Abdomen Sonography (AB)

2017-18 Job Task Analysis Summary Report

American Registry for Diagnostic Medical Sonography (ARDMS)

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ACKNOWLEDGEMENTS

This study was completed through the work of many individuals at Inteleos, who worked together to construct the survey, administer the survey, and analyze the data. Fifteen (15) subject matter experts also volunteered many hours to draft and review materials before and after the survey was administered. Thank you to the 1200+ ARDMS sonographer registrants around the nation and other countries who took the time to participate in the job task analysis survey.

EXECUTIVE SUMMARY

The American Registry for Diagnostic Medical Sonography (ARDMS) 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 job task analyses (JTAs) at the national and international levels facilitates ARDMS in evaluating the current practice expectations and performance requirements of the specialty. The 2017 Abdomen Sonography (AB) JTA was designed to collect information on the sonography-related work activities sonographer registrants perform in practice. The results of the JTA were used in updating the test content outline, which guides content distribution of the AB Examination. This report details the methodology, data collection and analysis, and survey results. It also includes the test content outline that resulted from the JTA.

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.

METHODOLOGY

Job Task Analysis Working Group

A JTA Working Group consisting of fifteen (15) subject matter experts (SMEs) led this project. The fifteen JTA Working Group members are all volunteers and included Assessment Oversight Team (AOT).

Survey Questionnaire Development

ARDMS contracted with *The Caviart Group*, a certification and testing consulting group, to facilitate a kick-off meeting. During this meeting, the JTA Working Group developed the task list and demographic questions to include on the survey. Tasks and demographic questions from previous job task surveys were used as a starting point in this development. The JTA Working Group reached consensus on a list of 99 tasks to be used in the survey. These tasks were divided into four (4) domains: (1) Anatomy, Perfusion, and Function; (2) Pathology, Trauma, Vascular Abnormalities, and Postoperative Anatomy; (3) Abdominal Physics; and (4) Clinical Care, Practice, and Quality Assurance. All task statements and response options were relevant to RDMS-AB credentialed sonographers.

The survey questionnaire was pilot-tested with the fifteen (15) members from the JTA Working Group and three validation group members.

Survey Process

Survey Administration Procedure

The survey was made available to participants as a web-based survey through the survey platform Qualtrics®. An invitation to participate in the survey was sent via email to the prospective respondents.

ARDMS sent the job task analysis survey to 2,590 registrants credentialed since 2001. These registrants were selected randomly using a stratified sampling method so that the sample was representative of all ARDMS sonographer registrants in terms of specialty, gender, and geographic region. The survey was made available to the participants for two weeks between July 24th and August 6th, 2017. All responses to the survey were kept confidential.

Response Rates

A total of 1,257 (49% of those sampled) sonographers responded to the survey. Of these, 1,143 (91% of respondents; 44% of the original sample) reported that they currently perform abdominal sonography. The final JTA data analyses were based on the responses from the 1,143 sonographers currently performing abdominal sonography.

Data Analysis

Respondents were asked the following questions for each task: 1) How frequently do newly certified Abdomen sonographers perform this task? and 2) How important is the task in affecting clinical decisions and patient outcomes? 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 Always (5). The response options for the importance scale were Not Important (1), Somewhat Important (2), Important (3), Very Important (4), and Critically Important (5).

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 Table 1). Higher criticality values indicate the most critical tasks for a sonographer performing diagnostic medical sonography examinations. These criticality values were averaged for each task and rank ordered and reviewed by the JTA Working Group. 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.

Table 1. Construction of Overall Criticality Scale

Survey Response Options		Overall Criticality Score
Importance	**Frequency**	
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
All options	Never (1)	0

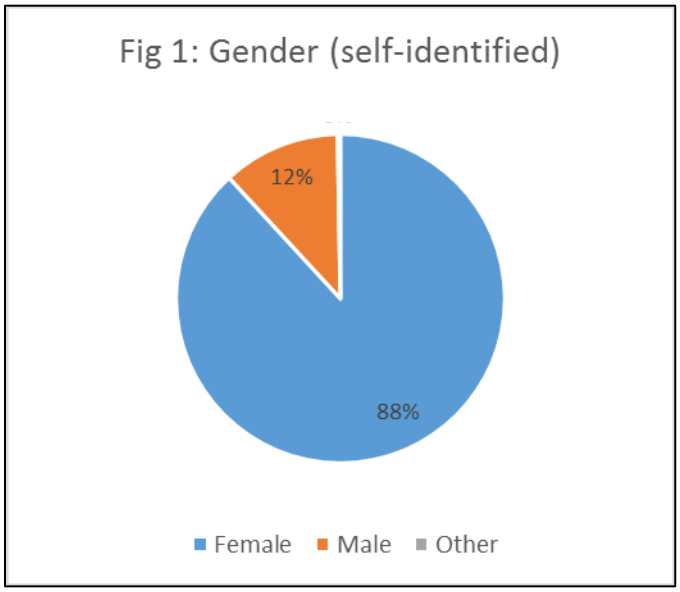
SURVEY RESULTS

Demographics and Backgrounds of Participants

Of the 1,143 participants who were currently practicing abdominal sonography, 857 completed the demographics portion of the JTA survey, and this section is based on those 857 participants.

