



Musculoskeletal Sonography 2020 Practice Analysis Detailed Report

Inteleos Psychometrics Services

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ACKNOWLEDGEMENTS

Thank you to the twelve subject matter expert volunteers who spent many hours developing the task inventory, evaluating the survey and responses, and reviewing the final content outline. Also, thank you to the 241 ARDMS sonographer registrants around the world who took the time to participate in the practice analysis survey. This study was completed through the efforts of many individuals at Inteleos, who worked together to construct the survey, administer the survey, and analyze the data.

EXECUTIVE SUMMARY

The American Registry for Diagnostic Medical Sonography (ARDMS), part of the Inteleos family of certifications, is the globally recognized standard of excellence in sonography. ARDMS is responsible for the preparation of valid and reliable certification examinations in the field of sonography. Conducting practice analyses at the national and international levels allows the ARDMS to evaluate the current practice expectations and performance requirements of the specialty. The 2020 Musculoskeletal Sonography (MSKS) practice analysis collected information on the sonography-related work activities sonographer registrants perform in musculoskeletal sonography practice. The results of the practice analysis are used to update the test content outline, which guides the content distribution of the MSKS Examination. This report details the methodology, data collection and analysis, and survey results. It also includes the resulting test content outline for musculoskeletal sonography.

BACKGROUND OF STUDY

The American Registry for Diagnostic Medical Sonography (ARDMS) recognizes that diagnostic medical sonography is a valuable tool in the healthcare industry. There are several healthcare professions that are utilizing sonography in practice to increase the efficacy of their patient care.

Successful mastery and demonstration of the knowledge and skills required to hold ARDMS sonographer credentials will provide sonographers with an additional source of validation. This will support the veracity of the diagnostic medical sonography exams that these practitioners perform.

The Registered Musculoskeletal Sonographer (RMSK) credential raises the standard of musculoskeletal ultrasound practice worldwide and promotes best practices for enhanced patient safety. The RMSKS credential is designed for sonographers in the musculoskeletal sonography field. By earning the RMSKS credential, healthcare professionals gain a critical edge in promoting public safety.

METHODOLOGY

Practice Analysis Panel

A practice analysis panel consisting of twelve subject matter experts (SMEs) led this project. The twelve panel members were volunteers, and some were members of the current MSKS Assessment Committee (see Appendix A). The panel was chosen to be representative of the practice to the extent possible and all panel members are Registered Musculoskeletal Sonographers (RMSKs). The Northeast U.S. and Canada were not represented on the panel to the degree they are present in the population, due to a cancellation and logistical issues. However, the survey participants were much more representative of the total population.

Panel Interviews and Workshop

Structured interviews were scheduled with panel members as schedules allowed to provide the facilitator background information about the practice. Panel members attended a workshop on July 18-19, 2019. The facilitator briefed the panel on the purpose and methods of practice analyses. Panel members were led through activities to determine broad categories of work and tasks that comprise the practice of an RMSKS. The panel then developed a preliminary task inventory and identified knowledge, skills, and abilities (KSAs) for sonographers who practice MSKS.

Survey

Survey Questionnaire Development

Working with the MSKS Assessment Committee, Inteleos staff made minor edits to the preliminary task inventory and KSAs for clarity and consistency of language. The inventory was compared with the existing content outline to verify that no topics

were inadvertently omitted. The final task inventory was approved by the MSKS Assessment Committee and used to build the practice analysis survey.

Survey participants were asked to rate each task on a scale of importance and frequency. Appendix B contains the instructions and scales used in the survey. The practice analysis survey was pilot tested with the Chair and Vice Chair of the MSKS Assessment Committee and with Inteleos clinical staff.

Survey Administration Procedure

Because the total number of Registered Musculoskeletal Sonographers (RMSKS) is relatively small, the survey was sent to all RMSKSs ($n = 768$). The survey was made available to participants as a web-based survey through the survey platform Qualtrics®. The survey was available to the participants between May 12th and May 28th, 2020. All responses to the survey were kept confidential.

Response Rates

Of the 768 individuals who received the survey, 241 respondents indicated that they currently perform and/or teach MSK ultrasound and completed the survey. Demographics of the 241 survey participants are listed in Appendix C.

RESULTS

Data Analysis

Respondents were asked the following questions for each task: 1) In your role as a Musculoskeletal Sonographer, how often do you perform this task, and 2) How important is it for a RMSKS to successfully perform this task? The frequency and importance rating scales were scored 1-5. The response options for the frequency scale were: Never (1), Rarely (2), Occasionally (3), Often (4), and Frequently (5). The response options for the importance scale were: Not Important (1), Somewhat Important (2), Important (3), Very Important (4), and Extremely Important (5). See Appendix B for instructions provided to candidates regarding how to apply the scale.

The frequency and importance rating scales were combined into a single measure of overall criticality (ranging from 0-16) using a hierarchical method in which values on the importance scale outweigh or outrank all values on the frequency scale, with the exception of 'Never' (see Appendix D). Higher criticality values indicate the most critical tasks for a sonographer performing diagnostic medical sonography examinations. These criticality values were averaged for each task. In addition, the criticality values were summed within each domain. The sum of criticality for each domain is divided by the overall criticality score to determine the initial percentages of the examination content in each domain.

Responses to demographic questions were also analyzed. Canadian Sonographers make up a large subgroup of the RMSKS overall practice and the survey respondents. Inteleos staff identified 10 tasks for which the Canadian participants' responses yielded a different category of criticality than those who practice in the United States. These tasks and the resulting decisions are in Appendix E.

The task criticality score and the initial domain weightings were sent to the assessment committee in advance of the final review call (see Appendix F).

Discussion of Results

Tasks were assigned to three categories to assist in discussing criticality scores. Tasks in the "Green" category had a criticality score of greater than or equal to nine. These were slated to be included on the content outline unless the committee could provide a strong rationale for not including them. Tasks in the "Yellow" category had a criticality score of greater than or equal to five and less than nine. The committee discussed the frequency and importance ratings and determined if the task should be included on the content outline. Tasks in the "Red" category had a criticality rating of below 5. These tasks were discussed by the committee and would only be included on the content outline if the committee had a strong rationale to defend that decision.

A conference call was held on July 16, 2020 with six members of the MSKS Assessment Committee and members of Inteleos

staff. The attendees reviewed the tasks and their criticality ratings, focusing on tasks with criticality weightings with values under nine. The attendees also evaluated the tasks for which the responses from those based in Canada were in a different criticality category than responses from those based in the United States. The attendees on the call suggested some minor changes to the wording of tasks and approved the content weighting.

The committee decided to remove six tasks. Four of these tasks had criticality ratings under five (“Red” category). The other two tasks had criticality values falling in the “Yellow” category. These tasks do not have a high frequency rating and the committee felt that they were more appropriate for the Pediatric Sonography exam (they are covered on the existing content outline for the Pediatric Sonography exam). Appendix F lists criticality scores and committee decisions for each task. The panel reviewed the domain weightings with the six tasks removed and approved the domain weightings.

