

THIRD ANNUAL  
**WORLD CONGRESS**  
ULTRASOUND IN MEDICAL EDUCATION

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OCTOBER 10–12, 2014 | PORTLAND, OREGON



OREGON  
**HEALTH**  
& SCIENCE  
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MARRIOTT WIFI: **Marriott\_CONFERENCE**  
MARRIOTT WIFI PASSWORD: **WCUME14**

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**#WCUME14** HASHTAG.

# Third Annual World Congress: Ultrasound in Medical Education

**October 10-12, Portland, OR**

OHSU is pleased to host the Third Annual World Congress: Ultrasound in Medical Education (WCUME), co-sponsored by World Interactive Network Focused On CriticalUltrasound (WINFOCUS) and Society for Ultrasound in Medical Education (SUSME). We are delighted that you are participating in this exciting event, which brings together Point-of-Care ultrasound experts from across the globe. The conference planning committee hopes that you will find this year's Congress to be enriching, informative, and fun.

At this year's WCUME, you'll find a wealth of thought-provoking plenary and session presentations, workshops, and poster sessions which together may well change the way you deliver care and educate healthcare learners. The Ultrasound World Cup scheduled for Saturday afternoon pairs medical students with world leaders in ultrasound in a sono-competition. And beautiful Portland offers a plethora of dining, shopping, sight-seeing, and entertainment options. (As you explore Portland, be sure to include a ride on the Portland Aerial Tram, which connects OHSU's Marquam Hill and South Waterfront campuses).

Again, a warm welcome to this year's WCUME. We value your participation and look forward to learning more about—and expanding—your experience with POCUS.

## WCUME 2014

### Planning Committee:

**Jeanette Mladenovic, MD, MBA, MACP**

**O. John Ma, MD**

**Richard A. Hoppmann, MD, FACP**

**Michael Blaivas, MD, FAIUM, FACEP**

# Continuing Medical Education

## OBJECTIVES:

1. Highlight the historical context surrounding ultrasound use at the bedside, and future directions
2. Outline core clinical uses for Point-of-Care ultrasound
3. Describe the utility of Point-of-Care ultrasound in resource challenged settings
4. Provide hands on application sessions for participants to practice ultrasound skills
5. Share examples of ultrasound application in medical education
6. Discuss widespread adoption of ultrasound: benefits and barriers

## ACCREDITATION

Oregon Health & Science University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

## CREDIT

OHSU School of Medicine, Division of CME, designates this live activity for a maximum of *13.5 AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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# Governor's Letter

Dear World Congress Attendees,

It is my pleasure as the Governor of Oregon to welcome you to the Third Annual World Congress on Ultrasound in Medical Education.

This year's event - the first time on the west coast - offers a unique opportunity to shape the future of medicine by influencing how we use ultrasound to teach and practice medicine. At this year's Congress, you will hear from internationally renowned ultrasound experts who will introduce you to the latest advances in this vital and growing field.

I'm proud the Congress selected Oregon and I think you will find this a receptive climate for innovation in health care practice and delivery. With the support of the federal government, Oregon is creating a new model of coordinated health care. We're working with local communities, hospitals and clinics, health care providers, educators and other stakeholders to deliver better care and improved health at lower costs.

I hope that while you are here you will get a chance to enjoy the vibrant cultural life of Portland and the tremendous natural beauty of Oregon. Again, thank you for attending the Third Annual World Congress - and welcome to the Rose City.

Sincerely,



**John Kitzhaber, M.D.**  
Governor

# Mayor's Letter

Welcome!

It is my pleasure to welcome you to the City of Portland for the Third Annual World Congress on Ultrasound in Medical Education.

As mayor of Portland, I want to offer you the warmest possible welcome to the rose city. I hope that our guests, in addition to exploring new ways to be successful as a community, will also take some time to explore the Portland metropolitan region. As Portlanders, we are extremely proud of what our city has to offer both residents and visitors. It is a place of outstanding natural beauty, fascinating and unique culture, a national destination for northwest-inspired culinary experiences and strong commercial activities accessible by our nationally renowned transportation system.

There is no better place to start your visit than the collaborative life sciences building (CLSB). The collaborative building is located in Portland's innovation quadrant, a hub of educational and research institutions stretching from downtown, across the new tilikum crossing bridge to open in the fall of 2015, and into Portland's eastside. OHSU is helping lead the development of the innovation quadrant, an alternative to the suburban and rural research parks set far from urban centers. The CLSB is also part of a neighborhood, known as the south waterfront that is rising up out of a former brownfield and embracing the river, creating a mixed-use neighborhood that is a hub for innovation and transit.

No matter what activities you choose to pursue during your stay, you'll find the people of Portland ready to help make your visit as enjoyable as possible. Best wishes for a successful congress and a wonderful visit to our fine city!

Sincerely,



**Charlie Hales**  
Mayor

# Agenda

## Thursday, October 9 @ Marriott

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
3:00–8:00PM	Registration & Information Desk			Ballroom Lobby
5:00–7:00PM	Welcome Reception			Mt. Hood Room

## Friday, October 10 @ Marriott

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
7:00AM–5:30PM	Registration & Information Desk			Ballroom Lobby
7:00–8:00AM	Breakfast			Exhibit Hall
<b>PLENARY SESSIONS</b>				
<b>Plenary 1</b> 8:00–9:30AM	<b>Point-of-Care Ultrasound (POCUS): A Disruptive Innovation for the Medical Tradition</b>		<b>Moderators:</b> <b>Jeanette Mladenovic, MD, MBA, MACP,</b> Oregon Health & Science University, Portland OR <b>Richard A. Hoppmann, MD, FACP,</b> University of South Carolina, Columbia SC	<b>Main Ballroom</b>
8:00–8:30AM	POCUS: A Disruptive Innovation		<b>Jeanette Mladenovic, MD, MBA, MACP,</b> Oregon Health & Science University, Portland OR	
8:30–9:00AM	The POCUS Movement		<b>Richard A. Hoppmann, MD, FACP</b> University of South Carolina, Columbia SC	
9:00–9:30AM	HOCUS, POCUS – Magic From the Past and For The Future		<b>James Mateer, MD, RDMS, FACEP</b> Medical College of Wisconsin, Milwaukee WI	
9:30–10:00AM	Break & Visit the Exhibits			Exhibit Hall
<b>Plenary 2</b> 10:00–11:30AM	<b>Moving the Practice of Medicine Back to the Bedside</b>		<b>Moderators: O. John Ma, MD</b> Oregon Health & Science University, Portland OR <b>Gabriele Via, MD</b> Fondazione IRCCS Policlinico San Matteo, Pavia, Italy	<b>Main Ballroom</b>
10:00–10:30AM	The Emergency Medicine Experience		<b>O. John Ma, MD</b> Oregon Health & Science University, Portland OR <b>Robert Reardon, MD</b> Hennepin County Medical Center, Minneapolis MN	
10:30–11:00AM	The Cardiac Physical: Back to the Future		<b>Bruce Kimura, MD, FACC</b> Scripps Mercy Hospital, San Diego CA	

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
11:00–11:30AM	Can We Improve Our Pulmonary Exam? "How Can I Do it in Practice: Point-of-Care Lung Ultrasound"		<b>Giovanni Volpicelli, MD, FCCP</b> San Luigi Gonzaga University Hospital, Torino, Italy	
11:30AM–1:00PM	Lunch & Poster Session			Exhibit Hall
<b>CONCURRENT SESSIONS 1:00–2:30PM</b>				
<b>Concurrent 1</b>	<b>Point-of-Care Ultrasound (POCUS) in Generalist GME I</b>		<b>Moderators:</b> <b>Vicki Noble, MD</b> Massachusetts General Hospital, Boston MA <b>Marcus Bastos, MD, PhD</b> Federal University of Juiz de Fora, Juiz de Fora, Brazil	<b>Salon A-B</b>
1:00–1:30PM	The Nuts and Bolts of Introducing Ultrasound Training for Internal Medicine		<b>Irene Ma, MD, MSc</b> University of Calgary, Calgary Canada	
1:30–2:00PM	Ultrasound Training in Internal Medicine		<b>David Tierney, MD, FACP</b> Abbott Northwestern Hospital, Minneapolis MN	
2:00–2:30PM	Implementation of Ultrasound Curriculum in Internal Medicine Residency Programs: A Step Wise Approach		<b>Anjali Bhagra, MBBS</b> Mayo Clinic, Rochester MN	
<b>Concurrent 2</b>	<b>New Clinical Applications of POCUS</b>		<b>Moderators:</b> <b>John Kendall, MD, FACEP</b> Denver Health, Denver CO <b>Chris Fox, MD, RDMS, FAAEM, FACEP, FAIUM</b> University of California, Irvine CA	<b>Salon C-D</b>
1:00–1:15PM	Characterizing Resident Physician Utilization of IVC Ultrasonography Versus Invasive CVP Monitoring in Guiding Fluid Resuscitation of Patients with Severe Sepsis and Septic Shock	1	<b>Mohammad Subeh, MD, MS</b> <b>James J. Walter, MD</b> <b>Michael Ward, MD</b> University of Chicago, Chicago IL <b>James M. Walter, MD</b> Northwestern University, Evanston IL	
1:15–1:30PM	PROtocolized Care to Reduce Hypotension After Spinal Anesthesia (ProCRHYSA Randomized Trial): Statistical Plan	2	<b>Daniele Franceschini</b> <b>Samuele Ceruti</b> <b>Sergio De Vivo</b> <b>Mattia Peruzzo</b> Ospedale San Giovanni Bellinzona, Bellinzona, Switzerland	

## Friday, October 10 @ Marriott (CONTD.)

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
1:30–1:45PM	US-CAB: Ultrasound Screening for Circulation, Airway and Breathing During Resuscitation	3	<b>Kuo-Chin Chen, MD</b> <b>Tzong-Luen Wang</b> Shin Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan <b>Matthew Huei-Ming Ma,</b> National Taiwan University Hospital, Taipei, Taiwan	
1:45–2:00PM	Estimation of Spleen Size by Medical Residents with Hand-carried Ultrasound	4	<b>Shane Arishenkoff, MD, FRCPC</b> <b>James Roberts, MD</b> <b>Luke Chen, MD,</b> University of British Columbia, Vancouver, Canada	
2:00–2:15PM	Point-of-Care Ultrasound for Primary Care Management of Patients with Chagas Disease in Rural Endemic Areas of Brazil	5	<b>Lucas Jordan Kreuser, MD</b> University of Minnesota, Minneapolis MN <b>Maria Carmo P. Nunes</b> Universidade Federal de Minas Gerais , Belo Horizonte, Brazil <b>Rob Reardon, MD</b> Hennepin County Medical Center, Minneapolis MN	
2:15–2:30PM	Evaluation of Shoulder Injury in the Emergency Department: Utility of Bedside Ultrasound in the Diagnosis of Acute Shoulder Dislocation	6	<b>Alex Trinh</b> <b>Shadi Lahham, MD</b> <b>Patrick Lenehan</b> <b>Nathan Lane, MD</b> University of California, Irvine CA	
<b>Concurrent 3</b>	<b>Developing Faculty and Tools for POCUS</b>		<b>Moderators:</b> <b>Susan Wieggers, MD, FACC, FASE</b> Temple University, Philadelphia PA <b>Roya Sohaey, MD</b> Oregon Health & Science University, Portland OR	<b>Salon G-H</b>
1:00–1:20PM	FOAMED for Self-Learning		<b>Mike Mallin, MD, FACEP</b> University of Utah, Salt Lake City UT <b>Matt Dawson, MD, RDMS, RDCS</b> University of Kentucky, Lexington KY	
1:20–1:40PM	An Internist Uses FOAMED		<b>Michael Kelley, MD</b> Zayed Military Hospital, Abu Dhabi, UAE	
1:40–1:55PM	Using Telemedicine to Teach Bedside Ultrasound Skills	7	<b>Anne-Marie Brisson</b> <b>Peter Steinmetz, MD</b> <b>John Lewis</b> McGill University, Montreal, Canada	

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
1:55–2:10PM	First "Glass" Education: Telementored Cardiac Ultrasonography Using Google Glass: A Pilot Study	8	<b>Patrick Russell, MD</b> <b>Jennifer Cotton</b> University of Kentucky, Lexington KY <b>Mike Mallin, MD, FACEP</b> University of Utah, Salt Lake City UT	
2:10–2:30PM	Panel: Developing Training Tools for Ultrasound Skills Acquisition	9	<b>Geoffrey Miller</b> <b>Craig Goodmurphy, PhD</b> Eastern Virginia Medical School, Norfolk VA	
<b>Concurrent 4</b>	<b>Improving Patient Care Through Ultrasound</b>		<b>Moderators:</b> <b>Bret Nelson, MD</b> Mount Sinai Hospital, New York NY <b>Luca Neri, MD</b> World Interactive Network Focused on Critical Ultrasound	<b>Salon I</b>
1:00–1:30PM	Improving Patient Care through POCUS		<b>Resa Lewis, MD</b> St. Luke's Roosevelt Hospital, New York NY	
1:30–1:45PM	The Rural Obstetrical Ultrasound Triage Exam (ROUTE): Teaching Obstetrical Ultrasound to Healthcare Workers In a Rural Low-Resource International Setting	10	<b>Jessica Vaughan</b> <b>Jessa Baker</b> <b>Olivia Sanchez</b> <b>Amanda Purdy</b> University of California, Irvine CA	
1:45–2:00PM	A Proposed Curriculum for Educating Paramedics and Other Out-of-hospital Providers on the Use of Ultrasound in the Field Setting	11	<b>Jenna M.B. White, MD</b> The Ohio State University, Columbus OH	
2:00–2:15PM	Point-of-Care Ultrasound Improves the Diagnosis of Organomegaly in Hospitalized Patients: A Randomized Trial	12	<b>Andrew Olson, MD</b> <b>Michael Newman, MD</b> <b>Bernard Trappey, MD</b> <b>L. James Nixon, MD</b> University of Minnesota, Minneapolis MN	
2:15–2:30PM	A Prospective Evaluation of Real-time, Transverse Tracheal Ultrasound in the Evaluation of Emergent Intubation by Minimally Trained Practitioners	13	<b>Shadi Lahham, MD</b> <b>Nathan Lane, MD</b> University of California, Irvine CA <b>James Baydoun</b> <b>James Bailey, MD</b> University of Nevada, Reno NV	
2:30–3:00PM	Break & Visit the Exhibits			Exhibit Hall

## Friday, October 10 @ Marriott (CONTD.)

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
<b>CONCURRENT SESSIONS 3:00–4:30PM</b>				
<b>Concurrent 5</b>	<b>Point-of-Care Ultrasound (POCUS) in Generalist GME II</b>		<b>Moderators:</b> <b>Resa Lewis, MD</b> St. Luke's Roosevelt Hospital, New York NY <b>Maxime Valois, MD</b> Charles-LeMoyne Hospital in Montréal, Canada	<b>Salon A-B</b>
3:00–3:20PM	Panel: Discussion on Pediatric Emergency Medicine Ultrasound Education: Moving Towards a Consensus	14	<b>Tarina Kang, MD</b> University of Southern California, Los Angeles CA <b>Resa Lewis, MD</b> St. Luke's Roosevelt Hospital, New York NY <b>Jason Fischer, MD, MSc</b> Hospital for Sick Children, Toronto Canada	
3:20–3:35PM	Current EM Ultrasound Training in Residency: Implications for Future Practice	15	<b>Joseph Minardi, MD</b> <b>Erin Setzer, MD</b> <b>Hollynn Larrabee, MD</b> <b>Danielle Davidov, PhD</b> West Virginia University, Morgantown WV	
3:35–3:50PM	Integrating an Ultrasound Curriculum into Internal Medicine Residency: Looking Back and Looking Forward	16	<b>Gregory Ranches, MD</b> <b>Stan Amundson, MD</b> <b>David Shaw, MD</b> <b>James Phan</b> Scripps Mercy Hospital, San Diego CA	
3:50–4:05PM	An Assessment of the Ultrasound Curricula of Osteopathic Emergency Medicine Residencies	17	<b>Nicholas Avitabile, DO</b> St Barnabas Hospital, Bronx, NY <b>Turandot Saul, MD</b> <b>Nicole Kaban, MD</b> <b>Sebastian Siadecki</b> Icahn School of Medicine at Mount Sinai, New York NY	
4:05–4:20PM	Bedside Ultrasound in Internal Medicine: Needs Assessment and Training Program Design at UCSF	18	<b>Trevor Jensen, MD</b> <b>Sophia Swanson, MD</b> <b>Kaija-Leena Romero, MD</b> <b>Roneesha Knight, MD</b> University of California, San Francisco CA	

