



# DR. RAMAKKO'S ULTRASOUND TRAINING

## POCUS MSK Ultrasound Syllabus

### Table of Contents

- 1) Program Overview
- 2) Learning Outcomes
- 3) Learning format
- 4) Assessment
- 5) Content Breakdown
- 6) Tech considerations
- 7) Supplementary Resources

## 1) Program Overview

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Musculoskeletal (MSK) ultrasound is a safe, cost effective, and efficient manner of imaging soft-tissue structures. With the advent of the latest handheld ultrasound transducers which meet the necessary criteria sufficient for MSK sonography ( $\geq 12$  MHz and  $\geq 192$  elements) for less than \$5,000 USD it is very affordable as well. While ultrasound imaging can rival even MRI, it requires specialized training which has not been available to many healthcare practitioners. Getting started can be intimidating.

The educational program was created by Dr. Brandon Ramakko who has a Bachelor of Science (BS) in Applied Physics, a BS in Human Biology, a Master of Science (MS) in Physics, and a Doctorate of Chiropractic (DC) degree from University of Western States. Dr. Ramakko is Board Certified in Neuromusculoskeletal Medicine (IANM) and has been certified nationally in Musculoskeletal Sonography (RMSK). Dr. Ramakko also holds a teaching certificate in higher education from Harvard University.

The Alliance of Physician Certification and Advancement (APCA) recommends 30+ hours of education and experience interpreting/performing 150 ultrasound scans for general mastery. In a point-of-care setting you can begin using ultrasound in practice with mere hours of training as you can learn to assess one structure at a time as you build your expertise: you don't need to know how to scan the hip to evaluate the median nerve at the wrist. This program is designed to get people started and, should they complete it, provides 80 hours of education,

including 150 cases interpreted. As intermediate steps, the program includes certificates of completion for individual modules which must be earned through examination (earning more than 70%). Most parts of the program have been approved for MOC credits for the IANM. No other CE credits are approved at this time.

There is an optional “Fellowship” or mentorship available for additional guidance through your first 150 scans on patients. With the additional fellowship component I think this program matches any program out there and meets, at the very least in spirit, any requirement or recommendations out there ([AMSSM](#), [AIUM](#)).

There are some parts of the program I would consider optional but are provided for convenience and/or to help those for the RMSK exam. This program should well prepare someone for the RMSK exam.

The program does have a recommended textbook: Fundamentals of Musculoskeletal Ultrasound (3rd edition) by Jon A. Jacobson M.D. Most of the content of the program can be found in this book.

## Learning Outcomes

### **Objectives**

- Increase the participant’s knowledge and ability to perform and interpret MSK ultrasound examinations in a POCUS setting.

### **Student learning outcomes**

- Outline appropriate transducer selection, system optimization, and identify commonly seen artifacts associated with MSK ultrasound.
- State pathology-relevant regional scanning protocols for performing shoulder, elbow, wrist/hand, knee, ankle/foot, and hip ultrasound examinations.
- Identify normal anatomy during musculoskeletal ultrasound imaging.
- Recognize ultrasound characteristics of commonly seen pathology of the shoulder, elbow, wrist/hand, knee, ankle/ foot, and hip ultrasound examinations.
- State the elementary principles of ultrasound including definition of ultrasound, basic properties and units of measure.
- Describe the fundamental principles of sound and the propagation of sound in soft tissue.
- Recognize common components and terminology of ultrasound equipment and instrumentation.
- List the advantages of Color Flow doppler and Color Power doppler Imaging.
- Differentiate imaging artifacts by their cause and characteristic appearance.
- Outline safety, quality control, quality assurance and bio effects concern regarding operation and maintenance of ultrasound equipment.

## 2) Learning Format

The program is split into 4 parts: The first three involve online recorded lectures, the 4th involves case studies, both interpreted and submitted, and the last is elective with supplementary information specific for preparation for the RMSK exam offered by the APCA.

**Part 1:** Roughly 10 hours of content. This part of the program is focused on preparing the student to start using ultrasound. These videos cover basic ultrasound physics and instrumentation, imaging artifacts and ultrasound settings, how to implement ultrasound in practice, and imaging characteristics of normal tissue and pathology. The online videos have formative assessments every 10-20 minutes for you to pause the video and assess your understanding. There are some sample ultrasound scanning videos that the student is expected to practice. There will be a summative evaluation in the form of a graded test at the end of part 1 (70% is required to pass).

**Meeting with the Instructor:** The student is expected to start using ultrasound in their practice after completing part one. To aid the implementation, the program cost includes a 1 hour virtual session with the instructor for the students to ask questions and receive guidance.

**Part 2:** Roughly 30 hours of content. This part of the program is to build expertise, region-by-region, in scanning the body with detailed anatomy and pathology reviews as well as details on how to best image each region. The student should pause the videos to reproduce/practice the scans. Other scans that are appropriate for a primary care practitioner are also covered here. There will be formative evaluations every 10-20 minutes of video. There will be a summative evaluation in the form of graded tests (70% is required to pass).

**Practical Exam:** There is a performance based assessment that can be performed any time after the completion of part 1. You must perform 2 scans and submit two reports. A Grading rubric will be provided and 70% is required to pass.

**Part 3:** Roughly 25 hours of content. Can be started after part 1. 150 case studies where you will be asked to comment on cases or images. You may be asked to write a report or identify structures.

