Clinical Experience Requirements
Clinical Competency Requirements and
Examination Content Specifications
For ARRT Certification in
Vascular Sonography

VASCULAR SONOGRAPHY

PRACTICE ANALYSIS

Final Report
2019

TABLE OF CONTENTS

APPENDICES

Introduction

In the past, the content of most certification exams was closely linked to the curriculum of educational programs or to the table of contents of a prominent textbook. In the late 1970s and early 1980s, certification boards and testing professionals began to realize that certification requirements should be closely linked to the requirements of practice. It is now recognized that the content of certification exams should be determined only after systematically studying and identifying the activities performed in the work setting. Enrichment topics, such as the history of a profession, should not be tested on a certification exam unless these topics are clearly job-related (NCHCA, 1979).

The job-relatedness of an examination is generally established through a job or practice analysis (AERA, APA, NCME, 1999). Practice analysis is useful for determining the topics to be covered by an examination and the degree of emphasis that each topic receives. The rationale for job and practice analysis is outlined in the Standards for Educational and Psychological Testing (AERA, APA, NCME, 1999) and in the standards adopted by the National Commission for Certifying Agencies (NCCA, 2003). Legislative activity and legal precedence also stress the importance of practice analysis in the development and validation of certification exams. The Uniform Guidelines on Employee Selection (1978), adopted by the U.S. Equal Employment Opportunity Commission, Department of Labor, and Department of Justice, also indicate that practice analysis is critical in the development of examinations related to employment (EEOC, 1979). Practice analysis is equally critical for establishing other types of certification requirements such as educational standards, experience requirements, and other eligibility criteria.

In 1980, The American Registry of Radiologic Technologists® (ARRT®) initiated its first large-scale effort to systematically document the job requirements of entry-level personnel in the areas of Radiography, Nuclear Medicine Technology, and Radiation Therapy Technology (Reid, 1983). Since the original project was completed, the ARRT has conducted practice analyses for those disciplines every five years for updating the task inventory and content specifications. Such updates are important for professions that continually evolve due to advances in technology because they help assure that the content specifications and other certification requirements (e.g., clinical competency requirements) reflect current practice.

History of Exam Program. In 1997 the ARRT Board of Trustees initiated a project to develop a Sonography Exam Program. After several meetings and a large national job analysis survey, a thorough analysis of the data led to the conclusion that ARRT should develop one exam that covered general sonography, and a second exam that focused on vascular sonography. The original job analysis project for vascular sonography was completed in 2000, and the first Vascular Sonography Exam was administered in 2001. Once an exam program has been established, the ARRT periodically conducts a practice analysis project to determine the need to update the content specifications and eligibility requirements. This report summarizes a practice analysis project, initiated in July 2016 to update the content specifications and clinical requirements for exams beginning in July 2019. A time and task schedule for this project is in Appendix A.

Practice Analysis Methods

Practice analysis studies can be conducted in a variety of ways (Raymond, 2001). These methods include direct observation, the use of work diaries, the use of task inventory surveys, and by logical analysis—i.e., convening panels of experts and eliciting their opinions about practice responsibilities. The choice of practice analysis method can be influenced by a number of factors including, but not limited to, previous studies, the size of the profession, and the amount of resources available to conduct the study. These factors affect various decisions on how to conduct the study. Perhaps the two most important decisions pertain to: (a) the type of practice-related information that is obtained; (b) the source(s) of that information.

Type of Information. Practice analysis involves reducing to words the things people do in work, and different types of descriptors can be used to accomplish this. On the one hand, work can be described in terms of behaviors necessary to complete a job, solve some problem, or create output, product, or service. For example, the statement "Verify that informed consent has been obtained" is a task-oriented descriptor. On the other hand, person-oriented approaches to job analysis focus on the knowledge, skills, and abilities (KSAs) that a person should possess to successfully complete the tasks required of a job. "Knowledge of radiation physics" is an example. Task-oriented descriptors indicate the activities performed on the job, while person-oriented descriptors reflect the KSAs and other personal characteristics presumed to be required

for successful job performance. Practice analyses can be designed to collect information about tasks/activities, about personal qualities, or both.

Sources of Information. Practice-related information can be obtained from various sources. Physician requisitions, patient charts, and billing statements all document, to some extent, what occurs in the practice setting. However, most practice analyses obtain data directly from persons who are knowledgeable about the work. This could include practitioners, supervisors, managers, educators, or committees of subject-matter experts (SMEs). The source of practice-related information will influence both the method of data collection and sample size.

Method for Present Study. The results of this study will be used to revise a task inventory, clinical requirements, and exam content specifications. These multiple needs require different types of information – data about actual practice activities and about the KSAs required to carry out those activities. Although the study could be completed by a committee of SMEs, we rely on two independent sources of information. For the present study, we first collect data regarding actual work activities primarily from entry-level staff sonographers with a task inventory survey. Survey recipients are asked to rate each task on it by how often it is performed. The task inventory is an efficient way to obtain extensive information about the nature of a profession. It is also conducive to statistical analyses that can help distinguish among a large number of employees who work in diverse settings. The task inventory is consistent with the methodology employed for previous ARRT studies and will enable changes in practice to be monitored over time. Once data about specific work activities are collected, a committee of SMEs will meet to provide judgments regarding the KSAs required to perform those activities. In short, the present study relies on staff vascular sonographers to find out what is done on the job, while SMEs are used to revise clinical requirements and exam content specifications.

Development of Job Analysis Survey and Administration

In July 2016 the Sonography/Vascular Sonography Practice Analysis Committee met and developed a survey to assess the job tasks performed by staff vascular sonographers. The committee reviewed the current task list, along with the previous vascular sonography task analysis survey from 2011 and developed a new survey with a goal of updating the job tasks to better reflect the job responsibilities of the vascular sonographer in 2017. The committee divided the list of tasks into two groups: 1. tasks that they wanted to acquire survey results for;

and, 2. an omitted task list, a list of tasks that they were certain a large majority (greater than 90%) of vascular sonographers were performing, or tasks that they were certain almost no one was performing. It was thought that by excluding the tasks that we already knew basically everyone was or was not performing that we could make the task survey shorter and easier to complete.

The omitted task list included 14 tasks that the committee was certain were performed by almost all vascular sonographers. Those 14 tasks will not appear on the survey, but they will be on the final task list. The *Omitted Task List* is in Appendix B.

The task analysis survey consisted of 117 tasks, 16 of which were general imaging department tasks and 101 that were imaging procedures. The survey also included a work environment and demographics sections. The survey asked for how often you personally perform each task; the possible responses were: NP – never perform; Y – yearly; Q – quarterly; M – monthly; W – weekly; and, D – daily. The task analysis survey is in Appendix C.

Based on past research with both ARRT's data and other data, ARRT uses a frequency scale with absolute anchors. Data from scales like importance and criticality, which use subjective anchors, have been shown to have inferior statistical properties compared to data produced from frequency scales with absolute anchors. This may possibly be due to survey respondent self-presentation bias (Babcock, Risk, & Wyse 2020). The data gathered by absolute anchor frequency scales have also been shown to correspond well to medical imaging practice as defined by external data sources (Babcock & Yoes, 2013) and to add value beyond advisory committee members' judgement without data (Wyse & Babcock, 2018).

The sample for the vascular sonography survey was designed to elicit responses from a cross section of R.T.s working in vascular sonography. A total of 1,000 were sampled, the target sample of the group was to be a mix of R.T.s working full-time, with job titles of staff vascular sonographer, supervisor/assistant chief vascular sonographer, or chief vascular sonographer, all having either a primary or secondary discipline of employment of vascular sonography. For this survey we sampled R.T.s fitting the above criteria with up to 20 years of experience in vascular sonography. After the surveys were returned, they were screened to verify that the data was truly representative of those working in vascular sonography. A few surveys were rejected for either having too few responses, or for what appeared to be unrealistic responses. It is not believable that someone could perform virtually all of the tasks on the survey daily, and a few surveys were

rejected for this reason. After this screening there were 310 useable surveys, for a survey response rate of 31%. The surveys were then screened further so that we included only those respondents that satisfied the target group criteria, and this cut the sample to 256.