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
<b>Concurrent 6</b>	<b>Setting Standards for Point-of-Care Ultrasound</b>		<b>Moderators:</b> <b>Harvey L. Nisenbaum</b> MD, FACR, FAIUM, FSRU Penn Presbyterian Medical Center, Philadelphia PA <b>James Mateer</b> MD, RDMS, FACEP Medical College of Wisconsin Milwaukee WI	<b>Salon C-D</b>
3:00–3:30PM	Story of Vascular Ultrasound Development		<b>David Dawson, MD</b> University of California, Davis CA	
3:30–4:00PM	Measuring Competence in Medical Students		<b>Chris Fox, MD, RDMS, FAAEM, FACEP, FAIUM</b> University of California, Irvine CA	
4:00–4:30PM	Exploring Certification for Ultrasound		<b>R. Eugene Zierler, MD, RPVI</b> University of Washington, Seattle WA	
<b>Concurrent 7</b>	<b>Point-of-Care Ultrasound Education in Speciality GME Programs</b>		<b>Moderators:</b> <b>O. John Ma, MD</b> Oregon Health & Science University, Portland OR <b>Daniel Lichtenstein, MD</b> University of Paris, France	<b>Salon G-H</b>
3:00–3:15PM	Emergency Ultrasound Training Practices and the Emergency Medicine Milestones Project	19	<b>Alyrene Dorey, MD</b> University of Colorado, Boulder CO <b>Courtney Smalley</b> <b>Molly Thiessen</b> <b>John Kendall, MD, FACEP</b> Denver Health, Denver CO	
3:15–3:30PM	Surgical Critical Care and Ultrasound Training: Changing the Paradigm	20	<b>Jacob Glaser, MD</b> <b>Cassandra Cardarelli, MD</b> <b>Sarah Murthi, MD</b> <b>Thomas Scalea, MD</b> University of Maryland, Baltimore MD	
3:30–3:45PM	Towards a Standardized Ultrasound Curriculum for Pulmonary and Critical Care Fellowships	21	<b>Sahar Ahmad, MD</b> <b>Rajeev Patel, MD</b> Stony Brook University Hospital, Stony Brook NY	
3:45–4:00PM	Assessing the Need for Dedicated Inferior Vena Cava (IVC) Ultrasound Education in Emergency Medicine Residents	22	<b>Tina Dulani, MD</b> <b>Tanya Bajaj, MD</b> <b>Samuel Ayala, MD</b> <b>Andrew Balk, MD</b> New York Methodist Hospital, Brooklyn NY	

## Friday, October 10 @ Marriott (CONTD.)

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
4:00–4:15PM	Ultrasound In Urology: A Novel Ultrasound Training Curriculum for Urologic Surgery Residency Programs	23	<b>David Bahner</b> MD, RDMS, FACEP <b>Geoffrey Box</b> , MD <b>Joseph Wan</b> , MD The Ohio State University, Columbus OH	
4:15–4:30PM	Development of a Novel Focused Ultrasound Training Program for Surgical Residents in the Critical Care and Trauma Setting	24	<b>Nelson Royall</b> , MD <b>Robin Roberts</b> <b>Joseph Ibrahim</b> , MD Orlando Health, Orlando FL	
<b>Concurrent 8</b>	<b>Point-of-Care Ultrasound in Undergraduate Medical Education</b>		<b>Moderators:</b> <b>Jongyeol Kim</b> , MD, RVPI, RVT Texas Tech University Health Sciences Center, Lubbock TX <b>Peter Steinmetz</b> , MD McGill University, Montreal, Canada	<b>Salon I</b>
3:00–3:15PM	Bedside Ultrasound Milestones for Undergraduate Medical Education	25	<b>Ross McDermott</b> <b>Creagh Boulger</b> , MD <b>Ash Panchal</b> <b>David Bahner</b> , MD, RDMS, FACEP The Ohio State University, Columbus OH	
3:15–3:30PM	Head and Neck Ultrasound: A Multimodal Education Approach in the Predoctoral Setting	26	<b>Stewart Bernard</b> , BS <b>Clare Richardson</b> <b>Vi Dinh</b> , MD <b>Carsten Hamann</b> <b>Steve Lee</b> , MD, PhD Loma Linda University, Loma Linda CA	
3:30–3:45PM	Does the Addition of an Integrated Cardiac Ultrasound Curriculum to the First and Second Years of Undergraduate Medical Education Enhance Comprehension of Cardiac Physiology and Pharmacology?	27	<b>Frank Lattanzio</b> , PhD Eastern Virginia Medical School, Norfolk VA	
3:45–4:00PM	Assessing Medical Student Background Characteristics, Psychomotor and Visual-spatial Abilities and How They Correlate with Aptitude in Learning Medical Ultrasound	28	<b>Eric Abrams</b> , MD <b>Samuel Ayala</b> , MD <b>Gerardo Chiricolo</b> , MD New York Methodist Hospital, Brooklyn NY	

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
4:00–4:15PM	A Pilot Study of Ultrasound Education at Harvard Medical School: First-year Experience	29	<b>Joshua Rempell</b> MD, MPH, RDMS <b>Fidencio Saldana</b> , MD <b>Navin Kumar</b> , MD <b>Donald Di Salvo</b> , MD Brigham and Women's Hospital, Boston MA	
4:15–4:30PM	Syncing Glass with Novel SonicEye Ultrasound Linear and Biplanar Finger Transducers During Anatomy Dissection Lab Exams of First-year Medical Students	30	<b>Deeka McDaniel</b> University of Colorado, Boulder CO <b>Brion Benninger</b> , MD Western University of Health Sciences, Lebanon OR	
5:00PM–8:00PM	Hosted Reception: Welcome to Portlandia			Exhibit Hall

## Saturday, October 11 @ Marriott and @ CLSB

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
7:00AM–5:30PM	Registration & Information Desk			Ballroom Lobby
6:30–8:00AM	Breakfast			Exhibit Hall
7:15AM	Shuttles start to Collaborative Life Sciences Building (CLSB)			
<b>PLENARY SESSIONS @CLSB</b>				
<b>Plenary 3</b> 8:00–9:30AM	<b>Ultrasound in Resource-Challenged Areas: What Global Health and Rural Medicine Have in Common</b>		<b>Moderators:</b> <b>Michael Blaivas</b> MD, FACEP, FAIUM, Northside Hospital, Atlanta GA <b>Mahmoud ElBarbary</b> MD, PhD, MSC, EDIC King Saud Ben Abdulaziz University for Health Sciences, Riyadh Saudi Arabia	<b>PSU Lecture Hall</b>
8:00–8:10AM	The Story of WINFOCUS		<b>Michael Blaivas</b> MD, FACEP, FAIUM Northside Hospital, Atlanta GA	
8:10–8:30AM	Point-of-Care US: Beyond the Hospital's Doors		<b>Michael Blaivas</b> MD, FACEP, FAIUM Northside Hospital, Atlanta GA	
8:30–8:50AM	Rural Slovenia: ER in a Car		<b>Gregor Prosen</b> , MD University of Maribor, Slovenia	
8:50–9:05AM	Implementation of an Ultrasound Training of Trainers Program for Limited Resource Settings: A Pilot Project from Rwanda	31	<b>Sachita Shah</b> , MD University of Washington, Seattle WA <b>Jean Claude Uwamungu</b> , MD <b>Oscar Mwizerwa</b> , MD <b>Killy Corneille</b> , MD Partners In Health, Rwanda	



## Saturday, October 11 @ Marriott and @ CLSB (CONTD.)

TIME	SESSION TITLE	ABS #	MODERATOR/SPEAKER	LOCATION
9:05–9:30AM	POCUS in the Developing World		<b>Vicki Noble, MD,</b> Massachusetts General Hospital, Boston MA	
9:30–10:00AM	Break			CLSB Atrium
*Tours of CLSB and Tram*				
<b>Plenary 4 10:00–11:30AM</b>	<b>Professional Education: The Ultrasound Challenge</b>		<b>Moderators:</b> <b>Richard A. Hoppmann</b> MD, FACP University of South Carolina, Columbia SC <b>Christian Pállson Nolsøe</b> MD, PhD Herlev Hospital, Copenhagen, Denmark	<b>PSU Lecture Hall</b>
10:00–10:20AM	POCUS in Medical School Education		<b>David Bahner, MD, RDMS,</b> FACEP, The Ohio State University, Columbus OH	
10:20–10:40AM	POCUS in Professional Education		<b>Vaughan Lee, PhD</b> Texas Tech University Health Sciences Center, Lubbock TX	
10:40–11:00AM	How Students View POCUS		<b>Nikolaus Matsler</b> Oregon Health & Science University, Portland OR <b>Katherine Neuffer</b> University of South Carolina, Columbia SC	
11:00–11:30AM	Panel: A Description of the 4-Year Longitudinal Ultrasound Curriculum Developed at the Wayne State University School of Medicine (WSUSOM)	32	<b>David Amponsah, MD</b> <b>Matt Jackson</b> <b>Gregory Hays, MD</b> <b>Julian Suszanski, MD</b> <b>Sudhir Baliga, MD</b> Wayne State University, Detroit MI	
11:30–1:00PM	Lunch & Poster Session			CLSB Atrium
*Tours of CLSB and Tram*				
<b>Ultrasound World Cup 1:00–4:30PM</b>	<b>See Page 20 for Details</b>		<b>World Cup Faculty</b>	<b>SoM Learning Studio</b>
1:30–4:00PM	WINFOCUS Meeting			3N054
<b>WORKSHOPS 1:00-4:30PM</b>				
WORKSHOPS 1:00–2:00PM	TOPIC		INSTRUCTORS	LOCATION
	Ultrasound Basics		<b>Vi Dinh, MD</b> Loma Linda University, Loma Linda CA <b>Cathy Erickson, MD, PI</b> Oregon Health & Science University, Portland OR	MD Room C, 2nd Floor

WORKSHOPS 1:00–2:00PM	TOPIC		INSTRUCTORS	LOCATION
	Cardiovascular Limited Ultrasound Exam (CLUE)		<b>Bruce Kimura, MD, FACC</b> Scripps Mercy Hospital, San Diego CA <b>Renee Dversdal, MD</b> Oregon Health & Science University, Portland OR <b>Daniel Sedehi, MD</b> Oregon Health & Science University, Portland OR	MD Room B, 2nd Floor
	Pediatrics: General and ER Skills		<b>Jason Fischer, MD, MSc</b> Hospital for Sick Children, Toronto, Canada <b>Tarina Kang, MD</b> University of Southern California, Los Angeles CA <b>Daniel Hubbard, MD</b> Hennepin County Medical Center, Minneapolis MN	MD Room A, 2nd Floor
	Musculoskeletal Ultrasound		<b>Ryan Petering, MD</b> Oregon Health & Science University, Portland OR <b>Rachel Bengtzen, MD</b> Oregon Health & Science University, Portland OR	Skills Room, 3rd Floor
	Pulmonary Ultrasound		<b>Daniel Lichtenstein, MD</b> University of Paris, France <b>Beatrice Hoffmann</b> MD, PhD, RDMS Beth Israel Deaconess Medical Center, Boston MA	PA Classroom, 1st Floor
	Multi-system Approach to Shock		<b>Vicki Noble, MD</b> Massachusetts General Hospital, Boston MA <b>Peter Steinmetz, MD</b> McGill University, Montreal, Canada	Classroom A, 4th Floor
	Introduction to Vascular Ultrasound		<b>David Dawson, MD</b> University of California, Davis CA <b>R. Eugene Zierler, MD, RPVI</b> University of Washington, Seattle WA	MD Room D, 2nd Floor
	Ultrasound to Teach Physiology & Anatomy		<b>William E. Cameron, PhD</b> Oregon Health & Science University, Portland OR <b>Craig Goodmurphy, PhD</b> Eastern Virginia Medical School, Norfolk VA	Classroom B, 4th Floor

## Saturday, October 11 @ Marriott (CONTD.)

WORKSHOPS 2:15–3:15PM	TOPIC	INSTRUCTORS	LOCATION
	Ultrasound Basics	<b>Bret Nelson</b> , MD Mount Sinai Hospital, New York NY <b>Victor Rao</b> MBBS, DMRD, RDMS University of South Carolina, Columbia SC	MD Room C, 2nd Floor
	Cardiovascular Limited Ultrasound Exam (CLUE)	<b>Bruce Kimura</b> , MD, FACC Scripps Mercy Hospital, San Diego CA <b>Renee Dversdal</b> , MD Oregon Health & Science University, Portland OR <b>Daniel Sedehi</b> , MD, Oregon Health & Science University, Portland OR	MD Room B, 2nd Floor
	Pediatrics: General and ER Skills	<b>Jason Fischer</b> , MD, MSc Hospital for Sick Children, Toronto Canada <b>Tarina Kang</b> , MD University of Southern California, Los Angeles CA <b>Daniel Hubbard</b> , MD Hennepin County Medical Center, Minneapolis MN	MD Room A, 2nd Floor
	Musculoskeletal Ultrasound	<b>Ryan Petering</b> , MD Oregon Health & Science University, Portland OR <b>Rachel Bengtzen</b> , MD Oregon Health & Science University, Portland OR	Skills Room, 3rd Floor
	Pulmonary Ultrasound	<b>Daniel Lichtenstein</b> , MD University of Paris, France <b>Beatrice Hoffmann</b> MD, PhD, RDMS Beth Israel Deaconess Medical Center, Boston MA	PA Classroom, 1st Floor
	Multi-system Approach to Shock	<b>Vicki Noble</b> , MD Massachusetts General, Boston MA <b>Peter Steinmetz</b> , MD, McGill University, Montreal, Canada	Classroom A, 4th Floor
	Introduction to Vascular Ultrasound	<b>David Dawson</b> , MD, University of California, Davis CA <b>R. Eugene Zierler</b> , MD, RPVI University of Washington, Seattle WA	MD Room D, 2nd Floor

WORKSHOPS 2:15–3:15PM	TOPIC	INSTRUCTORS	LOCATION
	Ultrasound Guided Procedures: Central Line Placement, Thoracentesis & Paracentesis	<b>Maxime Valois</b> , MD Charles-LeMoyné Hospital in Montréal, Canada <b>Alfredo Sabbaj</b> , MD, MA Oregon Health & Science University, Portland OR <b>Gabriele Via</b> Fondazione IRCCS Policlinico San Matteo, Pavia, Italy	Classroom B, 4th Floor
WORKSHOPS 3:30–4:30PM	TOPIC	INSTRUCTORS	LOCATION
	Ultrasound Basics	<b>Bret Nelson</b> , MD Mount Sinai Hospital, New York NY <b>Victor Rao</b> MBBS, DMRD, RDMS University of South Carolina, Columbia SC	MD Room C, 2nd Floor
	Cardiovascular Limited Ultrasound Exam (CLUE)	<b>Bruce Kimura</b> , MD, FACC Scripps Mercy Hospital, San Diego CA <b>Renee Dversdal</b> , MD Oregon Health & Science University, Portland OR	MD Room B, 2nd Floor
	Pediatrics: General and ER Skills	<b>Jason Fischer</b> , MD, MSc Hospital for Sick Children, Toronto Canada <b>Tarina Kang</b> , MD University of Southern California, Los Angeles CA	MD Room A, 2nd Floor
	Musculoskeletal Ultrasound	<b>Ryan Petering</b> , MD Oregon Health & Science University, Portland OR <b>Rachel Bengtzen</b> , MD, Oregon Health & Science University, Portland OR	Skills Room, 3rd Floor
	Pulmonary Ultrasound	<b>Daniel Lichtenstein</b> , MD University of Paris, France <b>Beatrice Hoffmann</b> MD, PhD, RDMS Beth Israel Deaconess Medical Center, Boston MA	PA Classroom, 1st Floor
	Thyroid Ultrasound	<b>Mira Milas</b> , MD, FACS Oregon Health & Science University, Portland OR	MD Room D, 2nd Floor
	Ultrasound to Teach Physiology & Anatomy	<b>William E. Cameron</b> , PhD Oregon Health & Science University, Portland OR <b>Craig Goodmurphy</b> , MD, Eastern Virginia Medical School, Norfolk VA	Classroom B, 4th Floor

## Saturday, October 11 @ Marriott (CONTD.)

WORKSHOPS 3:30–4:30PM	TOPIC	INSTRUCTORS	LOCATION
	Ultrasound Guided Procedures: Central Line Placement, Thoracentesis & Paracentesis	<b>Maxime Valois</b> , MD Charles-LeMoyné Hospital in Montréal, Canada <b>Alfredo Sabbaj</b> , MD, MA Oregon Health & Science University, Portland OR <b>Gabriele Via</b> , MD Fondazione IRCCS Policlinico San Matteo, Pavia, Italy	Classroom A, 4th Floor
<b>Ultrasound World Cup: Final Round</b> 4:30–5:00PM			CLSB Atrium
4:30–6:30PM	Best of Portland: Wine and Roses Reception		CLSB Atrium

OFFICIAL END OF CONFERENCE			
TIME	SESSION TITLE	MODERATOR/SPEAKER	LOCATION
9:30–10:00AM	Break		
10:30–11:30AM	Townhall: Towards a Common Ultrasound Curriculum		Eugene Room
	Break		Marriott Ballroom Lobby
12:00–2:00PM	Invitation Only: Ultrasound Curriculum		Salon I

## Sunday, October 12 @ Marriott

TIME	SESSION TITLE	MODERATOR/SPEAKER	LOCATION
7:00–8:00AM	Breakfast		Main Ballroom
7:30–8:00AM	Awards and SUSME Business		
PLENARY SESSIONS @ MARRIOTT			
<b>Plenary 5</b> 8:00–9:30AM	<b>Panel: Point Counterpoint: Should Point-of-Care Ultrasound Become a Required Clinical Skill?</b>	<b>Moderators:</b> <b>Jeanette Mladenovic</b> MD, MBA, MACP Oregon Health & Science University, Portland OR <b>Richard A. Hoppmann</b> MD, FACP University of South Carolina, Columbia SC	Main Ballroom
	Should We Await Evidence That it Will Improve Care?: • Could We Harm Patients? • What Are the Major Obstacles? • What Are the Next Steps in the POCUS Movement?	<b>Mahmoud ElBarbary</b> MD, PhD, MSc, EDIC King Saud Ben Abdulaziz University, Riyadh, Saudi Arabia <b>Harvey Nisenbaum</b> MD, FACR, FAIUM, FSRU Penn Presbyterian Medical Center, Philadelphia PA <b>John Kendall</b> , MD, FACEP Denver Health, Denver CO <b>Mark Gosselin</b> , MD Oregon Health & Science University, Portland OR <b>Sanjiv Kaul</b> , MD, MB, BS Oregon Health & Science University, Portland OR	

# Ultrasound World Cup

(Details from page 14 of the Agenda)

