Established Model Internationally

Over 4 decades in US military
Other institutions: Public Health Service
Indian Health Service
Other civil service sectors
Civilian Settings: Georgetown University Hospital
Kaiser-Permanente
University of Wisconsin Hospital & Clinics
Selectively used by practitioners in Colorado
In PT Practice for the Future

Logical extension of 1st contact clinician
Consistent with clinical doctorate status
Management decisions / referral

What is being taught in the US?

Survey of accredited programs:
75% of curricula (155) responded
98% included imaging
Remarkable inconsistency in instructional content
  Range: 2 - 75 hours
  Mean: 24.4 hours
MSK emphasis at 76% of total
Boissonnault et al, 2014

"Imaging Education Manual for Doctor of Physical Therapy Professional Degree Programs"
Written by Imaging SIG
Published by Orthopaedic Section, April 2015
Contributions from educators, clinicians, researchers across US
“How to” guide for DPT curricula
Includes suggested methods & exam questions
available at www.orthopt.org
Conceptual Framework of Imaging Instruction

Not teaching "imaging" teaching clinical reasoning, inclusive of imaging content
Integration into our typical clinical reasoning as with all other patient data & management decisions perspective—not a separate entity

Bases for Imaging Decision Making in ACR Appropriateness Criteria

Age
Trauma presence/absence
Mechanism of injury
Prior surgery
Risk factors
Appearance
Pain provocation / physical function tests
Other imaging results
Weight-bearing ability
Tenderness to palpation
Well established in PT educational curricula & clinical practice

Other Existing Standards & Practices

Normative Model of Physical Therapist Professional Education
No specific content on depth or breadth
Numerous statements mentioning imaging specifically & other diagnostics
Clinical Performance Instrument
At least 9 performance criteria allude to imaging
"Two separate studies of DPT programs, as well as data collected in the Biennial Accreditation Report, indicate that, in the main, programs converting to offering the DPT are making important, substantial changes. Among them are: Increased content in areas such as diagnostics, imaging . . . ."

CAPTE: PT Standards & Required Elements
Effective January 1, 2016

Standard 7
The curriculum includes content, learning experiences, and student testing and evaluation processes designed to prepare students to achieve educational outcomes required for initial practice in physical therapy and for lifelong learning necessary for functioning within an ever-changing health care environment.

REQUIRED ELEMENTS:

7A The physical therapist professional curriculum includes content and learning experiences in the biological, physical, behavioral and social sciences necessary for entry level practice. Topics usually include anatomy, physiology, genetics, exercise science, biomechanics, kinesiology, psychology, pharmacology, diagnosis, imaging, radiology, nutrition, and psychosocial aspects of health and disability.

Evolving Legislative Authority
Wisconsin Act 375:
Physical therapists granted privileges for ordering radiography
Signed into law April 2016

Other States:
Colorado
Maryland
Legislation considered in other states
“Diagnostic & Procedural Imaging in Physical Therapist Practice”

“White Paper”
Published May 2016 by the Orthopaedic Section, APTA

Comprehensive perspective
History, present & future
Evidence in support of expanded privileges
Addresses required legal, institutional & payer changes
available at www.orthopt.org

House of Delegates RC 12-16

Prior to NEXT, June 2016
Charged APTA to pursue practice authority for imaging in PT practice
Passed with 93% favorable vote
To address processes & barriers
APTA soon to analyze all state practice acts & monitoring in State Affairs

Parallels to Thrust Manipulation Education

2002
• 44% of curricula included Boissonnault et al. 2004

2004
• Manipulation Education Manual APTA, 2004

2006
• CAPTE Std 7D27 “...thrust & non-thrust...” CAPTE, 2006

2012
• 99% of curricula included thrust Noteboom et al. 2015
Imaging Resources

Becky Rodda, PT, DPT, OCS
Clinical Professor
Physical Therapy Department
School of Health Professions and Studies
University of Michigan - Flint

What content do I need to teach?

Imaging Education manual for Doctor of Physical Therapy Professional Degree Programs by APTA Orthopedic Section, Imaging SIG

APTA Resources
- Guide to Physical Therapist Practice (Guide 3.0)
- A Normative Model of Physical Therapist Professional Education: Version 2004
- Minimum Required Skills of Physical Therapist graduates at entry level

What Textbook would you use for students?