Analysis of Survey Data

The Sonography/Vascular Sonography Practice Analysis Committee met in March 2017 to review the survey data and finalize the task list. The focus of attention was primarily on the percent of the survey respondents who indicated that they are responsible for performing each task. Most of the decisions concerning whether to include tasks on the final task list were straightforward. The criteria normally used to include a task on the final task list is if 40% or greater of the survey respondents indicate that they are responsible for performing a task, the task then can be included. A large majority of the survey tasks far exceeded the 40% criterion, so the decision was routine for these tasks. However, a few exceptions came up during the analysis. Appendix D contains a series of tables that break down the survey data. The first table summarizes the responses of the entire target group to the tasks, and to the equipment and demographics sections. A second table breaks the target group into those working 17 to 32 hours per week in vascular sonography and those working greater than 32 hours per week in vascular sonography. The third table compares those working in hospitals with those working in other places of employment.

In March 2017, the committee analyzed the data for changes since the last update, using the Decision Guidelines. The committee discussed and considered excluding tasks and procedures that, according to the survey data, appeared not to be performed by a significant portion of vascular sonographers (i.e., less than 40% of the respondents indicated task performance). The committee also considered adding new tasks and procedures that 40% or greater of respondents indicated they perform.

The Decision Guidelines permitted tasks that failed to meet the standard (i.e., less than 40% perform) to be included on the task inventory if the committee thought that the task was critical or if the task was borderline and survey data indicated that it seemed to be trending toward being more commonly performed in the field. Similarly, the committee could remove

tasks from the task inventory when they agreed that survey data indicated that the tasks seemed to be trending towards being less commonly performed.

Decision Guidelines	Less than 40% Responsible	Equal to or Greater than 40% Responsible
Frequency Less than 20% Daily or Weekly	Exclude from task inventory	Include on task inventory but "on watch"
Frequency Equal to or Greater than 20% Daily or Weekly	Exclude from task inventory but "on watch"	Include on task inventory

The following tasks received a survey response of less than 40% performance, but were kept on the task inventory because the committee believes these tasks represent entry-level knowledge that are critical to patient safety and scanning knowledge:

- *Oxygen monitoring (e.g., pulse oximetry)* (28.4%) Rationale: The committee believes that this knowledge is critical when needed.
- *Vital signs – respiration* (31%) Rationale: The committee believes that it is important for primary pathway candidates to be able to demonstrate this procedure.
- *Vital signs – pulse* (36.9%) Rationale: The committee believes that it is important for primary pathway candidates to be able to demonstrate this procedure.
- Following clinical protocols, position patient and transducer using appropriate technical factors to produce diagnostic images and recognize pathology of:
    - *Transplant vasculature liver* (36.1%) Rationale: The survey showed that 49% of vascular sonographers working in a hospital perform this task. The committee indicated that since there is a good chance an entry level vascular sonographer may be employed at a hospital and the status of liver transplant patients is vital, this is critical entry level knowledge.

The following tasks are new patient care tasks that were added because of the new patient care area being added to transition the vascular sonography examination into a primary discipline. The committee agreed that they are being performed by more than 80% of vascular sonographers:

- *Follow ARRT Standards of Ethics.*
- *Monitor auxiliary equipment (e.g., IVs, supplement oxygen) to support patient's needs while in the department.*
- *Verify that informed consent is obtained when necessary.*
- *Verify that a time-out procedure is performed when necessary.*

The following tasks represent content currently on the vascular sonography content specifications and were added to better describe that content:

- Following clinical protocols, position patient and transducer using appropriate technical factors to produce diagnostic vascular studies and recognize pathology of:
    - *Palmar arch including Allen test* (45.1%) Rationale: This task previously was *digital including palmar arch*. The committee indicated that this task should be separated into two tasks: *digital* (52.7%) and *palmar arch including Allen test* to be more specific.
- Assist with the following sonographic interventional procedures:
    - *Pseudoaneurysm treatment – compression or guided thrombin injection* (47.3%) Rationale: This task previously read *post catheterization complications (e.g., pseudoaneurysm treatment – compression or guided thrombin injection)*. The committee indicated that this task should be separated into two tasks*: post catheterization complications* (78.3%) and *pseudoaneurysm treatment – compression or guided thrombin injection*.

The following tasks represent new content and were added to the vascular sonography task inventory because greater than 40% of survey respondents indicated that they performed them:

- Use the following enhanced sonographic techniques as appropriate:
    - *Volume flow* (83%)

    - *Doppler twinkle* (59.2%)
- Following clinical protocols, position patient and transducer using appropriate technical factors to produce diagnostic vascular studies and recognize pathology of:
    - *Testicular arterial* (50.2%)
    - *Ovarian arterial* (53.1%)
    - *Brachiocephalic arterial* (77.6%)
    - *Scrotal venous* (48.3%)
    - *Brachiocephalic venous* (78.2%)
- Assist with the following sonographic interventional procedures:
    - *Vein ablations* (40.6%)

The following task was deleted because the task is like another vascular sonography task:

- *Review pertinent patient data (e.g., patient charts, previous examinations/reports) for correlation with vascular examination findings*. This task is like*: Access patient data from an electronic medical record.*

The following tasks that were previously on the task inventory were removed because fewer than 40% of survey respondents indicated that they performed them:

- Assist with the following sonographic interventional procedures:
    - *Angioplasty* (12.7%) Rationale: This task is down from 55% in 2011. The committee indicated that this task is being done by interventional radiology.
    - *Thrombolysis* (17.2%) Rationale: This task is down from 54% in 2011. The committee indicated that this task is being done by interventional radiology.

Other tasks were reworded to better define the task and reflect current practice.

The final Vascular Sonography Exam Task List consists of 134 tasks, 120 tasks from the survey and subsequent discussion along with 14 tasks from the Omitted Task List. The final Vascular Sonography Task List was sent to the ARRT Board of Trustees for consideration of approval in July 2017; the task list can be seen at vs-task-inventory-2021.pdf (kc-usercontent.com)

Development of the Vascular Sonography Content Specification

Based on the approved changes to the *Task Inventory for Vascular Sonography*, updates to the *Content Specifications for the Vascular Sonography Examination* were prepared by the Sonography/Vascular Sonography Practice Analysis and CQR Advisory Committee and posted on the ARRT website for professional community comment. Professional organizations, such as the ASRT, SDMS, and AIUM were notified of the proposed changes and invited to submit comments via a survey on our website. Sonography educational programs, who often have a track for vascular sonography, were sent a copy of the proposed content specifications along with a postage-paid self-addressed envelope and invited to return them with their comments.

The committee reviewed and discussed the comments from the professional community and proposed changes to the *Content Specifications for the Vascular Sonography Examination*. The following reflect the recommended changes and the rationale for the changes:

- A Patient Care section was added. Rationale: The examination will become a primary examination as well as continue to be a postprimary examination. This section is very similar to the patient care areas in the other ARRT primary exam content specifications.

- The Image Production section was expanded, and more detail was added. Rationale: This change will help candidates to prepare for this exam. For example, the current content specifications only list resolution. The proposed content specifications list the five types of resolution that are important in vascular sonography. Pulse repetition frequency (PRF) moved from the image formation section to the basic principles of ultrasound section.

- Brachiocephalic (78%) arterial vasculature was added to the procedures section. Rationale: This task was added to the task inventory.

- Brachiocephalic (78%) venous vasculature was added to the procedures section. Rationale: This task was added to the task inventory.

- Photoplethysmography (PPG) (65%) and toe-brachial index (TBI) (68%) were added to the procedures section. Rationale: These tasks are on the task inventory.