## Teams

<b>SonoKittens</b> (University of Kentucky)	Jennifer Cotton Brett Dickens Carolyn Martinez
<b>Bronography</b> (UC Irvine)	James Mattson Lance Beier Bryan Sloane
<b>Sonobabes</b> (UC Irvine)	Lauren Sims Chanel Fischetti Tatiana Ramage
<b>Scarlet and Grayscale</b> (Ohio State)	Duane Allen Stephen Gardner Daniel Francescon
<b>Kentucky Dopplergangers</b> (University of Kentucky)	Alex Patterson Nicole Nolan Mannie Webb
<b>The Ultrasonic Gamecocks</b> (University of South Carolina)	Katherine Neuffer Garrett Holder Blake Goodbar
<b>Where The Wild Sounds Are</b> (University of Kentucky)	Kendra Campbell Monika Spacil Sahiba Chandel
<b>2 FAST 2 Furious</b> (West Virginia University)	Ben Lasure Brian Dilcher Andrew Küng
<b>Ultrasonic Vuvuzela</b> (Oregon Health & Science University)	Carly Cox Nikolaus Matsler Andy Lichtenheld
<b>The Motown Ultrasound</b> (Wayne State University)	Nicole Messenger Michael Devisser Jacob Price
<b>Team UltraUtes</b> (University of Utah)	Alexander Bracey Camille Enriquez Heather Beasley

## World Cup Faculty

- O. John Ma, MD**  
Oregon Health & Science University, Portland OR
- Michael Blaivas, MD, FACEP, FAIUM**  
Northside Hospital, Atlanta GA
- John Kendall, MD, FACEP**  
Denver Health, Denver CO
- Mark Gosselin, MD**  
Oregon Health & Science University, Portland OR
- Chris Fox, MD, RDMS, FAAEM, FACEP, FAIUM**  
University of California, Irvine CA
- David Bahner, MD, RDMS, FACEP**  
The Ohio State University, Columbus OH
- Matt Dawson, MD**  
University of California, Davis CA
- Robert Reardon, MD**  
Hennepin County Medical Center, Minneapolis MN
- James Mateer, MD, RDMS, FACEP**  
Medical College of Wisconsin, Milwaukee WI
- Harvey Nisenbaum, MD, FACR, FAIUM, FSRU**  
Penn Presbyterian Medical Center, Philadelphia PA
- Resa Lewiss, MD**  
St. Luke's Roosevelt Hospital, New York NY
- Richard A. Hoppmann, MD, FACP**  
University of South Carolina, Columbia SC
- David Amponsah, MD**  
Wayne State University, Detroit MI
- Vi Dinh, MD**  
Loma Linda University, Loma Linda CA
- Charisse Kwan, MD, FRCPC, RCSPC (PEM)**  
University of Toronto, Toronto, Canada
- Creagh Bolger, MD**  
The Ohio State University, Columbus OH

# Posters Participants

Friday, October 10th 11:30am-1:00pm

## TOPIC: NEW USES

Poster Title	Author(s)	Board #
<b>Lung Ultrasound Performed by Nurses to Check for Correct Lung Exclusion in Thoracic Surgery</b>	<b>Renato Tomasetti</b> Ente Ospedaliero Cantonale, Bellinzona, Switzerland <b>Antonio Lo Piccolo</b> <b>Andrea Saporito</b> <b>Daniele Franceschini</b> Ospedale San Giovanni Bellinzona, Bellinzona, Switzerland	1
<b>Ultrasonology: The Birth of a New Field of Study?</b>	<b>David Bahner</b> The Ohio State University, Columbus OH <b>Kevin McGill</b> <b>Nick Reeser</b> <b>Daniel Siegal</b> Henry Ford Hospital, Detroit MI	2
<b>Non-surgical Treatment of Compressive Neuropathy by the Ligament of Struthers</b>	<b>Kevin McGill</b> Henry Ford Hospital, Detroit MI	3
<b>Chronic Effects of Longterm Schistosomiasis Exposure in Mwanza and Ukerewe Island, Tanzania</b>	<b>Maria Barsky</b> <b>Lauren Kushner</b> <b>Megan Ansbro</b> <b>Michael Sassounian</b> University of California, Irvine CA	4
<b>Best Ultrasound Probe for Subclavian Vein Visualization via the Supraclavicular Approach</b>	<b>Rame Bashir</b> <b>Linda Joseph</b> <b>Nathan Lane</b> <b>Shadi Lahham</b> University of California, Irvine, CA	5
<b>Absent Sinusoid Sign Predicts Trapped Lung</b>	<b>Sahar Ahmad</b> <b>Timothy Fusiak</b> Stony Brook University Hospital, Stony Brook NY	6
<b>Transabdominal Ultrasound-guided Urethral Catheterization with Transrectal Pressure</b>	<b>Toru Kameda</b> Red Cross Society Azumino Hospital, Azumino, Japan	7

## TOPIC: PATIENT SAFETY

Poster Title	Author(s)	Board #
<b>Clinical Outcomes of Suspected Pediatric Appendicitis Following Ultrasound Evaluation</b>	<b>Anthony Galinato</b> <b>Andrew Moriarity</b> <b>Karyn Ledbetter</b> <b>Safwan Halabi</b> Henry Ford Hospital, Detroit MI	8
<b>Applying Ultrasound Sliding Lung Sign to Cadaveric Tissue of Varied Preparations: Method of Identifying Endotracheal Intubation and Diagnosing Pneumothorax</b>	<b>Kurtis Webster</b> <b>Eric Vincelio</b> <b>Brion Benninger</b> Western University of Health Sciences, Lebanon OR	9

## TOPIC: PATIENT SAFETY

Poster Title	Author(s)	Board #
<b>Ultrasound-guided, Percutaneous Liver Biopsy as a Day-case Procedure: Five-year Experience at a Single Institution</b>	<b>Stephen Liddy</b> <b>Kieran Carroll</b> St Luke's General Hospital, Kilkenny, Ireland	10

## TOPIC: POINT-OF-CARE ULTRASOUND IN GENERAL CLINICAL PRACTICE

Poster Title	Author(s)	Board #
<b>A Novel Universal Subcondylar Classification System Based on Anatomical Features for Ultrasound Triage</b>	<b>Adam Burch</b> Western University of Health Sciences, Lebanon OR <b>Brion Benninger</b> <b>Chris Harlin</b> Boston University, Boston MA	11
<b>A Novel Integration of the Fast FATE Exam to Rapidly Assess the Thorax in Acute and Subacute Clinical Situations</b>	<b>Adam Mina</b> <b>Tyler Andrea</b> <b>Brion Benninger</b> Western University of Health Sciences, Lebanon OR	12
<b>Point-of-Care Ultrasound and the Patients' Perspective: A Collaborative Quality Initiative</b>	<b>Arya Mohabbat</b> <b>Sharon Mulvagh</b> <b>Kyle Klarich</b> <b>Anjali Bhagra</b> Mayo Clinic, Rochester MN	13
<b>Posteromedial Corner of the Knee—Clinical Ultrasonography and Applications to Cadaveric Specimens, a Comparative Study</b>	<b>Babe Westlak</b> <b>Nathan Dodge</b> <b>Brion Benninger</b> Western University of Health Sciences, Lebanon OR	14
<b>The Role of Point-of-Care Ultrasound in the Diagnosis and Treatment of Critically Ill Patients</b>	<b>Binyue Chang</b> <b>Lisa Massie</b> <b>Otto Villa</b> Berkshire Medical Center, Pittsfield MA	15
<b>Bedside Sonographic Diagnosis of Pneumothorax in Pediatric Patients</b>	<b>Chia-Wan Tang</b> Kaohsiung Veterans General Hospital, Kaohsiung, Taiwan <b>Kai-Sheng Hsieh</b> Chang Gung Memorial Hospital, Kaohsiung, Taiwan	16
<b>Asynchronous Learning for Successful Training of Emergency Department Technicians in Ultrasound Guided Peripheral Intravenous Access</b>	<b>Colleen Kalynych</b> University of Florida, Gainesville FL <b>Petra Duran-Gehring</b> <b>Laurie Bryant</b> <b>Faheem Guirgis</b> University of Florida, Gainesville FL	17

Friday, October 10th 11:30am-1:00pm (CONTD.)

## TOPIC: POINT-OF-CARE ULTRASOUND IN GENERAL CLINICAL PRACTICE

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Regional Adductor Canal Blocks—a Thoroughfare or Separate Spaces	David Horn Brion Benninger Western University of Health Sciences, Lebanon OR Hemra Cil Ankara University, Ankara, Turkey Jean-Louis Horn Stanford University, Stanford CA	20
Point-of-Care Ultrasonography as an Adjunct Tool for Musculoskeletal Examination	David Jeong Ezhiludai Nambi Ramamoorthy James Daniels Merle Muller Southern Illinois University, Springfield IL	21
Variable Modalities of Endotracheal Tubes to Visualize Vocal Cords Using Ultrasound with Donor Cadaver Patients	Jesse Gortner Scott Sweeny Waylon Pearson Brion Benninger Western University of Health Sciences, Lebanon OR	22
Lateral Ankle Sprain Anatomy—Can the Bifurcate Ligament Be Consistently Identified with Ultrasound on Cadavers	Lyman Wood Bryan Beall Brion Benninger Western University of Health Sciences, Lebanon OR	23
Use of Ultrasound to identify Foreign Bodies in Variable Cadaver Preparations	Matthew Noble Eric Vinceslio Brion Benninger Western University of Health Sciences, Lebanon OR	24
Posterolateral Corner of the Knee—Erasing the Myth of the Dark Side	Nathan Dodge Brion Benninger Western University of Health Sciences, Lebanon OR	25
Conducting FAST Exam to Identify Spaces and Cavities of the Abdomen and Thorax Using a Novel Ultrasound SonicEye Finger Array Probe with Variable Cadaver Preparations	Rebecca Corbett Eric Vinceslio Matthew Noble Brion Benninger Western University of Health Sciences, Lebanon OR	26
Variable Anterior Jugular Vein Morphology and Urgent Airway Procedures	Scott Sweeny Jesse Gortner Waylon Pearson Brion Benninger Western University of Health Sciences, Lebanon, OR	27

## TOPIC: POINT-OF-CARE ULTRASOUND IN GENERAL CLINICAL PRACTICE

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Bedside and Consultative Doppler Ultrasound Evaluation of Flow Pattern in Testicular Torsion	Wendy Wen Gerardo Chiricolo New York Methodist Hospital, New York NY	30

## TOPIC: TECHNOLOGY

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Friday, October 10th 11:30am-1:00pm (CONTD.)

## TOPIC: USE OF ULTRASOUND IN GRADUATE MEDICAL AND CONTINUING EDUCATION

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Multidisciplinary Point-of-Care Ultrasound Education: A Mixed-Methods Evaluation	Andrew Smith Donna Marie Khalili Tia Renouf Memorial University of Newfoundland, Newfoundland, Canada	40
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Curriculum for Teaching Pediatric Cardiac Ultrasound in Rural Panama	Chris Fox Laura Curtis Caleb Shumway Kevin Simonson University of California, Irvine CA	42
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Retention Assessment of an Intensive Ultrasound Course in First and Fifth-year Medical Students	Daniel Lama Eric Gary Neema Pithia Jessica Andrusaitis University of California, Irvine CA	46
Advanced Ultrasound Competency in Anesthesia	Darab Zarrabi David Bahner The Ohio State University, Columbus OH	47

## TOPIC: USE OF ULTRASOUND IN GRADUATE MEDICAL AND CONTINUING EDUCATION

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Academic Residency Track in Focused Ultrasound	Daralee Hughes David Bahner Creagh Boulger Sarah Greenberger The Ohio State University, Columbus OH	48
General Surgery Ultrasound Training Program	David Bahner Benjamin Sigmond Daniel Eiferman Paul Paetow The Ohio State University, Columbus OH	49
Ultrasound In Urology: A Survey of Residents Regarding Ultrasound Training, Competency, and Utilization in Urologic Surgery Training	David Bahner Geoffrey Box Joseph Wan Firas Petros The Ohio State University, Columbus OH	50

## TOPIC: USE OF ULTRASOUND IN GRADUATE MEDICAL AND CONTINUING EDUCATION

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## Friday, October 10th 11:30am-1:00pm (CONTD.)

**TOPIC: USE OF ULTRASOUND IN GRADUATE MEDICAL AND CONTINUING EDUCATION**

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**TOPIC: USE OF ULTRASOUND IN GRADUATE MEDICAL AND CONTINUING EDUCATION**

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## Saturday, October 11th 11:30am-1:00pm

**TOPIC: USE OF ULTRASOUND IN UNDERGRADUATE MEDICAL EDUCATION**

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Saturday, October 11th 11:30am-1:00pm (CONTD.)

## TOPIC: USE OF ULTRASOUND IN UNDERGRADUATE MEDICAL EDUCATION

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## TOPIC: USE OF ULTRASOUND IN UNDERGRADUATE MEDICAL EDUCATION

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Should Ultrasound Be an Essential Skill for Anatomists Who Teach in Undergraduate Medical Education? A General Needs Assessment Study on the Role of Ultrasound in Anatomy Graduate Education	Danielle Royer University of Colorado, Aurora CO	89
Developing an Effective Curriculum for Incorporating Ultrasound Education into the Gross Anatomy Course in Medical School	David Amponsah Mark Ireland Wayne State University, Detroit MI Sudhir Baliga Julian Suszanski Henry Ford Hospital, Detroit MI	90
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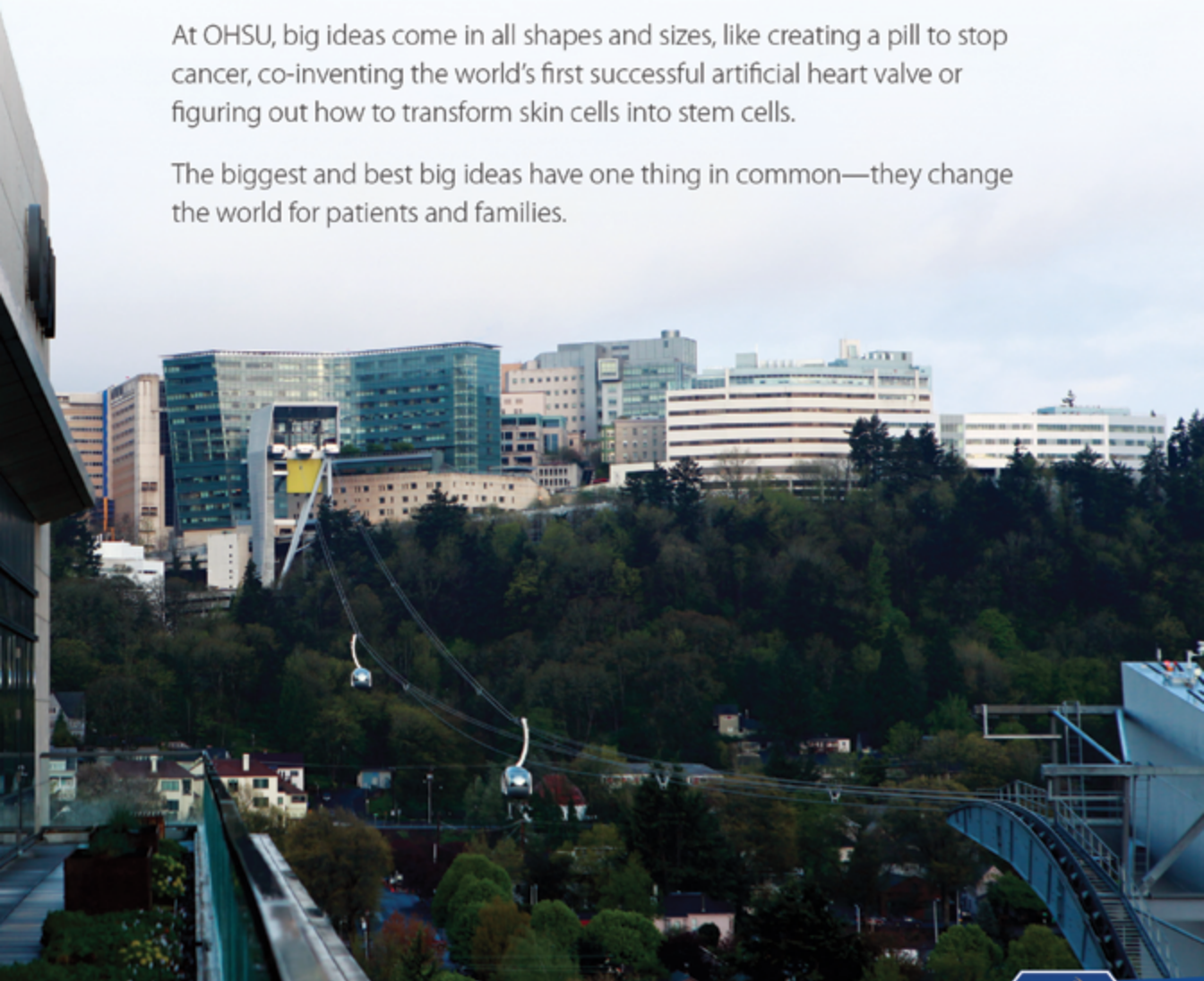
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# Abstracts

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Saturday, October 11, 2014

- Plenary 3:** Abstract 31  
**Plenary 4:** Abstract 32

## 1. Characterizing Resident Physician Utilization Of Ivc Ultrasonography Versus Invasive Cvp Monitoring In Guiding Fluid Resuscitation Of Patients With Severe Sepsis And Septic Shock

**BACKGROUND:** In patients with severe sepsis or septic shock, goal-directed fluid resuscitation during the first 6 hours of care is recommended. Techniques for guiding fluid resuscitation include, among others, invasive central venous pressure (CVP) monitoring and ultrasound (US) measurement of inferior vena cava (IVC) respiratory variation. CVP monitoring is often not performed for these patients in emergency departments (EDs) for a variety of reasons. IVC US is also under-utilized, primarily because resident training in this technique has been variable across institutions nationally.