**Part 4:** Roughly 10 hours of optional content. This elective section here is a deep dive into more detailed instrumentation, ultrasound physics, non-msk trauma, and interventional ultrasound, for students who intend to challenge the RMSK exam. There will be formative evaluations every 10-20 minutes of video. There will be a summative evaluation in the form of a graded tests (70% is required to pass).

### 3) Assessment

Each individual component of the program must be passed independently. All components of part 4 must be completed to graduate the program. A passing grade on the tests and practical assessment is 70%. The tests will be multiple choice questions. The practical assessment will be graded via a rubric that will be provided.

### 4)Content Breakdown

	Name	Course Content
Part 1	MSK ultrasound basics: physics and instrumentation	<ul style="list-style-type: none"> <li>-elementary principles of ultrasound including definition of ultrasound, basic properties and units of measure.</li> <li>-Fundamental principles of sound and the propagation of sound in soft tissue.</li> <li>-components and terminology of ultrasound equipment and instrumentation.</li> <li>- Color Doppler, pulse wave, and Power doppler Imaging.</li> <li>- Differentiate imaging artifacts by their cause and characteristic appearance.</li> <li>- Outline safety and bioeffects</li> <li>-other optional ultrasound features or modes: elastography, compound imaging, THI, speckle reduction, panoramic, chroma, and split screen</li> </ul>
	MSK ultrasound basics: using MSK ultrasound in practice	<ul style="list-style-type: none"> <li>-Standards of practice</li> <li>-Terminology conventions</li> <li>-How to scan for pathology</li> <li>-ultrasound machine settings</li> <li>-handheld vs cart-based ultrasound</li> <li>-Report writing basics</li> <li>-Billing codes</li> </ul>
	MSK ultrasound basics: normal sonoanatomy appearance and most common pathologies	<ul style="list-style-type: none"> <li>-normal bone, muscle, nerve, ligament, tendon, and cartilage.</li> <li>-pathological appearance: fracture, hematoma, DOMS, atrophy, edema, tears, nerve impingement, tendinosis, gout, effusion</li> <li>- focused scans of the most common locations of pathology are demonstrated.</li> <li>-Chiropractors should be able to scan for, and identify, the most common pathologies that are easily identified on ultrasound following this course.</li> </ul>
Part 2	Shoulder	<ul style="list-style-type: none"> <li>-anatomy review</li> <li>-scanning protocol</li> <li>-pathology</li> </ul>
	elbow	<ul style="list-style-type: none"> <li>-anatomy review</li> <li>-scanning protocol</li> </ul>

		-pathology
	wrist/hand	-anatomy review -scanning protocol -pathology
	hip	-anatomy review -scanning protocol -pathology
	knee	-anatomy review -scanning protocol -pathology
	ankle/foot	-anatomy review -scanning protocol -pathology
	Other Scans relevant for DDx and/or as a primary care physician	-hernias, thyroid, AAA, DVT, lymph nodes,
	Spine ultrasound	-introduction to various emerging uses of msk ultrasound such as: cervical functional instability, TMJ, brachial plexus, multifidus evaluation, facet joints, SI joints, etc...
Part 4 (optional)	Ultrasound physics and Instrumentation	More in depth review of ultrasound physics in preparation for the RMSK or SPI exam
	Interventional Ultrasound	More in depth look at upper and lower limb interventional ultrasound procedures in preparation for the RMSK exam
	Trauma	Non-msk trauma protocols to meet sports ultrasound fellowship content recommendations

## 5) Tech Considerations

This course requires

- a computer with internet access to access the online content
- a laptop/computer with webcam or a cell phone capable of being used for a skype call
- an ultrasound transducer

### Ultrasound Transducer

An ultrasound transducer is necessary for this program. A high frequency linear array transducer with 196 elements or more is recommended with a maximum frequency of at least 12 MHz, but ideally a bit higher like 15-18MHz. Colour and/or power doppler are useful to detect hyperemia (increased blood flow) as can be found in inflammation, vascularity in soft tissue

masses, or neovascularity in tendinosis. Other optional features like tissue harmonic imaging, compound imaging, elastography, and extended field of view may be useful. (arguably spatial compounding and extended field of view being the most useful).

I have and cautiously recommend the Clarius L15HD combined with the samsung tabs6 lite as a reasonable option (I have no affiliation with either company). I also use a chinese Suresult D2H double ended probe and I would consider it the minimum acceptable handheld.

### Accessing Online Content

The online content can be accessed at the following URL:

<https://msk-pocus-training.trainercentralsite.com/>

## 6) Supplementary Resources

[Fundamental of Musculoskeletal ultrasound \(3rd edition\) by Jon A. Jacobson M.D.](#)

- Written by the foremost expert in msk ultrasound

[European Society of Musculoskeletal Ultrasound scanning guides](#)

- Guides for [Ankle](#), [Knee](#), [Elbow](#), [Shoulder](#), [Hip](#), [Wrist](#)
- Shows normal anatomy with some standard positions and views.

### **Free youtube videos**

- [SMUG ultrasound](#): 2 minutes quick scan protocols with normal anatomy - perfect for the POCUS practitioner either to learn or to get a refresher. Longer 8min to 20 min videos, often featuring Jon Jacobson.
- [MSK Australia](#) - 2-5 min scanning videos featuring normal anatomy - great for POCUS practitioners.