

CEUS Education for Sonography Students: An imperative for modern training programs

Contrast Enhanced Ultrasound (CEUS) is a safe, portable, radiation-free imaging tool that produces high resolution, real-time images of the cardiovascular system, organ and tumor perfusion, and major blood vessels. CEUS has been an essential component of modern ultrasound laboratories throughout the world for over two decades.

Nonetheless, a knowledge resource gap has been identified in the teaching of CEUS indications and techniques to sonography students across all body indications.* In an effort to address this gap, the Joint Task Force on CEUS Curriculum in Sonographer Schools was formed in 2020 for the purpose of identifying reliable CEUS educational resources and presenting them in a practical framework that educators may include in their sonographer training curricular materials.

This CEUS Resource Guide is organized by discipline -- with one educational framework specific to echocardiography and another specific to general sonography. Each framework offers a curated selection of CEUS resources including webinars, clinical guidelines and other useful reference materials.

As new CEUS resources are identified, the Joint Task Force will add them to this Resource Guide -- which may be considered a living educational tool that, like the CEUS field itself, will continually grow. In addition, sonography educators and students are encouraged to seek out the many other excellent CEUS resources that may be found in peer-reviewed scientific publications and on the websites of each organization represented on the Joint Task Force.

The Joint Task Force is comprised of representatives from the following ultrasound organizations: **American Institute of Ultrasound in Medicine (AIUM)**; **American Registry of Diagnostic Medical Sonographers (ARDMS)**; **American Society of Echocardiography (ASE)**; **International Contrast Ultrasound Society (ICUS)**; **Intersocietal Accreditation Commission (IAC)**; and **Society of Diagnostic Medical Sonographers (SDMS)**.

The Task Force also gratefully acknowledges the administrative support of **Dentons** (dentons.com) and the educational resources that were provided free of charge by **Jefferson Ultrasound Radiology Education Institute (JUREI)**, **MedMentor Education (MedMentor.com)**, **Northwest Imaging Forums, Inc. (NWForums.com)** and **Society of Radiologists in Ultrasound (SRU)**.

**See, e.g., J Am Soc Echocardiogr 2020(33) 19A-21A.*

Additional CEUS resources are available on these websites

Task Force Member Organizations

American Institute of Ultrasound in Medicine (AIUM)

<https://www.aium.org/>

American Registry of Diagnostic Medical Sonographers (ARDMS)

<https://www.ardms.org/>

American Society of Echocardiography (ASE)

<https://www.asecho.org/contrast-zone/>

International Contrast Ultrasound Society (ICUS)

<http://icus-society.org/>

Intersocietal Accreditation Commission (IAC)

<https://www.intersocietal.org/echo/about.htm>

Society of Diagnostic Medical Sonographers (SDMS)

<https://www.sdms.org/>

Additional contributors of educational content

Jefferson Ultrasound Radiology Education Institute (JUREI)

<https://www.jefferson.edu/university/jmc/departments/radiology/jurei.html>

MedMentor

<https://www.medmentor.com/>

Northwest Imaging Forums

NWForums.com

Society of Radiologists in Ultrasound (SRU)

<https://www.sru.org/>

CME credit information

CME credit may be available for select CEUS webinars on individual websites, subject to registration and other requirements.

Joint Task Force Members

Task Force Co-Chairs



Beverly Gorman, RDCS

Ms. Gorman is Co-Chair of the Task Force and recently retired as Director of Accreditation for Echocardiography at the Intersocietal Accreditation Commission. She also is co-author of “Predictors of Delayed Accreditation of Echocardiography Laboratories: An Analysis of the Intersocietal Accreditation Commission Database.” Ms. Gorman began her career as a cardiac sonographer. Her many years of experience in both adult and pediatric echocardiography have included private practice and large hospital settings.



