

# Laerdal SonoSim Ultrasound Solution (LSUS) 2.0

## SimMan Critical Care Bundle

### Peer-to-Peer Checklist

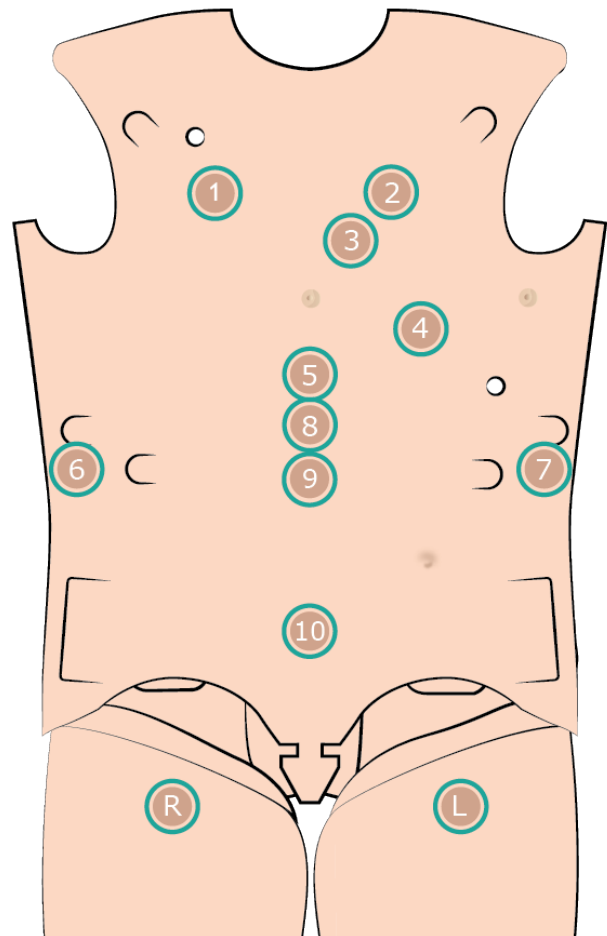
Critical Care bundle contains 10 different actual patient cases as part of the patient assessment and diagnosis.

Target group(s): Healthcare providers that participate in the care of critically ill patients and senior medical students.

Use: Each case checklist outlines the findings for each ultrasound window available for that case. Have the participant scan each location and verbalize their findings and confirm these with the checklist. For a comprehensive, expert-narrated summary of each ultrasound window finding, select the *Findings* tab located in the right menu. The locations highlighted in blue are the sites where ultrasound images can be seen.

#### Critical Care Bundle Active Tags:

1. Right Chest
2. Left Chest
3. Parasternal
4. Apical
5. Subcostal
6. Right Upper Quadrant
7. Left Upper Quadrant
8. Proximal IVC
9. Mid Aorta
10. Suprapubic
Right Groin
Left Groin



## Case 1

**Provide the following case summary** - 39-year-old man who is brought to hospital following a motorcycle accident. He is found alongside the roadway 16 hours after an accident, on a cold winter day.

**Initial Observations:** HR: 48 / RR: 20 / BP: 84/54 / Temp: "T blood" core temp 28C / SPO2-98% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Normal pelvic window; No free fluid; Decompressed bladder with indwelling Foley catheter	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with less than 50% collapse; Right atrial pressure 5 to 10 mmHg	
Mid-Aorta	Normal aorta; Normal caliber mid-IVC segment	
Parasternal	No pericardial effusion; Mildly reduced ejection fraction	
Apical	No pericardial effusion; Mildly reduced ejection fraction; Normal chamber sizes	
Subcostal	IVC diameter less than or equal to 2.1 cm with less than 50% collapse	
Right Chest	Normal lung sliding; No evidence of pneumothorax	
Left Chest	Normal lung sliding; No evidence of pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis (incomplete femoral vein collapse due to insufficient compression rather than thrombus)	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

### Clinical Diagnosis – Moderate hypothermia and hypokalemia

## Case 2

**Provide the following case summary** - 15-year-old male with remote history of myocarditis and recent history of pneumonia, who presents with vomiting and diarrhea for two days and fever for one day.