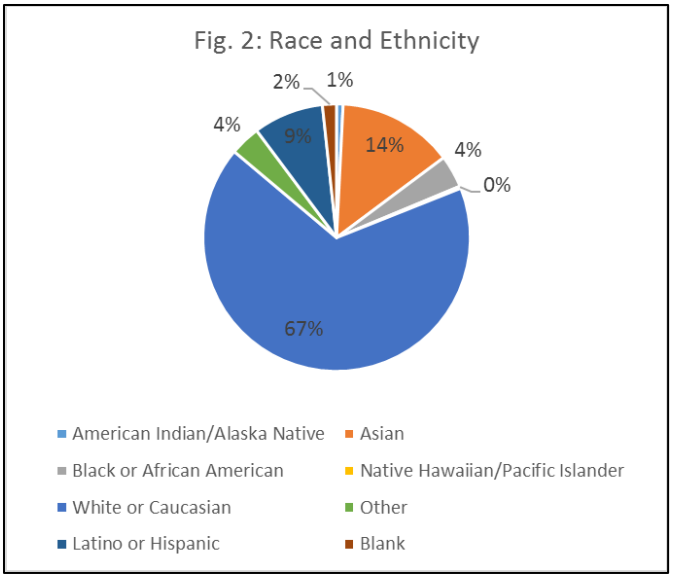
Gender

Approximately 88% of the respondents were female and 12% were male (see Figure 1). Two (2) respondents selected "other."



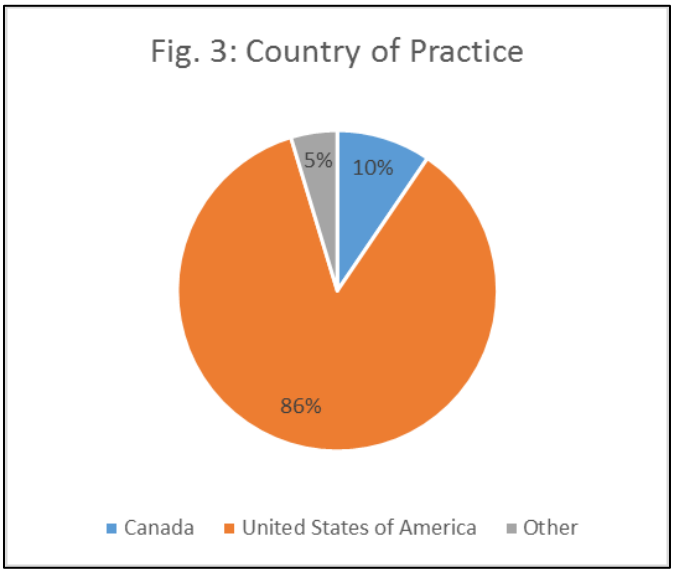
Race and Ethnicity

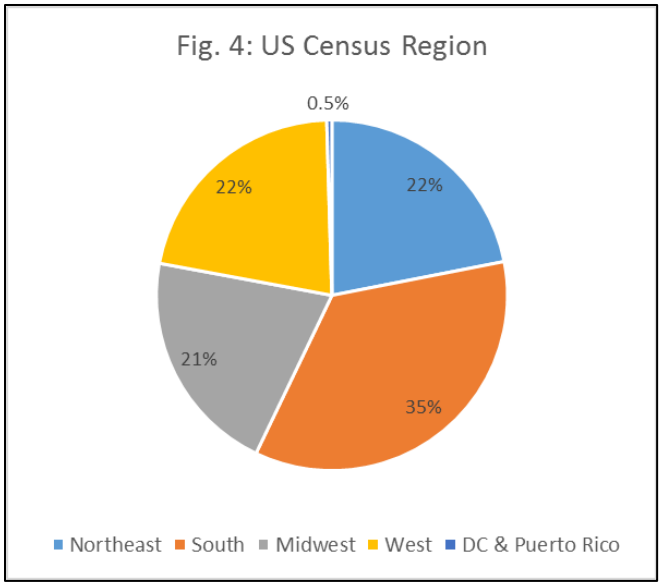
Approximately 67% of respondents were white or Caucasian, 14% of respondents were Asian, 4% black or African American, and 9% Hispanic or Latino. Additionally, 4% of respondents marked "other" (see Figure 2). Less than 1% of respondents selected American Indian or Pacific Islander (not shown), and 2% of respondents selected more than one race/ethnicity.



Location of Practice

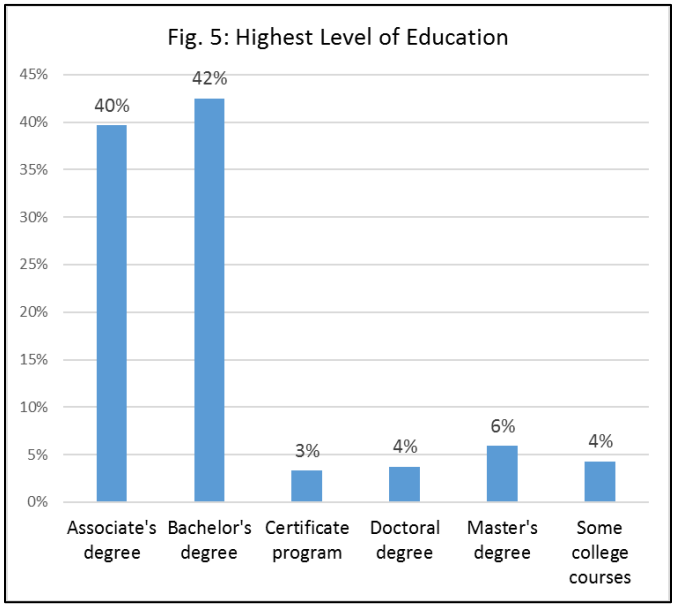
Of the respondents who reported the country in which they practice, 86% reported practicing in the United States and 10% in Canada, with the other 5% of respondents practicing in 20 other countries (see Figure 3). Among US residents who provided the US state they practice in, over a third (35%) practiced in the southern region of the United States (as defined by the US Census Bureau; Figure 4). One (1) respondent practiced in the District of Columbia and two (2) in Puerto Rico.