On subsequent review, the Chair and Vice-chair recommended moving one task to a different domain. This changed the domain weightings slightly. This suggestion was reviewed and approved by the committee.

Inteleos clinical staff worked with the Chair and Vice-chair of the assessment committee to identify knowledge, skills, and abilities (KSAs) which align with the proposed content outline. Although domain weights are based on the criticality scores for associated tasks, and items are linked to tasks, KSAs are included on the last page of the content outline as additional support for test takers and for item writers.

FINAL CONTENT OUTLINE

The revised content outline including domain weightings and KSAs were provided to the Assessment Committee for final review and approval on October 8, 2020. This report, including the final version of the content outline recommended by the Assessment Committee will go to the ARDMS Council for approval*. Once the ARDMS Council approves the content outline, this report will be appended to- include the approval date. The final recommended Content Outline can be found in Appendix G.

* The ARDMS Council approved the attached Content Outline via Qualtrics on November 25, 2020 (Resolution 20407).

Appendix A: Practice Analysis Panel

Table 1. Panelists

| Panelist Name | State/Province | Country |
|----------------------|-----------------------|----------------|
| Joseph Augustyn | WA | USA |
| Laura Bubar | AB | Canada |
| Christina Hendricks | WI | USA |
| Diane Kesti | MN | USA |
| William Medford | WA | USA |
| Ashley Moorefield | MD | USA |
| Kathleen Quenneville | MI | USA |
| Lauren Ramage | CA | USA |
| Lisa Rhines | MI | USA |
| Erwin Singh | AB | Canada |
| Parker Stanley | VA | USA |
| Rayth Yuen | ON | Canada |

Table 2. Gender Identification of MSKS Population and Panel

| Gender | Percent in Population | Panel | Percent of Panel |
|---------------|------------------------------|--------------|-------------------------|
| Female | 72.4% | 7 | 58.3% |
| Male | 27.6% | 5 | 41.7% |

Table 3. U.S. Census Region of MSKS Population and Panel

| U.S. Census Region | Percent in MSKS Population | Panel | Percent of Panel |
|---------------------------|-----------------------------------|--------------|-------------------------|
| Midwest | 31.9% | 4 | 44% |
| Northeast | 26.3% | 0 | 0% |
| South | 17.0% | 2 | 22% |
| West | 24.8% | 3 | 33% |

Table 4. Percent of Canada and U.S. Based Practitioners

| Country Based in | Percent in MSK Population | Panel | Percent of Panel |
|-------------------------|----------------------------------|--------------|-------------------------|
| U.S.A | 45% | 9 | 75% |

Appendix B: Survey Instructions and Scale

The survey began by asking demographic and practice setting questions. The second part of the survey asks respondents to rate each task on the task inventory in terms of frequency and importance. The instructions to the candidate are provided below.

In the next section of the survey, you will be examining tasks associated with being a Musculoskeletal Sonographer and consider two questions:

1. In your role as a Musculoskeletal Sonographer, how **often** do you ...

- Frequently (More than once a day)
- Often (Weekly)
- Occasionally (Every few weeks)
- Rarely (Every few months or less frequently)
- Never

2. How **important** is it for a Registered Musculoskeletal Sonographer (RMSKS) to successfully ...

- Extremely Important
- Very Important
- Important
- Somewhat important
- Not important

Appendix C: Demographics of Survey Respondents

Figure 1. Gender Identification of MSKS Population Compared to Survey Respondents