- Basic introductory book. Has chapters on the different patterns such as neuro, cardiopulmonary as well as musculoskeletal etc. This is used in several courses as a reference for medical imaging.

- Introductory book on all imaging modalities including ultrasound, MRI etc.
Reference Textbooks


- New handbook, does not have the depth of the Fundamentals book but is a great resource for practicing physical therapists. Includes the ACR guidelines for each area of the body. Has information on various imaging studies as well.


- A primary reference book for medical schools, practicing radiologists and orthopedic physicians.

Where Can I Get Imaging Studies to use in lectures?

http://radiologyreviewarticles.com/msk/musculoskeletal-imaging-websites/

- Has a list of different web sites you can review, some have pathology, some have actual cases.

http://www.acr.org/

- Main web site

http://www.acr.org/Quality-Safety/Appropriateness-Criteria

- Go to basic access or advanced search

http://xrayhead.com/

- Stanford MRA MRI Atlas, has specific cases that can be used

https://medpix.nlm.nih.gov/

- Over 53,000 cases, medical imaging data base, has a case of the week

http://learningradiology.com

- Online teaching, lectures

http://www.imagingpathways.health.wa.gov.au

- Imaging pathways or flow sheets for decision making on which type of study to order
Other Sources for Imaging?

Ask family, friends or whom ever may be able to lend you images

• Get a signed release so no HIPAA violations occur

I don’t know enough to teach this information. Where do I go to get more education?

Evidence in Motion course: Radiology/Essentials of Musculoskeletal Imaging cost $650
  • http://www.evidenceinmotion.com/educational-offerings/course/radiology-essentials-of-musculoskeletal-imaging/

Rehab Education cost $250
  • http://www.elinfind.com/Musculoskeletal-imaging-for-the-physical-and-occupational-therapist/

Med Bridge $100
  • Basic Musculoskeletal Radiology and Imaging
  • https://www.medbridgeeducation.com/courses/details/basic-musculoskeletal-radiology-and-imaging
Diagnostic Imaging Education: Military Model

US Army-Baylor Doctoral Program in Physical Therapy
Producing Clinician Scientists and Leaders of Tomorrow

History

• > 4 decades of successful, safe and accurate integration of diagnostic imaging in the US Military (Greathouse, 1994)

• 90.9% agreement between clinic exam and MRI Dx for direct access PT (Moore 2005a)

• No adverse effects in 472K direct access PT visits, includes diagnostic imaging ordering and prescribing medications (Moore 2005a)

Army-Baylor DPT
Mission Statement

To produce active duty, commissioned physical therapists who are clinician scientists and leaders prepared for worldwide military health system practice
Military Scope of Practice

- Musculoskeletal Injuries are Common!
  - 18.6M active duty healthcare visits in 2015 (MSMR, 2016)
  - Average 14 visits per member
  - 45% increase since 2006
  - 30% of all visits MSK-related, and on the rise!
- Direct access / first contact
- Home station and deployed environments
- Diagnostic Imaging is a core standard clinical privilege across Army, Navy, Air Force and Coast Guard

Army-Baylor DPT Curriculum Plan

- Phase I: 18 Months
  - Regionally-based MSK Curriculum
- Phase II: 12 Months
  - Neuroscience, Cardio-Pulm, Lifespan
  - Clinical Internship (daily practice ordering and interpreting)

Imaging Content:
Semesters 1 & 2

- 2-hour lecture: Introduction to Radiology
  - Principles of Imaging
  - Modality indications & contraindications
  - Safety
  - Introduces:
    - Clinical guidelines – Canadian C-spine, Ottawa Knee/Ankle; Low Back Pain
    - ACR Appropriateness Criteria
    - Principles of ordering diagnostic imaging
- 7 regional blocks
  - 2-hour plain film lecture:
    - Anatomy, pathology
    - Guidelines, ACR Appropriateness, clinical indicators
Imaging Content: Semesters 1 & 2
• Advanced Imaging:
  • Three 2-hour blocks covering:
    • Anatomy and pathology
    • Guidelines, ACR Appropriateness, clinical indicators
    • Procedures for ordering MRI, CT, Bone Scan, Dx US
    • Integrating imaging results into exam/management
  • Coincides with regional MSK instruction
    • Lower extremity
    • Upper Extremity
    • Spine – includes exposure to US use for clinical biofeedback