**OBJECTIVE:** To quantify resident physician utilization of IVC US versus CVP monitoring to guide fluid therapy in severe sepsis and septic shock prior to implementation of a formal curriculum in bedside IVC US.

**HYPOTHESIS:** In guiding fluid resuscitation in ED patients with severe sepsis or septic shock, CVP monitoring will not be commonly used and, in the absence of a formal US curriculum, IVC US will be used even less. Failure to routinely use one of these techniques will be reflected in inadequate fluid therapy and high mortality.

**METHODS:** This is a retrospective chart review of all patients presenting with severe sepsis or septic shock to a single ED from July to December 2012. Severe sepsis was defined as sepsis plus sepsis-induced organ dysfunction, elevated lactate, or markedly abnormal vital signs. Septic shock was defined as sepsis plus systolic BP <90 despite a 30 cc/kg saline challenge. All diagnoses of severe sepsis and septic shock were confirmed by the admitting service.

**RESULTS:** Fifty-seven (57) patients presented with severe sepsis or septic shock during the 6-month period. The mean age was 62.4 years (range 25-91 years). Thirty-one (31) patients met the criteria for severe sepsis and 26 for

septic shock. During the first 6 hours of ED care, the median volume of saline infused was 2.0 L (range 0-7 L). CVP was monitored in none of the patients with severe sepsis and in 7 of 26 patients (26.9%) with septic shock. IVC US was performed in 1 of 31 patients (3.2%) with severe sepsis and in none of the patients in septic shock. Overall mortality was 37% (severe sepsis 29%, septic shock 46%).

**CONCLUSIONS:** In this urban ED, CVP monitoring was uncommonly used in patients presenting with severe sepsis or septic shock. Monitoring IVC respiratory variation by US is a useful alternative technique to guide fluid resuscitation in these patients, but was used even less (in only 1 of 57 patients). The under-utilization of these techniques was associated with inadequate fluid therapy and a high mortality rate. Implementation of IVC US training for resident physicians and formal integration within ED sepsis management protocols can improve outcomes for these critically ill patients.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 2. PROtocolized Care to Reduce HYpotension after Spinal Anesthesia (ProCRHYSA randomized trial): statistical plan.

**BACKGROUND:** Spinal anesthesia is widely employed in everyday clinical practice. Its main side effect, consisting in an abrupt decrease of systemic vascular resistances, often translates into significant systemic hypotension. To prevent this, blind fluids administration is commonly used. However, this is accomplished on an empirical basis, carrying the risk of volume overload. The PROtocolized Care to Reduce HYpotension after Spinal Anesthesia (ProCRHYSA) is a randomized, monocentric, prospective, three-arm, parallel-group trial, aimed at evaluating non invasive techniques for guidance of volume repletion. These techniques have been validated in critically ill patients, but they have never been studied in a population undergoing elective surgery under spinal anesthesia.

**OBJECTIVE:** To compare significant hypotension rate after spinal anesthesia in three groups: the first without preliminary fluid repletion, the second undergoing vena cava echography-guided volume repletion and the third undergoing "passive legs raising test" (PLRT)-guided volume repletion. We provide here a preliminary data analysis.

**METHODS:** We randomized consecutive ASA 1 to 3 patients undergoing elective surgery under spinal anesthesia into three groups: the control group, the vena cava ultrasound group and the PLRT group. Patients found to be responsive to fluids within these last two groups were given sequential boluses of 500 ml crystalloids and reassessed afterward until found euvolemic. Control group did not receive fluids preoperatively. Non-invasive arterial pressure was periodically measured in every patient after spinal anesthesia until discharge to recovery room and significant hypotension (defined according to international guidelines) incidence was calculated in the three groups. Exclusion

criteria were: patients found hypotensive before spinal anesthesia, any contraindication to spinal anesthesia, patients' refusal, lack of protocol adherence. Data are given as percentage of significant hypotension, p value (p) and confidence intervals (CI).

**RESULTS:** Preliminary results (N=96, 20% of total calculated numerosity) showed a global significant hypotension rate of 45%, differently stratified in specific group: 66% of patients in the control group (N=32), 45% of patients in the vena cava echography group (N=32) and 66% of patient in the passive leg raising test group (N=32). A statistically significant difference with regard to significant hypotension rate was found between the group undergoing vena cava echography-guided volume repletion and the control group (p=0.043, CI=95%). No difference was found between patients undergoing PLRT-guided volume repletion and control group (p=1.0).

**CONCLUSIONS:** Preliminary data analysis showed a statistically significant difference in the incidence of significant spinal-related arterial hypotension among vena cava ultrasound-guided volume repletion and the control group. However the study is currently still underpowered to allow for definitive conclusions.

**TRIAL REGISTRATION:** The trial is registered on [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (number NCT02070276).

**FORMAT:** Oral

**TOPIC:** New Uses

**AUTHORS:**

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## 3. US-CAB: ultrasound screening for circulation, airway and breathing during resuscitation

Cardiopulmonary resuscitation emphasizes high-quality and easy-to-learn procedures. Therefore, American Heart Association changed resuscitation procedures from ABC to CAB in 2010 guidelines.

Emergency ultrasound has been used to identify treatable causes during resuscitation, such as cardiac tamponade, hypovolemia, pulmonary embolism and tension pneumothorax. Focused heart ultrasound may influence 78% of clinical management in resuscitation situations. However, it is still challenging for optimal use of Point-of-Care ultrasound (POCUS) during the initial phase of resuscitation.

Correct endotracheal intubation can be confirmed by using end-tidal CO<sub>2</sub> monitoring. However, EtCO<sub>2</sub> monitoring cannot provide convincing evidence to confirm correct endotracheal intubation during early phase of cardiac arrest. It is mandatory to develop a feasible and useful way to rapidly confirm correct endotracheal intubation during cardiac arrest resuscitation. Recent studies suggest ultrasound can be used to rapidly confirm correct endotracheal intubation and even bilateral ventilation in emergent situations.

We introduce a novel concept of POCUS during the initial phase of resuscitation: US-CAB. US-CAB means ultrasound screening for circulation, airway and breathing during resuscitation. We integrate US-CAB with standard CAB suggested by AHA during

cardiac arrest resuscitation. We suggest US-CAB to be used during the first 10 minutes of resuscitation to screen for cardiac status (C), confirm endotracheal intubation (A) and identify bilateral ventilation (A) rapidly without interruption of resuscitation.

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**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in general clinical practice

#### 4. Estimation of spleen size by medical residents with hand carried ultrasound

**OBJECTIVE:** Physical examination can identify easily palpable splenomegaly, but evaluating lesser degrees of splenomegaly is problematic. Hand carried ultrasound (HCU) allows rapid bedside assessment of patients. We conducted this study to determine if a brief educational intervention would allow medical residents to reliably assess spleen size using HCU.

**METHODS:** PGY 1 Internal medicine residents were shown a brief (45 min) powerpoint presentation on the basics of ultrasound, the use of an HCU device (Vscan, GE) and principles of splenic sonography. They were allowed to practice on each other using the HCU to assess spleen size for one hour, in the presence of an instructor.

Patients with varying degrees of splenomegaly were recruited from the hematology clinics and staff at UBC. A sonographer measured spleen size in each patient using conventional ultrasound (CU; Ultrasonix, SonixTouch, Richmond, BC). Subsequently, the trained medical residents scanned the same patients using the HCU, blinded to the sonographer's measurements. The instructor was not present during scanning.

**RESULTS:** Thirteen first year residents (all with minimal prior ultrasound training) and 19 patients (BMI  $24.3 \pm 1.6$  kg/m<sup>2</sup>; 10 M/9 F) were recruited. The greatest longitudinal measurement was  $14.0 \pm 0.4$ cm with CU

and  $12.6 \pm 0.4$  cm with HCU ( $p < 0.05$ ). The correlation between CU performed by a sonographer and HCU performed by a resident was  $r = 0.85$  ( $p < 0.0001$ ).

**CONCLUSIONS:** We have shown that minimal training of residents will allow them to reliably assess spleen size at Point-of-Care using HCU, although they appear to underestimate the actual size by about one cm. We believe that our findings, if replicated in other centres and in different clinical scenarios, may change the process by which clinicians examine the spleen.

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##### FORMAT: Oral

Topic: Use of ultrasound in Graduate Medical and Continuing Education

#### 5. Point-of-Care ultrasound for primary care management of patients with Chagas disease in rural endemic areas of Brazil.

**BACKGROUND:** Chagas disease is a major cause of heart failure in Latin America. There are 3 million people chronically infected in Brazil alone, and about 30% will eventually develop cardiomyopathy. Many of those affected by Chagas disease live in rural areas under poor conditions with limited access to cardiologists and echocardiography. Primary care physicians in rural Brazil manage Chagas disease patients using finite resources and referral options, and portable ultrasound is uncommon. Often, patients do not present to physicians with symptoms or physical exam signs until they already have significant cardiac dysfunction. However, once identified, Chagas disease patients with cardiomyopathy can move up referral channels in the Brazilian public health care system to receive formal cardiology evaluation, echocardiography, pacemakers/implantable cardioverter-defibrillators (ICD), and heart transplants.

**PURPOSE:** Our aim is to develop a model for rural primary care physicians in Brazil to use focused cardiac ultrasound to screen Chagas disease patients for the early stages of cardiomyopathy. If these patients can be identified early, there is potential to alter the course of their disease with closer follow-up, heart failure medications, and arrhythmia treatment. A screening protocol should be able to detect subclinical structural abnormalities and systolic dysfunction, while still being relatively simple for a physician with limited ultrasound experience to learn, and efficiently perform during an office visit.

**METHODS:** A medical student with limited training in ultrasound traveled to six rural Brazilian communities in high-endemic regions in the state of Minas Gerais. Using a portable ultrasound machine, 141 patients with serology-positive Chagas disease were examined. Patients with a pacemaker/ICD or New York Heart Association functional class III or IV were excluded. Measurements included left ventricular (LV) diameter, left ventricular ejection fraction, visual estimation of right and left ventricular systolic function,

and presence of apical aneurysm or wall motion abnormality. These measurements had previously been validated by the student using the same ultrasound machine and techniques compared with formal echocardiography. Lung ultrasound for pulmonary edema and pleural effusions, and focused physical examination for signs of heart failure were also performed.

**RESULTS:** Of the 141 patients examined, 59 (41.8%) showed evidence of cardiomyopathy on ultrasound. 13 (9.2%) patients had isolated LV dilation, and the remaining 46 (32.6%) patients had one or more of the following - LV systolic dysfunction, right ventricular systolic dysfunction, apical aneurysm, wall motion abnormality or intraventricular thrombus - with or without LV dilation.

**CONCLUSION:** Chagas disease patients with minimal or no symptoms can have cardiac structural or functional abnormalities identifiable with Point-of-Care ultrasound. There is potential for medical professionals with limited ultrasound training to screen chronic Chagas disease patients for the early signs of cardiomyopathy using focused cardiac ultrasound in a primary care setting for early detection, monitoring, and treatment.

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##### FORMAT: Oral

**TOPIC:** Point-of-Care ultrasound in health care delivery to underserved populations

## 6. Evaluation of shoulder injury in the emergency department: Utility of bedside ultrasound in the diagnosis of acute shoulder dislocation

Bedside ultrasound is emerging as a rapid, Point-of-Care imaging modality that may facilitate the diagnosis of acute shoulder dislocations and expedite definitive treatment in the Emergency Department. To date, no previous studies have attempted to standardize an approach for the evaluation of shoulder dislocation by ultrasound. Our study aims to determine the efficacy of ultrasound in diagnosing shoulder dislocations in patients presenting with acute shoulder pain. Bedside ultrasound was used to measure the distance between the humeral head and glenoid rim which is then compared to plain-film x-rays. Eighty-one patients presenting to the ED with complaints of shoulder pain that were scheduled for conventional plain film x-ray were enrolled in the prospective observational study. Bedside ultrasound measurements exceeding an acceptable distance were compared to plain-film x-ray interpretations with a 93.3% sensitivity and

98.5% specificity for acute dislocation. This data suggests that ultrasound is an effective tool used to help clinicians diagnose anterior shoulder dislocations.

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**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in general clinical practice

## 7. Using Telemedicine to Teach Bedside Ultrasound Skills

**OBJECTIVES:** The remote diagnosis and treatment of patients by means of telecommunication technology (telemedicine) has both financial and health care benefits for remote health care centers. Telemedicine is currently used for real-time supervision of experienced bedside ultrasound clinicians. It is unknown whether this technology can be used to teach bedside ultrasound to ultrasound-naïve clinicians. The aim of this study was to determine if telemedicine could be used to teach a bedside ultrasound skill important in the diagnosis of intra-abdominal bleeding.

**METHODS:** Nurses (n=10) were recruited from St. Mary's Hospital Center (a McGill University affiliated teaching hospital) and randomly divided in two groups (Control and Telemedicine). Both groups had similar levels of clinical experience and no ultrasound experience. Both groups were given identical

educational material to study one week prior to the teaching workshop. Each group received an identical teaching workshop on how to image Morison's pouch.

The Control group was taught to image Morison's pouch in-person (control teaching). The Telemedicine group was taught to image Morison's pouch via telemedicine (telemedicine teaching). The instructor and Telemedicine group were located in two different rooms within the same hospital. The Telemedicine group was able to view the instructor's scanning techniques and generated ultrasound images and vice-versa.

To assess the effectiveness of the control and telemedicine teaching workshops, both groups completed a theoretical and practical test before the workshop (pre-test) and an identical test after the workshop (post-test). The theoretical test (n=9 questions) was

designed to test for knowledge of basic ultrasound physics, probe choice, image generation technique, and the importance of imaging Morison's pouch. The practical test (n=four criteria) was designed to test for ultrasound skills regarding: 1) choice of probe with correct placement of the orientation marker, 2) optimal patient and sonographer positioning, and 3-4) identification and image quality of Morison's pouch. The ability to meet the four criteria was scored 'able' or 'unable' by an emergency physician with bedside ultrasound credentials and blinded to the teaching method.

**RESULTS:** Prior to teaching, the Control group and the Telemedicine group showed similar mean scores for the theoretical pre-test (Control: 69 ± 9%; Telemedicine: 73 ± 15%). Both groups also performed similarly on the practical pre-test (Control: scored 'unable' on 20/20 criteria; Telemedicine: scored 'unable' on 20/20 criteria). After teaching, the Control group significantly improved its mean score on the practical post-test (scored 'able' on 20/20 criteria). The Telemedicine group also significantly improved its mean score on the practical post-test (scored 'able' on 19/20 criteria). This resulted in similar scores between the Control group and the Telemedicine group for their performance on the practical post-test. After teaching, the Telemedicine group significantly improved its mean score on the theoretical post-test (89 ± 8%; p < 0.05; paired t-test) while the Control group showed no change on the theoretical post-test (67 ± 8%). The average time required to produce an ultrasound image of Morison's pouch was statistically similar in both groups (Control: 1.24 min; Telemedicine: 1.24 min).

**CONCLUSION:** The results demonstrate that telemedicine can successfully teach ultrasound-naïve clinicians the bedside ultrasound skills necessary to identify Morison's pouch. Telemedicine teaching 1) was equivalent to in-person teaching for the acquisition of practical skills and 2) was more successful than in-person teaching for the acquisition of theoretical knowledge. Remote teaching of this bedside ultrasound skill may help in the diagnosis of intra-abdominal

bleeding and trauma care in remote health care centers.

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**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in health care delivery to underserved populations

## 8. First “Glass” Education: Telementored Cardiac Ultrasonography Using Google Glass. A Pilot Study

**OBJECTIVES:** The objective of this study was to determine the feasibility of telementored instruction in bedside ultrasonography using Google Glass. We sought to examine whether first-time ultrasound users could obtain adequate parasternal long axis (PSLA) views to approximate ejection fraction utilizing Google Glass telementoring.

**METHODS:** This was a prospective, randomized, single-blinded study. Eighteen second-year medical students were randomized into three groups and tasked with obtaining parasternal long axis (PSLA) cardiac imaging. Group A received real-time telementored education through Google Glass via Google Hangout from a remotely located expert. Group B received bedside education from the same expert. Group C represented the control, and received no instruction. Each subject was given three minutes to obtain a best PSLA cardiac imaging using a portable GE Vscan. Image clips obtained by each subject were stored. A second expert, blinded to instructional mode, evaluated images for adequacy and assigned an image-quality rating on a 0-10 scale.

**RESULTS:** Group A was able to obtain an adequate image 6/6 (100%) of the time with median image quality rating of 7.5 (IQR 6-10) out of 10. Group B was also able to obtain an adequate view 6/6 (100%), with median image quality rating of 8 (IQR 7-9). Group C was able to obtain an adequate view in 1/6 (17%) of the time, with median image quality of 0 (IQR 0-2). There were no statistically significant differences between Group A and Group B in the achievement of adequate images for EPSS measurement, or in image quality.

**CONCLUSIONS:** In this pilot/feasibility study we demonstrated that novice ultrasound users were able to obtain adequate imaging to determine a healthy patient’s ejection fraction through telementored education utilizing Google Glass. This preliminary data suggest telementoring as an adequate means of medical education in bedside ultrasonography. This conclusion will need to be validated with larger, more powerful studies including evaluation of pathological findings and varying body habitus amongst models.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

## 9. Developing Training Tools for Ultrasound Skills Acquisition

### DESCRIPTION OF THE PANEL:

Access to training tools, simulators (phantoms, part-task trainers, and VR trainers) and devices are substantial rate limiting factors to providing appropriate opportunities for learners to appreciate and develop new skills and abilities related to the use of ultrasonography in healthcare. The cost of commercially available devices can be substantial while not specifically addressing curricular objectives, skills acquisition, and ranges of difficulty.

