Fetal Echocardiography

2016 Job Task Analysis Summary Report

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ABOUT THE REPORT

The American Registry for Diagnostic Medical Sonography (ARDMS) is the globally recognized standard of excellence in sonography. It is responsible for the preparation of valid and reliable certification examinations in sonography. The performance of job task analyses (JTAs) at the national and international levels assists ARDMS in evaluating the current practice expectations and performance requirements of the specialty. The 2016 Fetal Echocardiography (FE) JTA was designed to collect information on the sonography-related work activities sonographer registrants actually perform in practice. The results were used in the update of the test content outline that guides content distribution of the FE Examination. This report provides a summary of the methodology and survey results. It also includes the test content outline that resulted from the JTA.

METHODOLOGY

A JTA Working Group consisting of nine (9) subject matter experts (SMEs) led this project. All nine JTA Working Group members were Assessment Oversight Team (AOT) members and volunteers. The JTA Working Group developed the job task analysis survey instrument consisting of 101 task (work activity) statements.

Survey Administration

The survey was made available to participants as a web-based survey through the survey platform Qualtrics®. An invitation to participate in the study was sent via email to the sonographers. ARDMS sent the job task analysis survey to 1,776 registrants credentialed since 2010. These registrants were selected randomly using a stratified sampling method so that the sample is 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 21st and August 3rd, 2016. The participants responded anonymously, and all responses were kept confidential.

A total of 1,252 (70.5% of those sampled) sonographers responded to the survey. Of these, 1,111 (88.7% of respondents) reported that they currently perform fetal echocardiography. The data analysis was based on the responses from the 1, 252 sonographers.

Data Analysis

Respondents were asked the following questions for each task: How frequently do you perform the task in your practice, and 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, Rarely, Occasionally, Often, and Frequently. The response options for the importance scale were Not Important, Somewhat Important, Moderately Important, Very Important, and Critically Important.

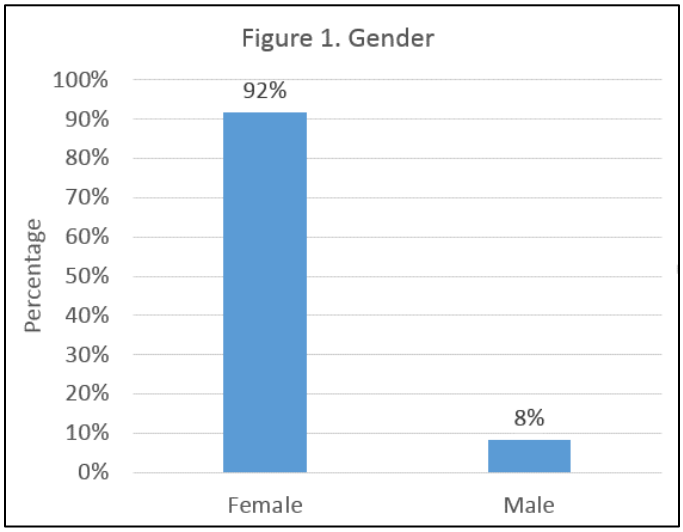
The frequency and importance rating scales were combined into a single measure of overall criticality (ranged from 0-16) using a hierarchical method where a particular value on the importance scale would outweigh or outrank all values on the frequency scale, with the exception of 'Never." Higher criticality values indicate the most critical tasks for a sonographer performing DMS exams. 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 to come up with the initial percentages of the examination content in each domain.

SURVEY RESULTS

Demographics and Backgrounds of Participants

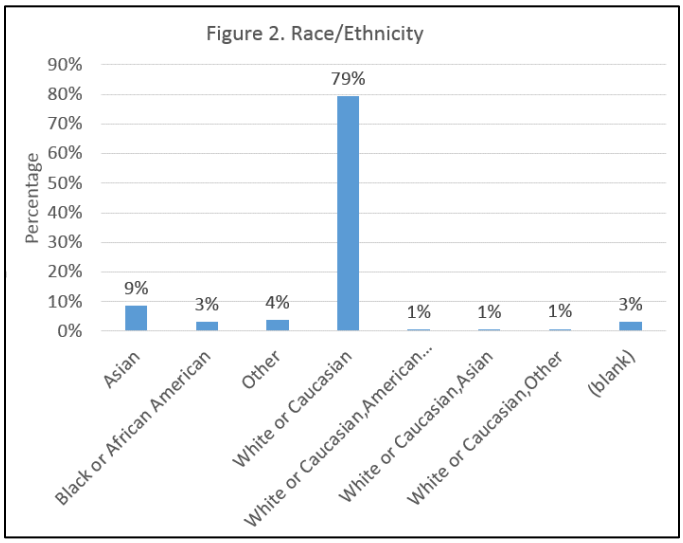
Gender

Approximately 92% of the respondents were female and 8% were male (Figure 1).