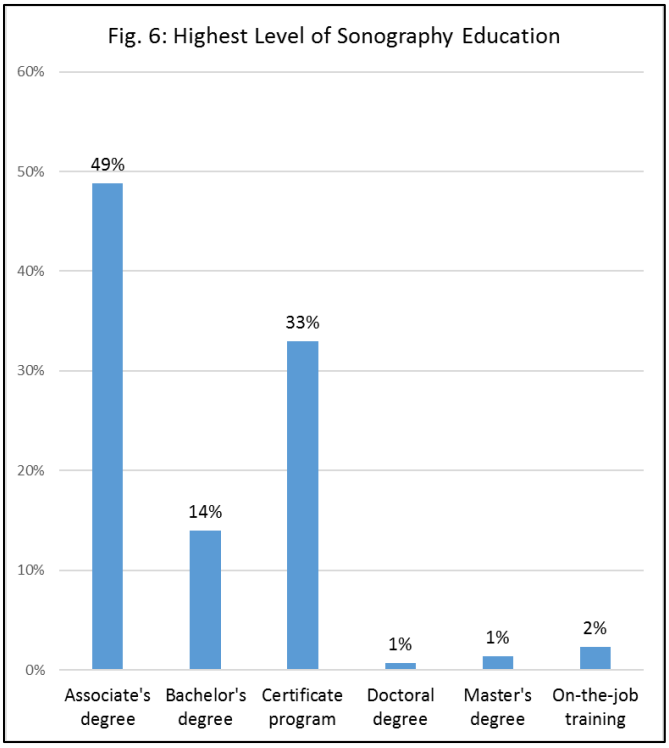




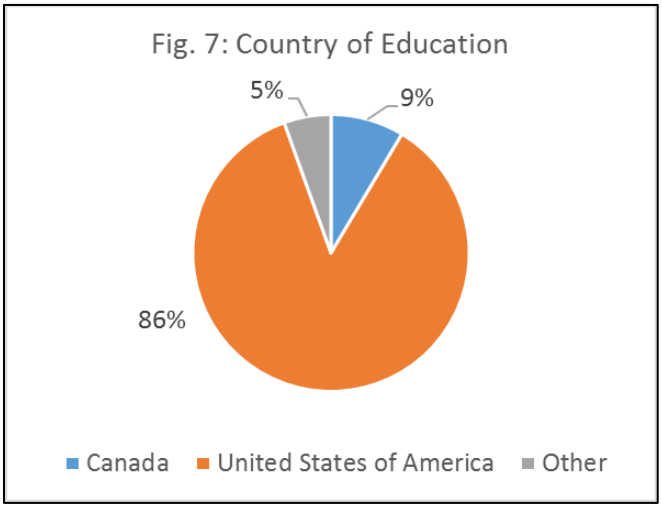
Level of Education

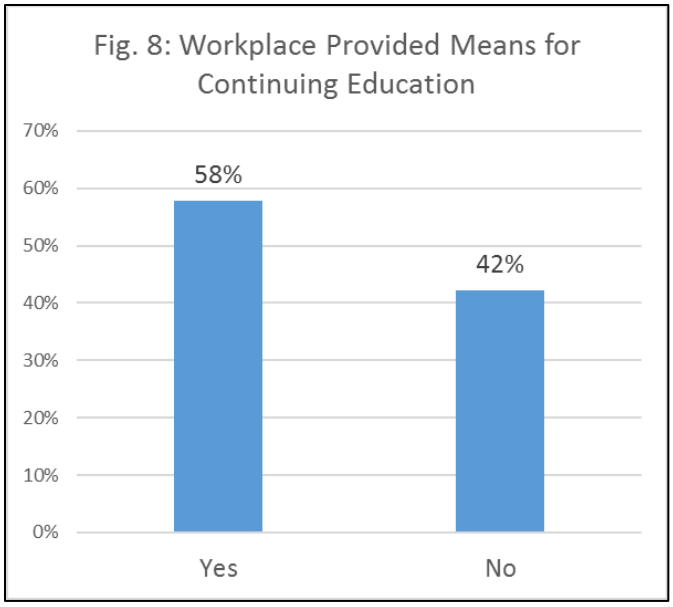
Approximately 40% had an Associate's degree and 42% of respondents had a Bachelor's degree as their highest level of education (see Figure 5). Within sonography-specific education, 49% of respondents had an Associate's degree and 33% of respondents had a certificate program as their highest level of education (see Figure 6).





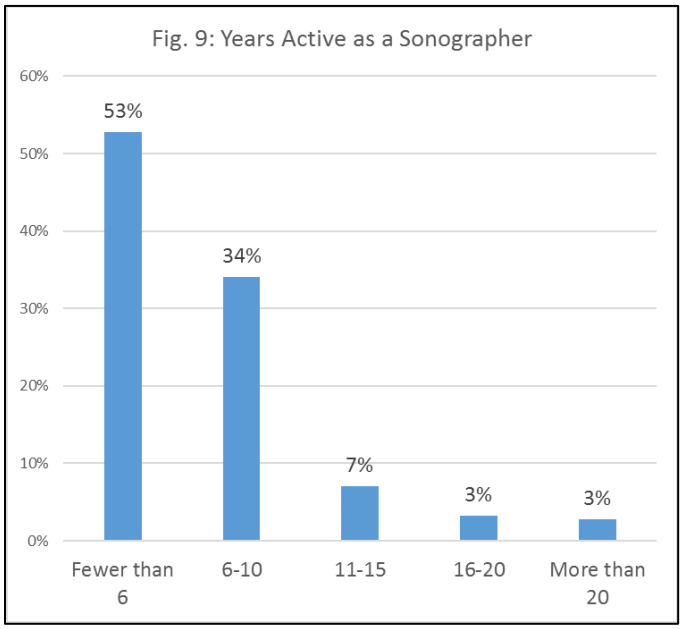
Almost all (86%) of respondents received their education in the United States, 9% in Canada, and the remaining 5% of respondents were educated in 25 other countries around the world (see Figure 7). A little over half of respondents (58%) had opportunities to continue their education provided by their employers (see Figure 8).