Andrej Lyshchik MD, PhD, DSc, FAIM, FSRU

Dr. Lyshchik is Co-Chair of the Task Force and is an Associate Professor of Radiology at Thomas Jefferson University Hospitals. Dr. Lyshchik publishes and lectures extensively on advances in contrast-enhanced ultrasound (CEUS) and chairs the American College of Radiology CEUS Liver Imaging Reporting & Data System (LI-RADS) working group. Dr. Lyshchik is a lead author of the first comprehensive CEUS textbook – Fundamentals of CEUS. He co-authored the American Institute of Ultrasound Practice Parameter for the Performance of Contrast-Enhanced Ultrasound Examinations and Guidelines and Good Clinical Practice Recommendations for Contrast-Enhanced Ultrasound in the Liver—Update 2020 WFUMB in Cooperation with EFSUMB, AFSUMB, AIUM, and FLAUS. Dr. Lyshchik has been the principal investigator and co-investigator on numerous NIH/NCI-funded clinical and preclinical CEUS studies exploring CEUS applications for early tumor detection, characterization and treatment response evaluation.



Sharon L. Mulvagh, MD FRCP(C), FACC, FASE, FAHA (US/Canada)

Dr. Mulvagh is Co-Chair of the Task Force, a cardiologist, Professor Emeritus at Mayo Clinic, and a Professor of Medicine at Dalhousie University, where she is Co-Director of the Women’s Heart Health Clinic at the Maritime Heart Center, Queen Elizabeth II Health Sciences Centre, Halifax, Nova Scotia, Canada. She is a clinical and investigative cardiologist recognized internationally for her research and education focused on the use of contrast enhanced ultrasound (CEUS) including myocardial perfusion imaging and detection of early atherosclerosis. Dr. Mulvagh has been the Principal Investigator for numerous preclinical and clinical CEUS trials, and is federally funded (CIHR) in collaborative CEUS studies. She also chaired the initial consensus documents for cardiovascular applications of CEUS and has guided their evolution over the last several decades to the current ASE Guidelines. She has over 150 peer-reviewed publications and book chapters, many relating to CEUS.

Task Force Members



Jennifer Bagley, MPH, RDMS, RVT, FAIUM, FSDMS

Jennifer Bagley is a Professor in the Department of Medical Imaging and Radiation Sciences at the University of Oklahoma Health Sciences Center, where she also serves as a Sonography Program Director and teaches vascular, gynecology, small parts, musculoskeletal, liver contrast agent imaging, and biological effects. Her 26 publications and 22 invited national, state, and local presentations reflect her focus on sonography education and clinical sonography. Ms. Bagley received first and second place honors in the Kenneth R. Gottesfeld award from the Journal of Diagnostic Medical Sonography and was named the SDMS Distinguished Educator in 2017. She has served as Chair of the SDMS infection control task force. She also has served as SDMS liaison to the AIUM biological effects and safety committee since 2009, and an elected position to that committee since 2013.



Pamela Burgess, ACS, BS, RDMS, RDCS, RVT, FASE

Pamela Burgess is Manager of the Cardiac Ultrasound & Stress Testing Lab at Wake Forest University/Baptist Medical Center in Winston-Salem, N.C. and is an Instructor of Adult Echocardiography at Wake Forest University School of Medicine. President of the Intersocietal Accreditation Commission (IAC) Echocardiography Board of Directors and a representative of the Society of Diagnostic Medical Sonography (SDMS). She also serves the IAC as a reviewer and site visitor. In addition, Ms. Burgess has been a speaker and director at numerous echocardiography courses across the country since 1993. Ms. Burgess has more than 30 years of experience as a sonographer including vascular, abdominal, obstetric-gynecology, and cardiac ultrasound.



Madeline Jankowski, BS, RDCS, FASE

Madeline Jankowski is the Lead Sonographer of Education at Northwestern Memorial Hospital in Chicago. She is dedicated to continuing education and quality assurance inside and outside of the echocardiography lab, and is recognized locally and nationally for her contributions to sonographer education. Ms. Jankowski also is a member of the ASE Sonographer Steering Committee and Vice Chair of the Adult Echo Boards Exam committee at ARDMS. Her mission is continued growth as a leader in education in the echo field and to cultivate a culture of passion for echo in those with whom she works.