Race and Ethnicity

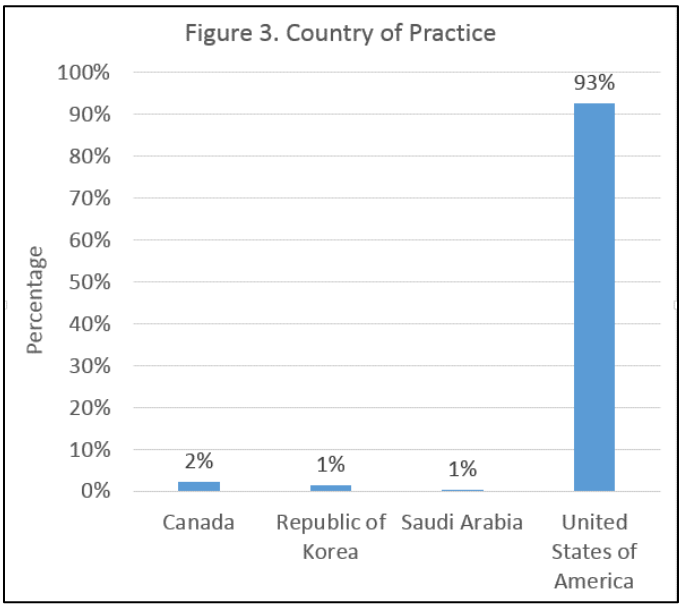
Approximately 79% of respondents were white or Caucasian, 9% of respondents were Asian, and 3% black or African American. Additionally, 4% of respondents marked "other" and 3% declined to respond (Figure 2).



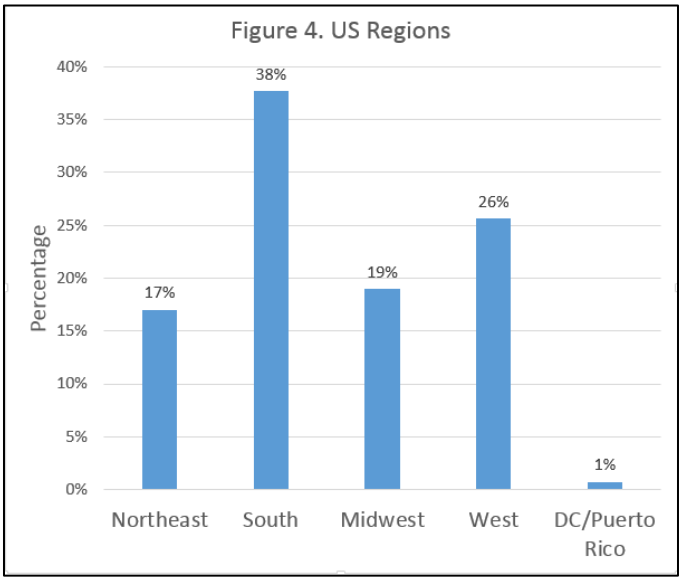
Note: Race/Ethnicities making up less than 1% of responses not shown.

Location of Practice

Of the respondents who reported the country in which they practice, 93% reported practicing in the United States, with the other 7% of respondents practicing in 18 other countries (Figure 3). Among US residents who provided the US state they practice in, over a third (38%) practiced in the southern region of the United States (as defined by the US Census Bureau) (Figure 4).