This panel will discuss practical and feasible methods to create reliable training tools and devices within your own institution. This will include the development of progressive training tools focusing on a range of learner levels and case complexity, and measuring the effectiveness of developed training aids to assure learning objectives and performance indicators are met.

### GENERAL QUESTIONS TO BE ADDRESSED BY THE PANEL:

1. How to develop tools for training ultrasound skills.
2. How to create a continuum of progressive skill devices to address longitudinal development of ultrasound skills.
3. How to test the reliability of developed devices.

### ANTICIPATED OUTCOMES (EDUCATIONAL OR OTHER) FOR THE SESSION.

1. Review techniques for developing practical and feasible training tools for ultrasonography education.
2. Review cost effective methods to develop progressive training devices for ultrasonography skills.
3. Discuss how to measure the effectiveness of a new training tool.

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**FORMAT:** Panel

**TOPIC:** Technology

## 10. The Rural Obstetrical Ultrasound Triage Exam (ROUTE): Teaching Obstetrical Ultrasound To Healthcare Workers In A Rural Low-Resource International Setting

**INTRODUCTION:** The purpose of this pilot study was to determine the feasibility of training rural healthcare workers, with little to no prior ultrasound experience, in the Rural Obstetrical Ultrasound Triage Exam (ROUTE). The ROUTE was developed to establish a diagnostic algorithm for the use of portable ultrasound in rural areas as a means of triaging obstetrical patients for future maternal or fetal complication risk. Healthcare workers were associates of Floating Doctors, a nonprofit medical relief organization providing services to indigenous communities in Panama. Participants included Panamanian physicians, nurses, Red Cross volunteers and Ministry of Health employees.

**METHODS:** Healthcare workers received a two-hour presentation on basic ultrasound techniques and the ROUTE, followed by six hours of hands-on sessions with standardized subjects and an ultrasound simulation program. The course was taught by medical students who completed a year-long ultrasound program at the University of California, Irvine School of Medicine and an average of twelve hours of additional training in obstetrical ultrasound with certified ultrasound technicians and obstetricians. Attitudes about obstetrical ultrasound, as well as prior experience and knowledge with the technology, were assessed with a twenty-item survey. Upon completion of the course, the same survey was given to assess knowledge gained and changes in attitudes. Healthcare workers then performed ROUTE scans on obstetrical patients to whom they were blinded. All scans were read in real time by trained medical students. Practical skills were assessed by comparison to the trained medical students who served as controls.

**RESULTS:** Following the didactic sessions, knowledge in obstetrical ultrasound improved from 31.31% correct on pre-course surveys to 70.71% on post-course surveys (n=12). In both pre- and post-course surveys, healthcare

workers reported that they felt obstetrical ultrasound was safe for both mother and fetus and that the technology was either useful or very useful in the healthcare setting in which they practice. They were able to accurately assess fetal number (n=26), fetal presentation (n=10) and presence of gross abnormalities (n=26) on 100% of scans. Placenta location was correctly assessed 76% of the time (n=25). On average, healthcare workers dated pregnancies based on crown-rump length (CRL) within 7 days (n=7) and biparietal diameter (BPD) within 12 days (n=10) of the trained medical student controls. Average healthcare worker amniotic fluid index (AFI) measurements were within 2.2cm (n=8) of the medical student controls.

**CONCLUSION:** This feasibility study found that rural healthcare workers are able to successfully learn the ROUTE exam following 8 hours of didactic and hands-on training. With this evidence, Floating Doctors plans to create a sustainable obstetrical ultrasound program so they can positively impact pregnancy management. Limitations included lack of familiarity with the multiple-choice testing method among some healthcare workers, which may have impacted pre- and post-course survey scores.

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**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in health care delivery to underserved populations

## 11. A proposed curriculum for educating paramedics and other out-of-hospital providers on the use of ultrasound in the field setting

**INTRODUCTION:** Use of ultrasound technology is still novel in the out-of-hospital setting, but it is an area of tremendous interest. Emergency medical care is a continuum that begins when emergency medical services (EMS) providers make first contact with a patient. It has been suggested that expanding the use of ultrasound into the prehospital environment could lead to more rapid diagnosis of potentially life-threatening conditions and improve patient outcomes. New Mexico is a prime location to begin evaluating the feasibility and efficacy of prehospital ultrasound training, being that it is a largely rural/frontier state with long EMS transport times, and sparse advanced care facilities. **Methods:** The University of New Mexico Department EMS Academy is the largest training institution for paramedics and emergency medical technicians (EMTs) in New Mexico. For two semesters, a prehospital ultrasonography course has been taught to paramedics at the University of New Mexico EMS Academy. Each semester, the course met for 14 class sessions, occurring once weekly for 3 hours. Ultrasound topics covered in the course included: basic physics and knobology, the E-FAST exam, pulmonary ultrasound findings, assessment of the aorta and inferior vena cava, deep venous thrombosis exam, ultrasound guidance for the placement of peripheral intravenous catheters, basic echocardiography, fetal assessment, soft tissue abnormalities, retinal assessment and measurement of optic nerve sheath diameter. These exams have the potential to provide the out-of-hospital provider with the most pertinent clinical information, to identify of a life-threatening problem, or to change resource utilization and hospital destination

decision-making. Students were evaluated with midterm and final written and practical examinations, as well as in-class quizzes and journal club written assignments. A timed E-FAST exam and the ability to perform a 4-view cardiac ultrasound assessment were part of the students' final examination for the course. Fourteen students' performance on these tasks was retrospectively reviewed. **Results:** The average time for completion of an E-FAST exam was 148.6 seconds. Ten of the 14 students were able to obtain all 4 cardiac ultrasound views on their examination. **Conclusion:** After 42 hours of classroom education, paramedics are able to quickly perform E-FAST exams, and the majority of the students evaluated were able to perform basic echocardiography. A prehospital ultrasound curriculum should focus on identifying life-threatening conditions which require immediate treatment, alter the patient's destination for definitive care, or provide justification for resource utilization such as air medical transport.

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**FORMAT:** Oral

**TOPIC:** New Uses

## 12. Point-of-Care ultrasound improves the diagnosis of splenomegaly in hospitalized patients: a randomized trial.

**INTRODUCTION:** Hepatomegaly and splenomegaly are important, clinically relevant conditions and the examination for these conditions is part of the traditional physical examination. However, previous studies have shown that the traditional physical examination has marked limitation in the ability to detect the presence or absence of hepatic or splenic enlargement. Thus, we examined if the addition of Point-of-Care ultrasonography (POCUS) to the traditional physical examination improves the diagnosis of hepatomegaly and splenomegaly.

**METHODS:** This was a prospective, randomized trial conducted in 2013 and 2014 at the University of Minnesota Medical Center. Adult patients who were able to give consent, without moderate or greater abdominal pain, with no recent abdominal surgeries, and in whom a CT, MR, or abdomen had been performed in the last 48 hours were enrolled. For each subject enrolled, one traditional physical examination and one ultrasound-assisted physical examination were performed by the physicians who were randomly assigned. Examiners consisted of 1 hospitalist, 12 senior residents, and 5 interns, all of whom had less than one hour experience in spleen and liver ultrasound. The findings were recorded by the examiner and compared by the investigators to abdominal CT, MRI, or radiologist-interpreted ultrasound, which served as the reference standards for the study. Excel (Microsoft Corporation, USA) was used for statistical calculations.

**RESULTS:** A total of 17 subjects were enrolled in the study; one patient did not have radiology results available for spleen size and thus 16 patients were included in the analysis for splenomegaly. The prevalence of hepatomegaly was 17.6% and splenomegaly 18.8%. For hepatomegaly, physical examination had a sensitivity of 0 (95% CI 0-56%) and specificity 71% (45-88%) while physical examination with POCUS had a sensitivity of 33% (6%-79%) and specificity 71% (45-88%). For physical examination alone for hepatomegaly, the LR+ was 0 and LR- 1.4 (1.01-1.95); for physical exam with POCUS the LR+ was 1.17 (0.19-7.07) and LR- was 0.93 (0.39-2.2). For splenomegaly, physical examination had a sensitivity of 33% (6-79%) and specificity 77% (50-92%) while physical examination with POCUS had a sensitivity of 100% (44-100%) and specificity 77% (50-92%). For physical examination alone for splenomegaly, the LR+ was 1.44 (0.22-3.5) and LR- 0.87 (0.37-2.04); for physical exam with POCUS the LR+ was 4.33 (1.61-11.69) and LR- was 0. The addition of POCUS to the traditional physical examination had a statistically significant effect on the examiners' confidence in their ability to detect splenomegaly (mean  $\pm$  SD) ( $3.6 \pm 0.8$  vs  $2.8 \pm 1.1$  on a 5 point scale,  $p < 0.05$ ) and hepatomegaly ( $3.9 \pm 0.7$  vs  $2.9 \pm 1.1$  on a 5 point scale,  $p < 0.05$ ).

**CONCLUSIONS:** Physical examination alone has marked limitation for the detection of hepatosplenomegaly in hospitalized adult patients. The addition of POCUS to the traditional physical examination, especially as a screening test, improves the examinations

and examiners' confidence in their examinations for both hepatomegaly and splenomegaly; the effect is more pronounced with splenomegaly. Further studies should be done to improve the ability of physicians to use POCUS to detect abdominal organomegaly. Further, addition of POCUS to the traditional physical examination appears warranted when organomegaly is being considered.

**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in general clinical practice

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## 13. A prospective evaluation of real-time, transverse tracheal ultrasound in the evaluation of emergent intubation by minimally trained practitioners

Securing a definitive airway via endotracheal intubation is often necessary in the management of critically ill patients in an emergency department (ED) setting. Despite the large number of ED intubations, there continue to be challenges in confirming correct placement of endotracheal tube with studies reporting the rate of esophageal intubation between 1-24%. Inability to detect an improperly placed endotracheal tube can lead to disastrous outcomes such as death or hypoxic brain injury if not discovered and corrected quickly. In our study, the primary objective is to determine if minimally trained Emergency Medicine resident physicians can confirm correct placement of endotracheal intubation using bedside ultrasound in real time. This study will compare immediate bedside ultrasound interpretation with CO<sub>2</sub> color change, direct visualization by intubator and post procedural chest x-ray for placement. A secondary objective will be to determine if level of training plays a role in the ability of a sonographer to determine endotracheal versus esophageal intubation. This was a multi-center, prospective, cohort study designed to assess the diagnostic accuracy of real-time Emergency Department

(ED) bedside ultrasound in confirming position of endotracheal intubation. To date, 41 patients have been enrolled with a sensitivity of 96% and a specificity of 100%. Although our results are promising, further larger clinical studies must be performed to thoroughly evaluate the usefulness of bedside ultrasound to confirm tube placement during emergent intubation.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education



## 14. Discussion on Pediatric Emergency Medicine Ultrasound Education: Moving Towards a Consensus

Point-of-Care Ultrasound (POC US) is a widely used clinical modality in the emergency department (ED), with over 90% of emergency medicine (EM) residency programs have an integrated curriculum for POC US. The Emergency Ultrasound Guidelines by the American College of Emergency Physicians (ACEP) and The Emergency Medicine Milestone Project (2013) delineate core competencies in POC US for residents, and reinforces its importance in emergency medicine training.

Not surprisingly, the use of POC US by pediatric emergency medicine (PEM) physicians is increasing with subsequent demands for training. A recent survey noted that 95% of PEM programs endorse the use of PEM in their emergency departments, and over 79% of these program offer a structured emergency US rotation. Despite the dramatic increase in US education within PEM fellowships, there is no standardized educational curriculum for Pediatric Emergency Medicine fellows. Veira et al. recommended in a recent article that EUS education could occur primarily during a PEM fellowship; and provided a program and curricular framework that could be integrated into the PEM fellowship curriculum. This is in contrast to a free-standing pediatric EUS fellowship that offers a more focused learning environment and opportunities for research and administrative experience that PEM fellows may or may not be offered in PEM fellowship. Although several publications have made recommendations regarding the core applications for PEM POC US training, there is currently no formal policy statement that includes comprehensive guidelines or a curriculum for POC US in PEM. Consensus on a succinct curriculum would help ensure that PEM clinicians and learn to use the US consistently and safely. Equally as important, this has significant ramifications on the type and quality of teaching PEM clinicians will then offer residents and students rotating within the department.

To further elucidate on the current state of pediatric emergency ultrasound in the U.S. we propose a panel discussion with several leaders in pediatric emergency ultrasound to discuss these issues.

### BY THE END OF THIS PANEL BASED DIDACTIC, THE PARTICIPANT WILL BE ABLE TO:

- Understand the similarities and differences of existing PEM POC US educational curriculums in PEM fellowships and pediatric EUS fellowships
- Understand differences between PEM and adult POC US applications
- Determine how one defined curriculum could provide educational benefit to EM attendings, fellows, residents, and students
- Understand how pediatric ultrasound applications can be integrated into medical school and residency training (pre-fellowship level)
- Discuss the future directions of POC US education in PEM

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**FORMAT:** Panel

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 15. Current EM Ultrasound Training in Residency: Implications for Future Practice

**INTRODUCTION:** Bedside Ultrasound (BU) is an essential skill in EM. Previous studies show that resident ultrasound (US) education varies widely among residency programs. The 2008 ACEP US Guidelines recommend that all EM residency programs have an US Director, 24-hour access to an US, perform a minimum of 150 scans and identified 11 core applications (trauma, IUP, AAA, cardiac, biliary, urinary tract, DVT, soft-tissue, thoracic, ocular and procedural guidance). The ACGME recently introduced new residency accreditation standards and out-come bases evaluations, Milestones. One of which, addresses residents' US skills based on 5 levels. There are no recent studies, which look at the current status of resident BU training.

**OBJECTIVE** The goal is to assess the current status of BU training and identify successful aspects of BU education. This study can help predict performance on the US Milestone assessment and provide implications to the evolving role of BU.

**METHODS:** This study is an observational, cross-sectional study that examined several aspects of senior EM residents' training and confidence with US. Data was collected between April and June 2012 via an online survey sent to the CORD listserv along with snowball sampling. Descriptive statistics were used to describe all study variables.

**RESULTS:** The survey received 270 responses of which 258 met inclusion criteria. Most were located in the Northeast (35%) or Midwest (33%). Almost all had an US Director (93%), a Fellowship (61%) and all had 24-hour access to an US. Approximately 37% found that designated US shifts were most

effective for learning. Obtaining high quality images was rated as the most challenging aspect (72%). More than 2/3 indicated that BU was frequently or almost always useful in clinical decision making. Resident confidence was rated highest with FAST, renal US and procedural guidance as opposed to lowest with musculoskeletal, ocular and DVT. Almost 70% plan to use ultrasound during every shift after residency.

**CONCLUSION:** EM BU training has improved with most residents meeting ACEP guideline and at least a Milestone Level 3 by gaining experience with all of the core applications. As suspected, the number of US performed correlated with the resident's confidence in that type of US. This indicates that hands-on experience is very valuable and should have emphasis in the training arena. Sample bias is a significant limitation to this study.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 16. Integrating an Ultrasound Curriculum into Internal Medicine Residency: Looking Back and Looking Forward

**BACKGROUND:** Although limited ultrasound exams can augment bedside diagnosis, significant challenges currently exist to the widespread teaching of this modality. Few data and no consensus exist on the integration of an ultrasound exam curriculum into an internal medicine residency to augment cardiac physical examination. Therefore, since 1997, we have sought to develop a single, evidence-based “quick look” cardiac limited ultrasound exam (CLUE) and incorporate its training into the mandatory curriculum of all internal medicine residents.

**METHODS:** Initial CLUE derivation studies occurred within the hospital’s echo lab and initial resident imaging began during cardiology rotations. After 10 years, the CLUE imaging protocol was included in all institutional echo studies, which provided ongoing validation and outcome data. In 2007, Graduate Medical Education deemed resident participation in the CLUE curriculum mandatory, with weekly ICU bedside teaching rounds, monthly noon lectures and competitions, grand rounds, proctored imaging on cardiology rotations, and recently, website/app training and assessment. Participation in CLUE research was an extracurricular activity. Laptop and pocket-sized devices for residents were available in outpatient clinic, ICU, inpatient wards and ED settings. Primary teaching responsibilities were delegated to the CLUE Program Director, sonographers in the echo lab, and resident-to-resident teaching. Resident knowledge, performance and competency were assessed using a CLUE-CEX assessment tool (2007-present) at the end of training. In the program’s formal resident assessment, CLUE competency was considered necessary in order to be considered “superior” in procedural skills.

**RESULTS:** The basic CLUE that developed and was validated included signs of LV dysfunction, left atrial enlargement, interstitial lung edema, pleural and pericardial effusion and elevated central venous pressures.

Over time, emphasis on imaging skills and web-based interpretation replaced didactic lecturing as primary teaching methods. Resident’s preferred method of learning CLUE was during rounds at the patient’s bedside, and independent use appeared heavily-based on device availability. Residents now perform the basic CLUE in <1 minute and are taught additional signs of AAA and carotid atherosclerosis. Although variable by resident, the overall hours dedicated to the CLUE curriculum accounted for <2% of the total residency curriculum. No significant decrement was noted in overall mean in-training program scores during the phase-in of the ultrasound curriculum. Of 78 senior residents (100% participation), n=64 (82%) have passed the CLUE-CEX. In 2014, four interns passed the CLUE-CEX. CLUE competency was without relationship to resident in-training exam scores or gender. In CLUE research, since 1998, 16 residents published in CLUE of whom 8(50%) entered cardiology or critical care.

