

# FUNDAMENTALS OF OB/GYN ULTRASOUND

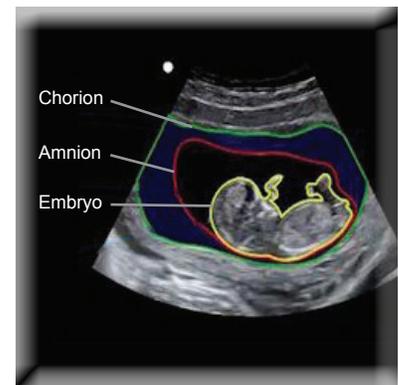
## COMPETENCY BASED PROGRAM

### OVERVIEW

This two-part competency based program provides foundational concepts for sonographers, physicians, and health care professionals desiring to learn and integrate OB/GYN Ultrasound into their practice.

Features include:

- Interactive Didactic Lectures
- Clinical ScanLabs
- Pre-test assessment
- Bookmarking
- Integrated CheckPoints
- Post-test assessment, identifies areas of weakness
- Correlates incorrect answers back to content



### PART 1 - POINT OF CARE OB/GYN ULTRASOUND PHYSICS

This eight module course builds the foundation for understanding and learning Point of Care (POC) OB/GYN ultrasound for sonographers, physicians, and health care professional who have a need to practice limited scope OB/GYN ultrasound. This modular eCourse teaches physics from a unique perspective with direct clinical application to ultrasound using many analogies, animations, ultrasound images, and ultrasound videos. Concepts presented include ultrasound and wave fundamentals, imaging fundamentals, ultrasound system controls, image artifacts, basic Doppler theory, PW spectral Doppler, color Doppler, and ultrasound bioeffects and safety. The instructor for this course, Frank Miele, is a dynamic, world-renown lecturer who holds multiple patents in diagnostic ultrasound, with a unique ability to make seemingly difficult concepts come to life and comprehensible.

### PART 2 - FUNDAMENTALS OF OB/GYN ULTRASOUND FOR MIDWIVES

The Fundamentals of OB/GYN Ultrasound is designed for participants with minimal or no experience in OB/GYN ultrasound. This unique course is comprised of didactic lectures to build a strong foundational understanding, coupled with the popular Pegasus ScanLabs to facilitate proper image acquisition. The clinical ScanLabs provide insight into proper technique for image acquisition and sonographic measurements. This program is offered as a competency-based progression course or as an online series. Interactive questions are integrated throughout the presentation to reinforce key concepts, creating a dynamic and engaging series.

## INSTRUCTOR BIOGRAPHY - PHYSICS



**Frank Miele, MSEE**

*President, Pegasus Lectures, Inc., Dallas, Texas*

Frank graduated cum laude from Dartmouth College with a triple major in physics, mathematics, and engineering. While at Dartmouth, he was a Proctor Scholar and received citations for academic excellence in comparative literature, atomic physics and quantum mechanics, and real analysis. After co-teaching a course in digital electronics at Dartmouth, Frank was a research and design engineer and project leader, designing ultrasound equipment and electronics for more than ten years at Hewlett Packard Company. Frank also served as the chief scientist and Vice President of Research and Development for a small medical company designing non-invasive hemodynamic based measurements. As a designer of ultrasound, he has lectured across the country to sonographers, physicians, engineers and students on myriad topics.

Frank has authored multiple texts on ultrasound physics, produced multiple educational videos, designed exam simulation programs, as well as created the patented analysis algorithm method and apparatus for evaluating educational performance. Frank has recently produced multiple online ultrasound seminars, focusing on making high quality educational programs affordable and accessible to the domestic and international ultrasound community. He is credited with several ultrasound and medical device patents, trade secrets, and publications.

## INSTRUCTOR BIOGRAPHY - OB/GYN



**Dr. Susan Campbell Westerway, AMS  
PhD (Medicine) MAppSc (Research)  
DMU BAsC (NMT) Churchill Fellow**

*Sydney, Australia*

Dr. Susan Westerway is an Australian sonographer who has been involved in ultrasound since 1975. With a major interest in obstetrics, her research work has included formulating the fetal biometry charts for an Australian population, which were adopted by the Australasian Society for Ultrasound in Medicine (ASUM) in 2001.

In 1981 she was awarded a Churchill Fellowship, which allowed her to study echocardiography at major cardiac institutions in the United States and London. On her return she became one of Australia's first application specialists, traveling extensively to teach all streams of ultrasound to those new to the field. Sue was involved in introducing ultrasound to the Australian veterinary field.

With a passion for teaching, Dr. Westerway is a tutor and examiner for many Australian and international universities and colleges. As an author of numerous journal and research articles she has presented extensively, both nationally & internationally.