Parallel Content: Semesters 1 & 2
• MSK Region: Examination & Management
• Primary Care
  • 1 hour medical screening per region
  • Signs/symptoms, systems review and medical comorbidities
• Clinical Affiliation: initial exposure to integrating imaging into practice
• Competence Assessment
  • Written Exams: identify anatomy, pathology and principles of management/integration
  • Imaging decision-making integrated into MSK region practical and written exams, and primary care exams
  • Oral comprehensives prior to beginning Clinical Internship

Imaging Content: Clinical Internship
• 1-year experience in military clinics/hospitals
• CIs are Fellowship Trained clinicians with full scope of clinical privileges to order diagnostic imaging
• Interns generally allowed to order imaging with-in 2 weeks of start date
  • Clinical discussion with faculty
  • Faculty approve all electronic orders/documentation
• Receive 16-30 hrs with MSK Radiologist
Capstone Project

- Case presentation demonstrating medical screening and diagnostic work-up
- 3 imaging cases published since 2014
  - Sperier et al, JOSPT, 2015
  - Dummar, et al, OPTP, 2015

Army-Baylor DPT Dx Imaging Research

- Faculty-led, student driven research program
- > 25% of DPT students involved in imaging research
- DN in patients with LBP, neck pain
- Shear Wave Elastography
- Foot/ankle instability
- > $500K intramural research funding since 2013
- Equipment: 4 Sonosite Titan; 1 Supersonic Imagine Ultrasound Elastography machine
- 5 conference platforms/posters since 2014

Diagnostic Imaging Education: Small Private University

- Liberal Arts Education
- 2,000 Undergraduates
- 270 Graduate (DPT, OT, Med)
- No Medical School/Medical Center Affiliation
- Located in Tacoma, WA
University of Puget Sound DPT
Mission Statement
To prepare students at the clinical doctoral level for entry into the
physical therapy profession. Our presence on a liberal arts campus
underscores our belief that the development of clinician scholars is a
natural extension of the values of critical analysis, sound judgment, active
inquiry, community participation and apt expression. Through a careful
blending of rigorous academic work and mentored clinical practice, our
program seeks to prepare clinician scholars for informed, ethical, and
efficacious professional practice.

UPS DPT
Curriculum Plan
Year One (foundational year)
• Students concentrate on foundational courses, begin to plan research projects, and
  begin to study elements of clinical management. Anatomy, Neuroanatomy.

Year Two (clinical education year)
• Students’ main focus is to learn all aspects of patient examination, assessment, and
treatment design, progressively dealing with more complex situations through
integrated experiences under close supervision in the on-site clinic.
• Summer: 1st full time 12 weeks internship

Year Three
• Fall semester: Capstone projects, take on greater responsibility in the on-site clinic,
  and study areas of special interest in advanced elective courses.
• Spring semester: two, 12 weeks off-campus internships.

MSK Imaging
Within the Orthopaedic Content
• Fall semester, 2nd year:
  • Lumbopelvic spine, hip, knee, foot & ankle.
  • 2-hour lecture. Introduction to Radiology
  • Principles of Imaging
  • Modality indications & contraindications
  • Safety.
  • Introduce:
    • Clinical guidelines – Canadian C-spine, Ottawa Knee/Ankle, Low Back Pain
    • ACR Appropriateness Criteria
    • Principles of ordering diagnostic imaging
  • 1 hour region specific blocks.
  • Integrate into lab/clinical scenario discussions.
• Spring semester, 2nd year.
  • Cervicothoracic spine, shoulder, elbow, wrist & hand.
  • 1 hour region specific blocks.
  • Integrate into lab/clinical scenario discussions.
Key Instructional Resources

- McKinnis textbook
- American College of Radiology Appropriateness Criteria
- Clinical Decision Rules / Guidelines
- J Orthop Sports Physical Therapy MSK Imaging feature articles
- http://learningradiology.com/

Imaging Content: Clinical Internship

- Three 12 week full time internships in settings throughout the U.S.
  - Imaging experiences are varied.
- Two 8 week on-site clinical experiences.
  - No imaging privileges, have ability to review images and/or reports.

Published Cases
Other Options?