**CONCLUSIONS:** Development and incorporation of an ultrasound curriculum based on a single exam can be accomplished within an internal medicine residency. Despite agreement on the imaging protocol, future challenges need to address faculty development and clinical outcome studies in residents deemed competent in CLUE.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 17. An Assessment of the Ultrasound Curricula of Osteopathic Emergency Medicine Residencies

**BACKGROUND:** There is currently no standardized osteopathic (DO) curriculum for emergency ultrasound (EUS) amongst the 48 accredited DO residency programs. The requirement as a joint statement of the American College of Osteopathic Emergency Physicians and the American Osteopathic Association asks residents to perform 40 EUS examinations during training.

The 2008 American College of Emergency Physicians guidelines suggest more detailed EUS graduation requirements. Also, the Accreditation Council for Graduate Medical Education has designated EUS as one of the 23 milestones.

It is now imperative that DO programs be at the same level as the allopathic programs since the major accrediting bodies have recently agreed to a single accreditation system for graduate medical education programs.

This survey study sought to assess all DO emergency medicine residencies. An analysis was performed to summarize the state of EUS training. This may contribute to a future standardized curriculum.

**METHODS:** An anonymous email survey was sent to the DO EUS director or residency program director. Associations between categorical variables were assessed using Fisher’s Exact test. Comparisons between medians of continuous variables were made using Wilcoxon’s Rank Sum test. The association between two continuous variables was assessed using Pearson’s Correlation, and the correlation was tested for significance using the z-test. Two-sided p-values were calculated with p<0.05 considered as significant.

**RESULTS:** 39 of 48 programs responded (81% response rate). Responding programs had an average of 24 residents (range 4-70).

59% (23/39) of programs had an EUS director. Programs with an EUS director were more likely to require a specified number of scans as a graduation requirement. (Programs with EUS director: 90.9% required a specified

number of scans; programs without EUS director: only 60.0% required a specified number of scans.) The difference was statistically significant (p=0.042).

Programs required an average of 2.9 weeks (range 0-8) of EUS education. 65% of the programs had quality assurance during the rotation. 35% of the programs had faculty evaluate the resident use of ultrasound on shift. No program had an EUS fellowship.

Reported barriers to EUS education included: no protected time for EUS faculty (65%), faculty disinterest (57%), difficulty recruiting EUS focused faculty (49%), and difficulty purchasing hardware (46%).

**CONCLUSIONS:** There is a considerable amount of variability in the resources and scan requirements for graduation amongst DO EM programs.

Limitations of this study include an 81% response rate.

Our data suggests that improving DO EUS education may begin with the recruitment of an EUS director. If DO EM residencies adopt a single and similar set of graduation requirements as allopathic EM residencies, DO uniformity may increase amongst trainees.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 18. Bedside Ultrasound in Internal Medicine: Needs assessment and training program design at UCSF

**PURPOSE:** Over the past two decades emergency medicine (EM) has aggressively adopted bedside ultrasound (BUS) as an efficient tool that can improve quality of care. BUS has recently enjoyed increased applications in other specialties including anesthesia and critical care (CC), and many support its use in internal medicine (IM). Our goal was to conduct a needs assessment for BUS within UCSF's IM residency program, and to design a curriculum to address the identified needs.

**METHODS:** We invited IM residents to complete a survey regarding their interest and experience in BUS, and conducted a pretest to assess knowledge in pulmonary, cardiac, abdominal and vascular BUS. We brought these results to an expert physician panel from IM, EM, CC, and cardiology to develop a BUS curriculum.

**RESULTS:** One hundred of 180 UCSF IM residents responded to the survey. Ninety-nine percent felt that BUS training should be part of the IM curriculum. Greater than 90% believed that BUS was important for obtaining peripheral venous access, assessing volume status, and identifying peritoneal fluid, pleural effusions, and pericardial effusions, while more than 65% believed it was important for assessing LV function and identifying pneumothorax, pulmonary edema, and hydronephrosis. Although few residents expressed confidence in even basic BUS applications such as obtaining peripheral venous access (18.2%), assessing volume status (19%), and identifying pericardial effusions (10%), a large number still utilized BUS for such applications - peripheral venous access (43%), volume status (54%), and pericardial effusion (26%). Few residents reported adequate BUS supervision on IM wards (28%).

Ninety-seven residents took a difficult pretest. Scores were generally low. Forty-seven percent of residents recognized a moderate pericardial effusion, but just 25% recognized

a small pleural effusion. Forty percent identified criteria for "fluid responsiveness". Seven percent recognized the popliteal vein and artery. Only 4% recognized the greater saphenous and common femoral veins.

After review of the survey data, pretest scores, and discussion of the evidence base for BUS in IM, the expert panel identified the following needs: broad safety education, increased didactic and hands-on training BUS, and increased supervision. A curriculum was designed in which all interns receive training in BUS safety and high-yield/low-risk applications such as volume status assessment and peripheral venous access guidance. A BUS training track was also developed for senior residents interested in more advanced cardiac, vascular, pulmonary, abdominal, and soft tissue exams. A cadre of UCSF hospitalists is undergoing BUS training to increase resident supervision.

**CONCLUSIONS:** We found strong interest in BUS among UCSF IM residents. Many residents are already using BUS despite low confidence, poor knowledge and minimal supervision. We used an expert panel to develop a curriculum that addresses these deficiencies. This curriculum is currently being piloted within the UCSF IM residency program.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 19. Emergency Ultrasound Training Practices and the Emergency Medicine Milestones Project

**OBJECTIVE:** With the introduction of the Emergency Medicine (EM) Milestone Project in 2013, EM residencies are required to assess resident Emergency Ultrasound (EUS) skill at regular intervals throughout training. The goals of our study were to determine: 1) which of the Council of EM Residency Directors (CORD) recommended EUS applications are being taught to residents, 2) methods used by programs to instruct EUS and assess EUS competency, and 3) post-graduate year of training in which residents are expected to achieve each milestone. We also sought to establish expert opinion on the adequacy of the EUS Milestones as a tool to measure resident competency.

**METHODS:** Participants completed an online survey consisting of 24 multiple choice and free-response questions. The survey was emailed to Ultrasound Program Directors or Residency Program Directors at 168 EM residency programs in the United States. Topics queried included: EUS rotation structure, curriculum and requirements; when, how and by whom EUS competency is evaluated; how the Milestones are integrated into EUS education and competency evaluation; and utility of the EUS Milestones as currently drafted. Survey findings were reported using descriptive statistics.

**RESULTS:** Responses were received from 89 of the 168 programs surveyed (53%). Programs measure competency in the following modalities: FAST (99%), AAA (96%), cardiac (97%), pregnancy (82%), biliary (86%), central line (75%), renal (60%), DVT (58%), soft tissue (56%), pneumothorax (56%), and ocular (39%). For teaching methods, programs used didactic lectures (93%), procedural workshops (79%), US phantoms (69%), textbook or journal readings (67%), and computer-based learning modules (57%). To assess EUS competency, programs used direct observation on shift (99%), video review

(89%), quality assurance (QA) database review (84%), still image review (76%), Standard Direct Observation Tools (SDOT) (55%) and/or Objective Structured Clinical Examination (OSCE) (35%). Sixty-one percent of programs expect post-graduate year 1 (PGY-1) residents to have obtained the Level 1 Milestone prior to beginning residency; 65% expect Level 2 mastery during PGY-1; 55% expect Level 3 mastery during PGY-2; and 45% expect Level 4 mastery during PGY-3. Sixty-two percent responded that the EUS Milestones do not reflect their expectations of residents. They cite insufficient minimum number of scans, paucity of specific criteria, and a Level 5 Milestone which is unattainable for most attending-level physicians as the sources of their concern.

**CONCLUSION:** These data demonstrate substantial variability across programs in EUS applications taught, methods of EUS instruction, and approaches to measurement of EUS competency. The majority of respondents expect Milestone Levels 2, 3 and 4 to be achieved during PGY-1, 2 and 3 respectively, a view consistent with the intentions of the Milestones Project. However, most feel that the EUS Milestones are insufficient for assessment of EUS competency.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 20. Surgical Critical Care and Ultrasound Training: Changing the Paradigm

The ideal method to train physicians in Point-of-Care ultrasound (POCUS) remains unclear. Guideline inconsistencies exist between governing organizations and specialties, further complicating the matter. In the field of surgical critical care, there is no standard. The training for critical care fellows at the Shock Trauma center (STC) has consisted of a one month dedicated rotation in the Critical Care Ultrasound Program (CCUP), with an emphasis on US for trauma and hemodynamic echocardiography. Noting gaps in our training, we have recently modernized our training pathway and aim to validate it against historical means.

**METHODS:** Outgoing fellows from the 2013–2014 year group were tested in the areas of knowledge, image interpretation, image acquisition and technical ultrasound skills. Testing was created and proctored through the CCUP. Knowledge categories included FAST, lung, cardiac, vascular, and ultrasound physics. Also included was a self-evaluation instrument measuring confidence and self-perceived competence. Incoming fellows for the 2014-2015 year group completed an identical testing algorithm prior to initiation of the academic year and again after taking 'The Leading Edge,' a one day intensive ultrasound introduction course. Fellows have continued assessments quarterly as the new training algorithm is validated.

**RESULTS:** Eleven outgoing fellows (OF) and 13 incoming fellows (InF) were included in the study group (n=24). 83% were surgeons. Internal review of the CCUP, in combination with OF assessment results, revealed gaps in training. These included image interpretation, advanced cardiac imaging, and lung ultrasound. As expected, initial knowledge and skills scores were significantly less in the InF than the OF group. However, image interpretation was not different between groups. After an intensive one day course, InF skill significantly

increased from initial testing (p=0.007), and approached skills of the OF group.

Both groups reported similar initial self-confidence and competence. OF group reported significantly improved scores in the areas of basic and advanced cardiac imaging, lung for pneumothorax, and imaging of the IVC. No differences were noted in the areas of FAST or procedural US skills.

**CONCLUSIONS:** The CCUP is unique in surgical critical care training. After a one month of dedicated training in ultrasound, trainees showed improved scores in ultrasound knowledge, image interpretation, and skills. Knowledge gaps prompted a change in training, which remains to be validated. Preliminary results reveal that the one day and one month courses led to equivalent skills and knowledge. High levels of initial confidence existed in both group with regards to FAST and procedural skills, not surprising in a group of surgeons. However, a significant difference existed amongst those from a medical background regarding the FAST exams. The prior training algorithm led to improved confidence and self-reported competence in all other categories amongst OF group. Long term retention of knowledge and skills remains to be seen, and we have ongoing data collection directed at answering this question. Additional testing can further elicit retention of both skills and knowledge amongst those of different training backgrounds, thus allowing for a more tailored teaching approached if needed.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 21. Towards a standardized Ultrasound curriculum for Pulmonary and Critical Care Fellowships

Currently no standardized curriculum exists for ultrasound (US) training at the Pulmonary and Critical Care Medicine (PCCM) fellowship level. Such training is required by the Accreditation Council for Graduate Medical Education (ACGME) and is invaluable to the care of patients encountered in PCCM practice. Many barriers to PCCM US training exist, including content redundancy, time constraints, and a need for practice on abnormal subjects. Furthermore, adult professional learners are internally motivated and have improved learning in the event that the learning objectives are well aligned with their personal and professional motivations. Therefore a successful PCCM US curriculum must engage these motivations.

Our curriculum is a comprehensive and multi-faceted year long program with simulation training, targeted and interactive didactics, escalating portfolio development, deliberate practice and real-time patient scanning as the key elements. All teaching events are targeted and time efficient, barriers to education at a busy academic program are eliminated. We use a case based approach and the incorporation of supervised practice sessions with MICU patients as scanning models in order to engage the adult trainees' internal motivations, namely the motivations to perform well in fellowship training, to advance the care of their patients and to feel more confident in handling of critical medical situations with their newly acquired skills.

We have begun the first stage of our proposed curriculum, which is comprised of self-directed learning, and a comprehensive and interactive formal course. Our coursework incorporates not only clear didactics but also real-time (normal model) scanning, simulation training, and supervised scanning in the Medical Intensive Care Unit (MICU) of abnormal findings.

An anonymous survey described 100% approval ratings for course design, teaching

effectivity and the benefits of real-time scanning, MICU scanning and simulation based supervised practice techniques. Fifty percent of responders tagged time as a constraint, indicating that increasing the allotted of time for the course overall, practice time and for machine control would be considered beneficial.

Testing to evaluate key elements of ultrasound learning (image acquisition, scan plane control, and image recognition and interpretation of findings within clinical context) was used to evaluate skill and knowledge level at this early stage of curriculum implementation. Analyses of pre-course and post-course testing showed an improvement in performance (cohort average of 25%, range 12.5- 43.75% vs 71.25%, range 56.25- 87.5%). This improvement in scores was statistically significant (p<0.0007).

Our educational program is a novel approach to PCCM US training. We anticipate it to be an effective method of training using our multifaceted teaching approach. We believe our method circumvents barriers to effective training in PCCM fellowships and is designed to engage the motivations of our trainees. Our study protocol is designed to validate this educational program and initial testing suggests that our methods have been successful in their initial stages.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 22. Assessing the Need for Dedicated Inferior Vena Cava (IVC) Ultrasound Education in Emergency Medicine Residents

**BACKGROUND:** Ultrasound of the Inferior Vena Cava (IVC) is used as a surrogate to estimate intravascular volume status as an alternative to invasive central venous pressure monitoring. Visualizing the IVC is routinely taught as a standard view on the focused echocardiographic exam in the Emergency Department. Given the adoption of its routine use with sepsis protocols, we predict that emergency medicine (EM) residents will need training and specific education in order to locate and evaluate the IVC with bedside ultrasound.

**OBJECTIVES:** The objective is to assess the need for dedicated IVC ultrasound education in Emergency Medicine Residents.

**METHODS:** 25 EM residents (9 EM-1, 7 EM-2, 9 EM-3) participated in this study. Residents were surveyed about their experience and self-assessment of competency in finding the IVC with ultrasound. These same residents were asked to image and record the IVC as they would a clinical setting using a healthy medical student volunteer under direct observation by an ultrasound credentialed attending. Residents were then given an educational lecture. An instructional video link was sent out via electronic mail that residents could view at their leisure. At a later date, the residents repeated the IVC ultrasound exam under direct observation. The Emergency Medicine Ultrasound Director reviewed these images for quality and clinical applicability and compared them with pre-education scans. A post-education self-assessment survey was sent out to all residents.

**RESULTS:** All results were found to be statistically significant with a p-value < 0.05.

Using the z-test for comparison of adequacy of IVC image acquisition improved with a p-value = 0.0046 and the comparison of ability to make clinical decision based on images improved p-value = 0.014. The quality of the images improved in 76% of residents; the chi-test for differences in outcomes gave p-value = 0.013. Using the paired t-test, the self-assessment of comfort in performing an IVC ultrasound showed improvement with a p-value of 0.00001. All residents felt that dedicated IVC ultrasound teaching was needed.

**CONCLUSION:** As IVC ultrasound use becomes routine in the determination of intravascular volume status in septic patients, dedicated IVC ultrasound education is needed and desired amongst EM residents.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 23. Ultrasound In Urology: A Novel Ultrasound Training Curriculum for Urologic Surgery Residency Programs

**BACKGROUND:** Ultrasound in the practice of urology is expanding, as advances in miniaturization are making clinician-performed ultrasound even more common for genitourinary complaints. Owing to its convenience and availability, low cost, real-time results, and ease of use, ultrasound plays an important role as an initial imaging modality for many genitourinary complaints. Scanning the kidney for renal cysts or hydronephrosis, the bladder for size, volume and presence of blood, as well as the testicle for acute torsion are common tasks for modern urologists. Despite this, training in urologic ultrasound for residents has been limited as many programs struggle to incorporate ultrasound into an already busy resident curriculum.

**METHODS:** At our institution, a novel residency based initiative was developed to provide residents in urology an experience in acquiring and interpreting focused Point-of-Care ultrasound. Online education materials, interactive modules, and videos were utilized initially to provide background. A comprehensive training booklet with protocols, ultrasound flowsheets, quality checklists, and curriculum requirements was developed and distributed. Resident learners then participated in seminar series covering ultrasound physics and basic scanning technique, as well as renal, bladder, and testicle ultrasound pathology. These sessions included hands-on instruction and the opportunity to individually practice scans on live volunteers. Sessions were held on a quarterly basis with a final exam that included normal and abnormal recognition testing, along with a practical ultrasound standardized assessment test. All residents were asked to keep track of their clinical scans during the year and log them electronically. A clinical skills lab with multiple ultrasound machines was made available at all hours with keycard access for further practice and development of their skills as needed.

**RESULTS:** Fourteen residents completed the training and logged an average of 31 scans for renal, 37 scans for bladder and 18 for testicle. Scores on recognition and pathology exams were very positive, ranging from 70 to 95%. All residents successfully completed an ultrasound standardized assessment test that critiqued each learner on their acquisition, interpretation and medical decision making in regards to focused urologic ultrasound scanning. Based on their participation in this curriculum, residents were provided a training certificate affirming their sonographic competency in urologic ultrasound.