Dr. Westerway serves on the Board of Directors of the Australasian Society for Ultrasound In Medicine (ASUM), is a past board member of the Australian Sonographers Association, and an advisor to the Australian Government Department of Health.

## PART 1 - POINT OF CARE OB/GYN ULTRASOUND PHYSICS MODULE DESCRIPTIONS

### **Module 1: Ultrasound & Sound Wave Fundamentals**

Module 1, Ultrasound and Sound Wave Fundamentals, lays the foundation for all of the subsequent modules. Unlike most introductory physics modules, this module directly connects the physics concept to the ultrasound application, making clear not only the concept, but how the concept applies clinically and why it matters. The module uses myriad ultrasound images, demonstrations, and analogies to simplify the underlying physics concepts on which ultrasound is based. Specifically this module answers the questions: What is ultrasound?, How does ultrasound work?, What parameters characterize a wave?, and How do sound waves interact with tissues in the body?

*Viewing Time: 1 hr 18 min*

### **Module 2: Ultrasound Imaging Fundamentals**

Module 2, Transducers and Image Generation, develops the foundation for understanding the practical and logistical aspects of scanning. The module begins by discussing transducer basics including functionality, transducer types, and image formats. This is followed by multiple animations which demonstrate how ultrasound images are actually generated – including transducer movements (translation, angulation, and rotation), scan planes, image planes, correlation with anatomical planes, and transducer orientation requirements. These concepts are all unified with actual ultrasound cases which illustrate how to determine fetal lie. In the second part of the module, reflection from tissue is discussed as relates to sonographic appearance. Again, ultrasound images are used to reinforce the concepts being taught.

*Viewing Time: 48 min*

### **Module 3: Ultrasound System Controls: OB/GYN**

Third of eight modules, Ultrasound System Controls: OB/GYN, this module reviews the function of the ultrasound system controls, relating each control back to the underlying physics concept taught in the previous two modules. The module covers using the appropriate transmit frequency, transmit power, receiver gain, the use of harmonics, imaging depth, image width, focal depth, compression (dynamic range), presets, automated optimization, screen brightness, and cine loop. Ultrasound images and video loops are used throughout to illustrate the functionality of each control.

*Viewing Time: 32 min*

### **Module 4: Image Artifacts: OB/GYN**

With ultrasound, not everything is as it appears to be. Sometimes, structures appear that do not exist, sometimes structures do not appear that do exist, and sometimes structures appear differently than they really are. When any of these situations occur, artifacts exist in the image. In this module, you will learn what an artifact is as well as the most common artifacts, their causes, and how you recognize these artifacts in the image. Most importantly, by understanding the mechanisms that cause the artifacts, you will recognize the existence of artifacts when they occur and understand what the artifact tells you about the body structures that are causing the artifact.

*Viewing Time: 31 min*

### **Module 5: Introduction to Doppler Fundamentals**

Module 5, Introduction to Doppler Fundamentals, teaches Doppler theory and serves as the foundation for the following two modules on spectral Doppler and color Doppler. Whereas 2D ultrasound images provide grayscale representation of tissues, fluids, and structures, the use of Doppler techniques allows for appreciation and quantification of blood flow. Learning the specific techniques and system controls of Doppler is greatly facilitated by first learning the underlying principles employed in Doppler assessments. Concepts taught in this module include the Doppler Effect, reflection of ultrasound waves from red blood cells, and the principles of spectral Doppler and of color Doppler.

*Viewing Time: 41 min*

### **Module 6: Introduction to PW Spectral Doppler**

Building on the concepts taught in the previous module, Module 6 develops an understanding of the specifics of Pulsed Wave (PW) spectral Doppler. The module begins with an illustration of the information contained in a Doppler spectrum. From here, you will learn how PW Doppler is performed, the importance of the PW Doppler sample volume, and the angle dependence of the spectral Doppler. Once you have learned the fundamentals of PW spectral Doppler, the module reviews the Doppler system controls related to spectral brightness and signal strength, velocity display, low velocity flow, sweep speed, and auto spectral optimization. As with the system controls module, the controls will be taught through direct application on actual Doppler spectrums. Finally, the module reviews spectral characteristics, measurements, and indices. We explore the effects of resistance on spectral Doppler waveform characteristics as are needed for assessments of the umbilical artery.

*Viewing Time: 1 hr 22 min*

### **Module 7: Introduction to Color Doppler Ultrasound**

Module 7, Introduction to Color Doppler, begins with the basics of color Doppler and how color Doppler images are generated. Once color basics are understood, the color Doppler system controls are reviewed to improve your ability to employ color Doppler in your ultrasound exams. As with 2D and PW Doppler, ultrasound images are used throughout this section to make evident the effects of each color Doppler control. The last part of the module teaches how to interpret flow direction from a color Doppler image as well as the use of color power Doppler.