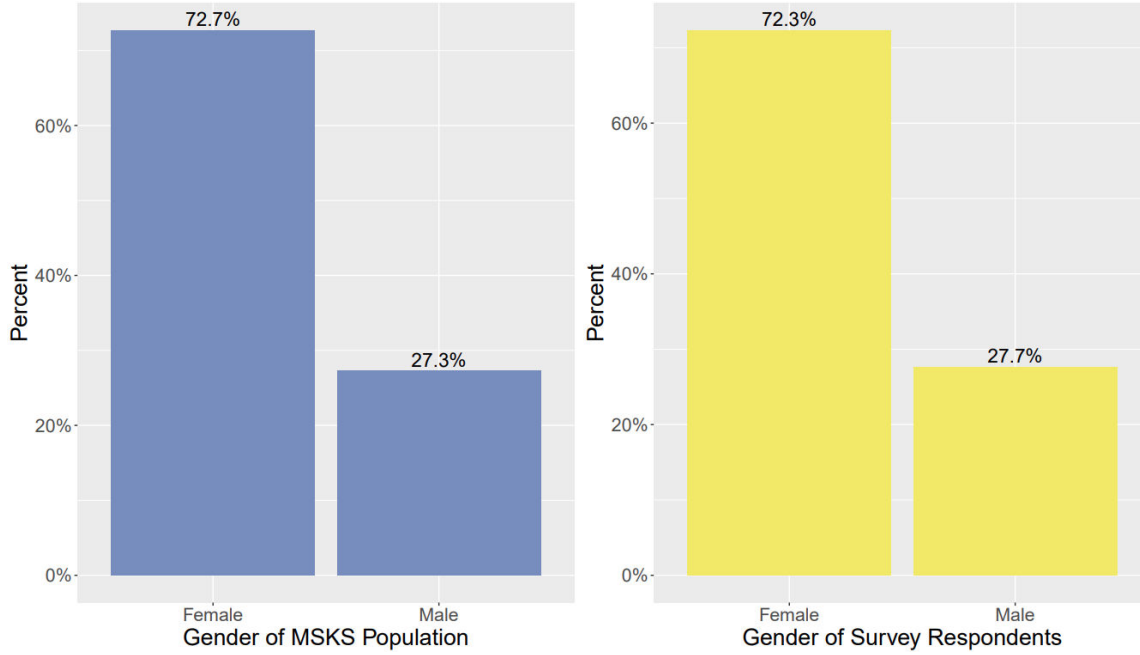


Figure 2. Age of MSKS Population Compared to Survey Respondents

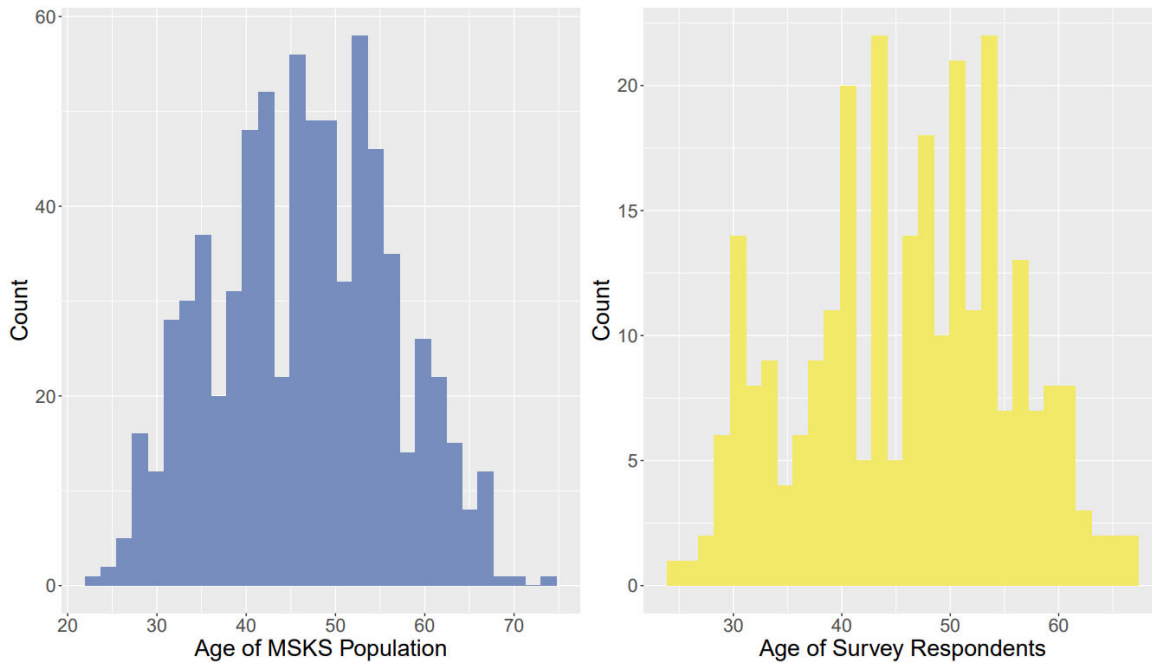


Figure 3. Comparison of Country of Residence for MSKS Population and of Survey Respondents

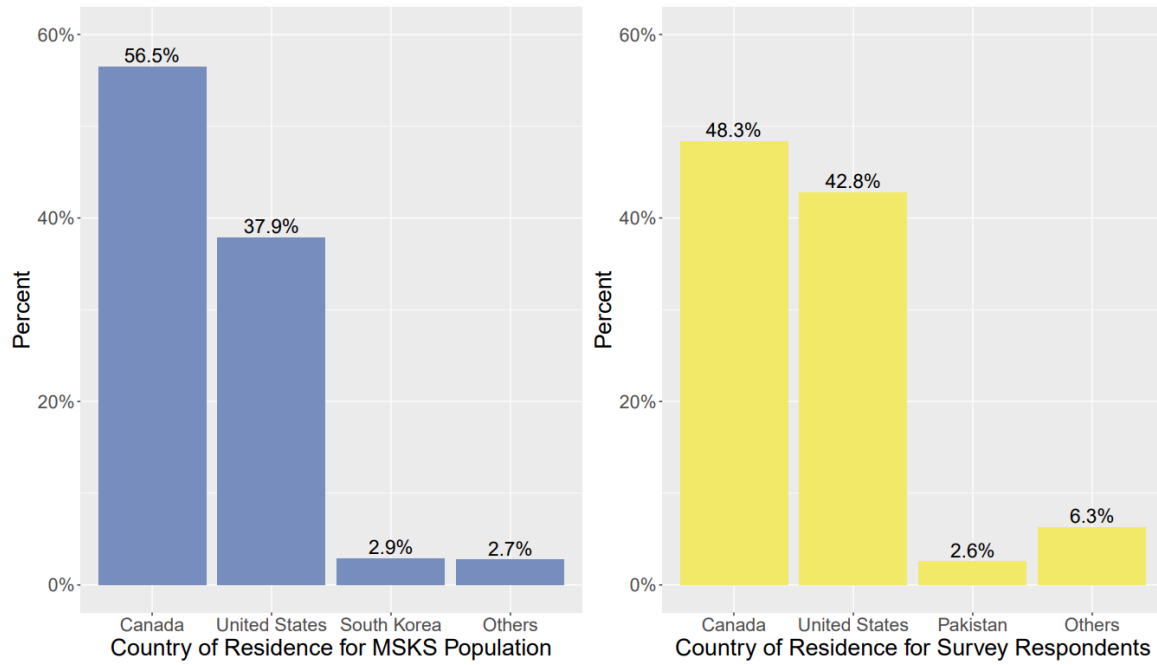


Figure 4. Comparison of U.S. Census Region of MSKS Population and Survey Respondents