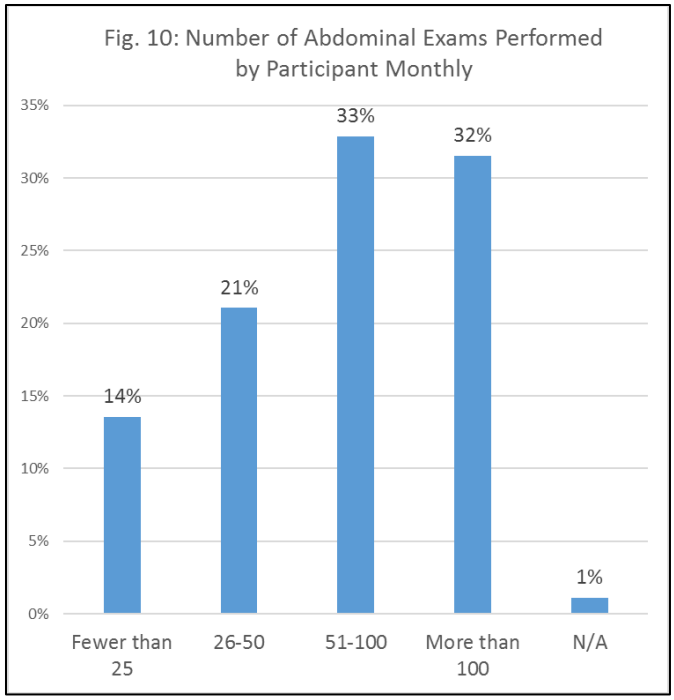




Work Experience

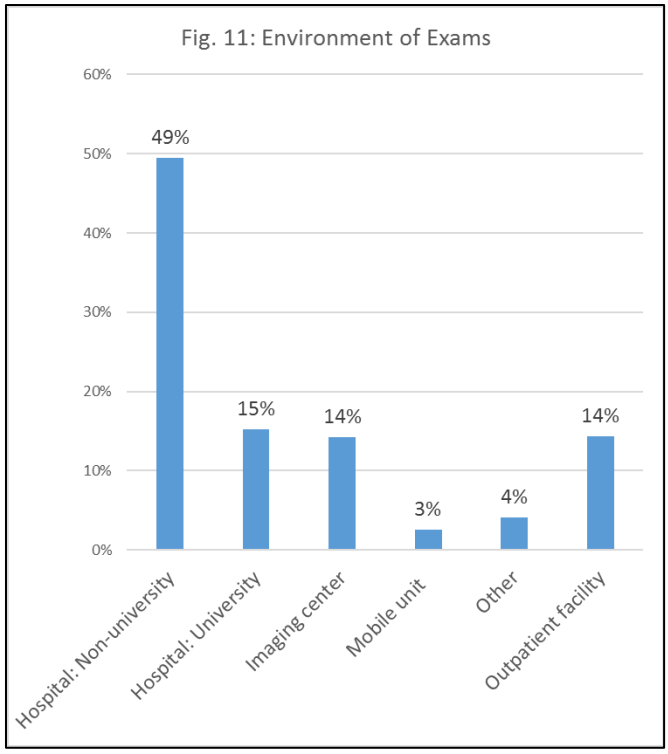
Approximately 53% of respondents had been practicing sonography for fewer than 6 years, and 34% had been practicing for 6 to 10 years (see Figure 9). Approximately a third of respondents performed 51-100 abdominal exams (33%) every month and another third performed over 100 exams a month (32%; see Figure 10).