Kathy Kelly, MA, MS, MS

Kathy Kelly is Chief Assessment Officer of Inteleos, a certification alliance affiliated with ARDMS as well as the Alliance for Physician Certification & Advancement and the Point-of-Car Ultrasound Certification Academy.



Jonathan Lindner, MD

Jonathan Lindner is a Professor of Medicine at Oregon Health & Science University where he is the Director of Cardiovascular Imaging and holds the M. Lowell Edwards Professorship of Cardiology. He is also the Chief of the Division of Cardiometabolic Research at the Oregon National Primate Research Center. Dr. Lindner has expertise in the fields of cardiovascular imaging and microvascular physiology, and is the principal investigator on several NIH RO1 grants as well as a grant from NASA. His research laboratory has pioneered the use of contrast enhanced ultrasound (CEUS) for non-invasive molecular imaging of disease and the evaluation of microvascular function/dysfunction. A past president of ASE, Dr. Lindner holds leadership positions on the Exam Writing Committee for the National Board of Echocardiography, the NIH Clinical Translational Imaging Science (CTIS) study section and the NIH/NHLBI Data Safety Monitoring Board for Gene and Cell Therapies. Dr. Lindner has received the ASE Feigenbaum Award and the Richard Popp Teaching Award, as well as the Oregon Mentor Award.



Christina Merrill, BSc, CRGS, CRVS, RDMS, RVT

Christina Merrill is a registered Canadian and American general and vascular sonographer. She has worked at the Foothills Medical Center in Calgary, Alberta, Canada for 15 years. She has been the lead sonographer in the department for Contrast Enhanced Ultrasound (CEUS) for the past 10 years working with Dr. Stephanie Wilson. Christina plays a leading role in the teaching and training of CEUS to ultrasound students and physicians. She also is actively involved in CEUS research and development, and has contributed to multiple peer-reviewed publications as part of Alberta Health Services and through the University of Calgary.



Carol K. C. Mitchell, PhD, RDMS, RDCS, RVT, RT(R), ACS, FASE

Carol Mitchell is an Associate Professor in the Division of Cardiovascular Medicine within the Department of Medicine at the University of Wisconsin. She also has an affiliate appointment with the Department of Medical Physics at the university. Dr. Mitchell is a prolific teacher and education researcher, having won numerous awards for both including the SDMS Distinguished Educator of the Year, Cardiac Sonographer Distinguished Teacher Award, and the SDMS Joan P. Baker Pioneer Award. Dr. Mitchell also received the ASE 2010 Cardiac Sonographer Distinguished Teacher Award. Her research interests include utilizing development of interactive learning modules to enhance inter-professional knowledge of non-invasive testing procedures and improve ultrasound measurement and analyses techniques.



Maria Stanczak, MS, RDMS, RVT, R.T(R)(M)

Maria Stanczak is an Assistant Professor and Vascular Sonography Clinical Coordinator at Thomas Jefferson University in the Department of Medical Imaging and Radiation Sciences, College of Health Professions. A seasoned sonographer with CEUS clinical and research experience, her interests include advanced technologies in sonography, such as ultrasound contrast agents, photoacoustic imaging, elastography and 3D applications. Ms. Stanczak's professional goals are to raise awareness of the benefits of utilizing ultrasound contrast agents in general sonography and urging fellow educators to incorporate CEUS curriculum into their programs.



Matt M. Umland, ACS, RDCS, FASE

Matt Umland is the Quality Director/Advanced Cardiac Sonographer at Aurora Health Care in Milwaukee, where he ensures clinical imaging compliance and achievement of quality standards for the echocardiography departments and assists in the development of operational policies and procedures related to echocardiography quality standards. Mr. Umland also assisted in the development of a cardiac sonography program at Aurora. He has served on the faculty of numerous national and international conferences and was a contributor to the first ASE echocardiography textbook (Dynamic Echocardiography). Mr. Umland has served as chair of the Committee on Accreditation for Advanced Cardiovascular Sonography.