**Initial Observations:** HR: 130 / RR: 20 / BP: 90/52 / Temp: 38.3C / SPO2-96% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Normal pelvic window; No free fluid; Small bowel containing liquid contents posterior to bladder	
LUQ	No free fluid in splenorenal window; Mild splenomegaly	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Normal aorta; Flattened distal IVC	
Parasternal	No pericardial effusion; Hyperdynamic heart with normal ejection fraction and chamber sizes	
Apical	No pericardial effusion; Hyperdynamic heart with normal ejection fraction and chamber sizes	
Subcostal	No pericardial effusion; Normal LV ejection fraction and chamber sizes	
Right Chest	Normal lung sliding; No evidence of pneumothorax	
Left Chest	Normal lung sliding; No evidence of pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis (incomplete femoral vein collapse due to insufficient compression rather than thrombus)	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Severe hypovolemia secondary to gastroenteritis**

## Case 3

**Provide the following case summary** - 63-year-old male presenting with dyspnea, hypotension, and seven days of bilateral lower-extremity swelling.

**Initial Observations:** HR: 110 / RR: 22 / BP: 77/48 / Temp: 39C / SPO2-93% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Abnormal pelvic window; No free fluid; Decompressed bladder with indwelling Foley catheter and adjacent echogenic mass (organized thrombus vs. solid tumor)	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Normal aorta	
Parasternal	Normal LV ejection fraction and chamber sizes; No evidence of right heart strain	
Apical	Normal LV ejection fraction and chamber sizes; No evidence of right heart strain	
Subcostal	Limited image window quality; Normal LV ejection fraction and chamber sizes	
Right Chest	Normal lung sliding; B-lines; No evidence of pneumothorax	
Left Chest	Normal lung sliding; Increased B-lines; No evidence of pneumothorax	
Right Groin	Right femoral vein DVT; Non-compressible femoral vein; Venous flow absent with color Doppler	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis (incomplete femoral vein collapse due to insufficient compression rather than thrombus)	

**Clinical Diagnosis – Severe sepsis complicated by deep venous thrombosis**

## Case 4

**Provide the following case summary** - 57-year-old male with altered sensorium. There is no history of trauma.

**Initial Observations:** HR: 120 / RR: 24 / BP: 74/38 / Temp: 38.3C / SPO2-92% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Positive RUQ window; Large amount of anechoic free fluid; Small-sized liver with irregular margins and coarse echotexture	
Suprapubic	Positive pelvic window; Multiple areas of anechoic free fluid surrounding bladder	
LUQ	Positive LUQ window; Moderate anechoic free fluid surrounding spleen	
Proximal IVC	IVC poorly visualized; Unable to make clinical inference due to poor image quality	
Mid-Aorta	Normal aorta; Flattened IVC with respirophasic collapse	
Parasternal	Mild LVH; Normal LV ejection fraction; Normal cardiac contractility	
Apical	Mild LVH; Normal LV ejection fraction; Normal cardiac contractility	
Subcostal	Mild LVH; Normal LV ejection fraction; Normal cardiac contractility	
Right Chest	Normal lung sliding; No evidence of pneumothorax; A-line; Positive B-line; Clinical diagnosis of interstitial edema	
Left Chest	Normal lung sliding; No evidence of pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis (incomplete femoral vein collapse due to insufficient compression rather than thrombus)	
Left Groin	Normal femoral vein; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Severe sepsis with distributive +/- hypovolemic shock**

## Case 5

**Provide the following case summary** - 3-year-old with and altered mental status following a motor vehicle accident. The scene contained a lot of smoke and fire.