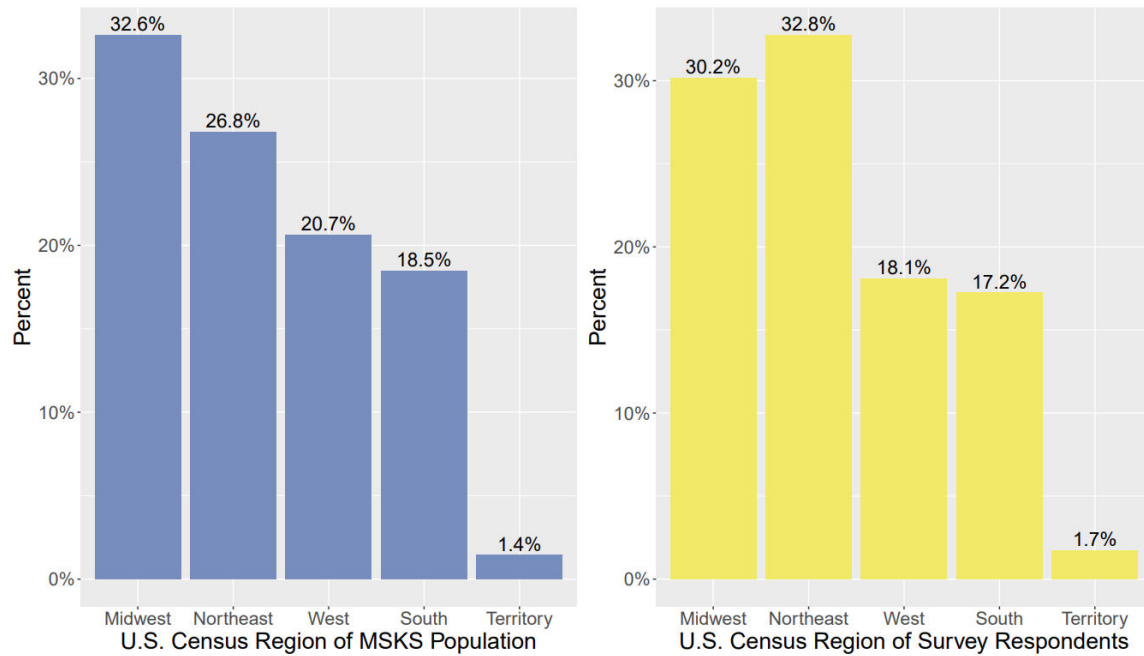


Figure 5. Primary Job Function of MSKS Population

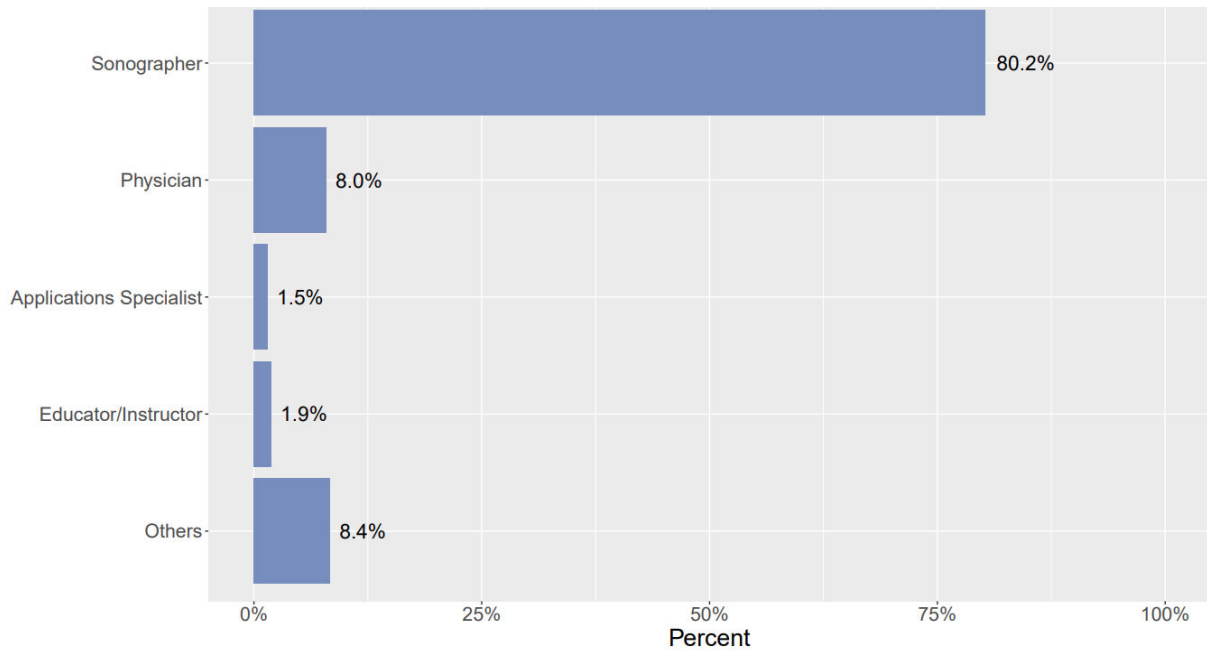


Figure 6. Primary Job Function of Survey Respondents

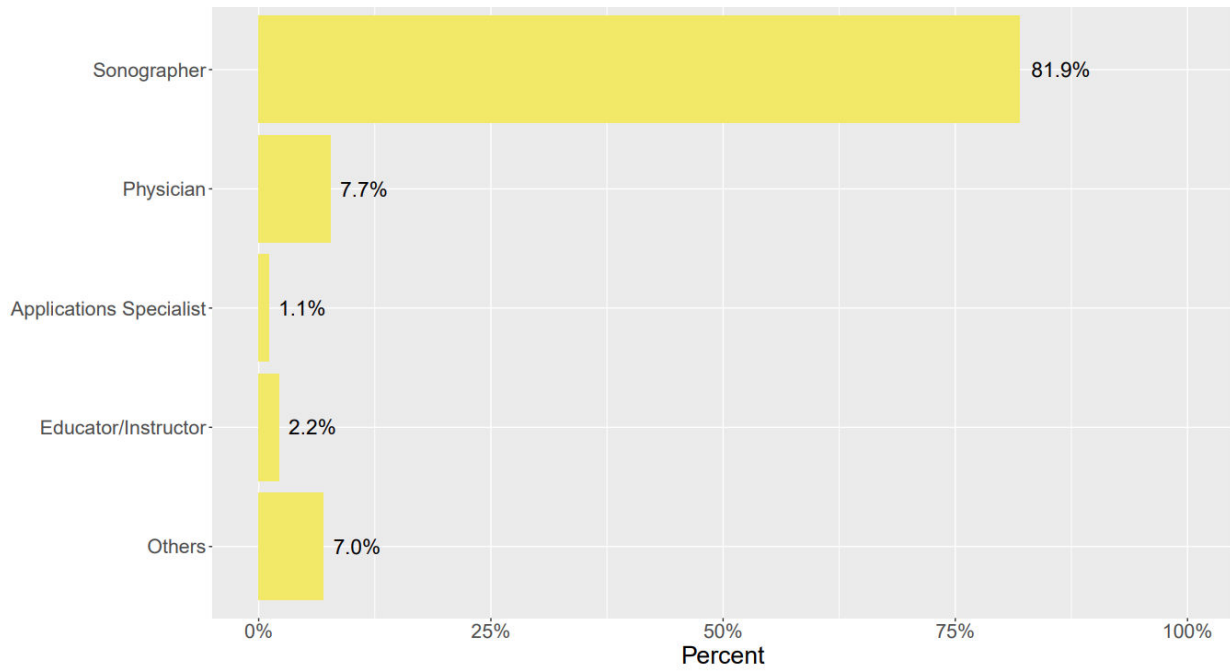


Figure 7. Years of Experience of Survey Respondents

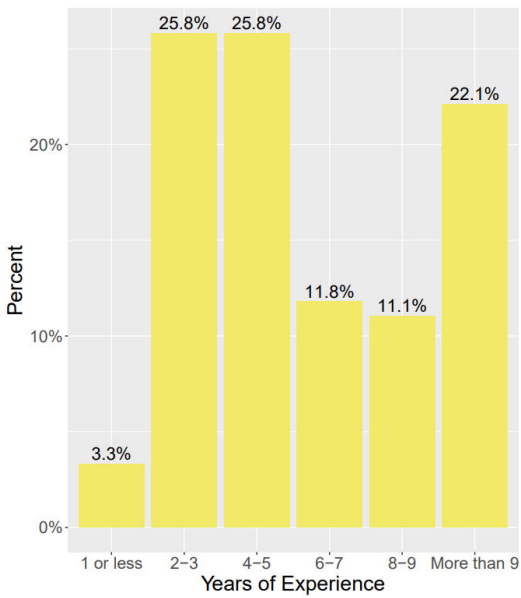


Figure 8. Country of Education of Survey Respondents

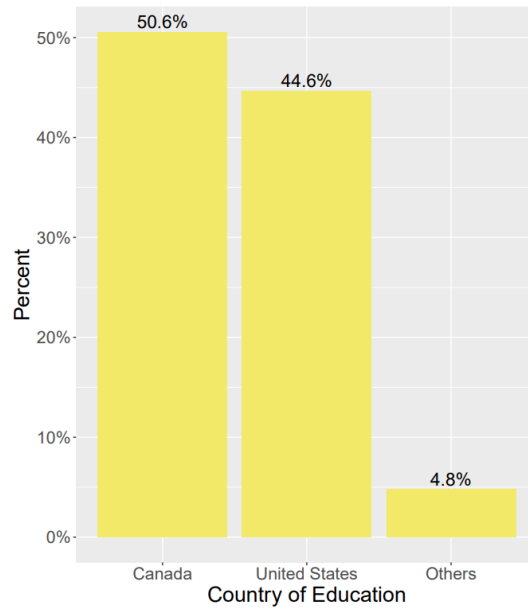


Figure 9. Specialty of Survey Respondents

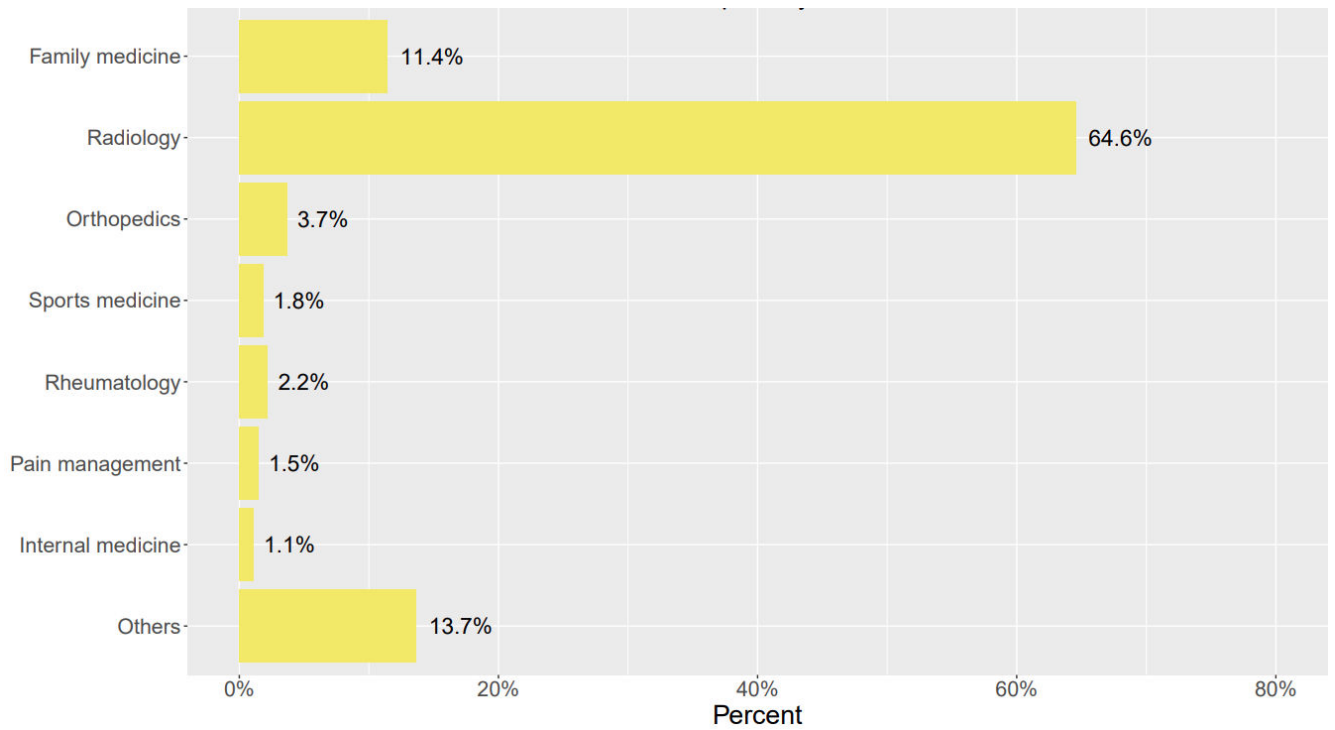


Figure 10. Work Setting of Survey Respondents

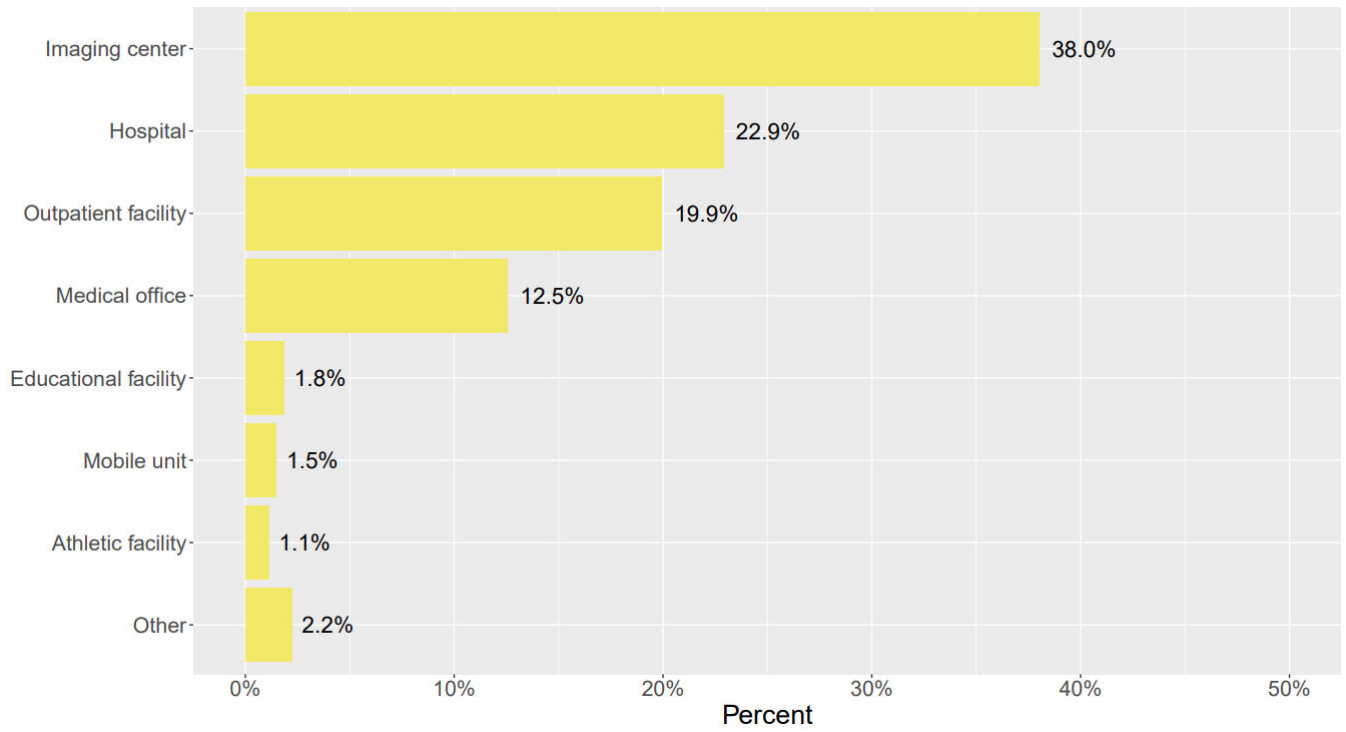
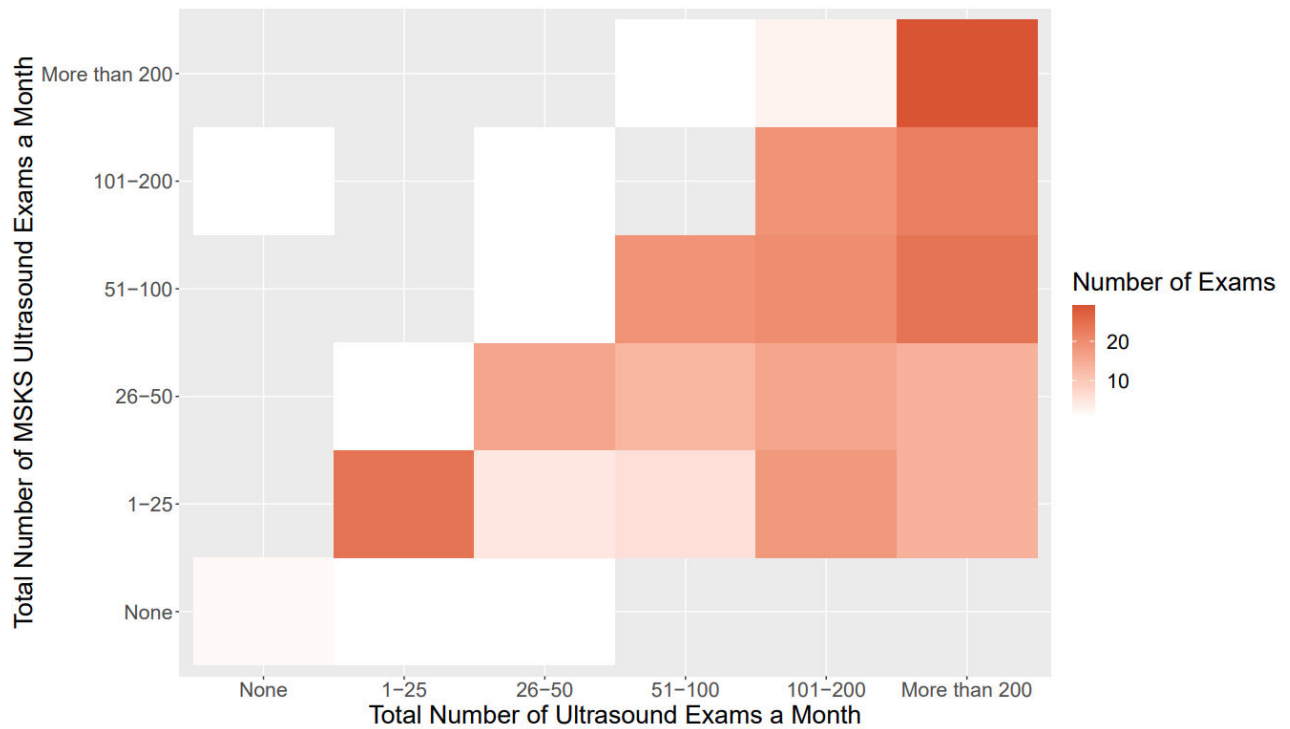


Figure 11. Volume of MSKS Ultrasound Examinations Compared to Total Number of Ultrasound Exams Performed



Appendix D: Criticality Scale

| Response Options | | Overall Criticality |
|--------------------------|------------------|---------------------|
| Importance | Frequency | Score |
| Critically Important (5) | Always (5) | 16 |
| | Often (4) | 15 |
| | Occasionally (3) | 14 |
| | Rarely (2) | 13 |
| Very Important (4) | Always (5) | 12 |
| | Often (4) | 11 |
| | Occasionally (3) | 10 |
| | Rarely (2) | 9 |
| Important (3) | Always (5) | 8 |
| | Often (4) | 7 |
| | Occasionally (3) | 6 |
| | Rarely (2) | 5 |
| Somewhat Important (2) | Always (5) | 4 |
| | Often (4) | 3 |
| | Occasionally (3) | 2 |
| | Rarely (2) | 1 |
| Not Important (1) | All options | 0 |
| | Never (1) | 0 |