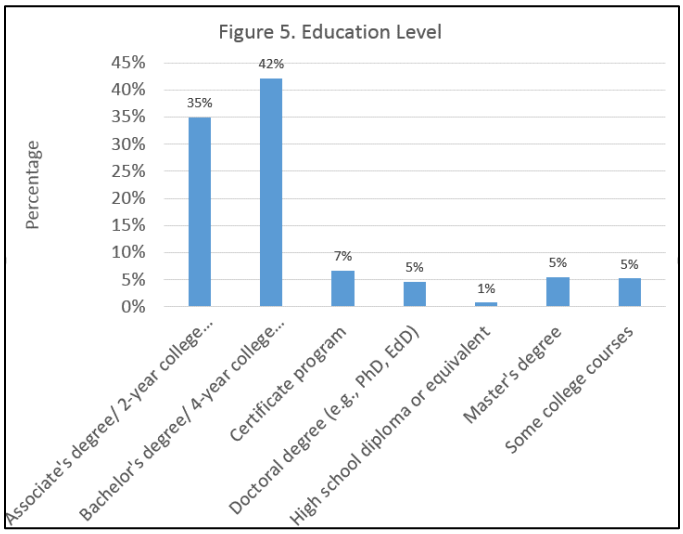


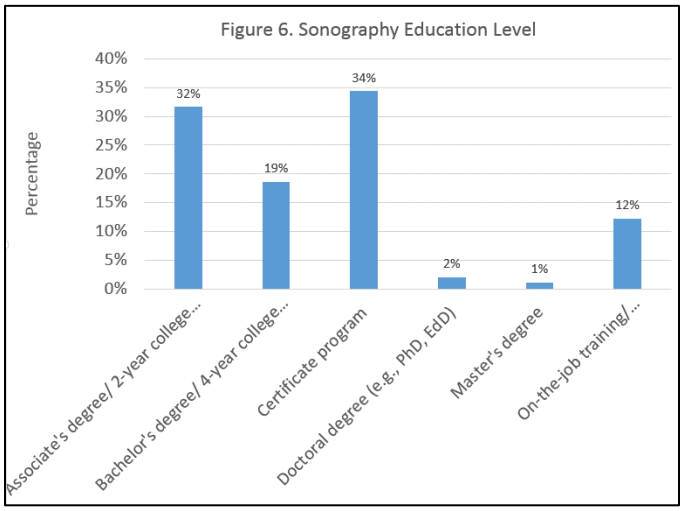
Note: Countries making up less than 1% of responses not shown.



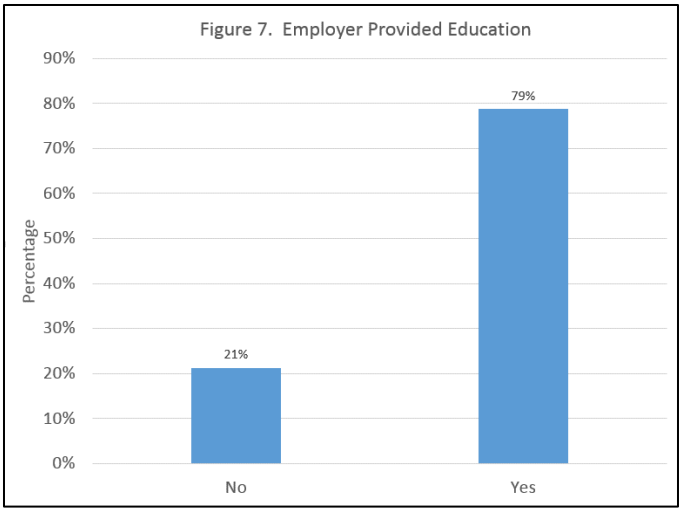
Level of Education

Approximately 42% of respondents had a bachelor's degree and 35% had an associate degree as their highest level of education (Figure 5). In sonography education, only 19% had a bachelor's degree or higher and 32% had an associate degree, with 34% of respondents having a certificate program as their highest level of sonography-specific education (Figure 6).

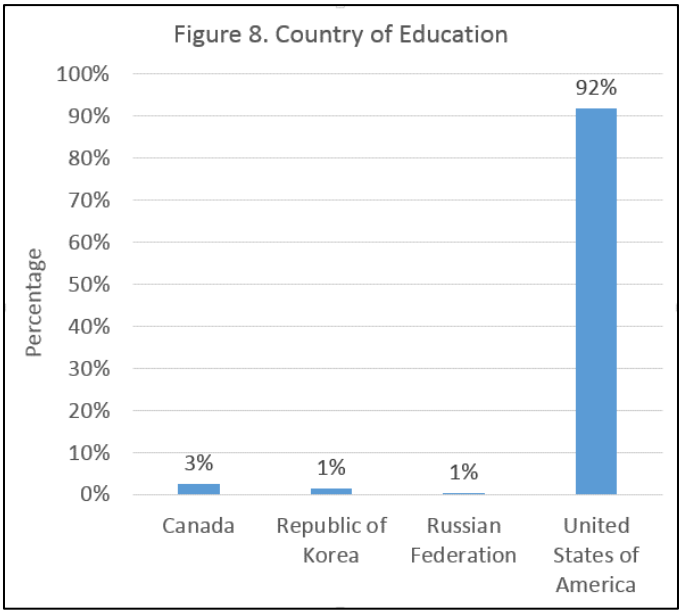




Most respondents (79%) had opportunities to continue their sonography education provided by their employers (Figure 7).