• What happens when,
  • Programs are too small to provide adequate imaging in the curriculum.
  • Not enough faculty to teach extra courses.
  • Faculty doesn’t feel they have the expertise to teach the subject matter.
  • Curriculum already too full.
  • Not enough money/space to hire another faculty for imaging content.
  • Or......

On-line, distance learning options

• Programs have been created to cover MSK imaging content.

• Examples:
  • Medbridge, Seattle, WA: an online medical education program which already has basic imaging content, as well as imaging specific for those interested in DCS and SCS certifications. [https://www.medbridgeeducation.com/]
  • The University of the Incarnate Word, San Antonio, TX, has created an on-line distance education program in MSK imaging for their IDPT program.
  • Both programs provide testing after modules to evaluate learning.
  • Can these, or systems like these, be integrated into your DPT programs?

The Legislative Connection

• Experience from Washington State Physical Therapy Association (PTWA).
• 7 year legislative battle to remove the prohibition on spinal manipulation by Physical Therapists.
• Eventually successful in removing prohibition. However to gain state endorsement, PTs must demonstrate:
  • 100 hours of training in differential diagnosis.
  • 250 hours of didactic and practical training related to the delivery of spinal manipulative procedures.
  • 300 hours of supervised clinical experience in spinal manipulative procedures.
  • 150 hours of specific training in spinal diagnostic imaging.
Musculoskeletal Imaging Education in a Doctor of Physical Therapy Program
Boyles RE, Lancaster RL, Muraoka T, Sak-Ocbina WC

As direct access musculoskeletal experts, Physical Therapists (PTs) must have clinical decision making skills to direct care and decide appropriateness for imaging. Evidence shows that, with adequate imaging education, PTs decrease imaging and associated health care costs compared to other primary care providers. Additionally, PTs have been found to be comparable to orthopedic surgeons in their ability to decide appropriateness of imaging. The APTA’s goal is to have enough imaging education in entry level programs so that PTs will have imaging privileges. Currently, there are no published studies reporting time spent with musculoskeletal imaging in entry level DPT education. The purpose of this study is to survey the type and amount of imaging education provided in one entry level DPT program.

More to come......

KEEP CALM AND Shiver in Anticipation
References

• Moore JH et al. Clinical diagnostic accuracy and magnetic resonance imaging of patients referred to physical therapists, orthopedic surgeons, and nonorthopedic providers. J Orthop Sports Phys Ther. 2005a
• American College of Radiology Appropriateness Criteria http://www.acr.org/QualitySafety/AppropriatenessCriteria

Feinberg School of Medicine
Mission Statement

Our mission is to impact the practice of medicine through discovery and education
NUPTHMS Mission Statement

• To educate doctors of physical therapy and movement scientists in an academic medical environment that integrates research, education, and clinical care.
• To promote optimal health outcomes for our patients and society through the advancement of rehabilitation science and practice.
• To be a diverse faculty and student body producing global leaders in the profession of physical therapy and the science of human movement.

NUPTHMS DPT Curriculum Plan

Year One (foundational year)

• Students concentrate on foundational courses: Anatomy, Kinesiology, Physiology, Psychosocial, Intro to Clinical Decision Making, Neuroscience, Exam and Evaluation, Synthesis
• Spring Trimester: 1st full time clinical experience – 6 weeks

Year Two (clinical management year)

• Students’ main focus is to learn all aspects of patient examination, assessment, and treatment design across the lifespan, progressively dealing with more complex multi-systems involvement. Synthesis
• Imaging content throughout the entire thread
• Spring Trimester: 2nd full time clinical experience – 6 weeks

Year Three (clinical experiences)

• Fall & Winter Trimesters: 3rd and 4th clinical experiences - 13 weeks x 2
  * "Keeping an eye out for interesting patient cases where imaging findings and results influenced POC"

Imaging Throughout the Curriculum

• Year One (foundational year)
  * Anatomy, Kinesiology, Neuroscience, Exam and Evaluation, Synthesis

• Year Two (clinical management year)
  * Imaging throughout with support of faculty expertise, research methods, interdisciplinary support, ACR guidelines centered around case examples, complex cases, and synthesis projects

• Year Three
  * Clinical experiences
Key Instructional Resources

- McKiniss textbook
- American College of Radiology Appropriateness Criteria
- Clinical Decision Rules / Guidelines
- J Orthop Sports Physical Therapy MSK Imaging feature articles
- http://learningradiology.com/
- www.auntminnie.com

Published Cases

Dr. Boyles - Other Options?