- Tibioperoneal trunk was removed from lower extremity venous vasculature. Rationale: The committee says this vessel only exist as an artery, not as a vein. Tibioperoneal trunk remains on lower extremity arterial vasculature.

- Angioplasty (13%) and thrombolysis (17%) were removed from the procedures section. Rationale: These tasks were removed from the task inventory.

- Subclavian artery (93%) was removed from the extracranial cerebral vasculature and other sonographic procedures section because it is already listed in the arterial peripheral vasculature and venous peripheral vasculature sections.

- Pseudoaneurysm treatment – compression or guided thrombin injection (47%) was moved from post catheterization to its own procedure. Rationale: It is not a post catheterization complication.

- In the procedures area under 'Focus of Questions', the Doppler Applications/Blood Flow Characteristics was expanded to include more detail. Rationale: The committee believes that understanding Doppler techniques is entry level and fundamental for many vascular sonography exams.

- All sections of the content specifications were edited for clarity and to update terminology to reflect current practice.

Weighting. An ARRT staff psychometrician led the committee through a content weighting exercise to determine the number of questions to be asked in each area of content. The activities typically conducted are labeled "top-down" and "bottom-up". In the top-down weighting activity, the Advisory Committee members individually assign percentages of the entire exam to the major topic areas that are reported for scoring. In the bottom-up weighing

activity, the Advisory Committee members individually start with finer areas of content and assign numbers of questions that they feel would sufficiently cover the finer topics for the exam. The staff psychometrician compiles and displays the results of the top-down and bottom-up activities directly beside the weighting of the current content specifications. The committee then discusses the results and comes to a consensus about potential changes in the section weightings for each exam. For more details on the top-down and bottom-up methods, see Raymond and Neustel (2005). As part of an initiative to standardize the content specifications of all ARRT examinations the content areas were also streamlined. Below is a table comparing how the content weighting changed in the new content specifications.

Content Area	Number of Questions, 2013 Implementation	Number of Questions, 2021 Implementation
Patient Interactions and Management	**0**	**20**
Basic Principles of Ultrasound	**28**	**26**
Image Formation	**12**	**14**
Evaluation and Selection of Representative Images	**35**	**35**
Abdominal/Pelvic Vasculature	**20**	**23**
Arterial Peripheral Vasculature	**22**	**21**
Venous Peripheral Vasculature	**20**	**18**
Extracranial Cerebral Vasculature and Other Sonographic Procedures	**23**	**18**

The content specifications were sent to the ARRT Board of Trustees in July 2018 for consideration of approval; the content specifications can be seen at https://www.arrt.org/pages/arrt-reference-documents/by-document-type/examination-content-specifications

Development of the Vascular Sonography Clinical Experience Requirements

As part of the comprehensive practice analysis, the Sonography/Vascular Sonography Practice Analysis and CQR Advisory Committee revised the clinical experience requirements

based upon the task inventory approved by the Board of Trustees in January 2018. Updates to the *Clinical Experience Requirements for Vascular Sonography* were prepared by the committee and posted on the ARRT website for professional community comment. Professional organizations, such as the ASRT, SDMS, and AIUM were notified of the proposed changes and invited to submit comments.

The committee reviewed and discussed the comments from the professional community and proposed changes to the *Clinical Experience Requirements for Vascular Sonography*. The following reflect the recommended changes and rationale for the changes:

- The mandatory procedures increased from 27 to 39 procedures. Volunteers may be used for up to 50% of the repetitions. The required number of actual mandatory procedures increased from 900 to 1,025 repetitions. Rationale: The committee believes that entry level vascular sonographers need to have experience with a larger variety of exams. The mandatory procedures are the same for the vascular sonography primary candidates.

- The required number of elective procedures increased from 14 to 19 of 36 possible procedures. Volunteers may be used for up to 50% of the repetitions. The minimum number of actual elective procedures required increased from 70 to 95 repetitions. Rationale: The committee believes that entry level vascular sonographers need to have experience with a larger variety of exams. The types of elective procedures are the same for the vascular sonography primary candidates.

- The following exams were added to the mandatory procedures*: external iliac arterial* (91%), *anterior tibial arterial* (90%), *peroneal arterial* (89%), *dorsal pedis arterial* (92%), *external iliac venous* (90%), and *femoral venous* (99%). The following exams moved from elective to mandatory procedures: *Renal arterial* (84%), *renal venous* (75%), *subclavian arterial* (93%), *axillary arterial* (92%), *brachial arterial* (93%), *radial arterial* (92%), and *calf veins venous* (98%). Rationale: Most vascular sonographers are performing these exams.

- The following exam was moved from mandatory to elective procedures: *hepatic arterial* (76%). Rationale: The committee believes that when the candidate performs the required number of electives, the skillset for this exam will be acquired even if the candidate does not select to perform this exam.

- The following exams were added to the elective procedures: *brachiocephalic arterial* (78%), *brachiocephalic venous* (78%), *toe-brachial index (TBI)* (68%), *photoplethysmography (PPG)* (65%), *post endarterectomy* (91%), *vein ablations* (41%), and *pseudoaneurysm treatment (compression or guided thrombin injection)* (47%). Rationale: A significant number of vascular sonographers are performing these exams.

- The following exams were removed from the elective procedures: *angioplasty* (12%) and *tibioperoneal trunk venous vasculature*. Rationale: *Angioplasty* was removed from the task inventory. *Tibioperoneal trunk venous vasculature* does not exist.

- The *digital arterial and digital pressure* exams were replaced by *palmar arch (with Allen test)* (45%) as an elective procedure. Rationale: This reflects actual terminology and practice.

- The *posterior tibial* (96%), *anterior tibial* (90%), and *peroneal* (89%) arterial exams that were listed together were separated into their own mandatory procedures. The *ankle-brachial index (ABI)* (88%) and *segmental pressure-lower extremities* (70%) that were listed together were separated into their own elective procedures. Rationale: These procedures are different and should be listed as separate procedures.

All areas of the clinical experience requirements were edited for clarity and to update terminology to reflect current practice. The new clinical experience requirements will be available in Spring of 2021 at https://www.arrt.org/pages/arrt-reference-documents/by-document-type/clinical-experience-requirements

New Eligibility Pathway Established

Beginning in 2020 students who have graduated from a vascular sonography educational program will be eligible to take the ARRT Vascular Sonography exam. The educational program must be accredited by a mechanism acceptable to ARRT, and educators must verify that students completed the clinical competency requirements. More specifics for this pathway will be elucidated in 2019.

Development of the Vascular Sonography Clinical Competency Requirements

As part of the comprehensive practice analysis study, the Sonography/Vascular Sonography Practice Analysis and CQR Advisory Committee created the clinical competency requirements based upon the task inventory approved by the Board of Trustees in July 2017. The requirements were posted on the ARRT website for professional community comment and professional organizations, such as the ASRT, SDMS, and AIUM were notified and invited to submit comments. Sonography educational programs, who often offer a vascular sonography track, were sent a copy of the proposed clinical competency requirements along with a postage-paid self-addressed envelope and invited to return them with their comments.

The committee reviewed and discussed the comments from the professional community. The types of mandatory and elective procedures are like the *Clinical Experience Requirements for Vascular Sonography*. Since this is a new document created for the primary route, there are no changes to note. The Clinical Competency Requirements were submitted to the ARRT Board of Trustees for consideration of approval in January 2018; the approved document can be seen at https://www.arrt.org/pages/arrt-reference-documents/by-document-type/didactic-and-clinical-competency-requirements

Content Weighting

The committee conducted a content weighting exercise to evaluate how many exam items should be used to assess each content area. This exercise involved independent judgments followed by group discussion. The committee used the worksheet found in Appendix G and formed a consensus of the numbers that can be see on the 2021 content specifications.

Exam Passing Standard

Many factors go into deciding when to readdress the passing standard for an exam. When conducting a practice analysis study, the degree to which the content is changed is one important factor that goes into making the decision. A standard setting exercise for Vascular Sonography will be held in July, 2021.Cut scores for new forms going forward will be determined by IRT equating using the existing standard.