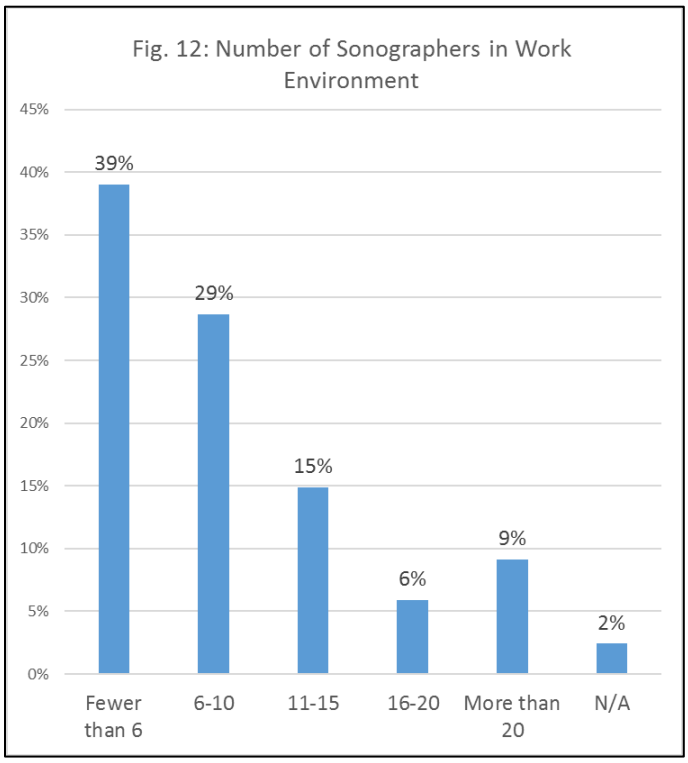


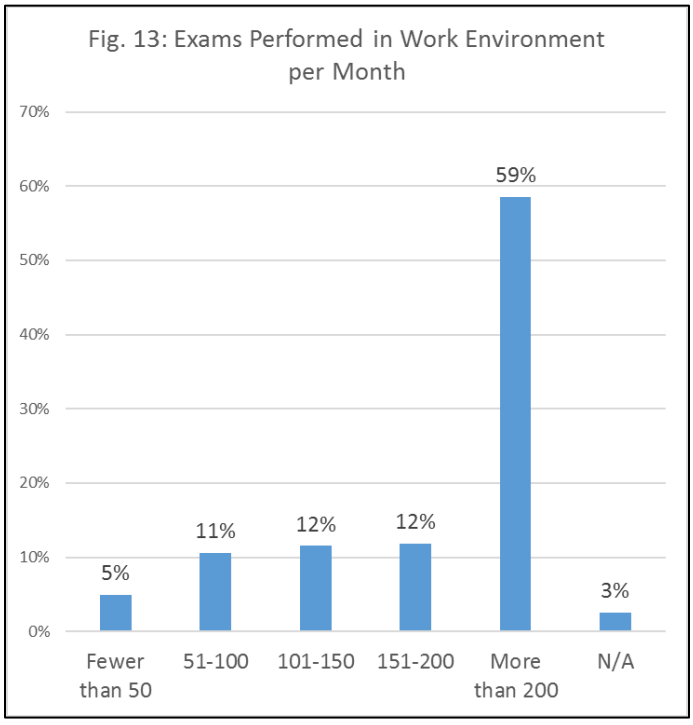
Work Environment

The respondents were asked to indicate the type of environment in which they perform most of their sonographic examinations. The most common response (49%) was a non-university hospital (see Figure 11).



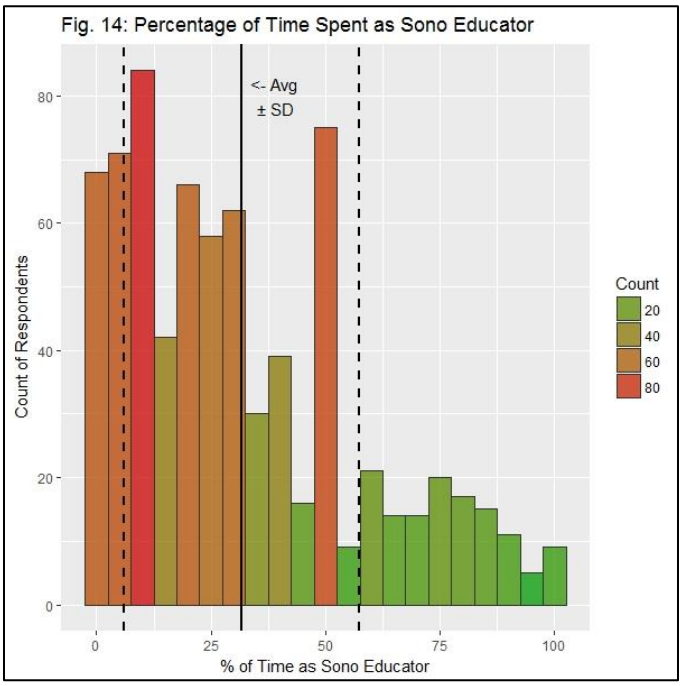
The most common number of sonographers in respondents' labs was less than 6 sonographers (39%) followed by 6 to 10 sonographers (29%; see Figure 12). Respondents reported that their labs performed a large number of abdominal exams in a month, with 59% performing over 200 (see Figure 13).



