

MEDB 1.12 Ultrasound Imaging (Sonography)

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MEDB # and Title:	MEDB 1.12 Ultrasound Imaging (Sonography)
Sponsor:	Medical Operations
Discipline:	N/A
Category:	Medical Requirements
References:	SSP 50260 ISS Medical Operations Requirements Document (MORD) SSP 50667 Medical Evaluations Document (MED) Volume B
Purpose/Objectives:	To evaluate health status pre-, in-, and postflight utilizing ultrasound.
Measurement Parameters:	Abdominal and Retroperitoneal Ultrasound, Pelvic Ultrasound (female), Thyroid Ultrasound, Carotid Ultrasound, Venous Ultrasound (Upper Extremity Venous: bilateral internal jugular veins, entire subclavian-axillary axis, and Lower Extremity Venous: bilateral deep veins).
Deliverables:	All pre-, in-, and postflight reports are located and/or accessible from the Electronic Medical Record (EMR) or Picture Archive and Communication System (PACS) systems. Image modality files are included in the PACS or other relevant image viewing/archival software.
Flight Duration:	≥ 30 days
Number of Flights:	All long duration flights
Number and Type of Crew Members Required:	ISS crewmembers
Other Flight Characteristics:	N/A

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3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity	Description: Classes will be conducted to train the crew to conduct in-flight ultrasound examinations.				
	Duration:		Schedule:	Flexibility:	Personnel Required:
	Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	L-12/9 months	+/- one trip	Remote Guider Instructor, Ultrasound Sonographer/Remote Guider, Research Operations and Integration (ROI) personnel, Crewmember, PDL mock up personnel
Ground Support Requirements Hardware/Software	Preflight Hardware:		Preflight Software:		Test Location:
	Flight-like SSC laptop, Flight-like Ultrasound device, Ultrasound gel, BZK wipes, KIM wipes, video camera, video camera cables, video camera mounting hardware, HDMI capable TV; stretcher on wheels with wheel lock; hand sanitizer; NetGear Box and cables; Rolling stool x2; Floor lamp		N/A		JSC Space Vehicle Mockup Facility (SVMF) supporting ISS Ultrasound use and remote guidance simulation
Training Facilities	Minimum Room Dimensions:		Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:
	Standard room, 8 ft. x 10 ft.,		4 (U.S. 110V, Russia 220V)	Ambient, 68°F – 77°F	Dimmed lighting
	Hot or Cold Running Water:		Privacy Requirements:	Other:	
	Hot and cold water for hand washing.		Private room required	Internet access; Enough chairs and tables to accommodate the crew and instructors	
Constraints/Special Requirements:	None				
Launch Delay Requirements:	None				
Notes:	Training procedures can be found in Space Medicine crew training lesson plans and the SODF: ISS Med (Medical Checklist). This training is accomplished in concert with other medical ultrasound training and is not intended to require a standalone class. This class may be combined with the training class for MEDB 1.10.1, 2D Ultrasound, due to substantial overlap of contents. It is accomplished within the 1-hour allocation for crewmembers with prior training or in-flight performance experience (without adding time), or within 1 hour and 15 minutes (total between the training events) for crew members with no prior training or experience (or can be offered to all). An alternative distance training option is available as a substitute for in-person training for crewmembers on a case-by-case basis.				

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3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	Preflight assessment of health status is conducted using Abdominal/Retroperitoneal Ultrasound, Pelvic Ultrasound, Thyroid Ultrasound, Carotid Ultrasound, and Venous Ultrasound, consisting of: Upper Extremity Venous (bilateral internal jugular veins, entire subclavian-axillary axis) and Lower Extremity Venous: (bilateral deep veins).			
	Schedule:	Activity:	Duration:	Schedule:	Flexibility:
		Abdominal and Retroperitoneal Ultrasound	45 minutes.	AME L- 21/18 months	If needed, as close in to schedule as possible
		Pelvic Ultrasound (female)	30 minutes	AME L- 21/18 months	
		Thyroid Ultrasound	20 minutes	L- 21/18 months	
		Carotid Ultrasound Duplex (Complete with Carotid Intima Media Thickness (CMT))	30 minutes	AME 21/18 unless completed within the previous 5 years	
Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	L-21/18 months unless on record			
Ground Support Requirements Hardware/Software	Preflight Hardware:	Preflight Software:		Test Location:	
	GE Logiq E10 Ultrasound or comparable general purpose ultrasound system	N/A		JSC Flight Medicine Clinic (FMC)	
Testing Facilities	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	8' x 10'	2 (110V)	Ambient, no less than 72°F	Dimmed	
	Hot or Cold Running Water:	Privacy Requirements:	Vibration/Acoustic Isolation:	Other:	
Hot and cold water for hand washing	Area with restricted access	N/A	N/A		
Constraints/Special Requirements:	Abdominal and pelvic ultrasounds: No solid food or drinks with high sugar, solids, or carbonation should be consumed by subject for eight hours preceding the test (water and other unsweetened clear fluids, such as coffee or tea, are allowed).				
Launch Delay Requirements:	N/A				
Notes:	Reference - MEDB 2.1 for laboratory testing (MEDB 2.1 update is in work).				
Data Delivery	Raw data/images are transferred to the PACS. Preliminary reports containing preliminary analysis and DICOM images are sent for a Radiologist's clinical interpretation. The resulting final reports are loaded into PACS and accessible from the EMR once received, nominally within 72 hours of the imaging procedure. The report will be included in the crewmember's medical record. Discrete data parameters are archived in a structured data storage format.				