- What happens when,
  - Programs are too small to provide adequate imaging in the curriculum.
  - Not enough faculty to teach extra courses.
  - Faculty doesn’t feel they have the expertise to teach the subject matter.
  - Curriculum already too full.
  - Not enough money/space to hire another faculty for imaging content.

Questions:
- Does this provide foundation for ‘post-doc’, residency, fellowship, internship opportunities with key locations/players on a national and international scale?
- How do you explain the findings with a patient and how do you use it in clinical decision making?
Imaging Education at a Small Private University

• Ira Gorman, PT, PhD, MSPH
• President, HPA The Catalyst, APTA
• Assistant Dean, Associate Professor
• School of Physical Therapy, Regis University

Regis University is one of 28 Jesuit colleges and universities (eight have DPT education programs) nationwide.

Rueckert-Hartman College for Health Professions
Loretto Heights School of Nursing
School of Physical Therapy MS-1996, DPT 2004
Division of Health Services Education
Division of Counseling and Family Therapy

Doctor of Physical Therapy Program

Mission Statement

The DPT Program is dedicated to providing a value-centered education within the Jesuit Catholic tradition. The professional education is extensive in depth and breadth and promotes current best practice across settings. The program is designed to prepare graduates as leaders in the profession who bridge theory and practice in a dynamic health care environment. Special attention is placed on developing an appreciation of the uniqueness of the individual and recognition of how this uniqueness influences health and wellness of diverse populations. Emphasis is placed on developing advocates for the public welfare and common good by changing self-conceptions and other values that compromise a sense of community. Graduates are challenged to integrate Jesuit values with future personal and professional pursuits. Graduates practice autonomously, ethically, and legally as primary care providers. As professionals, graduates are decision-makers and critical thinkers who have a clear understanding of the value of lifelong learning and contributing to the body of knowledge of physical therapy.
DPT Curriculum

- 1 credit Radiology Course added to DPT curriculum in 2002, Sem IV (Fall of year 2)
- 2 credit Diagnostic Imaging and Procedures- 2005
  - Added NCV/EMG content and lab
  - Added RUSI lab
  - Added Decision making lab
- Transition DPT: 2003-2014
- Fellowship in Manual Therapy- 2003
- RegisCares- onsite faculty practice- 2010

DPT 712 Diagnostic Imaging and Procedures

- 2 Semester credits- Semester IV
- CREDITED CONTACT HOURS: Lecture:16 Lab: 6 Final Exam :2
- APPLIED SCIENCE SET OBJECTIVES:
- COURSE DESCRIPTION:
  - Introduces the foundations and principles of diagnostic imaging and procedures used in clinical management to include radiograph imaging, CT, RUSI, MRI and electrophysiologic studies. Rationales and guidelines for examination selection are discussed. Performs nerve conduction and needle EMG studies. Examines basic interpretation of diagnostic imaging as well as interpretation of EMG and nerve conduction studies. Laboratory included.

Course Content

- 8 lectures, 6 labs
- Intro to diagnostic imaging with focus on history, terminology, technology
- Plain Film radiography- Fracture evaluation
- Plain Film radiography- spine evaluation
- CT, arthrography, Bone scans, Pet Scans
- MRI
- RUSI
- NCV
- EMG/NCV
- Clinical decision making, legal implications
- Set foundation for more detailed clinical application in future musculoskeletal and neurological management course, as well as differential diagnostic course.
- Students will know about the technology, how to communicate and understand reports, how to use ACR and other clinical decision making tools.
Course Resources

- Textbooks

- Articles
- Electronic Resources

Course Evaluative Activities

- Quizzes
- Final Exam – electronic with images
- Article review
- 2006P assignment-3 image corner reviews
- Small groups with radiologic professional- MD, PA, NP, RT

Colorado Physical Therapy Practice Act

- 12-41-105. Limitations on authority.
- (1) Nothing in this article authorizes a physical therapist to perform any of the following acts: (a) Practice of medicine, surgery, or any other form of healing except as authorized by the provisions of this article; or
- (b) Use of roentgen rays and radioactive materials for therapeutic purposes; the use of electricity for surgical purposes; or the diagnosis of disease.
- Precedent of rule by omission vs. commission
  - Direct access
  - Ordering or requesting imaging