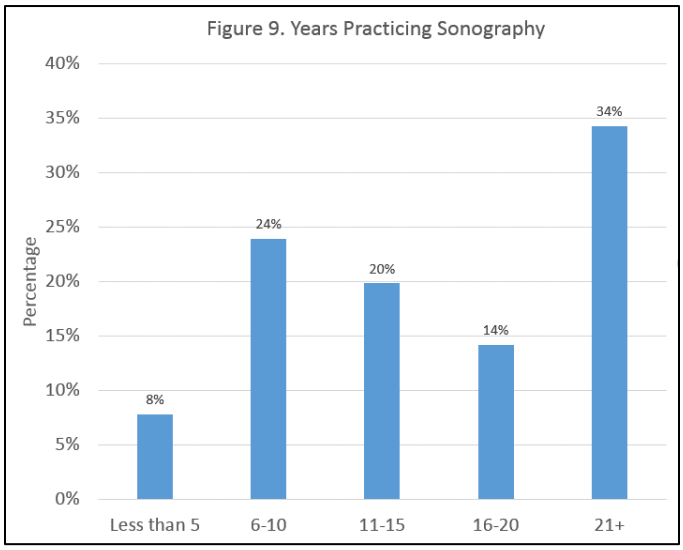
Almost all (92%) of respondents received the majority of their education in the United States, and the remaining 8% of respondents were educated in 19 other countries around the world (Figure 8).

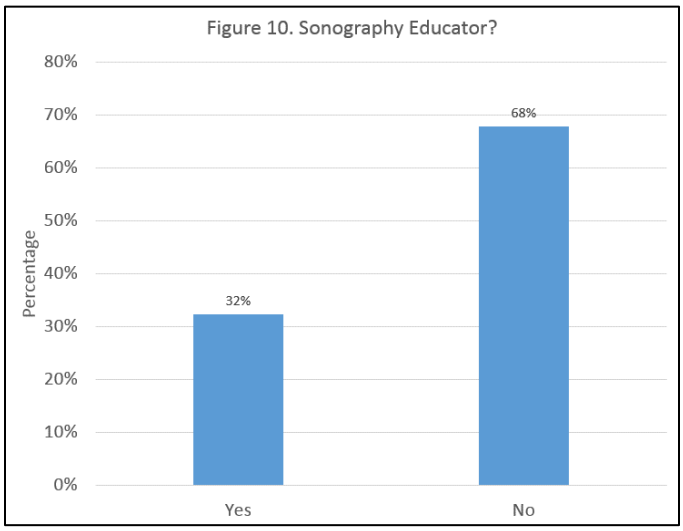


Note: Countries making up less than 1% of responses not shown.

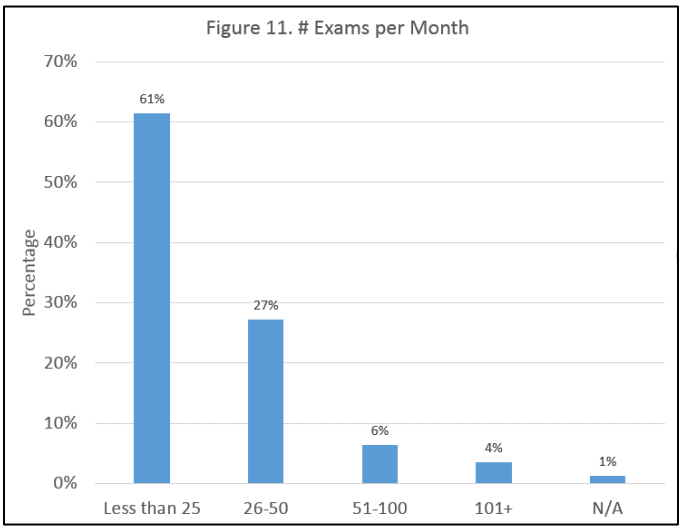
Work Experience

Approximately 34% of respondents had been practicing sonography for more than 20 years, and 24% had been practicing for 6 to 10 years (Figure 9). Approximately 32% of respondents are also sonography educators (Figure 10).



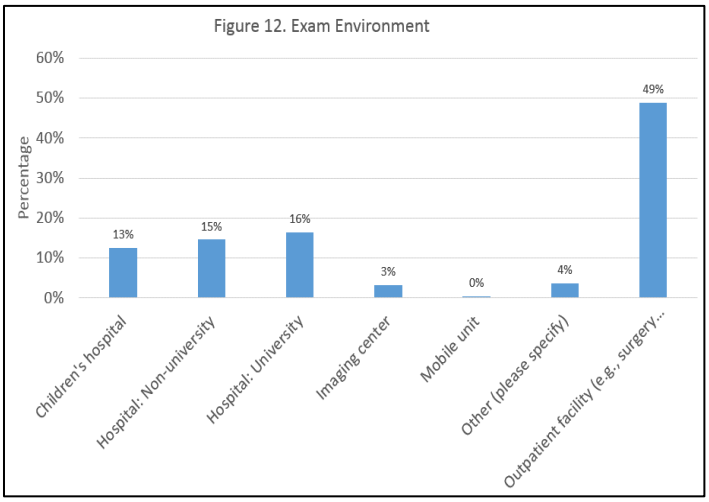


Most respondents (61%) performed less than 25 exams per month, and 10% performed more than 50 exams in an average month (Figure 11).