Conclusion

Many individuals contributed to this project, as committee members, document reviewers, or as survey respondents. Periodic practice analysis is a necessary step in the life cycle of an exam program to ensure that the content of the exam and the eligibility requirements remain relevant with current practice. This study noted many significant changes to the field of vascular sonography, and thanks to the efforts of all involved it assures that the ARRT vascular sonography exam program will continue to be an excellent assessment of vascular sonographers wishing to demonstrate their abilities by seeking certification and registration.

APPENDIX A

Time and Task Schedule for

Sonography & Vascular Sonography Practice Analysis

Steps	Approx. Date	Activity
1	July 2015 BOT meeting	Board appoints members to the Sonography/Vascular Sonography PA Advisory Committee. Staff mails appointment letter, contract, and proposed dates for meeting.
3	Spring 2016	Staff compiles existing task inventory and other materials for Advisory Committee review.
5	* July 2016	Advisory Committee meets to review and update task inventory and also discuss survey content and format.
6	August 2016	Staff prepares first draft of survey and mails to Advisory Committee for review and comments from Committee members.
7	Oct/Nov 2016	Survey Systems mails survey to large sample of sonographers. • 10/7/2016: initial mailing • 10/28/2016: send thank you/reminder post card
8	Dec 2016/Jan 2017	Psychometrics Team analyzes data, prepares preliminary report, and the report is mailed to the Advisory Committee.
9	* March 2017	Advisory Committee meets to 1) review survey results, 2) finalize new task inventories, 3) develop initial content specifications, 4) develop initial clinical requirements, and 5) perform Task-Content Area Mapping procedure.
10	**July 2017	Board of Trustees approves the task inventories.
11	July/Aug 2017	Draft clinical competence requirements and content specifications put on website for review and comment by professional community and Board of Trustees.
12	Sept 2017	Staff collates comments from professional community and Board of Trustees, and sends summary to BOT and Advisory Committee.
13	* October 2017	Advisory Committee meets to finalize content specifications and clinical requirements.
14	**Jan 2018	Board of Trustees approves SON clinical competency requirements, VS clinical experience requirements, and content specifications for both SON and VS.
15 SON	Fall 2018	SON Examination Committee meets to assemble examination form and SSA form according to new content specifications.
16 VS	Spring 2019	VS Examination Committee meets to assemble examination form and SSA form according to new content specifications.
17 SON	January 2019	SON Exam form and SSA form with new content specifications are launched. New clinical requirements become effective.
18 VS	July 2019	VS Exam form and SSA form with new content specifications are launched. New clinical experience requirements become effective.

*indicates onsite PA/CQR committee meeting
**indicates BOT Action

Appendix B
Omitted Task List

Access patient data from an electronic medical record.
Maintain confidentiality of patient information.
Confirm patient's identity.
Provide for patient comfort and modesty.
Guarantee Patient’s Bill of Rights.
Use proper body mechanics and/or mechanical transfer devices when assisting patients.
Select immobilization devices, when indicated, to prevent patient movement and/or ensure patient safety.
Utilize standard precautions.
Follow appropriate procedures when in contact with a patient in isolation.
Use sterile or aseptic technique on or near wounds, surgical dressings, drains, or hardware.
Use sterile or aseptic technique to prevent contamination of sterile trays, instruments, or fields.
Properly dispose of contaminated items.
Maintain accurate patient log.
Use teleradiology or PACS.

APPENDIX C

Vascular Sonography Job Analysis Survey

VS survey

APPENDIX D

Vascular Sonography Job Analysis Survey Results

Table 1 lists the target group responses to demographic questions.

Table 2 lists the percent responsible, percent performing daily or weekly, and percent performing from 2011 survey. Tasks below 40% are highlighted in yellow.

Table 3 lists the target group sorted by Rasch rank. Tasks that more than 40% are performing that are above the line are highlighted in blue, and tasks that less than 40% are performing that are below the line are highlighted in green.

Table 4 lists the percent performing by hours/week working in VS.

Table 5 lists the percent performing by employment setting.

Table 6 lists the percent performing by years working in VS.

Table 7 lists the tasks that between 25% and 50% are performing.

1. VS 2016 Practice Analysis Survey Demographics of Target Group

1. How are study results reported to the interpreting physician?

Paper worksheets	53.2%
Automated data transfer from ultrasound unit to PACS	57.6%
Sonographer direct input from PACS workstation	51.2%
In person	33.2%

2. Who is responsible for performing quality control tests on sonographic equipment at your facility?

Sonographers	31.2%	
Maintenance contactor	45.9%	
Physicist	16.1%	
Facility biomedical department	44.9%	
Other	1.0%	(lead sonographer; supervisor)

3. Who is responsible for performing quality control of vascular sonography images at your facility?

Staff sonographers	36.1%	
Lead/supervising sonographer	66.8%	
Physician	34.6%	
Other	4.9%	(biomed, lab director, QA person, QC officer, radiologist; technical director)

4. Which of the following best describes your primary place of employment?

Hospital/Medical center (e.g., inpatient facility)	54.6%	
Free-standing imaging facility/Outpatient clinic	13.2%	
Private office	24.9%	
Other	2.9%	(various mobile – 3, both outpatient clinic and inpatient lab, hospital owned office, vein clinic, vein center)

5. If you work in a hospital/medical center providing inpatient care, what is the approximate size?

Less than 100 beds	9.3%
100 – 250 beds	19.0%
251 – 500 beds	20.0%
More than 500 beds	13.2%
Not applicable	32.7%

6. Which of the following best describes your job title?

Staff vascular sonographer	65.4%
Lead or chief sonographer	34.6%

7. How many total hours per week are you performing vascular sonography?

17 – 32 hours	39.0%
More than 32 hours	61.0%

8. How many years have you been performing vascular sonography?

1 – 5 years	17.1%
6 – 10 years	23.4%
11 – 20 years	53.7%
More than 20 years	5.9%

9. What percentage of vascular sonography exams are performed outside of the ultrasound area (including but not limited to portable studies)?

0%	31.2%
1-20%	29.3%
21-40%	14.1%
41-60%	11.7%
61-80%	6.8%
81-99%	2.9%
100%	3.4%

10. Have you received training in ergonomics?

Yes	68.8%
No	31.2%

11. In the past few years has your department changed to equipment with improved ergonomic design?

Yes	40.5%
No	38.0%
My department changed to ergonomic equip. more than 3 yr ago	19.0%

12. Has anyone in your department had work loss due to work-related injury?

Yes	34.6%
No	65.4%

13. Do you regularly experience pain while working?

Yes	54.1%
No	45.9%

Are there other imaging tasks that you regularly perform that were not on this survey?