Appendix E: Tasks with Different Category Ratings for Practitioners Based in U.S. Compared to Those Based in Canada

| Domain & Task | Canada Criticality | U.S. Criticality | Overall | Decision (Keep?) | Comment |
|--|--------------------|------------------|---------|------------------|---|
| Perform general ultrasound of the muscles and fasciae of the abdominal wall | 10.29 | 8.47 | 9.64 | Yes | Panel felt it was important to practice in either country as the overall criticality score reflects. |
| Perform general ultrasound of the neurovascular system of the ankle and foot | 8.16 | 10.79 | 9.36 | Yes | Panel felt it was important to practice in either country as the overall criticality score reflects. |
| Perform general ultrasound of the infant hip | 4.37 | 5.36 | 5.15 | No | Panel felt this had a lower overall criticality rating and that the topic is more appropriate for the pediatric exam |
| Perform general ultrasound of the pediatric hip | 4.87 | 5.55 | 5.39 | No | Panel felt this had a lower overall criticality rating and that the topic is more appropriate for the pediatric exam |
| Differentiate pediatric from adult anatomy | 9.75 | 7.19 | 8.69 | Yes | Even though this is not done frequently in the U.S, importance ratings were higher. Panel felt this warranted leaving in. |
| Evaluate for gas within the soft tissue | 9.29 | 8.31 | 9.1 | Yes | Panel felt it was important to practice in either country as the overall criticality score reflects. |