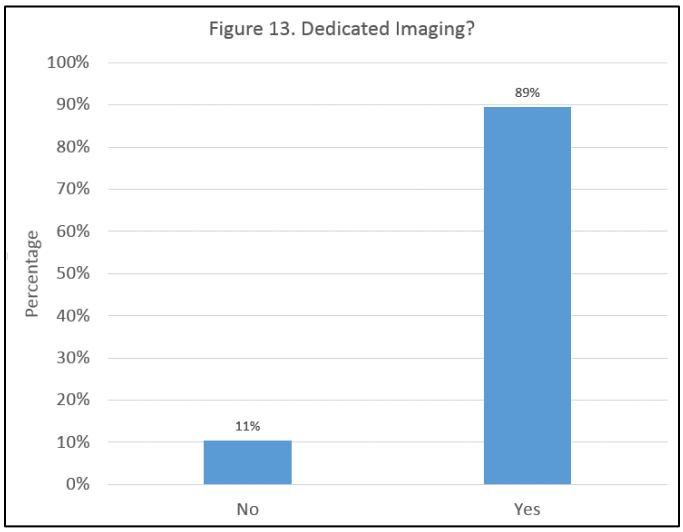


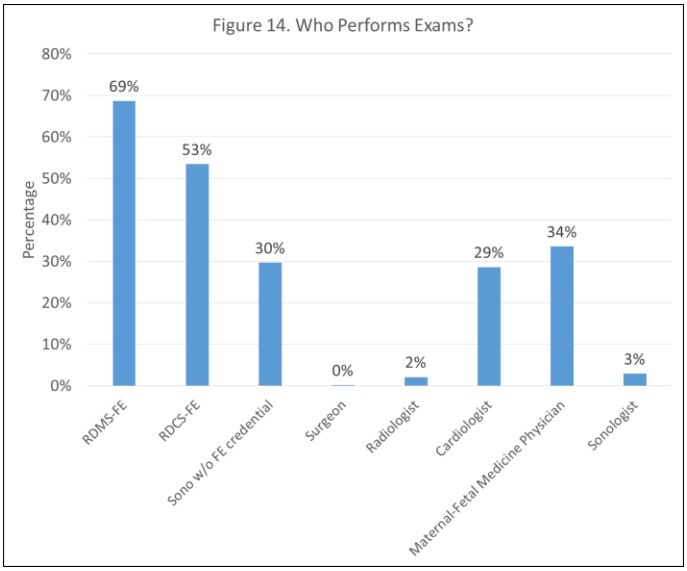
Work Environment

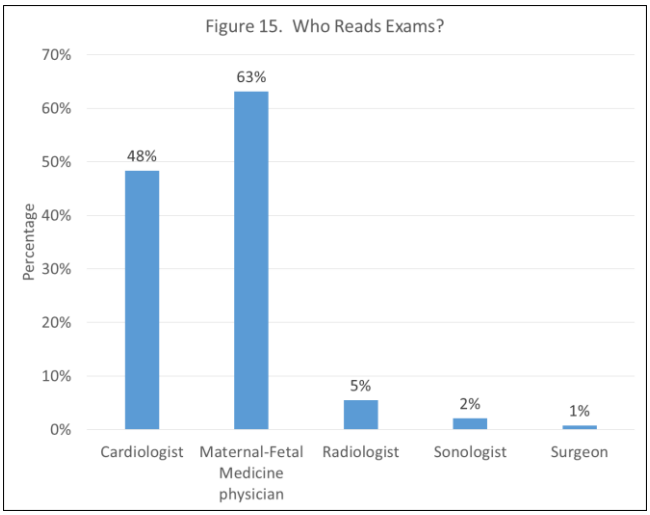
The respondents were asked to indicate the type of environment they perform most of their sonographic examinations in. Nearly half (49%) performed their exams in outpatient facilities (Figure 12).



Additionally, a great majority of the respondents (89%) reported working in a lab that provides dedicated imaging (Figure 13). Respondents were asked, in their lab, who performed fetal echocardiography exams and who read the results, selecting all that apply. Most labs have RDMS-FE and RDCS-FE registered sonographers that perform exams (69% and 53%, respectively) (Figure 14). The majority of labs also have Maternal-Fetal Medicine physicians and cardiologists to read exam results (63% and 48%, respectively) (Figure 15).