Temporal artery 3
Thoracic outlet syndrome 2
Balloon angioplasty with US guidance of AVF
Digital PVRs and pressure during AVF studies
Intra-operative assist with carotid endarterectomy
Microphibectomy US guided sclero injection
Post ablation venous studies
Thyroid/parathyroid nonvascular studies
Gallbladder
US guidance for vein injections
Intraoperative CEA
Transcranial imaging
LEA - popliteal entrapment

2. PERCENT RESPONSIBLE AND PERCENT DAILY OR WEEKLY TARGET GROUP (N = 256)

#	TASK	%RESP	%DAY/WK	%2011
1	Access and review pertinent patient data with sono	100.0	99.2	91
2	Explain patient preparation (e.g., diet restrictions	83.7	73.9	68
3	Conduct physical and mental assessment of patient to	85.7	81.5	
4	Ensure compliance with American Hospital Association	83.6	81.6	
5.1	volume flow (e.g., hemodialysis fistulas)	83.0	60.9	
5.2	Doppler twinkle (e.g., stone recognition)	59.2	53.0	
6	Select immobilization devices or positioning aids,	80.3	70.9	73
7	Recognize signs and symptoms of abnormal respiratory	91.6	74.3	90
8	Measure respiratory rate, pulse, or blood pressure	82.6	64.1	58
9	Access and review pertinent patient data with vascular	99.5	98.0	91
10	Maintain accurate patient log.	88.4	85.2	
11	Evaluate vascular studies for artifacts and determine	93.6	81.2	88
12	Determine if additional areas should be evaluated sono	93.6	88.5	90
13	Determine if additional imaging studies should be req	73.4	63.1	61
14	Use teleradiology or PACS.	87.6	86.5	
15	Verify exam coding.	78.2	71.9	65
16	Review pertinent patient information and vascular	98.5	86.6	100
17	arterial - aorta	90.2	85.9	92
18	arterial - celiac	74.4	35.4	67
19	arterial - hepatic	75.5	48.8	71
20	arterial - splenic	73.3	43.1	69
21	arterial - superior mesenteric	70.6	33.7	65
22	arterial - inferior mesenteric	60.7	26.6	58
23	arterial - renal	84.1	63.5	86
24	arterial - common iliac	90.6	77.9	87
25	arterial - internal iliac	75.9	50.8	72
26	arterial - external iliac	87.7	68.9	81
27	arterial - testicular	50.2	46.4	
28	arterial - penile	16.3	0.8	13
29	arterial – ovarian	53.1	48.4	
30	venous - IVC	85.9	65.5	85
31	venous - hepatic	65.5	47.8	71
32	venous - portal	63.4	50.0	70
33	venous - splenic	63.2	33.6	62
34	venous - superior mesenteric	52.3	22.9	45
35	venous - renal	75.4	55.6	75
36	venous - pelvic congestion	44.6	26.9	
37	venous - common iliac	81.4	58.8	72
38	venous - internal iliac	64.9	42.5	62

#	TASK	%RESP	%DAY/WK	%2011
39	venous - external iliac	82.8	56.5	75
40	venous - scrotal (e.g., varicocele)	48.3	44.0	
41	transplant vasculature liver	36.1	8.7	35
42	transplant vasculature kidney	53.9	10.2	55
43	transplant vasculature pancreas	18.4	4.0	21
44	UE - innominate	77.6	44.4	
45	UE - subclavian	92.6	64.8	89
46	UE - axillary	92.1	55.2	88
47	UE - brachial	92.6	58.1	89
48	UE - radial	92.1	56.1	88
49	UE - ulnar	92.1	54.3	87
50	UE - palmar arch including Allen test	45.1	9.4	
51	UE - digital	52.7	18.2	
52	UE - brachial artery flow-mediated dilatation (FMD)	13.3	4.0	
53	LE - external iliac	91.2	69.8	83
54	LE - common femoral	97.6	85.1	93
55	LE - superficial femoral	97.1	85.0	93
56	LE - deep femoral	93.6	81.8	86
57	LE - popliteal	96.0	84.9	92
58	LE -tibioperoneal trunk	90.7	78.0	
59	LE - posterior tibial	95.6	85.9	91
60	LE - anterior tibial	89.7	75.7	84
61	LE - peroneal	88.6	74.2	81
62	LE - dorsalis pedis	91.5	78.0	84
63	UEV - internal jugular	94.6	74.1	95
64	UEV - innominate	78.2	56.5	
65	UEV - subclavian	96.1	74.4	96
66	UEV - axillary	96.1	74.0	96
67	UEV - brachial	96.1	73.9	96
68	UEV - cephalic	95.6	74.9	95
69	UEV - basilic	95.6	75.2	95
70	UEV - radial	93.1	65.9	90
71	UEV - ulnar	93.1	65.2	90
72	UEV - vein mapping	74.5	42.6	68
73	LEV - external iliac	90.1	71.9	84
74	LEV - common femoral	99.5	98.0	98
75	LEV - femoral	99.0	98.0	98
76	LEV - deep femoral	96.1	93.4	92
77	LEV - popliteal	99.5	98.4	98
78	LEV - great saphenous	99.5	96.1	97
79	LEV - small saphenous	92.5	79.7	89
80	LEV - tibioperoneal trunk	93.6	88.2	83

#	TASK	%RESP	%DAY/WK		%2011
81	LEV - calf veins	97.5	90.9	93
82	LEV - vein mapping	76.8	49.0	72
83	LEV - reflux assessment (e.g., venous insufficiency,	80.9	60.5	80
84	carotid artery (CCA, ICA, ECA)	97.1	93.3	97
85	vertebral artery	96.6	93.4	96
86	subclavian artery	91.7	73.3	88
87	transcranial Doppler (TCD)	17.2	8.2	
88	elastography	3.4	3.1	
89	pulse volume recording (PVR)	57.1	40.6	52
90	segmental pressures – upper extremities	65.5	28.3	64
91	segmental pressures – lower extremities	70.1	54.3	68
92	ankle-brachial index (ABI)	88.2	77.9	83
93	post-exercise testing	62.3	34.9	54
94	photoplethysmography (PPG)	64.7	46.3	
95	toe-brachial index (TBI)	67.8	50.4	
96	bypass grafts	88.7	49.8	83
97	endografts	78.7	39.1	74
98	dialysis access grafts/fistulae	80.3	39.1	74
99	stents	90.0	51.0	78
100	post catheterization complications	78.3	32.1	77
101	IVC filters	52.0	11.8	50
102	TIPS	45.1	7.5	45
103	lines	41.4	18.5	48
104	post endarterectomy	90.5	51.0	
105	angioplasty	12.7	5.9	55
106	thrombolysis	17.2	4.3	54
107	vein ablations	40.6	22.5	
108	pseudoaneurysm treatment compression or guided th	47.3	7.0	
109	line placement	19.5	6.7	
110	vital signs-blood pressure	59.8	44.7	
111	vital signs- pulse	36.9	21.3	
112	vital signs-respiration	31.0	16.2	
113	vital signs-temperature	20.4	8.4	
114	transfer of patient to scanning table	82.7	68.0	
115	CPR (simulated or actual)	72.4	2.4	
116	oxygen administration	54.4	31.8	
117	oxygen monitoring (e.g., pulse oximetry)	28.4	12.9	

3. PERCENT RESPONSIBLE, PERCENT DAILY OR WEEKLY, RASCH RANK TARGET GROUP (N = 256)

#	TASK	%RESP	%DAY/WK	RASCH	
88	elastography	3.4	3.1	118
28	arterial - penile	16.3	0.8	117
52	UE - brachial artery flow-mediated dilatation (FMD)	13.3	4.0	116
105	angioplasty	12.7	5.9	115
106	thrombolysis	17.2	4.3	114
43	transplant vasculature pancreas	18.4	4.0	113
109	line placement	19.5	6.7	112
87	transcranial Doppler (TCD)	17.2	8.2	111
113	vital signs-temperature	20.4	8.4	110
117	oxygen monitoring (e.g., pulse oximetry)	28.4	12.9	109
115	CPR (simulated or actual)	72.4	2.4	108
41	transplant vasculature liver	36.1	8.7	107
112	vital signs-respiration	31.0	16.2	106
50	UE - palmar arch including Allen test	45.1	9.4	105
102	TIPS	45.1	7.5	104
108	pseudoaneurysm treatment compression or guided	47.3	7.0	103
101	IVC filters	52.0	11.8	102
103	lines	41.4	18.5	101
111	vital signs- pulse	36.9	21.3	100
107	vein ablations	40.6	22.5	99
42	transplant vasculature kidney	53.9	10.2	98
51	UE - digital	52.7	18.2	97
34	venous - superior mesenteric	52.3	22.9	96
36	venous - pelvic congestion	44.6	26.9	95
22	arterial - inferior mesenteric	60.7	26.6	94
116	oxygen administration	54.4	31.8	93
90	segmental pressures – upper extremities	65.5	28.3	92
93	post-exercise testing	62.3	34.9	91
89	pulse volume recording (PVR)	57.1	40.6	90
21	arterial - superior mesenteric	70.6	33.7	89
40	venous - scrotal (e.g., varicocele)	48.3	44.0	88
33	venous - splenic	63.2	33.6	87
27	arterial - testicular	50.2	46.4	86
18	arterial - celiac	74.4	35.4	85
110	vital signs-blood pressure	59.8	44.7	84
38	venous - internal iliac	64.9	42.5	83
100	post catheterization complications	78.3	32.1	82
97	endografts	78.7	39.1	81