| Evaluate joint laxity/ altered function | 8.54 | 10.62 | 9.67 | Yes | Panel felt it was important to practice in either country as the overall criticality score reflects. |
| Evaluate postsurgical anatomy and hardware (including prosthetic hip) | 8.33 | 9.84 | 9.1 | Yes | Panel felt it was important to practice in either country as the overall criticality score reflects. |
| Evaluate temporal mandibular joint pathology | 5.71 | 3.55 | 4.95 | No | Panel felt that the overall low criticality value and the low criticality value for each country indicated that this task should not be included on the content outline. |
| Assist/support during ultrasound guidance during interventional procedures | 7.18 | 12.84 | 9.91 | Yes | Panel felt this is important to include in the outline, even if it is not performed as frequently in Canada. This topic is covered by US and Canadian educational programs. |

As discussed in the “Discussion of Results” section, tasks in the “Green” category have a criticality score of greater than or equal to nine. Tasks in the “Yellow” category have a criticality score of greater than or equal to five and less than nine. Tasks in the “Red” category have a criticality rating of below 5. When looking at the two largest subgroups (practitioners based in the U.S. and practitioners based in Canada) the criticality category is different for the ten tasks listed above. Special attention was given to discussions of these tasks to ensure they were appropriate for both sub-groups.