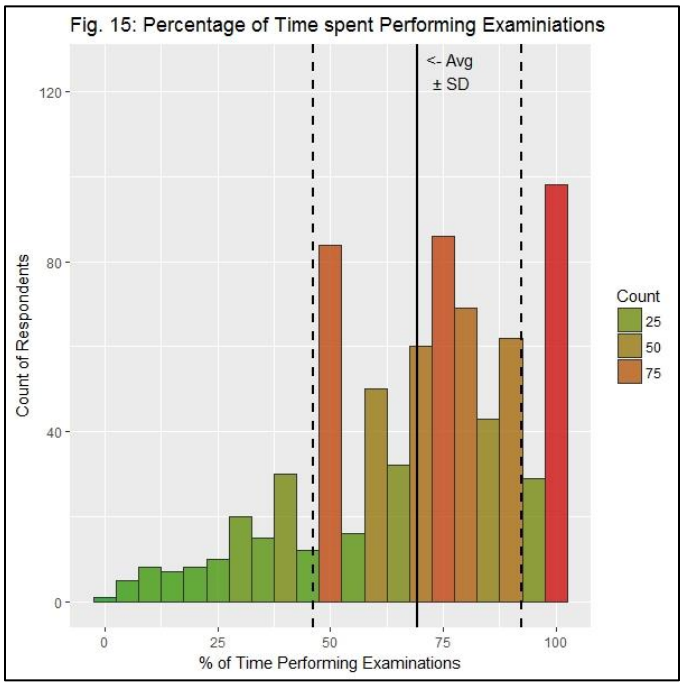


Breakdown of Time

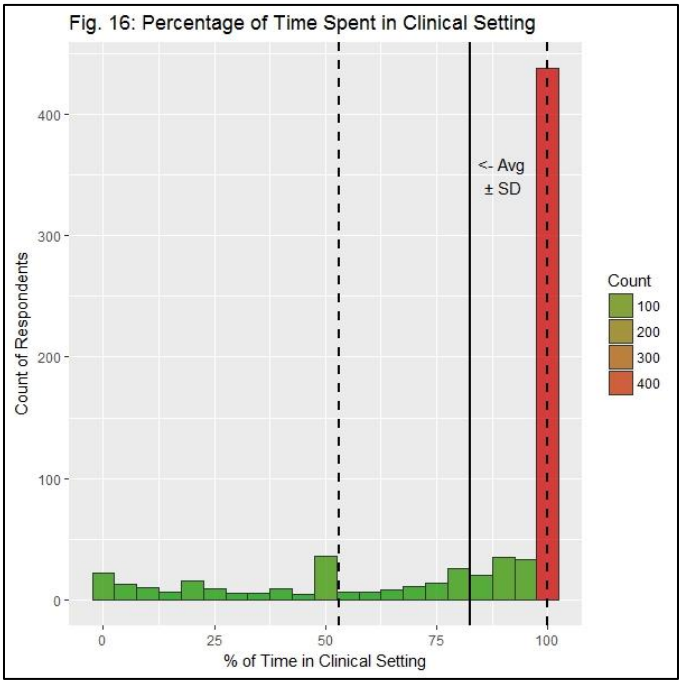
Respondents were asked to elaborate how their professional time is spent. The majority of participants spent less than half of their time as a sonography educator. The mean (Avg.) portion of time spent as a sonography educator among respondents was 32%, and the range of one standard deviation (SD) away from the mean was 6%-58% (see Figure 14).



The majority of respondents also said that the spend more than 50% of their time performing examinations. The mean (Avg) portion of time spent performing examinations among respondents was 70%, and the range of one standard deviation (SD) away from the mean was 46%-93% (see Figure 15).



A majority of the respondents (about 2 out of 3) said that they spent 100% of their time in a clinical setting. The mean (Avg) portion of time spent in a clinical setting among respondents was 83%, and the range of one standard deviation (SD) away from the mean was 53%-112% (represented as 100%, the max possible portion of time) (see Figure 16).



Conclusion

When the survey concluded, Inteleos staff analyzed the results to determine criticality ratings of each of the task statements. These results were used to develop an initial list of tasks and domain weightings. This list was shared with the JTA working group via a Qualtrics® survey to allow JTA working group members to review and provide feedback prior to the "Discussion of Results" call.

Discussion of Results

A call was held on November 2, 2017 to discuss the survey results with the JTA Working Group. Nine members of the JTA Working Group and five Inteleos staff members were in attendance. The call was facilitated by *The Caviart Group*. Table 2 shows the results shared with the Working Group. The overall frequency, importance, and criticality statistics are presented in rank order of criticality by domain and subdomain based on the survey data. Each task was reevaluated for inclusion in the final list based on the JTA Working Group's opinion and criticality scoring from the survey participant. The JTA Working Group decided to lower the number of tasks from 99 to 84, discarding 15 tasks with low criticality ratings and/or other content issues. The JTA Working Group also reviewed the preliminary content outline based on the data and the outline based on their task removals/combinations to decide what percentage of the examination should be in each domain. The JTA Working Group was allowed to deviate ±10% in each domain from the preliminary content outline based on the 84 tasks. Table 2 below shows this process and the resulting domain weightings.

Table 2. Content domain breakdown before and after JTA Working Group Review of Survey Results

	Based on JTA			***After Task Selection***			***Final Recommendation***	
Domain	**# Tasks**	**Criticality Sum**	**% of Total**	**# Tasks**	**Criticality Sum**	**% of Total**	**Acceptable Range**	**Committee Recommendation**
Anatomy, Perfusion, and Function	27	231	25%	26	226	27%	25%-30%	30%
Pathology, Trauma, Vascular Abnormalities, and Postoperative Anatomy	40	360	38%	38	350	43%	38%-47%	42%
Abdominal Physics	11	127	14%	5	63	8%	7%-8%	8%
Clinical Care, Practice and Quality Assurance	21	219	23%	15	184	22%	20%-25%	20%
Total	*99*	*937*	*100%*	84	823	100%	*100%*	*100%*

Final Approval by JTA Working Group

After the call, the JTA Working Group completed an approval survey (administered March 17-March 25, 2018). Some questions were raised, and minor edits proposed through the survey. The proposed edits were reviewed, clarified and minor edits were made. There were no changes made to the final tasks and domain weightings. The Chair and co-chair of the JTA working group approved these changes on a call held on April 5, 2018. The ARDMS Council voted and approved this content outline on June 24, 2018.

Abdomen Sonography Examination Content Outline

(Outline Summary)

#	Domain	Subdomain	Percentage
1	**Anatomy, Perfusion, and Function**	Assess physical characteristics of anatomic structures Assess perfusion and function of anatomic structures	**30%**
2	**Pathology, Vascular Abnormalities, Trauma, and Postoperative Anatomy**	Assess anatomic structures for pathology Assess anatomic structures for vascular abnormalities Assess anatomic structures for trauma-related abnormalities Assess aspects related to postoperative anatomy	**42%**
3	**Abdominal Physics**	Apply concepts of equipment/image optimization Apply concepts of imaging artifacts	**8%**
4	**Clinical Care, Practice, and Quality Assurance**	Incorporate clinical data with performed study Incorporate clinical standard/guidelines with performed study Obtain accurate measurements Assist/support during procedures	**20%**

(Detailed Outline)