#	TASK	%RESP	%DAY/WK	RASCH	
94	photoplethysmography (PPG)		64.7	46.3	80
29	arterial - ovarian		53.1	48.4	79
98	dialysis access grafts/fistulae		80.3	39.1	78
95	toe-brachial index (TBI)		67.8	50.4	77
72	UEV - vein mapping		74.5	42.6	76
20	arterial - splenic		73.3	43.1	75
5.2	Doppler twinkle (e.g., stone recognition)		59.2	53.0	74
31	venous - hepatic		65.5	47.8	73
44	UE - innominate		77.6	44.4	72
32	venous - portal		63.4	50.0	71
82	LEV - vein mapping		76.8	49.0	70
91	segmental pressures – lower extremities		70.1	54.3	69
25	arterial - internal iliac		75.9	50.8	68
19	arterial - hepatic		75.5	48.8	67
35	venous - renal		75.4	55.6	66
96	bypass grafts		88.7	49.8	65
64	UEV - innominate		78.2	56.5	64
104	post endarterectomy		90.5	51.0	63
83	LEV - reflux assessment (e.g., venous insufficiency,		80.9	60.5	62
39	venous - external iliac		82.8	56.5	61
99	stents		90.0	51.0	60
37	venous - common iliac		81.4	58.8	59
13	Determine if additional imaging studies should be		73.4	63.1	58
5.1	volume flow (e.g., hemodialysis fistulas)		83.0	60.9	57
8	Measure respiratory rate, pulse, or blood pressure		82.6	64.1	56
49	UE - ulnar		92.1	54.3	55
46	UE - axillary		92.1	55.2	54
48	UE - radial		92.1	56.1	53
23	arterial - renal		84.1	63.5	52
47	UE - brachial		92.6	58.1	51
114	transfer of patient to scanning table		82.7	68.0	50
30	venous - IVC		85.9	65.5	49
71	UEV - ulnar		93.1	65.2	48
26	arterial - external iliac		87.7	68.9	47
15	Verify exam coding.		78.2	71.9	46
70	UEV - radial		93.1	65.9	45
45	UE - subclavian		92.6	64.8	44
6	Select immobilization devices or positioning aids,		80.3	70.9	43
53	LE - external iliac		91.2	69.8	42
2	Explain patient preparation (e.g., diet restrictions		83.7	73.9	41
73	LEV - external iliac		90.1	71.9	40
92	ankle-brachial index (ABI)		88.2	77.9	39

#	TASK	%RESP	%DAY/WK	RASCH	
86	subclavian artery		91.7	73.3	38
61	LE – peroneal		88.6	74.2	37
60	LE - anterior tibial		89.7	75.7	36
24	arterial - common iliac		90.6	77.9	35
63	UEV - internal jugular		94.6	74.1	34
69	UEV - basilic		95.6	75.2	33
68	UEV - cephalic		95.6	74.9	32
67	UEV - brachial		96.1	73.9	31
66	UEV - axillary		96.1	74.0	30
7	Recognize signs and symptoms of abnormal respiratory		91.6	74.3	29
65	UEV - subclavian		96.1	74.4	28
62	LE - dorsalis pedis		91.5	78.0	27
58	LE -tibioperoneal trunk		90.7	78.0	26
3	Conduct physical and mental assessment of patient to		85.7	81.5	25
79	LEV - small saphenous		92.5	79.7	24
4	Ensure compliance with American Hospital Association		83.6	81.6	23
56	LE - deep femoral		93.6	81.8	22
17	arterial - aorta		90.2	85.9	21
11	Evaluate vascular studies for artifacts and determin		93.6	81.2	20
10	Maintain accurate patient log.		88.4	85.2	19
57	LE - popliteal		96.0	84.9	18
55	LE - superficial femoral		97.1	85.0	17
59	LE - posterior tibial		95.6	85.9	16
54	LE - common femoral		97.6	85.1	15
14	Use teleradiology or PACS.		87.6	86.5	14
12	Determine if additional areas should be evaluated sono		93.6	88.5	13
80	LEV - tibioperoneal trunk		93.6	88.2	12
16	Review pertinent patient information and vascular		98.5	86.6	11
81	LEV - calf veins		97.5	90.9	10
85	vertebral artery		96.6	93.4	9
84	carotid artery (CCA, ICA, ECA)		97.1	93.3	8
76	LEV - deep femoral		96.1	93.4	7
78	LEV - great saphenous		99.5	96.1	6
75	LEV - femoral		99.0	98.0	5
74	LEV - common femoral		99.5	98.0	4
77	LEV - popliteal		99.5	98.4	3
9	Access and review pertinent patient data - vascular		99.5	98.0	2
1	Access and review pertinent patient data - sono		100.0	99.2	1

4. PERCENT RESPONSIBLE BY HOURS PER WEEK WORKING IN VS

TASK	<16 HR	17-32 HR	>32 HR
Access and review pertinent patient data - sono	98	100	100
Explain patient preparation (e.g., diet restrictions	74	80	86
Conduct physical and mental assessment of patient to	82	85	86
Ensure compliance with American Hospital Association	94	84	83
volume flow (e.g., hemodialysis fistulas)	77	84	83
Doppler twinkle (e.g., stone recognition)	73	76	48
Select immobilization devices or positioning aids	92	82	79
Recognize signs and symptoms of abnormal respiratory	90	91	92
Measure respiratory rate, pulse, or blood pressure	70	81	84
Access and review pertinent patient data - vascular	100	100	99
Maintain accurate patient log.	80	86	90
Evaluate vascular studies for artifacts and determin	88	95	93
Determine if additional areas should be evaluated sono	94	95	93
Determine if additional imaging studies should be	61	76	72
Use teleradiology or PACS.	90	90	86
Verify exam coding.	75	77	79
Review pertinent patient information and vascular	96	97	99
arterial - aorta	98	95	87
arterial - celiac	75	75	74
arterial - hepatic	86	83	71
arterial - splenic	80	77	71
arterial - superior mesenteric	71	69	72
arterial - inferior mesenteric	53	59	62
arterial - renal	90	89	81
arterial - common iliac	86	94	89
arterial - internal iliac	67	77	75
arterial - external iliac	80	85	89
arterial - testicular	86	75	34
arterial - penile	20	19	15
arterial - ovarian	86	73	30
venous – IVC	96	88	84
venous - hepatic	88	84	54
venous - portal	88	80	52
venous - splenic	80	78	54
venous - superior mesenteric	50	56	50
venous - renal	84	80	73
venous - pelvic congestion	61	56	37
venous - common iliac	86	80	82