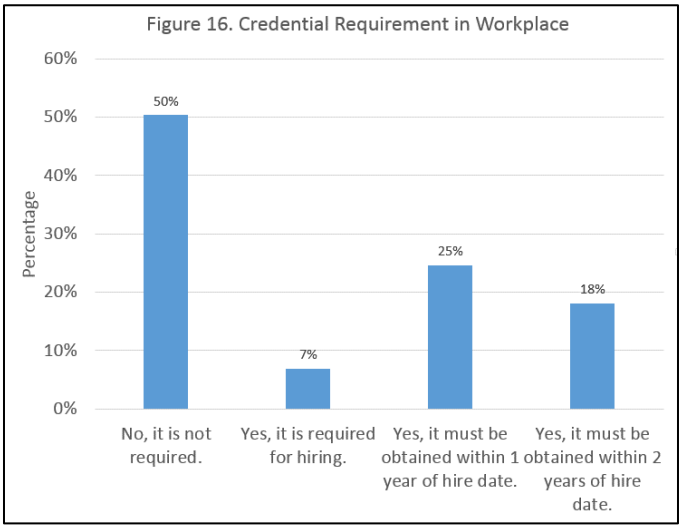




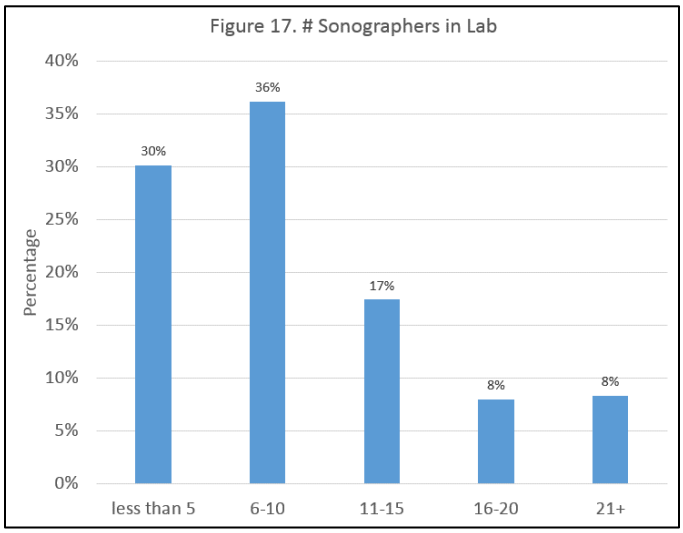


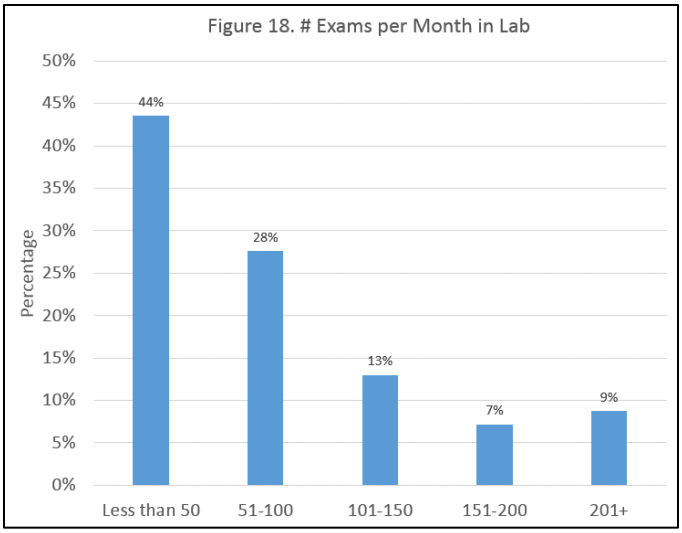
Note: Figure 14 and 15 sums are greater than 100% because respondents were asked to select all applicable items.

One-half (50%) of respondents reported that their labs did not require an FE credential to work in the lab, and half of the labs that did require an FE credential gave workers at least a year to obtain the credential (Figure 16).



Respondents reported working in labs with various numbers of sonographers. The most common number of sonographers in respondents' labs were 6 to 10 (36%) followed by less than 5 (30%) (Figure 17). Almost half of respondents' labs performed less than 50 exams per month (44%), with most labs performing 100 or more exams per month (Figure 18).





Content Outline and Task Descriptions

Table 3 contains a summary of the content outline and Table 4 the detailed content outline including task descriptions.

Table 3. Summary of the content outline by domain

#	Domain	Subdomain	Percentage
1	**Assess Anatomy**	Assess anatomy and physiology	**18%**
2	**Evaluate Pathology and Pathophysiology**	Assess abnormal perfusion and function Evaluate for congenital anomalies	**21%**
3	**Integrate Data**	Assess fetal diagnostic images	**31%**
4	**Perform the Exam**	Gather pertinent medical history prior to the exam	**30%**

Note. Exam forms built to this outline may not match approved percentages exactly.