1.	Anatomy, Perfusion, and Function	Knowledge and/or skill related to anatomy, perfusion, and function
1.A.	**Assess physical characteristics of anatomic structures (normal anatomy, anatomic variants, congenital anomalies)**	
1.A.1.	Biliary system	Knowledge of normal anatomy, anatomic regions, and anatomic variants Knowledge of sonographic appearance of anatomic structures Ability to recognize and utilize anatomic landmarks in obtaining and documenting diagnostic images Ability to recognize and apply proper scan technique in obtaining and documenting diagnostic images Ability to recognize, evaluate and document congenital anomalies
1.A.2.	Breast	
1.A.3.	Chest	
1.A.4.	Liver	
1.A.5.	Neck (including: thyroid, parathyroid, salivary glands, lymph nodes)	
1.A.6.	Pancreas	
1.A.7.	Penis	
1.A.8.	Peritoneal cavity (including: stomach, bowel, appendix)	
1.A.9.	Prostate	
1.A.10.	Retroperitoneum (including: great vessels & branches)	
1.A.11.	Scrotum	
1.A.12.	Spleen	
1.A.13.	Superficial structures (for example: abdominal wall & subcutaneous tissue)	
1.A.14.	Urinary system	
1.B.	**Assess perfusion and function of anatomic structures**	

1.B.1.	Biliary system	Knowledge of normal vascular anatomy and hemodynamics Ability to recognize appearance of normal vascular flow patterns Ability to recognize and utilize anatomic landmarks in evaluating and documenting perfusion and function Ability to recognize and apply proper scan technique in evaluating and documenting perfusion and function
1.B.2.	Chest	
1.B.3.	Liver	
1.B.4.	Neck (including: thyroid, parathyroid, salivary glands, lymph nodes)	
1.B.5.	Penis	
1.B.6.	Peritoneal cavity (including: stomach, bowel, appendix)	
1.B.7.	Prostate	
1.B.8.	Retroperitoneum (including: great vessels & branches)	
1.B.9.	Scrotum	
1.B.10.	Spleen	
1.B.11.	Superficial structures (for example: abdominal wall & subcutaneous tissue)	
1.B.12.	Urinary system	
2.	**Pathology, Vascular Abnormalities, Trauma, and Postoperative Anatomy**	**Knowledge and/or skill related to pathology, vascular abnormalities, trauma, and postoperative anatomy**
2.A.	**Assess anatomic structures for pathology**	
2.A.1.	Abdominal wall for hernia (for example: ventral, inguinal, incisional)	Knowledge of etiology/pathophysiology of abnormal perfusion and function Ability to recognize ultrasound findings related to abnormalities of anatomy, perfusion, and function in obtaining and documenting diagnostic images Ability to recognize and apply proper scan technique in evaluating and documenting pathology Ability to recognize foreign bodies, infection, fluid, masses, etc. Knowledge of hernia types and their sonographic appearance
2.A.2.	Adrenal glands for masses, hemorrhage, etc.	
2.A.3.	Biliary system for infection, masses, metastatic disease, obstructions, etc.	
2.A.4.	Breast for infection, abscess, masses, etc.	
2.A.5.	Chest for fluid, masses, etc.	
2.A.6.	Gastrointestinal system for masses, obstruction, pyloric stenosis, intussusception, etc.	
2.A.7.	Joints for abnormalities (for example: fluid)	
2.A.8.	Liver for hepatitis, fatty infiltration, cirrhosis, neoplasm, abscess, cyst, etc.	
2.A.9.	Neck (including: thyroid, parathyroid, salivary glands, lymph nodes) for diffuse parenchymal disease, inflammation, masses, etc.	
2.A.10.	Pancreas for infection, masses, obstruction, etc.	
2.A.11.	Penis for abnormalities	
2.A.12.	Peritoneal cavity (including: stomach, bowel, appendix) for fluid	
2.A.13.	Popliteal fossa for abnormalities (for example: masses, fluid)	

2.A.14.	Prostate for parenchymal disease or masses (for example: benign prostatic hypertrophy)	
2.A.15.	Retroperitoneum (including: great vessels & branches) for fibrosis, lymphadenopathy, etc.	
2.A.16.	Scrotum for fluid, hernia, masses, infection, parenchymal disease, etc.	
2.A.17.	Spleen for splenomegaly, parenchymal changes, masses, etc.	
2.A.18.	Superficial structures (for example: abdominal wall, subcutaneous tissue) for foreign bodies, infection, fluid, masses, etc.	
2.A.19.	Urinary system for masses, obstruction, parenchymal disease, infection, etc.	
2.B.	**Assess anatomic structures for vascular abnormalities**	
2.B.1.	Liver for Budd-Chiari syndrome, arteriovenous fistula, portal vein thrombosis, collateralization, etc.	Knowledge of anatomic and vascular changes associated with vascular abnormities Knowledge of sonographic findings associated with vascular abnormalities Ability to recognize and apply proper scan technique in evaluating and documenting vascular abnormalities
2.B.2.	Retroperitoneum (including: great vessels and branches) for aneurysm, dissection, thrombus, etc.	
2.B.3.	Scrotum for torsion, varicocele, etc.	
2.B.4.	Spleen for infarction, hemangiomas, etc.	
2.B.5.	Urinary system for renal artery stenosis, arteriovenous fistulas, etc.	
2.C.	**Assess anatomic structures for trauma-related abnormalities**	
2.C.1.	Hepatic system	Knowledge of sonographic appearance as a result of trauma Ability to rapidly prioritize and evaluate sonographic findings due to trauma Ability to perform focused assessment for free fluid following a traumatic event Ability to recognize and apply proper scan technique in evaluating and documenting trauma
2.C.2.	Penis	
2.C.3.	Scrotum	
2.C.4.	Spleen	
2.C.5.	Superficial structures (for example: abdominal wall, subcutaneous tissue)	
2.C.6.	Urinary system	
2.C.7.	Focused assessment for free fluid related to traumatic events	
2.D.	**Assess aspects related to postoperative anatomy**	
2.D.1.	Anatomy of transplanted organs	Knowledge of hemodynamics of transplanted organs Knowledge of common causes of transplant failure Ability to recognize signs of rejection Ability to adjust scan technique based on patient condition and surgical history
2.D.2.	Perfusion and function of transplanted organs	
2.D.3.	Complications related to organ transplants	