TASK	<16 HR	17-32 HR	>32 HR
venous - internal iliac	59	66	64
venous - external iliac	76	81	84
venous - scrotal (e.g., varicocele)	86	72	33
transplant vasculature liver	53	56	24
transplant vasculature kidney	78	66	46
transplant vasculature pancreas	22	28	12
UE - innominate	76	80	76
UE - subclavian	88	95	91
UE - axillary	86	94	91
UE - brachial	90	94	92
UE - radial	90	94	91
UE - ulnar	86	95	90
UE - palmar arch including Allen test	34	41	48
UE - digital	26	46	57
UE - brachial artery flow-mediated dilatation (FMD)	6	11	15
LE - external iliac	76	89	93
LE - common femoral	90	96	98
LE - superficial femoral	90	95	98
LE - deep femoral	90	91	95
LE - popliteal	90	94	98
LE -tibioperoneal trunk	88	89	92
LE - posterior tibial	92	94	97
LE - anterior tibial	86	87	91
LE - peroneal	88	85	91
LE - dorsalis pedis	86	88	93
UEV - internal jugular	92	98	93
UEV - innominate	80	84	75
UEV - subclavian	92	99	94
UEV - axillary	92	99	94
UEV - brachial	94	99	94
UEV - cephalic	94	98	94
UEV - basilic	94	97	94
UEV - radial	90	96	91
UEV - ulnar	90	96	91
UEV - vein mapping	65	68	79
LEV - external iliac	90	86	93
LEV - common femoral	98	99	100
LEV - femoral	98	98	100
LEV - deep femoral	98	94	98
LEV - popliteal	98	99	100
LEV - great saphenous	96	99	100

TASK	<16 HR	17-32 HR	>32 HR
LEV - small saphenous	86	90	94
LEV - tibioperoneal trunk	96	95	93
LEV - calf veins	98	94	100
LEV - vein mapping	68	69	82
LEV - reflux assessment (e.g., venous insufficiency,	59	72	87
carotid artery (CCA, ICA, ECA)	90	97	97
vertebral artery	90	98	96
subclavian artery	88	90	93
transcranial Doppler (TCD)	16	15	18
elastography	8	5	2
pulse volume recording (PVR)	29	50	62
segmental pressures – upper extremities	47	57	71
segmental pressures – lower extremities	56	63	74
ankle-brachial index (ABI)	74	84	91
post-exercise testing	31	48	71
photoplethysmography (PPG)	31	51	74
toe-brachial index (TBI)	43	59	74
bypass grafts	75	86	90
endografts	53	74	81
dialysis access grafts/fistulae	68	77	82
stents	76	89	91
post catheterization complications	69	72	82
IVC filters	51	50	53
TIPS	62	59	36
lines	43	41	41
post endarterectomy	73	86	93
angioplasty	14	10	14
thrombolysis	16	11	21
vein ablations	24	33	46
pseudoaneurysm treatment compression or guided thrombin	35	50	46
line placement	30	25	16
vital signs-blood pressure	55	54	63
vital signs- pulse	41	35	38
vital signs-respiration	31	31	31
vital signs-temperature	14	19	21
transfer of patient to scanning table	67	85	81
CPR (simulated or actual)	70	75	71
oxygen administration	57	60	51
oxygen monitoring (e.g., pulse oximetry)	39	34	25

Commented [SC1]: this should be thrombin. I think it just got cut off in the table.

5. RESPONSES BASED ON PLACE OF EMPLOYMENT (HOSPITAL, CLINIC, OR OFFICE)

TASK	HOSP	CLINIC	OFFICE
Access and review pertinent patient data - sono	100	100	98
Explain patient preparation (e.g., diet restrictions	80	77	87
Conduct physical and mental assessment of patient to	80	95	89
Ensure compliance with American Hospital Assoc	85	95	82
volume flow (e.g., hemodialysis fistulas)	87	74	71
Doppler twinkle (e.g., stone recognition)	70	62	40
Select immobilization devices or positioning aids,	86	86	72
Recognize signs and symptoms of abnormal respiration	92	90	89
Measure respiratory rate, pulse, or blood pressure	74	83	91
Access and review pertinent patient data – vascular	100	98	100
Maintain accurate patient log.	85	90	89
Evaluate vascular studies for artifacts and determin	94	88	94
Determine if additional areas should be evaluated so	94	90	94
Determine if additional imaging studies should be	70	62	78
Use teleradiology or PACS.	93	93	72
Verify exam coding.	70	88	83
Review pertinent patient information and vascular	98	95	100
arterial - aorta	94	93	83
arterial - celiac	78	67	70
arterial - hepatic	82	79	63
arterial - splenic	81	70	61
arterial - superior mesenteric	75	63	63
arterial - inferior mesenteric	60	56	52
arterial - renal	90	79	77
arterial - common iliac	92	91	81
arterial - internal iliac	77	70	68
arterial - external iliac	89	74	87
arterial - testicular	65	67	27
arterial - penile	22	10	8
arterial - ovarian	66	62	19
venous - IVC	91	86	81
venous - hepatic	76	77	51
venous - portal	76	71	49
venous - splenic	74	69	42
venous - superior mesenteric	57	52	33
venous - renal	82	71	66
venous - pelvic congestion	53	43	36

Commented [SC2]: word cut off - there are others like this.

Commented [TW3R2]: There are lots of them. I'm not really sure what to do about them. This is the appendix, and I don't own whatever doc they came from.

TASK	HOSP	CLINIC	OFFICE
venous - common iliac	85	79	76
venous - internal iliac	64	62	61
venous - external iliac	85	69	83
venous - scrotal (e.g., varicocele)	63	64	27
transplant vasculature liver	49	40	13
transplant vasculature kidney	75	53	24
transplant vasculature pancreas	23	12	14
UE - innominate	79	72	73
UE - subclavian	95	88	85
UE - axillary	94	86	85
UE - brachial	95	88	87
UE - radial	94	88	87
UE - ulnar	95	84	85
UE - palmar arch including Allen test	47	37	38
UE - digital	54	30	46
UE - brachial artery flow-mediated dil (FMD)	11	12	15
LE - external iliac	88	81	91
LE - common femoral	98	91	94
LE - superficial femoral	96	90	96
LE - deep femoral	94	86	94
LE - popliteal	95	91	96
LE -tibioperoneal trunk	92	84	91
LE - posterior tibial	95	91	96
LE - anterior tibial	89	81	92
LE - peroneal	87	88	90
LE - dorsalis pedis	90	88	92
UEV - internal jugular	99	93	83
UEV - innominate	82	72	72
UEV - subclavian	99	95	85
UEV - axillary	99	95	85
UEV - brachial	99	95	87
UEV - cephalic	99	95	87
UEV - basilic	99	95	87
UEV - radial	96	93	81
UEV - ulnar	96	93	81
UEV - vein mapping	81	60	57
LEV - external iliac	90	79	96
LEV - common femoral	100	95	100
LEV - femoral	99	95	100
LEV - deep femoral	97	93	96
LEV - popliteal	100	95	100

TASK	HOSP	CLINIC	OFFICE
LEV - great saphenous	99	98	100
LEV - small saphenous	88	88	100
LEV - tibioperoneal trunk	96	91	91
LEV - calf veins	99	95	96
LEV - vein mapping	79	65	69
LEV - reflux assessment (e.g., venous insuff	75	59	90
carotid artery (CCA, ICA, ECA)	97	98	91
vertebral artery	97	98	89
subclavian artery	93	91	85
transcranial Doppler (TCD)	23	7	9
elastography	4	5	4
pulse volume recording (PVR)	49	51	56
segmental pressures – upper extremities	66	49	57
segmental pressures – lower extremities	69	63	62
ankle-brachial index (ABI)	86	77	89
post-exercise testing	54	51	61
photoplethysmography (PPG)	60	51	57
toe-brachial index (TBI)	67	47	61
bypass grafts	94	79	70
endografts	76	70	67
dialysis access grafts/fistulae	87	67	59
stents	94	81	76
post catheterization complications	83	67	65
IVC filters	57	42	46
TIPS	60	45	19
lines	54	23	15
post endarterectomy	89	88	81
angioplasty	13	12	13
thrombolysis	20	12	15
vein ablations	29	40	53
pseudoaneurysm treatment compression	58	19	31
line placement	31	5	7
vital signs-blood pressure	52	65	69
vital signs- pulse	30	44	54
vital signs-respiration	26	37	37
vital signs-temperature	13	22	30
transfer of patient to scanning table	85	79	66
CPR (simulated or actual)	80	62	58
oxygen administration	67	44	30
oxygen monitoring (e.g., pulse oximetry)	32	35	24