Table 4. Content Outline Breakdown by Domain, Subdomain, and Task

1.	Assess Anatomy 18%	Knowledge and/or skill related to assessing anatomy
1.A.	**Assess anatomy and physiology**	
1.A.1.	Assess for normal embryologic development (e.g., timing of development, early chamber development, normal septal formation)	Understanding of cardiac embryology and its major components (e.g., ventricular looping, atrioventricular junction development, conal/infundibular development, truncal/semilunar valve development) Understanding of methodology for determining situs, axis, and position Ability to perform situs, axis, and position techniques Ability to differentiate between normal and abnormal positioning Knowledge of normal fetal abdominal and thoracic anatomy Ability to recognize the fetal abdomen, femur, liver, bladder, and other gross anatomy Ability to measure extracardiac structures such as biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), and femur length (FL) Knowledge of normal and abnormal fetal cardiac anatomy Knowledge of fetal aortic arch anatomy, including brachiocephalic artery origins and course Knowledge of normal and abnormal fetal patent ductus arteriosus
1.A.2.	Evaluate situs, axis, and position	
1.A.3.	Evaluate fetal anatomic structures related to the abdomen/pelvis (e.g., inferior vena cava, ductus venosus, hepatic veins, stomach, bladder, spleen)	
1.A.4.	Evaluate fetal anatomic structures related to the chest/thorax (e.g., lungs, esophagus, trachea)	
1.A.5.	Evaluate tissues composing the heart (e.g., pericardium, myocardium)	
1.A.6.	Evaluate cardiac chambers	
1.A.7.	Evaluate septa (e.g., atrial, ventricular, and arterial septa)	
1.A.8.	Evaluate valves (e.g., atrioventricular and semilunar valves)	
1.A.9.	Evaluate systemic veins and arteries	
1.A.10.	Evaluate pulmonary veins and arteries	
1.A.11.	Evaluate aortic arch	
1.A.12.	Evaluate ductal arch (e.g., ductus arteriosus)	

2.	Evaluate Pathology and Pathophysiology 21%	Knowledge and/or skill related to evaluating pathology and pathophysiology
2.A.	**Assess abnormal perfusion and function**	
2.A.1.	Assess for signs of fetal distress	Knowledge of normal, abnormal fetal and fetoplacental hemodynamics Knowledge of congenital heart disease associated with various genetic syndromes Knowledge and recognition of differences and key features associated with cardiac malposition, including atrial malposition, ventricular malposition, and great artery malposition Knowledge and recognition of normal and abnormal fetal atrioventricular junction, fetal atrial septum, and fetal ventricular septum Knowledge and recognition of normal and abnormal left atrium, mitral valve, left ventricle, left ventricular outflow tract, aortic valve, and aortic arch Knowledge and recognition of normal and abnormal right atrium, tricuspid valve, right ventricle, right ventricular outflow tract (RVOT), and pulmonary valve Knowledge and recognition of conotruncal anomalies such as tetralogy of Fallot, truncus arteriosus, double outlet right ventricle, and dextro-transposition of the great arteries (d-TGA) Knowledge and recognition of normal and abnormal fetal systemic veins Knowledge and recognition of normal and abnormal fetal pulmonary veins Knowledge and recognition of the three-vessel view, the three-vessel trachea view, and the aortic arch long axis view Knowledge and recognition of common fetal congenital cardiac masses and echocardiographic characteristics Knowledge and recognition of features of different types of fetal cardiomyopathies Knowledge of normal fetal heart rate and rhythm, and recognition of abnormalities such as complete heart block, premature atrial and ventricular contractions, and tachyarrhythmias (e.g., fetal supraventricular tachycardia and atrial flutter)
2.A.2.	Evaluate for the presence of fetal cardiomyopathies	
2.A.3.	Evaluate for the presence of fetal dysrhythmias	
2.B.	**Evaluate for congenital anomalies**	
2.B.1.	Evaluate for abnormalities related to genetic syndromes (e.g., Down, Noonan, Turner)	
2.B.2.	Evaluate for cardiac malpositioning (e.g., mesocardia, levoposition, ambiguous, inversus)	
2.B.3.	Evaluate for cardiac septal defects	
2.B.4.	Evaluate for left-sided cardiac anomalies	
2.B.5.	Evaluate for right-sided cardiac anomalies	
2.B.6.	Evaluate for conotruncal anomalies	
2.B.7.	Evaluate for systemic venous anomalies	
2.B.8.	Evaluate for pulmonary venous anomalies	
2.B.9.	Evaluate aortic arch anomalies	
2.B.10.	Evaluate ductal arch abnormalities (e.g., ductus arteriosus)	
2.B.11.	Evaluate for the presence of congenital cardiac masses	