2.D.4.	Abnormalities in Postsurgical Anatomy	Ability to distinguish characteristics of common anastomosis sites Ability to recognize fluid collections Ability to interpret and integrate surgical history with sonographic findings Knowledge of surgical procedures used in organ transplant Knowledge of surgical zones of the neck Ability to evaluate and document findings within surgical zones of the neck Knowledge of patterns and sonographic appearance of disease recurrence Ability to evaluate transjugular intrahepatic portosystemic shunts (TIPS) Ability to recognize and apply proper scan technique in evaluating and documenting postsurgical findings
2.D.5.	Abnormalities in Postsurgical Breast	
2.D.6.	Abnormalities (for example: recurrent disease, lymphadenopathy) in postsurgical neck	
2.D.7.	Implanted medical devices (for example: transjugular intrahepatic portosystemic shunt [TIPS])	
3.	**Abdominal Physics**	**Knowledge and/or skill related abdominal physics**
3.A.	**Apply concepts of equipment/image optimization**	
3.A.1.	Use appropriate transducer (for example: curvilinear, linear, phased array)	Ability to select the appropriate transducer and machine presets based on body habitus Ability to use acoustic windows creatively to optimize visualization Ability to adjust machine settings to maximize penetration while minimizing resolution loss Knowledge of appropriate application of Doppler techniques Ability to manipulate color, power, and pulsed wave settings to accurately display and measure blood flow
3.A.2.	Use two-dimensional, real-time, gray-scale imaging (for example: B-mode, compound, harmonic)	
3.A.3.	Use Doppler (for example: color, power, pulsed wave)	
3.B.	**Apply concepts of imaging artifacts**	
3.B.1.	Assess artifacts of gray-scale imaging (for example: shadowing, resonance, comet tail)	Ability to recognize artifacts and correlate them with anatomy and pathology Ability to manipulate machine settings to enhance or minimize artifacts
3.B.2.	Assess artifacts of Doppler imaging (for example: twinkle, spectral broadening)	
4.	**Clinical Care, Practice, and Quality Assurance**	**Knowledge and/or skill related to clinical care, practice, and quality assurance**
4.A.	**Incorporate clinical data with performed study**	
4.A.1.	Assess indications for examination requested	Knowledge of appropriate indications and contraindications for a specific exam and/or procedure Knowledge of potential effects of patient medications on an exam or procedure Knowledge of lab values relevant to specific examinations Ability to obtain and evaluate patient history relevant to the exam Ability to assimilate patient's signs and symptoms and modify the exam/or describe the findings Ability to modify the exam based on information from other modalities Ability to localize pathology for sonographic correlation Ability to modify the exam based on real-time findings
4.A.2.	Assess relevant clinical lab values for examination being performed	
4.A.3.	Assess relevant family history and patient signs/symptoms for examination being performed	
4.A.4.	Correlate ultrasound findings with previous imaging results	
4.A.5.	Evaluate images from other imaging modalities (for example: computed	

	tomography, magnetic resonance imaging, nuclear medicine, x-ray)	Knowledge of modalities associated with the exam being performed Ability to utilize resources, such as physicians, literature, or peers
4.B.	**Incorporate clinical standard/guidelines with performed study**	
4.B.1.	Communicate effectively with the patient, physician, and others, including communication of findings that require immediate action	Ability to communicate with patient in a professional and appropriate manner to effectively explain procedures, deal with inappropriate behavior, and engage patient cooperation Ability to communicate using appropriate medical terminology Ability to modify exam preparation, patient position, and/or image acquisition based on patient condition and/or sonographic findings Ability to recognize findings and/or situations that require immediate action and respond effectively Knowledge of appropriate patient preparation for an exam and knowledge of factors that may affect patient preparation (for example: patient history, patient condition, sequencing requirements of multiple modality exams) Knowledge of sonographer scope of practice and regulations regarding patient information and interactions
4.B.2.	Inform patient or referring practitioner of examination preparations (for example: fasting for biliary imaging)	
4.B.3.	Maintain and protect patient confidentiality/privacy	
4.B.4.	Modify the examination based on patient condition and/or sonographic findings	
4.B.5.	Use multiple patient positions and scan planes to evaluate anatomic structures	
4.C.	**Obtain accurate measurements**	
4.C.1.	Obtain measurements of anatomic structures	Knowledge of normal measurement ranges Knowledge of proper techniques for measuring anatomic structures Knowledge of hemodynamics Knowledge of normal and abnormal Doppler waveforms Ability to analyze Doppler measurements Ability to distinguish artifacts from actual blood flow Ability to apply knowledge of measurement techniques (for example: Doppler and gray-scale)
4.C.2.	Obtain measurements of Doppler waveforms	
4.D.	**Assist/support during procedures**	
4.D.1.	Obtain consent form and patient lab results prior to the procedure	Knowledge of sonographer's role in obtaining consent Ability to verify and document patient consent Ability to verify correct patient, side (laterality), and site Knowledge of contraindications for specific procedures Knowledge of proper safety precautions in interventional procedures Knowledge of equipment and materials used for a specific procedure Knowledge of interventional procedures and sonographer's role Knowledge of protocols during surgical procedures, related to the sonographer's role Ability to adapt protocol due to different circumstances Ability to optimally display the needle path and tip Ability to recognize implanted medical devices Knowledge of potential post-procedural complications
4.D.2.	Provide ultrasound guidance for procedures	
4.D.3.	Evaluate for post-procedural changes/complications	