Appendix F: Criticality Scores

| Domain & Task | Criticality | Recommendation | Keep? |
|--|-------------|----------------|-------|
| Anatomy | 11.08 | | |
| Perform general ultrasound of the muscles and fasciae of the abdominal wall | 9.64 | + | Yes |
| Perform general ultrasound of the bones, bursae, fat pads, and joints of the ankle and foot | 12.77 | + | Yes |
| Perform general ultrasound of the fasciae, ligaments, muscles, retinaculum, and tendons of the ankle and foot | 13.35 | + | Yes |
| Perform general ultrasound of the neurovascular system of the ankle and foot | 9.36 | + | Yes |
| Perform general ultrasound of the bones, muscles, and fasciae of the chest wall | 6.65 | ± | Yes |
| Perform general ultrasound of the bones, bursae, fat pads, joints, and ligaments of the elbow | 12.42 | + | Yes |
| Perform general ultrasound of the fasciae, muscles, and tendons of the elbow | 12.79 | + | Yes |
| Perform general ultrasound of the neurovascular system of the elbow | 11.36 | + | Yes |
| Perform general ultrasound of the bones, cartilage, and joints of the hand and wrist | 13.16 | + | Yes |
| Perform general ultrasound of the fasciae, muscles, tendons, retinaculum, pulleys, sagittal bands, and ligaments of the hand and wrist | 13.54 | + | Yes |
| Perform general ultrasound of the neurovascular system of the hand and wrist | 12.79 | + | Yes |
| Perform general ultrasound of the bones, bursae, cartilage, and joints of the hip, groin, and pelvis | 11.42 | + | Yes |
| Perform general ultrasound of the muscles and tendons of the hip, groin, and pelvis | 11.62 | + | Yes |
| Perform general ultrasound of the lymphatic and neurovascular system of the hip, groin, and pelvis | 8.87 | ± | Yes |
| Perform general ultrasound of the infant hip | 5.15 | ± | No |
| Perform general ultrasound of the pediatric hip | 5.39 | ± | No |
| Perform general ultrasound of the bones, bursae, fat pads, cartilage, and joints of the knee | 13.64 | + | Yes |
| Perform general ultrasound of the muscles, tendons, retinaculum, and ligaments of the knee | 13.83 | + | Yes |

| | | | |
|---|--------------|---|-----|
| Perform general ultrasound of the neurovascular system of the knee | 9.88 | + | Yes |
| Perform general ultrasound of the bones, bursae, cartilage, joints, and ligaments of the shoulder | 14.35 | + | Yes |
| Perform general ultrasound of the muscles and tendons of the shoulder | 14.69 | + | Yes |
| Perform general ultrasound of the neurovascular system of the shoulder | 9.36 | + | Yes |
| Differentiate pediatric from adult anatomy | 8.69 | ± | Yes |
| Pathology | 11.23 | | |
| Evaluate bone pathology and erosion | 10.76 | + | Yes |
| Evaluate impingement, subluxations/dislocation and altered function | 13.40 | + | Yes |
| Evaluate muscle pathology and tears | 13.72 | + | Yes |
| Evaluate bursa pathology | 13.84 | + | Yes |
| Evaluate nerve pathology and entrapment | 11.54 | + | Yes |
| Evaluate soft tissue pathology | 13.37 | + | Yes |
| Evaluate for gas within the soft tissue | 9.10 | + | Yes |
| Evaluate infections | 11.16 | + | Yes |
| Evaluate subcutaneous abnormalities | 12.19 | + | Yes |
| Evaluate for foreign body | 11.84 | + | Yes |
| Evaluate masses | 13.02 | + | Yes |
| Evaluate cartilage pathology | 10.21 | + | Yes |
| Evaluate fluid collections, e.g., abscess, hematoma | 13.20 | + | Yes |
| Evaluate cystic structures | 13.24 | + | Yes |
| Evaluate hernias | 12.45 | + | Yes |
| Evaluate retinaculum pathology | 10.16 | + | Yes |
| Evaluate pulley and sagittal band pathology | 10.56 | + | Yes |
| Evaluate synovitis | 13.27 | + | Yes |
| Evaluate synovial proliferation | 11.85 | + | Yes |
| Evaluate joint effusions | 14.09 | + | Yes |
| Evaluate crystal deposits | 10.85 | + | Yes |
| Evaluate joint laxity/altered function | 9.67 | + | Yes |
| Evaluate ligament pathology and tears | 13.86 | + | Yes |
| Evaluate tendon pathology, calcifications, and tears | 14.66 | + | Yes |
| Evaluate postsurgical anatomy and hardware (including prosthetic hip) | 9.10 | + | Yes |
| Evaluate pediatric specific musculoskeletal pathology | 6.46 | ± | Yes |
| Evaluate sternoclavicular joint pathology | 8.20 | ± | Yes |
| Evaluate temporal mandibular joint pathology | 4.95 | — | No |
| Evaluate spine pathology | 4.97 | — | No |

| | | | |
|---|-------|---|-----|
| Protocols and Integration of Data | 14.17 | | |
| Verify appropriateness of the order and obtain pertinent clinical history from the patient and/or medical records | 14.88 | + | Yes |
| Position patient and ultrasound machine | 15.02 | + | Yes |
| Assess the physical condition of the patient, focusing on the area to be examined | 14.82 | + | Yes |
| Follow ultrasound imaging protocols for musculoskeletal-related studies | 14.68 | + | Yes |
| Perform anatomic assessment during dynamic scanning | 14.47 | + | Yes |
| Communicate ultrasound findings | 13.16 | + | Yes |
| Recognize ultrasound findings that require immediate action | 13.16 | + | Yes |
| Perform measurements | 13.96 | + | Yes |
| Manipulate probe positioning for optimal image acquisition, i.e., anisotropy | 15.42 | + | Yes |
| Correlate ultrasound findings with clinical presentation and previous imaging | 14.63 | + | Yes |
| Follow course of disease with serial ultrasound exams | 11.64 | + | Yes |
| Procedures and Patient Care | 7.50 | | |
| Maintain aseptic techniques during interventional procedures | 12.91 | + | Yes |
| Assist/support during ultrasound guidance during interventional procedures | 9.91 | + | Yes |
| Follow postprocedural protocols, i.e., pain assessment, complications, and specimen management | 9.99 | + | Yes |
| Use elastography when evaluating musculoskeletal anatomy and pathology | 2.53 | — | No |
| Use contrast-enhanced ultrasound when evaluating musculoskeletal anatomy and pathology | 2.15 | — | No |