**CONCLUSIONS:** Focused training for urologic ultrasound is feasible for resident training and can improve physician exposure and competence in bedside ultrasound. Residents demonstrated increased comfort in obtaining and interpreting urologic ultrasound images and a better understanding of the appropriate ultrasound-guided techniques used in urology. Future studies may investigate optimal training times and number of exams to maintain a minimum proficiency in genitourinary ultrasound.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 24. Development of a Novel Focused Ultrasound Training Program for Surgical Residents in the Critical Care and Trauma Setting

Focused ultrasound has become an increasingly important component of practice for many general subspecialty surgeons. New surgical graduates are now expected to have developed a proficiency in focused ultrasound for the bedside evaluation of patients, particularly within the trauma and critical care setting. To date however, there are no clear training methods which provide inexperienced surgical residents with focused ultrasound training in the controlled clinical setting needed for competency development. In July 2013 the Orlando Health Department of Surgery developed a novel focused ultrasound training program for surgical residents with the purpose of developing basic ultrasound competency utilizing multimodal training methods. The program was developed in conjunction with Department of Emergency Medicine faculty who hold additional ultrasound certifications and experience. The one month course consisted of both cognitive and behavioral learning models. The cognitive component was developed through two one-hour didactic sessions, which introduce basic ultrasound physics, knobology and probe selection, ultrasound terminology, exam indications and contraindications, image acquisition techniques, and image interpretation

methods. The behavioral component was developed through two one-hour hands-on sessions under faculty supervision with selected critical care patients with the goal of developing psychomotor skills necessary for scanning in addition to interpretation of normal and abnormal exam findings while performing a focused assessment for trauma (FAST) exam. Additionally, participants performed FAST exams independently on all trauma patients admitted to our Level 1 trauma center. A log of all ultrasound exams performed by participants has been maintained in addition to pre and post-course proficiency and satisfaction tests.

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### FORMAT:

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

## 25. Bedside Ultrasound Milestones for Undergraduate Medical Education

The practice of physician-performed bedside ultrasound is increasing in scope and importance. However, ultrasound image acquisition and interpretation remains a technically challenging skill. A number of medical schools are experimenting with formal longitudinal education, extra-curricular activities, and/or elective courses in ultrasound at the medical student level. A method for tracking ultrasound experience, fostering student growth, and incorporating leadership within ultrasound has yet to be optimally defined.

At the resident level, the Accreditation Council for Graduate Medical Education (ACGME) uses milestones to track resident competency in areas of clinical practice. As part of the Emergency Medicine Milestone Project, ACGME and the American Board of Emergency Medicine (ABEM) identified focused ultrasound as one of twenty-three milestone competencies for EM residents. We used the five-tiered ACGME-ABEM milestone system as a model to develop ultrasound milestones for medical students. This framework comprises a series of graded accomplishments, separating learners into basic and advanced competency based on academic commitment and leadership. The medical student milestones may be a valuable scaffold for educators and students designing and pursuing educational experience in ultrasound. The milestones provide a flexible model integrating multiple programs yet allowing the student to tailor their experience.

As bedside ultrasound is a rapidly-evolving field, students must learn both current knowledge and also skills to innovate and adapt for the future. Truly in-depth ultrasound education involves more than just scanning techniques and image interpretation. We looked to fellowship ultrasound education as a model for producing leaders in ultrasound. At the fellowship level, broader ultrasound education includes a series of didactics,

scanning shifts, research activities, quality assurance, image review/critique, project presentations, and ultimately manuscript preparation. We have likewise chosen to emphasize competence in leadership and scientific discovery in our milestone framework. In this way we provide a structure for producing future leaders in the evolving field of ultrasound.

Our flexible milestone framework consists of four categories of competence: clinical skills, administrative leadership, research, and educational experience. For each of these competency categories, we have designated five levels of competency milestones. These achievements may be amenable to a one week, one month, or longitudinal programs depending on the level of commitment involved. The milestone framework not only gives students and educators a flexible model for tracking ultrasound knowledge and clinical skills, but also a toolkit to integrate leadership, innovation, and research into medical student ultrasound curriculum. As the field of ultrasound expands and more specialties use this tool in their practice, codifying the leadership paths students can take using ultrasound is imperative. This milestone framework attempts to organize many ultrasound opportunities to lead, serve and inspire within the medical student curriculum at our institution.

The medical student progressing through a topic area demonstrates knowledge on what indications lead to performing a focused ultrasound exam. This is milestone number 1. As the learner acclimates to the machine and the process of acquiring images, they can be assessed in an objective structured exam in a simulated setting for milestone 2. providing and saving multiple exams leads to 3 and 4 while level 5 is reserved for expertise.

The milestones between undergraduate medical education and graduate medical



education may be a bridge where learners can demonstrate competency rather than layer education temporally between various educational strata. The undergraduate medical education experience is a rich one with inquiry, content and opportunity, especially with ultrasound. Milestones help define the competency curve of the learner as they attempt to master this skill to image patient anatomy, use ultrasound images/videos and provide care.

The aggregate of ultrasound experiences can be appropriated into body areas or organ system and academic programs built around these content areas. Advanced competencies build on those basic skills in areas of acquisition, interpretation and medical decision making in a variety of clinical scenarios.

Interpretation skills can be measured in a knowledge exam while medical decision making and compliance are assessed in a quality assurance program. The learner's digital portfolio is an evolving record of milestones in simulation and clinical cases each learner logs during their training period. Since this field is just beginning, this framework serves as an introduction to this important topic area and may provide a comparative to future advances in this area.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

## 26. Head and Neck Ultrasound: A Multimodal Education Approach in the Predoctoral Setting

**INTRODUCTION:** The traditional method of ultrasound instruction in medical education is to have ultrasound taught on a live, healthy model in conjunction with standard physical exam maneuvers. However, this method cannot demonstrate pathology and does not allow students to practice more advanced ultrasound procedures. In this study, we demonstrate that by augmenting the traditional instructional program with additional modalities, students can gain a more comprehensive understanding of ultrasound technique and gain a greater confidence in their own ultrasound skills.

**METHODS:** A new, multimodal curriculum was developed and applied to the Head and Neck module of the 2014 Loma Linda University Ultrasound Symposium. The teaching sessions were divided into five components: 1) an instructor given didactic session that focused on anatomy and pathology, 2) an instructor given live model demonstration of normal anatomy and ultrasound technique, 3) student practice session on a live model, 4) computer simulated pathologic cases, and 5) fine needle aspiration (FNA) biopsy on ultrasound phantom models.

Students were asked to fill out a brief survey rating each teaching method as well as rating their confidence with head and neck ultrasound before and after the teaching session. Data from these surveys was analyzed as a whole as well in groups of MS1+MS2 students who had received previous ultrasound training and MS3+MS4 student who had not.

**RESULTS:** The survey showed that students previously trained in ultrasound had an average pre-instruction confidence with head and neck ultrasound of 4.14/10 compared to 1.44/10 in the ultrasound naïve group ( $p=0.003$ ). Following the instructional sessions, the students' confidence increased respectively to 8.14/10 and 7.78/10 ( $p=0.53$ ), showing a 4.14 (96%) increase in the

MS1+MS2 and a 6.34 (440%) increase in the MS3+MS4 group.

The highest rated instructional method for MS1+ MS2 group was instructor demonstration on live model (9.5), while the lowest rated was the computer simulation cases (7.79). For the MS3+MS4 group, the highest rated category was participant practice on live model (9.78) and the lowest rated was the didactic presentation (8.22). The combined results among all students rated instructor demonstration on a live model highest (9.47) and computer simulation cases lowest (8.25)

**CONCLUSION:** Overall, our study shows that a multimodal ultrasound instruction was beneficial in increasing medical students' confidence in head and neck ultrasound. All five modalities were rated highly by students, and the results of pre- and post-instructional surveys showed a significant increase in confidence in both ultrasound "naïve" and ultrasound trained groups. It is our hope that more medical schools will expand their curriculums so that students are given well-rounded ultrasound education including normal anatomy, pathological findings, and procedural techniques.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

## 27. Does the addition of an integrated cardiac ultrasound curriculum to the first- and second years of undergraduate medical education enhance comprehension of cardiac physiology and pharmacology?

F. Lattanzio and the EVMS Ultrasound Group. Eastern Virginia Medical School, Norfolk, VA..

**BACKGROUND:** Understanding cardiac physiology is a formidable educational challenge encountered by entering medical students. The complex series of electro-mechanical events that occur during the cardiac cycle can be difficult to comprehend. Deficiencies in learning cardiac physiology are manifested in lower cardiac physiology test grades, coupled with lower student course evaluation scores. In addition, learning deficits may carry over into the second year, impairing performance in cardiovascular pharmacology. Our hypothesis is that by using ultrasound to visualize the cardiac cycle and other dynamic events, medical students can better comprehend and retain the fundamental elements of cardiac mechanics and function throughout their medical school tenure and beyond. The purpose of this abstract is to present preliminary data examining this hypothesis.

**METHODS:** The average GPA and MCAT scores of entering classes in years 2003 -2013 at Eastern Virginia Medical School (EVMS) were used to estimate performance of first year medical school students who were taught cardiac physiology presented in a consistent format by EVMS instructors over a ten year period. Standardized test questions were used to create two examinations encompassing cardiac physiology, with approximately 40 five-choice questions per exam. Student responses were graded and discrimination ratios determined for the questions utilized. Results of student course evaluations were collected using a 0 (poor) to 5 (excellent) scale. In addition to the standard curriculum, the most recent student groups (2012 and 2013) received ultrasound training. The ultrasound

educational program included six didactic and five "hands on" laboratory sessions scanning standardized patients. Ultrasounds were performed using GE Logic e and V-scan ultrasound systems.

**RESULTS:** The average GPAs and MCAT scores of years 2003-2011 entering medical students were not significantly different from years 2012 and 2013. In 2003- 2011, medical students' averaged scores for both cardiac physiology exams were 81.5+2.8. In 2012 and 2013, students' averaged scores were 88.35 and 86.5 respectively, trending nearly two standard deviations higher than the 2003-2011 average. Cumulative test scores for all other physiology sections were 83.5+4.46 in 2003-2011 compared to 84.3+2.37 in 2012 and 87.2+5.8 in 2013 (not significantly different). Student physiology course evaluations averaged 3.92 in 2012 and 3.8 in 2013, trending higher than 3.21 in the previous years. Of the 2012 and 2013 students responding to course surveys, ~99% affirmed that learning ultrasound improved their overall medical school experience. The 2012 and 2013 class data demonstrated positive trends linking cardiovascular pharmacology and physiology test scores with ultrasound test scores.

**CONCLUSIONS:** Our data demonstrate upward trends in cardiovascular physiology and pharmacology test scores and student course evaluations when an ultrasound curriculum is integrated into the first-year of undergraduate medical education. In addition, students felt that ultrasound improved their overall medical school experience. We will continue to follow the performance of these medical student classes to determine if there will also be a trend for improvement in clinical tasks involving elements of cardiac physiology in the third and fourth years of medical school.

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### FORMAT:

 Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

## 28. Assessing Medical Student Background Characteristics, Psychomotor and Visual-spatial Abilities and How They Correlate with Aptitude in Learning Medical Ultrasound

**INTRODUCTION:** Ultrasound skills are integral to the practice of emergency medicine. Its application requires bimanual dexterity and training in 3D image interpretation. However, given its technological complexity, many training programs lag in assessing the skill of its trainees in this task. This begs the question as to whether individual background characteristics or intelligence types are predictive of aptitude in this area.

**STUDY OBJECTIVES:** To determine whether trainee background characteristics or intelligence types: Psychomotor (PM) or Visual-spatial (VS), are more predictive of increased aptitude for learning ultrasound.

**METHODS:** This prospective study was conducted with a cohort of 3rd year medical students rotating through their emergency medicine clerkship at NY Methodist Hospital, Brooklyn, NY. IRB approval and written consent for participation was obtained. Students with previous exposure to the administered intelligence assessments or medical ultrasound training were excluded.

A survey was created based on previous procedural aptitude studies assessing medical student background characteristics; information on hand dominance, self-report of anatomy knowledge, skill at geographical map interpretation, video game and computer

usage, and interest in learning ultrasound. Subsequently, the Purdue Pegboard (PM task) and the Revised Purdue Spatial Visualization Tests (VS task) were given and scored for each student.

Each student was tested separately with a simple ultrasound task; identifying the subxiphoid (SX) cardiac view. First, a brief video tutorial on basic ultrasound instrumentation was given to each subject. In addition, the correct SX view was shown to them. Immediately after, the students had to identify an optimal SX view on a model. A rubric assessed each student's ability in this area, with a single rater giving an ultrasound task score (UTS). This was validated by also testing on ultrasound-trained physicians. A score of 75% or higher was considered to show proficiency.

**RESULTS:** Forty-eight medical students were tested. One medical student was excluded from the study due to previous exposure to the PM task. For the pre-test survey, an analysis of variance was used to determine whether any background characteristics had positive correlation with the UTS. The student's interest in learning ultrasound showed the most correlation with a p-value of 0.01. Comparing the PM and VS tasks, linear regressions against the UTS were used. Respectively, the p-values were 0.08 and 0.02.



**CONCLUSIONS:** The study results were statistically significant when looking at a student's interest in learning ultrasound and their visual-spatial ability based on the Revised Purdue Spatial Visualization Test. These are noteworthy findings that suggest that a beginner's enthusiasm in learning may help them grasp this skill easier than others. Furthermore, ultrasound is a skill that is based in spatial relationships and a higher aptitude in this ability may predict who will succeed at learning medical ultrasound. Enrollment is still ongoing.

## 29. A Pilot Study of Ultrasound Education at Harvard Medical School: First Year Experience

**BACKGROUND:** Point-of-Care ultrasound (POCUS) use is expanding across all medical specialties and there has been increasing interest and effort to introduce ultrasound into the medical school curriculum. Ultrasonography has been shown to be feasible, well received, and to enhance learning across all four years of medical education.

**OBJECTIVES:** To determine the feasibility of integrating clinician-performed ultrasound into the Harvard Medical School curriculum. Led by a multidisciplinary team of instructors, ultrasound was introduced into the first year anatomy course as well as the second year physical exam course.

**METHODS:** During the gross anatomy course, 176 first-year medical students attended a 40-minute introductory lecture and participated in four small-group sessions during dissection lab sessions. Focused ultrasound sessions reviewed anatomy of the neck, chest, cardiac system, and abdomen.

For the physical exam course, 4 brief lectures followed by hands-on sessions were introduced to 38 second year students. Four sessions were developed, including: 1) introduction to ultrasound; 2) the evaluation

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Graduate Medical and Continuing Education

of the neck and thyroid; 3) the musculoskeletal exam; and 4) the abdominal exam. Pre- and post- course questionnaires were administered to evaluate student-perceived experience, attitudes, understanding, and knowledge of ultrasound, and its applications to learning the physical exam.

**Results:** The four sessions integrated into the gross anatomy lab proved feasible. Among the first year students, 91% agreed or strongly agreed that the ultrasound sessions were a positive addition to the course.

Within the physical exam course, 33 out of 38 students (87% response rate) completed a post-assessment survey of the ultrasound sessions. Using a 5-point Likert scale, 94% of students strongly agreed that they would like to see ultrasound incorporated into the medical school curriculum, and 95% felt that US teaching should continue to be part of the physical diagnosis course. Eighty-eight percent of students agreed that the ultrasound sessions allowed them to more effectively learn the physical exam and improved confidence in their exam skills. In addition, 91% of students agreed or strongly agreed that ultrasound should be given additional time throughout the 4 year medical school curriculum.

**CONCLUSIONS:** Clinician-performed ultrasound can effectively be integrated into the Harvard Medical School curriculum by utilizing didactic and small group hands-on sessions. Medical students perceived that ultrasound training in the curriculum is valuable in understanding human anatomy as well as learning physical exam skills. Following this pilot program, students surveyed overwhelmingly desired continued and greater incorporation of ultrasonography into the medical school curriculum. We hope to expand on the past year's work and continue towards incorporation of ultrasound education into all four years of the Harvard Medical School curriculum. This innovative program demonstrates the feasibility of incorporating clinician-performed ultrasound as an additional learning modality during medical school education.

### AUTHORS:

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education



### 30. Syncing Glass with novel SonicEye ultrasound linear and biplanar finger transducers during anatomy dissection lab exams of 1st year medical students

**INTRODUCTION:** Google Glass provides a freedom to allow the user to become more directly engaged with the task that involves a combination of technology and human interaction. An ideal physical examination would involve acute observation of subtle signs, palpatory information, and viewing of the architecture of the anatomy beneath the surface. The objective of this study was to investigate whether Glass and a novel ultrasound finger transducer can be integrated during a medical anatomy lab to teach and examine ultrasound skills.

**METHODS:** Literature search was conducted regarding the use of Glass synced with ultrasound to teach and examine ultrasound skills during anatomy lab. Glass was synced with the Sonivate SonicEye ultrasound finger probe using the Fukuda-Denshi UF-760AG system to identify common important clinical structures. Thirty minute blocks were allocated for each student (n=15), during dissection of each region of the body: upper limb, thorax, abdomen, pelvis, and lower limb. Students were encouraged and given access to practice with combined Glass and ultrasound finger transducer. During each anatomy lab exam Glass synced with ultrasound finger transducer was used by each student to identify a structure after reading a short vignette. A Likert Scale was applied to a questionnaire following the anatomy lab course. **RESULTS.** No studies were identified regarding Glass synced with ultrasound to train and examine first year medical students. The results of correctly

identified structures from clinical vignettes during each anatomy lab examination was 87% for the first exam, 100% for the second exam, and 80% for the third exam respectively. The questionnaire regarding Glass synced with ultrasound use and assessment revealed an average Likert score of 4.0. **DISCUSSION.** Glass technology can provide the opportunity to strive for the ideal physical examination of acute observation, palpatory information, and imaging of the body's architecture during movement. In order to achieve the benefit of Glass synced with ultrasound, it may be essential to acquire a basic foundation of Glass with ultrasound skills during an anatomy dissection course. This study revealed that fifteen students during an accelerated summer anatomy course with cadaver dissection were able to acquire the basic technical skills to use Glass synced with ultrasound to identify clinically relevant structures demonstrated by examination results and Likert scale scores. **CONCLUSION.** This study revealed that Glass synced with a SonicEye ultrasound finger probe can successfully combine modern technology and physical examination with dissection as an effective teaching tool during a medical anatomy lab course for first year students.