*Viewing Time: 57 min*

### **Module 8: Ultrasound Bioeffects and Safety**

The official statement by the AIUM regarding the safety of ultrasound is that ultrasound is a very safe modality but that there are some risks. Module 8, Ultrasound Bioeffects and Safety, reviews the concepts of ultrasound safety, bioeffects, and transducer care so that you can minimize the risks as much as possible. Topics discussed include AIUM statements on safety, mechanisms of bioeffects (thermal and mechanical) the ALARA principle, and specifics of transducer care.

*Viewing Time: 18 min*

### **Point of Care OB/GYN Ultrasound Physics Summary**

**Viewing Time with Interactive Questions: 11 hours**

**CME:** This activity is approved for a maximum of 11 SDMS CME credits.

## PART 2 - FUNDAMENTALS OF OB/GYN ULTRASOUND FOR MIDWIVES MODULE DESCRIPTIONS

### Module 1: Normal Sonographic Anatomy Review

This module builds from the concepts taught in the Physics modules to help you understand the normal sonographic appearance of various maternal and fetal anatomy. Learning objectives for maternal anatomy include recognizing the normal sonographic appearance of the uterus, cervix, ovaries and adnexa, and the maternal bladder. The module advances to cover various aspects of fetal anatomy in the first trimester including recognizing the normal appearance of the gestational sac(s), identifying fetal number, evaluation of the sac shape and location, and recognition of the sonographic appearance of fetal development. Second and third trimester anatomy includes identifying the normal sonographic appearance of the fetal brain, face, heart, stomach, kidneys, cord insertion, bladder, spine and extremities. In conclusion, the function and assessment of amniotic fluid is covered and cervical competency is discussed.

*Viewing Time: 57 min*

### Module 2: Maternal and First Trimester Anatomy

Building upon your knowledge of normal maternal and fetal anatomy, this module addresses how to image, evaluate, and measure various anatomy including the uterus, ovaries, and fetal structures in the first trimester. Topics include identifying an intrauterine or extra-uterine pregnancy, recognizing multiple gestations, determining accurate dating, documentation of cardiac activity, and assessment for gross abnormalities. The procedure for an anatomy survey is discussed with ScanLabs demonstrating the proper technique. The module concludes with a discussion of reporting, documentation, quality review and patient care instructions.

*Viewing Time: 49 min*

### Module 3: Second and Third Trimester Anatomy

This module expands on your first trimester knowledge and teaches how to image, evaluate, and measure various second and third trimester fetal anatomy, amniotic fluid, placental locations, and the maternal cervix. Learning objectives include assessing for multiple gestations, determining fetal position, identifying placental location relative to the cervix, documenting cardiac activity for each fetus identified, and observing for major fetal anomalies. In addition, documentation of the amniotic fluid level, assessment of fetal growth, and correlation of fetal dating are discussed.

*Viewing Time: 1 hour 36 min*

### Module 4: Technical Scanning Tips

Technical errors may cause a sonogram to inaccurately represent the maternal or fetal condition. This module reviews some technical scanning tips which can be employed to minimize potential errors. These tips address a variety of scan techniques that can be used when encountering sonographic imaging challenges. Topics include gain and depth selection, probe-skin contact, probe-air artifact, probe and display orientation, bowel gas, bladder fullness, fetal motion, amniotic fluid levels, and a series of common measurement errors.

*Viewing Time: 1 hour 19 min*

### Module 5: Abnormal Anatomy

In previous modules, you were provided with a solid foundational understanding of the sonographic appearance of normal maternal and fetal anatomy. The focus of this module is to give you a basic understanding of common abnormal maternal and fetal findings using transabdominal ultrasound. Common maternal abnormalities covered include identifying the appearance of an incompetent cervix, recognizing the negative effects of improper bladder fullness, differentiating between a low-lying placenta and placenta previa, and identifying the sonographic appearance of oligohydramnios and polyhydramnios. Other abnormalities discussed by Dr. Westerway include fibroids, corpus luteal cyst, ectopic pregnancy, subchorionic hemorrhage, yolk sac abnormalities, placental abruption, anencephaly, abdominal wall defects, fetal position and growth, and fetal demise.