Appendix G: Content Outline

Musculoskeletal Sonography Examination Content Outline

(Outline Summary)

| # | Domain | Subdomain | Percentage |
|---|-----------------------------------|---|------------|
| 1 | General Anatomy and Physiology | Abdominal wall Ankle and foot Chest wall Elbow Hand and wrist Hip, groin, and pelvis Knee Shoulder Developmental changes | 33% |
| 2 | General Pathology | Abnormal physiology | 42% |
| 3 | Protocols and Integration of Data | Clinical standards and guidelines Incorporate outside data | 21% |
| 4 | Interventional Procedures | Sonographer role in procedure | 4% |

(Detailed Outline)

| | |
|---------------|---|
| 1. | Anatomy 33% |
| 1.A. | <i>Abdominal wall</i> |
| 1.A.1. | Perform general ultrasound of the muscles and fasciae of the abdominal wall |
| 1.B. | <i>Ankle and foot</i> |
| 1.B.1. | Perform general ultrasound of the bones, bursae, fat pads, and joints of the ankle and foot |
| 1.B.2. | Perform general ultrasound of the fasciae, ligaments, muscles, retinaculum, and tendons of the ankle and foot |
| 1.B.3. | Perform general ultrasound of the neurovascular system of the ankle and foot |
| 1.C. | <i>Chest wall</i> |
| 1.C.1. | Perform general ultrasound of the bones, muscles, and fasciae of the chest wall |
| 1.D. | <i>Elbow</i> |

| | |
|---------------|--|
| 1.D.1. | Perform general ultrasound of the bones, bursae, fat pads, joints, and ligaments of the elbow |
| 1.D.2. | Perform general ultrasound of the fasciae, muscles, and tendons of the elbow |
| 1.D.3. | Perform general ultrasound of the neurovascular system of the elbow |
| 1.E. | <i>Hand and Wrist</i> |
| 1.E.1. | Perform general ultrasound of the bones, cartilage, and joints of the hand and wrist |
| 1.E.2. | Perform general ultrasound of the fasciae, muscles, tendons, retinaculum, pulleys, sagittal bands, and ligaments of the hand and wrist |
| 1.E.3. | Perform general ultrasound of the neurovascular system of the hand and wrist |
| 1.F. | <i>Hip, Groin, and Pelvis</i> |
| 1.F.1. | Perform general ultrasound of the bones, bursae, cartilage, and joints of the hip, groin, and pelvis |
| 1.F.2. | Perform general ultrasound of the muscles and tendons of the hip, groin, and pelvis |
| 1.F.3. | Perform general ultrasound of the lymphatic and neurovascular system of the hip, groin, and pelvis |
| 1.G. | <i>Knee</i> |
| 1.G.1. | Perform general ultrasound of the bones, bursae, fat pads, cartilage, and joints of the knee |
| 1.G.2. | Perform general ultrasound of the muscles, tendons, retinaculum, and ligaments of the knee |
| 1.G.3. | Perform general ultrasound of the neurovascular system of the knee |
| 1.H. | <i>Shoulder</i> |
| 1.H.1. | Perform general ultrasound of the bones, bursae, cartilage, joints, and ligaments of the shoulder |
| 1.H.2. | Perform general ultrasound of the muscles and tendons of the shoulder |
| 1.H.3. | Perform general ultrasound of the neurovascular system of the shoulder |
| 1.I. | <i>Developmental changes</i> |

| | |
|-------------|---|
| 1.I.1. | Differentiate pediatric from adult anatomy |
| 2. | General Pathology 42% |
| 2.A. | <i>Abnormal physiology</i> |
| 2.A.1. | Evaluate bone pathology and erosion |
| 2.A.2. | Evaluate cartilage pathology |
| 2.A.3. | Evaluate synovitis |
| 2.A.4. | Evaluate synovial proliferation |
| 2.A.5. | Evaluate joint effusions |
| 2.A.6. | Evaluate crystal deposits |
| 2.A.7. | Evaluate joint laxity/altered function |
| 2.A.8. | Evaluate ligament pathology and tears |
| 2.A.9. | Evaluate tendon pathology, calcifications, and tears |
| 2.A.10. | Evaluate impingement, subluxations/dislocation and altered function |
| 2.A.11. | Evaluate muscle pathology and tears |
| 2.A.12. | Evaluate bursa pathology |
| 2.A.13. | Evaluate nerve pathology and entrapment |
| 2.A.14. | Evaluate soft tissue/subcutaneous pathology |
| 2.A.15. | Evaluate for gas within the soft tissue |
| 2.A.16. | Evaluate infections |
| 2.A.17. | Evaluate for foreign body |
| 2.A.18. | Evaluate masses |
| 2.A.19. | Evaluate fluid collections |
| 2.A.20. | Evaluate cystic structures |
| 2.A.21. | Evaluate hernias |
| 2.A.22. | Evaluate retinaculum pathology |

| | |
|----------------|---|
| 2.A.23. | Evaluate pulley and sagittal band pathology |
| 2.A.24. | Evaluate pediatric specific musculoskeletal pathology |
| 2.A.25. | Evaluate sternoclavicular joint pathology |
| 2.A.26. | Evaluate postsurgical anatomy and hardware (including prosthetic hip) |
| 3. | Protocols and Integration of Data 21% |
| 3.A. | <i>Clinical standards and guidelines</i> |
| 3.A.1. | Position patient and ultrasound machine |
| 3.A.2. | Assess the physical condition of the patient, focusing on the area to be examined |
| 3.A.3. | Follow ultrasound imaging protocols for musculoskeletal-related studies |
| 3.A.4. | Perform anatomic assessment during dynamic scanning |
| 3.A.5. | Manipulate probe positioning for optimal image acquisition, i.e., anisotropy |
| 3.A.6. | Follow course of disease with serial ultrasound exams |
| 3.A.7. | Perform measurements |
| 3.A.8. | Communicate ultrasound findings |
| 3.A.9. | Recognize ultrasound findings that require immediate action |
| 3.B. | <i>Incorporate outside data</i> |
| 3.B.1. | Verify appropriateness of the order and obtain pertinent clinical history from the patient and/or medical records |
| 3.B.2. | Correlate ultrasound findings with clinical presentation and previous imaging |
| 4. | Procedures 4% |
| 4.A. | <i>Sonographer role in procedure</i> |
| 4.A.1. | Maintain aseptic techniques during interventional procedures |
| 4.A.2. | Assist/support ultrasound guidance during interventional procedures |
| 4.A.3. | Follow postprocedural protocols, i.e., pain assessment, complications, and specimen management |