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**FORMAT:** Oral

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

### 31. Implementation of an Ultrasound Training of Trainers Program for Limited Resource Settings: A pilot project from Rwanda

**INTRODUCTION:** Clinician-performed Point of-Care ultrasound (POCUS) is emerging as an important diagnostic tool for use in low and middle income countries (LMICs) and other resource limited settings. The most prominent barrier to adoption of this operator dependent modality in LMICs is lack of training. To create sustainable ultrasound services and continued supply of ultrasound-trained clinicians, local trainers must be cultivated. We describe a pilot training program and curriculum for the development of Rwandan physicians into Point-of-Care ultrasound trainers.

**METHODS:** We selected 7 physicians representing 4 hospitals in Rwanda who had previously had at least 6 months of ultrasound experience and coursework. Subjects participated in a 2 day training including education on adult learning theory, commonly made ultrasound mistakes and corrections, focused training in areas of self-identified weakness, and ultrasound specific education methods (Table 1).

Course evaluation included pre and post confidence surveys and pre and post observed ultrasound training skills exams. Wilcoxon Signed-Rank Test was used to compare pre and post-course results.

**RESULTS:** We created a unique curriculum focusing on improvement of trainers personal ultrasound skills, education on methods of teaching and adult learning theory, and ultrasound-specific teaching considerations (table 1). We administered the curriculum using lectures, hands-on practice on live volunteers, hands-on practice on patients with pathology, flip chart discussions and brainstorming sessions, and observed displays of ultrasound training techniques. 7 physicians participated in training provided by 2 ultrasound expert clinicians. We also piloted a novel assessment tool including a pre and post survey assessing confidence in performing and training various POCUS exams; On a Likert scale of 1-5 (least to most

confident) there was an increase in confidence to deliver a lecture (2.6 to 4.3), recognize ((2.9 to 4.6) and correct mechanical learner mistakes in hands-on scanning sessions (3 to 4.4) after the course. Pre and post course observations of course participants teaching ultrasound for trauma (eFAST exam) (Table 2) were conducted. This observed exam included patient and ultrasound learner actors who systematically made a series of common mistakes that the trainer had to recognize and correct to score points. There was a trend toward improvement in confidence in performing and teaching all ultrasound exams, and in the observed ability to teach ultrasound skills.

**CONCLUSION:** We describe a novel curriculum and assessment tools for the development of a cadre of ultrasound trainers in a low resource setting. Future research should focus on the sustainability and productivity of ultrasound trainers in LMICs and the impact on physician performance.

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**FORMAT:** Oral

**TOPIC:** Point-of-Care ultrasound in health care delivery to underserved populations

### 32. A Description of the 4-Year Longitudinal Ultrasound Curriculum Developed at the Wayne State University School of Medicine (WSUSOM)

**OBJECTIVES:** At the completion of this session, participants should be able to:

1. Discuss key components for developing a 4-year longitudinal ultrasound curriculum for undergraduate medical education.
2. Identify core areas in the medical school curricula where ultrasound education can be incorporated.
3. Discuss ways of recruiting faculty to assure program success.
4. Discuss challenges associated with program implementation.
5. Recognize the importance of collaboration with course directors / deans to accomplish the educational objectives.

**DESCRIPTION:** This session will provide participants with a description of effective ways of incorporating ultrasound education into the medical school curricula. Participants will learn about the Wayne State University School of Medicine experience since 2006, when the program was implemented. We will include examples of curriculum documents, and also discuss how an ultrasound program at a large medical school like WSUSOM can be implemented effectively. We will also make mention of the Liaison Committee on Medical Education (LCME) standards, and how ultrasound curriculum objectives can be developed to fulfill some of the requirements for medical student education. We will also discuss unique ways of recruiting enough faculty for training sessions, and the effective use of students as instructors (super users). Course participants will also learn about some of the challenges with program implementation, and how to overcome

potential roadblocks to help establish a firm foundation for a longitudinal four-year curriculum for ultrasound education in medical school.

**Anticipated Outcomes:** Developing effective ways to integrate ultrasound education into the undergraduate medical school curricula. Developing effective evaluation methods. How to develop student interest in ultrasound from Yr 1-4.

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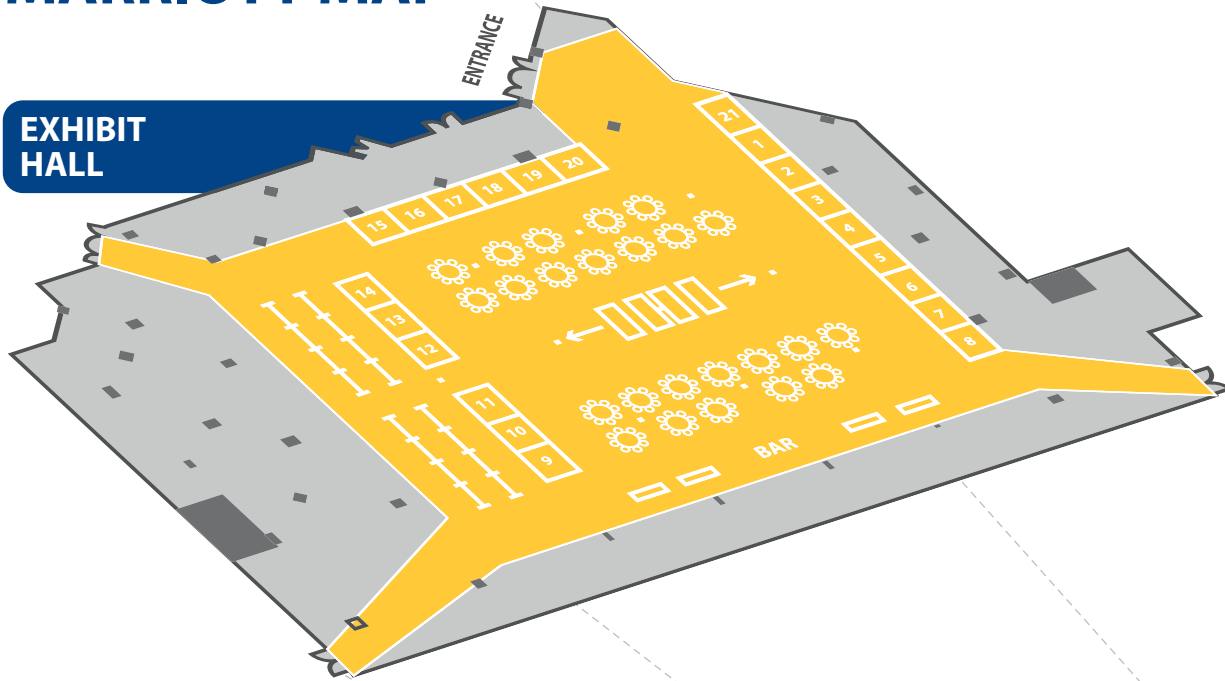
**FORMAT:** Panel

**TOPIC:** Use of ultrasound in Undergraduate Medical Education

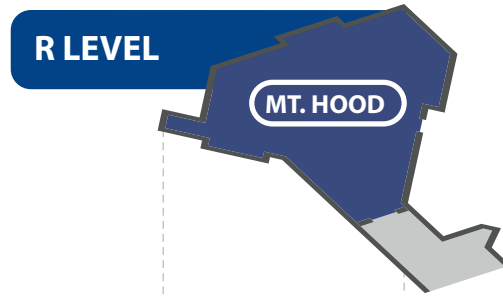


# MARRIOTT MAP

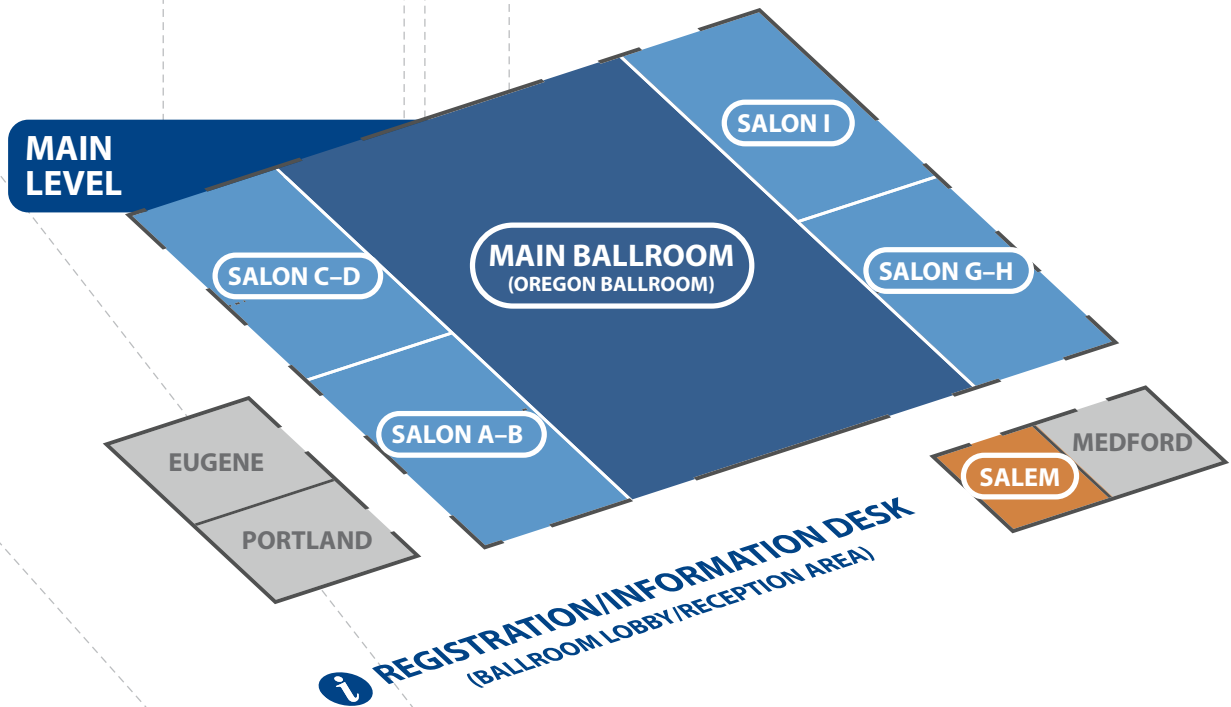
EXHIBIT HALL



R LEVEL



MAIN LEVEL



## KEY

**WELCOME RECEPTION**

MT. HOOD (R LEVEL)

**VISIT THE EXHIBITS & BREAK ROOM**

EXHIBIT HALL

**PLENARY SESSIONS**

MAIN BALLROOM (OREGON BALLROOM)

**CONCURRENT SESSIONS**

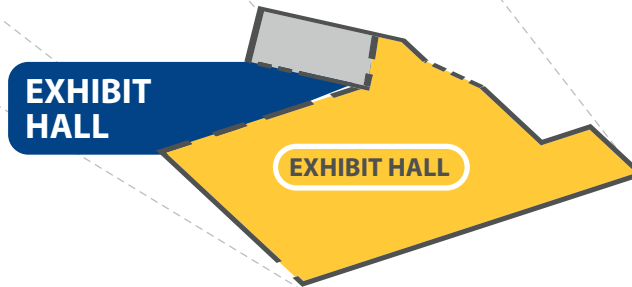
SALONS A-B, C-D, G-H & I

**SPEAKER READY ROOM**

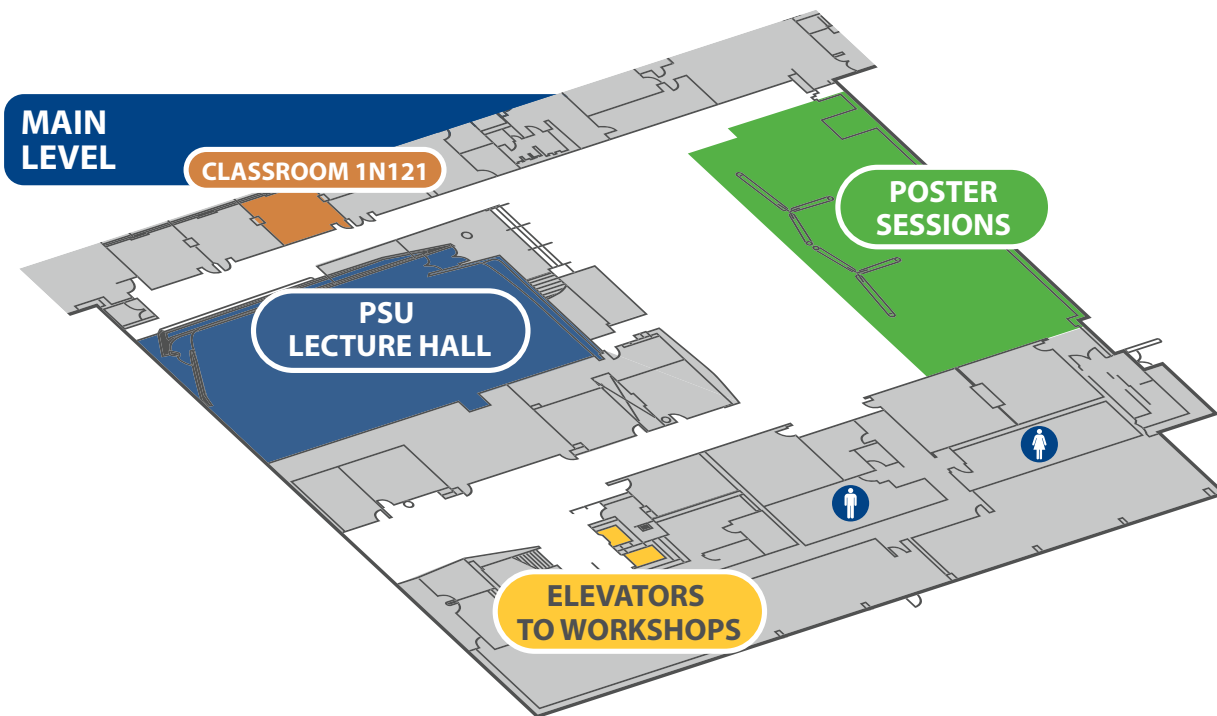
SALEM

**i INFORMATION**

EXHIBIT HALL



# CLSB MAP



## KEY

**PLENARY SESSIONS**  
PSU LECTURE HALL

**POSTER SESSIONS**

**ELEVATORS TO WORKSHOPS**

**SPEAKER READY ROOM**  
CLASSROOM 1N121

**WOMEN'S RESTROOM**

**MEN'S RESTROOM**

## EXHIBITORS:

GE 1-2

CAE Healthcare 3

Sonosim, INC. 4

Medaphor 5

Phillips 6

Samsung 7

Terason 8

American Registry for Diagnostic Medical Sonography 9

Limbs & Things 10

Sonivate 11

3D Systems, Symbionix 12

Syndaver Labs 13

Telexy Healthcare, Inc. 14

Jump Trading Simulation and Education Center 15

Society of Ultrasound in Medical Education 16

Cook Medical 17-18

FUJIFILM Sonosite, Inc. 19-20

7D Imaging, Inc 21

# WCUME 2014: At a Glance

**Thursday,  
October 9th**

3:00–8:00PM	Registration/Information Desk at Marriott
5:00–7:00PM	Welcome Reception at Marriott

**Friday,  
October 10th  
Portland Marriott**

7:00AM–5:30PM	Registration/Information Desk
7:00–8:00AM	Breakfast
8:00–9:30AM	Plenary Sessions
9:30–10:00AM	Break
10:00–11:30AM	Plenary Sessions
11:30AM–1:00PM	Lunch/Poster Presentations
1:00–2:30PM	Concurrent Sessions
2:30–3:00PM	Break
3:00–4:30PM	Concurrent Sessions
5:00–8:00PM	Hosted Reception: Welcome to Portlandia

**Saturday,  
October 11th  
Portland Marriott  
& CLSB**

7:00AM–5:30PM	Registration/Information Desk at Marriott
6:30–8:00AM	Breakfast at Marriott
7:15AM	Shuttles to CLSB from Marriott
8:00–9:30AM	Plenary Sessions
9:30–10:00AM	Break
10:00–11:30AM	Plenary Sessions
11:30AM–1:00PM	Lunch/Poster Presentations
1:00–4:30PM	Ultrasound World Cup Preliminary Rounds
1:00–2:00PM	Workshops
1:30–4:00PM	WINFOCUS Meeting
2:15–3:15PM	Workshops
3:30–4:30PM	Workshops
4:30–5:00PM	Ultrasound World Cup Finals
4:30–6:30PM	Best of Portland: Wine and Roses Reception

**Sunday,  
October 12th  
Portland Marriott**

7:00–8:00AM	Breakfast
7:30–8:00AM	Awards
8:00–9:30AM	Plenary Sessions
9:30–10:00AM	Break
10:30–11:30AM	Townhall: Towards a Common Ultrasound Curriculum
11:30AM–12:00PM	Break
12:00–2:00PM	Invitation Only: Ultrasound Curriculum

## Oregon Health & Science University is proud to host WCUME 2014.

It would not have happened without the time and dedication of the following people:

**Jennifer Boyd, PhD, MBA**

**William E. Cameron, PhD**

**Cathy Erickson, MD, PI**

**Renee Dversdal, MD**

**Erica L. Mitchell, MD, MEd, SE, FACS**

**Jesika Gavilanes, MA**

**Julie Meek**

**OHSU Office of Protocol and Events**





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