6. RESPONSES BASED ON YEARS WORKING IN VS

		YEARS IN VS		
TASK		**1-5**	**6-10**	**11-20**
Access and review pertinent patient data - sono		100	99	100
Explain patient preparation (e.g., diet restrictions		78	81	82
Conduct physical and mental assessment of patient to		90	82	85
Ensure compliance with American Hospital Association		92	80	86
volume flow (e.g., hemodialysis fistulas)		87	85	79
Doppler twinkle (e.g., stone recognition)		67	55	63
Select immobilization devices or positioning aids,		85	76	84
Recognize signs and symptoms of abnormal respiratory		95	88	92
Measure respiratory rate, pulse, or blood pressure w		80	84	79
Access and review pertinent patient data - vascular		100	100	99
Maintain accurate patient log.		85	91	87
Evaluate vascular studies for artifacts and determin		95	91	92
Determine if additional areas should be evaluated sono		95	94	92
Determine if additional imaging studies should be		66	72	72
Use teleradiology or PACS.		90	91	85
Verify exam coding.		73	78	80
Review pertinent patient information and vascular		95	99	98
arterial - aorta		85	93	93
arterial - celiac		66	76	76
arterial - hepatic		67	74	82
arterial - splenic		63	72	80
arterial - superior mesenteric		61	72	72
arterial - inferior mesenteric		46	59	63
arterial - renal		83	81	88
arterial - common iliac		83	91	92
arterial - internal iliac		63	74	78
arterial - external iliac		76	84	91
arterial - testicular		55	56	58
arterial - penile		10	15	20
arterial - ovarian		48	58	56
venous - IVC		80	91	88
venous - hepatic		66	66	73
venous - portal	62	65	71	
venous - splenic		56	64	69
venous - superior mesenteric		44	52	52
venous - renal		80	66	81
venous - pelvic congestion		44	46	51

TASK	1-5	6-10	11-20
venous - common iliac	76	76	88
venous - internal iliac	60	60	66
venous - external iliac	78	78	84
venous - scrotal (e.g., varicocele)	48	55	58
transplant vasculature liver	38	44	38
transplant vasculature kidney	50	66	59
transplant vasculature pancreas	18	16	21
UE - innominate	71	78	80
UE - subclavian	88	94	92
UE - axillary	88	94	90
UE - brachial	88	96	92
UE - radial	88	96	91
UE - ulnar	88	93	91
UE - palmar arch including Allen test	44	42	45
UE - digital	46	43	50
UE - brachial artery flow-mediated dilatation (FMD)	12	16	11
LE - external iliac	80	88	91
LE - common femoral	90	99	97
LE - superficial femoral	90	97	97
LE - deep femoral	85	96	94
LE - popliteal	90	98	95
LE -tibioperoneal trunk	83	94	90
LE - posterior tibial	90	99	95
LE - anterior tibial	78	94	90
LE - peroneal	80	96	87
LE - dorsalis pedis	88	94	90
UEV - internal jugular	88	93	97
UEV - innominate	75	78	80
UEV - subclavian	92	94	97
UEV - axillary	92	94	97
UEV - brachial	92	96	97
UEV - cephalic	90	96	97
UEV - basilic	90	96	97
UEV - radial	90	91	94
UEV - ulnar	90	91	94
UEV - vein mapping	62	80	71
LEV - external iliac	85	90	92
LEV - common femoral	98	100	99
LEV - femoral	95	100	99
LEV - deep femoral	93	99	96
LEV - popliteal	98	100	99

TASK	1-5	6-10	11-20
LEV - great saphenous	97	100	99
LEV - small saphenous	90	94	90
LEV - tibioperoneal trunk	93	96	94
LEV - calf veins	98	99	97
LEV - vein mapping	60	82	75
LEV - reflux assessment (e.g., venous insufficiency,	68	77	78
carotid artery (CCA, ICA, ECA)	95	93	98
vertebral artery	95	93	97
subclavian artery	90	93	91
transcranial Doppler (TCD)	17	18	17
elastography	0	7	4
pulse volume recording (PVR)	54	55	51
segmental pressures – upper extremities	63	60	63
segmental pressures – lower extremities	68	69	68
ankle-brachial index (ABI)	78	91	86
post-exercise testing	54	56	57
photoplethysmography (PPG)	54	59	59
toe-brachial index (TBI)	63	69	60
bypass grafts	80	84	89
endografts	73	75	72
dialysis access grafts/fistulae	68	81	79
stents	85	87	88
post catheterization complications	64	75	80
IVC filters	49	50	54
TIPS	37	51	50
lines	29	46	43
post endarterectomy	78	85	91
angioplasty	10	15	13
thrombolysis	15	15	18
vein ablations	29	37	40
pseudoaneurysm treatment compression or guided throm	34	47	47
line placement	17	21	22
vital signs-blood pressure	66	56	60
vital signs- pulse	32	35	42
vital signs-respiration	27	27	35
vital signs-temperature	15	12	25
transfer of patient to scanning table	83	72	82
CPR (simulated or actual)	66	68	75
oxygen administration	54	49	58
oxygen monitoring (e.g., pulse oximetry)	27	26	36

7. TASKS THAT BETWEEN 25% AND 50% ARE PERFORMING

#	TASK	TARGET%	DAY/WK	RASCH
36	venous - pelvic congestion	44.6	26.9	95
40	venous - scrotal (e.g., varicocele)	48.3	44.0	88
41	transplant vasculature liver	36.1	8.7	107
50	UE - palmar arch including Allen test	45.1	9.4	105
102	TIPS	45.1	7.5	104
103	lines	41.4	18.5	101
107	vein ablations	40.6	22.5	99
108	pseudoaneurysm treatment compression	47.3	7.0	103
111	vital signs- pulse	36.9	21.3	100
112	vital signs-respiration	31.0	16.2	106
117	oxygen monitoring (e.g., pulse oximetry)	28.4	12.9	109

APPENDIX G
CONTENT WEIGHTING WORKSHEET
TOPIC WEIGHTS FOR VASCULAR SONOGRAPHY

For each of the three major categories listed below, please indicate the percentage of test questions that you believe should be allocated to that category. Percentages should add to 100%.

Patient Care	_____ %
Image Production	_____ %
Vascular Sonographic Procedures	_____ %
Total =	100 %

For each of the subcategories listed below under ***Image Production***, indicate the percentage of test questions that you believe should be assigned to that category. The percentages should add to 100%.

Image Production

Basic Principles of Ultrasound	_____ %
Image Formation	_____ %
Evaluation and Selection of Representative Images	_____ %
Total =	100 %

For the topics listed under ***Vascular Sonographic Procedures***, indicate what percent should focus on the following factors. The percentages should add to 100%.

Vascular Sonographic Procedures

Abdominal/Pelvic Vasculature	_____ %
Arterial Peripheral Vasculature	_____ %
Venous Peripheral Vasculature	_____ %
Extracranial Cerebral Vasculature and Other Sonographic Procedures	_____ %
Total =	100 %

For each of the eight categories listed below the CURRENT column lists the number of questions and the percent of the total number of questions on the current exam. The 2021 column indicate the number of questions that the committee decided should be allocated to that category beginning in 2021.

Commented [SC4]: This is actually May 2021. Does it matter?? Not sure.

Commented [TW5R4]: Yes, I think it needs to read 2021

	CURRENT	2021
Patient Care		
Patient Interactions and Management	0(0%)	20
Image Production		
Basic Principles of Ultrasound	28(17.5%)	26
Image Formation	12(7.5%)	14
Evaluation and Selection of Representative Images	35(21.9%)	35
Procedures		
Abdominal Pelvic Vasculature	20(12.5%)	23
Arterial Peripheral Vasculature	22(13.8%)	21
Venous Peripheral Vasculature	20(12.5%)	18
Extracranial Cerebral Vasculature and Other Sonographic Exams	23(14.4%)	18