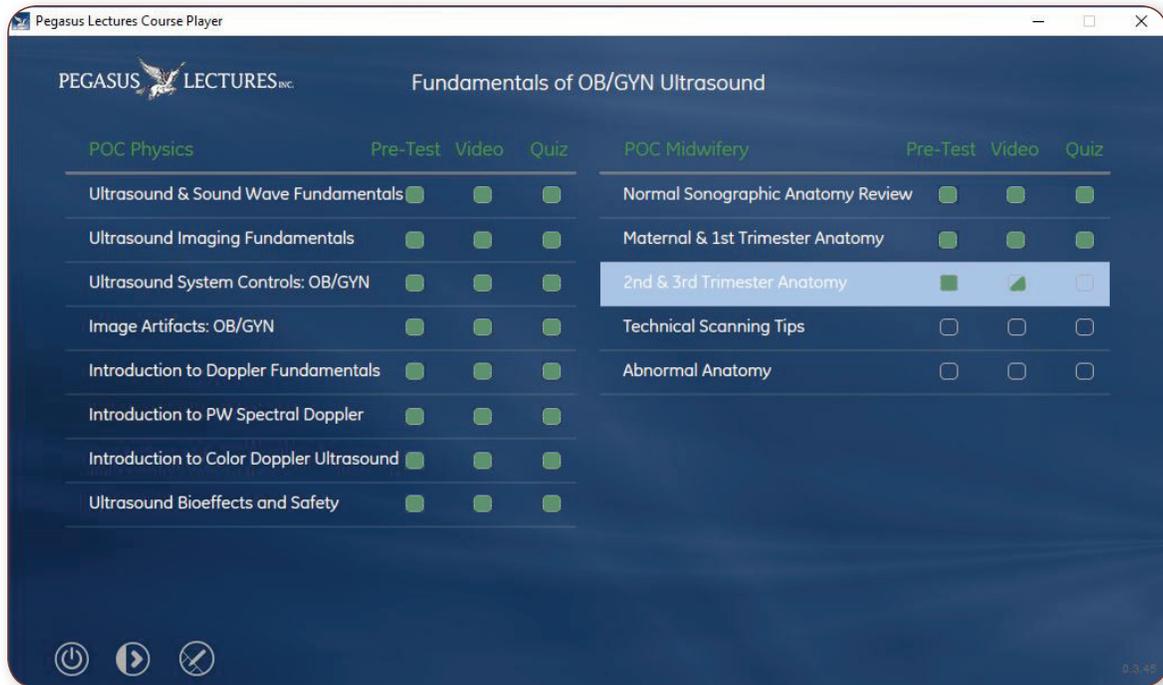
**Viewing Time: 59 min**

### Fundamentals of OB/GYN Ultrasound for Midwives eCourse Summary

**Viewing Time with Interactive Questions: 10.25 hours**

**CME:** This activity is approved for a maximum of 8.75 SDMS CME credits.

## COURSE FEATURES



Course structure for Competency-Based Progression version

PEGASUS  LECTURES INC. Fundamentals of OB/GYN Ultrasound

Post-Test Result of Ultrasound System Controls: OB/GYN

Percentage Correct = 50%

Unfortunately, you did not pass.

Note: Topics in which you answered questions incorrectly will be indicated in red on the playlist.

In order to enhance your learning experience, the questions in the Post-Test are linked to the content presented in the video.

The list below indicates the topics in which you answered questions incorrectly. You can choose to review just the areas in which you answered questions incorrectly (indicated by the red bookmark(s) on the playlist) or you can watch the entire video again.

- 0:01:42 Imaging Depth Control
- 0:02:51 Imaging Depth Control
- 0:03:43 Frame Rate/Temporal Resolution
- 0:06:45 Frame Rate/Temporal Resolution (video)
- 0:22:34 Zoom
- 0:07:02 Transmit Frequency
- 0:07:47 Harmonics
- 0:11:11 Basic System Controls: Transmit Power
- 0:12:21 Basic System Controls: Transmit Power
- 0:13:27 Basic System Controls: Receiver Gain
- 0:15:11 Receiver Gain
- 0:17:52 Receiver Gain vs Transmit Power
- 0:18:59 Receiver Gain vs Transmit Power

Please click the forward arrow in the lower right corner to return the beginning of this module for review.

*The Competency-Based Progression version identifies areas of weakness*



## Transmit Frequency




High Frequency
Low Frequency

0:00:19 Learning Objectives	R
0:00:40 Terminology Review	R
0:01:01 Outline: Ultrasound System...	R
0:01:26 System Controls	R
0:01:42 Imaging Depth Control	R
0:02:49 CheckPoint	R
0:02:51 Imaging Depth Control	R
0:03:39 CheckPoint	R
0:03:43 Frame Rate/Temporal Resol...	R
0:06:45 Frame Rate/Temporal Resol...	R
0:07:00 CheckPoint	R
0:07:02 Transmit Frequency	R

Ultrasound System Controls: OB/GYN

*Red bookmarks indicate topics in which participant answered questions incorrectly*

**For more information:**

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