3.	Integrate Data 31%	Knowledge and/or skill related to integrating data
3.A.	**Assess fetal diagnostic images**	
3.A.1.	Assess fetal cardiac function	Knowledge of normal fetal cardiac hemodynamics and normal fetal heart rate Knowledge of normal fetal heart rhythm Knowledge and recognition of abnormal fetal cardiac rhythm and rate Knowledge of cardiac electrical conduction system Knowledge of normal fetal anatomy of thoracic and abdominal cavities Knowledge of normal fetal anatomic measurements Knowledge of appropriate measurements of cardiac structures Knowledge of appropriate color and spectral Doppler techniques to assess fetal hemodynamics Recognition of abnormal fluid collections in the fetus Knowledge of M-mode evaluation Recognition and knowledge of artifacts, e.g., 2-D, color, and Doppler
3.A.2.	Assess fetal hemodynamics	
3.A.3.	Assess fetal heart rhythm	
3.A.4.	Use Doppler to evaluate fetal heart rate	
3.A.5.	Use M-mode to evaluate fetal heart rate	
3.A.6.	Measure mechanical PR intervals	
3.A.7.	Evaluate for normal and abnormal fluid collection (e.g., pericardial effusion, ascites, pleural effusion, skin edema)	
3.A.8.	Perform two-dimensional measurements to assess pathology	
3.A.9.	Perform measurements of chamber size using two-dimensional or M-mode techniques	
3.A.10.	Perform Doppler measurements to assess pathology	
3.A.11.	Perform measurements of valves	
3.A.12.	Perform measurements of vessels	
3.A.13.	Use color Doppler to assess ductal arch and flow	
3.A.14.	Use color and spectral Doppler to assess for valvular regurgitation	
3.A.15.	Use spectral Doppler to assess blood flow across cardiac valves	
3.A.16.	Use spectral Doppler to assess blood flow in cardiac vessels	
3.A.17.	Use spectral Doppler to assess ductus arteriosus	
3.A.18.	Use spectral Doppler to assess ductus venosus	
3.A.19.	Use spectral Doppler to assess umbilical artery	
3.A.20.	Use spectral Doppler to assess umbilical vein	
3.A.21.	Perform measurement of cardiothoracic (CT) ratio	
3.A.22.	Perform fetal biometric measurements (e.g., abdominal circumference (AC), biparietal diameter (BPD), femur length (FL), and head circumference (HC))	
3.A.23.	Use color Doppler and power Doppler to assess cardiac blood flow	
3.A.24.	Use spectral Doppler to assess middle cerebral artery (MCA)	
3.A.25.	Recognize and inform the supervising physician of findings of an emergent nature	

4.	Perform the Exam 30%	Knowledge and/or skill related to performing the exam
4.A.	**Gather pertinent medical history prior to the exam**	
4.A.1.	Review referral information and clarify pertinent data and indications for exam (e.g., review lab work and prior sonographic studies)	Understanding of indications for fetal echocardiogram exams, including patient history, lab tests, and previous imaging Knowledge of universal precautions Knowledge of caval compression syndrome Understanding of system settings to optimize two-dimensional and Doppler evaluation of fetal cardiac structure and function Ability to evaluate the number of fetuses Knowledge of fetal position evaluation Knowledge of normal and abnormal fetal abdominal and thoracic anatomy Ability to obtain and recognize normal cardiac anatomy in various views
4.A.2.	Correlate indication(s) with the order using existing data (e.g., previous images, imaging reports, lab values, written patient history) to identify risk factors for fetal heart disease	
4.A.3.	Interview the patient to identify additional risk factors for fetal heart disease	
4.B.	**Perform ultrasound exam**	
4.B.1.	Practice universal precautions	
4.B.2.	Explain procedure and educate patient on signs and symptoms of positional discomfort	
4.B.3.	Prepare and monitor the patient	
4.B.4.	Select transducer and console settings appropriate for the exam	
4.B.5.	Determine the number of fetuses	
4.B.6.	Determine fetal position	
4.B.7.	Determine visceral-atrial situs	
4.B.8.	Obtain four-chamber view (e.g., apical, subcostal)	
4.B.9.	Obtain short axis views (e.g., ventricles, great vessels)	
4.B.10.	Obtain cardiac left ventricular outflow tract (LVOT) long axis view	
4.B.11.	Obtain cardiac right ventricular outflow tract (RVOT) long axis view	
4.B.12.	Determine orientation and relationship of the great vessels using various cardiac views	
4.B.13.	Obtain views of branch pulmonary arteries	
4.B.14.	Obtain views of systemic veins (e.g., bicaval view)	
4.B.15.	Obtain views of pulmonary veins	
4.B.16.	Obtain three-vessel-and-trachea view	
4.B.17.	Obtain various views of the arches (i.e.., aortic, ductal)	