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3.5 In-flight Activities

TABLE 3.5: IN-FLIGHT ACTIVITIES

In-flight Activity	Description:	Venous Ultrasound, consisting of: Upper Extremity Venous (bilateral internal jugular veins, entire subclavian-axillary axis), and Lower Extremity Venous (bilateral deep veins).					
	Schedule:	Activity:	Duration:	Schedule:	Flexibility:	Personnel Required:	
		Upper Extremity Venous and Lower Extremity Venous Ultrasound	USND 2 Set Up (if required)	25 minutes	All long duration crewmembers: L+30, L+60, R-6 weeks, as clinically indicated	+/- 5 days	Crewmembers – Subject and Operator Remote Guider (Sonographer)
			USND 2 Power On	5 minutes			
			Ultrasound Prep	10 minutes			
			Venous Ultrasound (Operator and Subject each)	60 minutes			
Ultrasound Post exam			5 minutes				
USND 2 Stow (if required)	10 minutes						
Procedures:	In-flight procedures can be found within the SODF: ISS Med (Medical Checklist) and PODF: HRF USND 2-Ultrasound 2						
Constraints/Special Requirements:	<ul style="list-style-type: none"> • Ultrasound may not be done during docking, attitude maneuvers, or burns. • Other crew activities in COL should be minimized to prevent bumping/contacting the subject during the scan. 						
Notes	If Ground is unable to perform USND 2 Data Export, an additional 10 minutes (per exam) or 5 minutes (per exam with continuous Ku-band) is required for Crew Data Export.						
Photo/Video Requirements:	<ul style="list-style-type: none"> • Privatized 2-way audio communication • Privatized live cabin video downlink (as requested by remote guidance team or Flight Surgeon) • Privatized live ultrasound scanhead video downlink 						
Mission Extension Requirements:	None; schedule includes venous ultrasound at R-6 weeks						
Landing Wave-Off Requirements:	N/A						
Data Delivery	In-flight ultrasound data/images are routed by the Telescience Center to the Life Sciences Data Warehouse (LSDW) to be verified for corruption, converted, and split, if necessary, by ROI. The converted and split in-flight data/images are transferred back to LSDW, and then transferred to PACS. Preliminary reports containing preliminary analysis and DICOM images are sent for a Radiologist's clinical interpretation, within 72 hours from imaging. The resulting final reports are loaded into PACS and accessible from the EMR once received, nominally within 72 hours of the imaging procedure. The report will be included in the crewmember's medical record. Discrete data parameters are archived in a structured data storage format.						

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3.6 Postflight Activities

TABLE 3.6 POSTFLIGHT ACTIVITIES

Postflight Activity	Description:	Venous Ultrasound, consisting of: Upper Extremity Venous (bilateral internal jugular veins, entire subclavian-axillary axis), and Lower Extremity Venous (bilateral deep veins).				
	Schedule:	Duration:	Schedule:	Flexibility:	Personnel Required:	
		Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	ACI	ACI	Crewmember, Sonographer, Flight Surgeon
Ground Support Requirements Hardware/Software	Postflight Hardware:	Postflight Software:		Test Location:		
	GE Logiq E10 Ultrasound or comparable general purpose ultrasound system	N/A		JSC FMC		
Testing Facilities (NASA/JSC Flight clinic, or other qualified providers)	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:		
	8' x 10'	2 (110V)	Ambient, no less than 72°F	Dimmed		
	Hot or Cold Running Water:	Privacy Requirements:	Vibration/Acoustic Isolation:	Other:		
	Hot and cold water for hand washing	Private room free of distraction	N/A	N/A		
Constraints/Special Requirements:	None					
Notes	N/A					
Data Delivery	Raw data/images are transferred to the PACS. Preliminary reports containing preliminary analysis and DICOM images are sent for a Radiologist's clinical interpretation. The resulting final reports are loaded into PACS and accessible from the EMR once received, nominally within 72 hours of the imaging procedure. The report will be included in the crewmember's medical record. Discrete data parameters are archived in a structured data storage format.					

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3.7 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training:					
Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	L-12/9 months	+/- one trip	Remote Guider Instructor, Ultrasound Sonographer/Remote Guider , ROI personnel, Crewmember, PDL mock up personnel	None
Preflight Activity:					
Abdominal and Retroperitoneal Ultrasound	45 minutes	AME L- 21/18 months	If needed, as close in to schedule as possible	Crewmember, Sonographer	Abdominal and Pelvic ultrasounds: No solid food or drinks with high sugar, solids, or carbonation should be consumed by subject for eight hours preceding the test (water and other unsweetened clear fluids, such as coffee or tea, are allowed).
Pelvic Ultrasound (female)	30 minutes	AME L- 21/18 months			
Thyroid Ultrasound	20 minutes	L- 21/18 months			
Carotid Ultrasound Duplex (Complete with CIMT)	30 minutes	AME 21/18 months unless completed within the previous 5 years			
Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	L-21/18 months unless on record			
In-flight Activity:					
USND2 Set-Up (if required)	25 minutes	All long duration crewmembers: L+30, L+60, R-6 weeks, as clinically indicated	+/- 5 days	Crewmembers – Subject and Operator Remote Guider (Sonographer)	Venous Ultrasound may not be done during docking, attitude maneuvers, or burns. Other crew activities in COL should be minimized to prevent interference with the subject during the scan.
USND2 Power On	5 minutes				
Ultrasound Prep	10 minutes				
Upper Extremity Venous and Lower Extremity Venous Ultrasound (operator and subject each)	60 minutes				
Ultrasound Post Exam	5 minutes				
Ultrasound Stow (if required)	10 minutes				
Postflight Activity:					
Upper Extremity Venous and Lower Extremity Venous Ultrasound	60 minutes	ACI	ACI	Crewmembers, Sonographer, Flight Surgeon	None
Postflight Debrief : N/A					