**Initial Observations:** HR: 78 / RR: 22 / BP: 110/78 / Temp: 37C / SPO2-98% on mask with high flow oxygen

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Normal pelvic window; No free fluid; Prominent prostate gland	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Normal aorta; Collapsed distal IVC	
Parasternal	Normal LV ejection fraction and chamber sizes; No evidence of right heart strain	
Apical	Normal LV ejection fraction and chamber sizes; No evidence of right heart strain	
Subcostal	Normal LV ejection fraction and chamber sizes; No evidence of right heart strain	
Right Chest	Normal lung sliding; No evidence of pneumothorax	
Left Chest	Normal lung sliding; No evidence of pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	
Left Groin	Normal femoral vein study; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Blunt trauma following motor vehicle accident, smoke inhalation injury, including carbon monoxide toxicity**

## Case 6

**Provide the following case summary** - 65-year-old male with acute-onset diffuse weakness.

**Initial Observations:** HR: 94 / RR: 15 / BP: 60/35 / Temp: 36C / SPO2-95% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Positive RUQ window; Anechoic free fluid	
Suprapubic	Positive pelvic window; Moderately distended bladder; Marked free fluid in the pelvis	
LUQ	Positive LUQ window; Anechoic free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Abdominal aortic aneurysm (10 cm) with mural thrombus; Highly reflective linear echo with mural thrombus suggestive of GORE-TEX® graft	
Parasternal	Normal LV ejection fraction; Mild LVH; No evidence of right heart strain	
Apical	Normal LV ejection fraction; No evidence of right heart strain	
Subcostal	Normal LV ejection fraction; Normal chamber sizes; No evidence of right heart strain	
Right Chest	Normal right-lung sliding and comet-tail artifact; No pneumothorax	
Left Chest	Normal left-lung sliding and comet-tail artifact; No pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis (incomplete femoral vein collapse due to insufficient compression rather than thrombus)	
Left Groin	Normal femoral vein; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Hemorrhagic shock secondary to ruptured abdominal aortic aneurysm**

## Case 7

**Provide the following case summary** - 40-year-old female, who has history of metastatic carcinoma, with fever, weakness, and dyspnea.

**Initial Observations:** HR: 76 / RR: 28 / BP: 70/44 / Temp: 39C / SPO2-93% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Normal pelvic window; No free fluid	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with less than 50% collapse; Right atrial pressure 5 to 10 mmHg	
Mid-Aorta	Normal aorta; Plethoric distal IVC	
Parasternal	Pericardial effusion (moderate-size); No evidence of cardiac tamponade	
Apical	Pericardial effusion; Mild heart swinging; No definitive evidence of cardiac tamponade	
Subcostal	Pericardial effusion (moderate-size); no evidence of cardiac tamponade	
Right Chest	Normal right-lung sliding; No pneumothorax	
Left Chest	Normal left-lung sliding; No pneumothorax; Focal comet-tail artifacts	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

### Clinical Diagnosis – Severe sepsis complicated by pericardial effusion



## Case 8

**Provide the following case summary** - 44-year-old female, who has pre-existing cardiomyopathy and an automatic internal cardiac defibrillator, presenting with acute on-set shortness of breath.

**Initial Observations:** HR: 95 / RR: 32 / BP: 85/51 / Temp: 38.1C / SPO2-92% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Live first-trimester intrauterine pregnancy; No pelvic free fluid	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter greater than 2.1 cm with less than 50% collapse; Right atrial pressure 15 to 20 mmHg	
Mid-Aorta	Normal aorta	
Parasternal	Moderately depressed LV ejection fraction; Trace pericardial effusion	
Apical	Moderately depressed LV ejection fraction; Dilated right ventricle with decreased contractility; Pacemaker wire in right atrium and ventricle	
Subcostal	Moderately depressed LV ejection fraction; Pacemaker wire in right atrium and ventricle	
Right Chest	Multiple B-lines; Alveolar interstitial syndrome	
Left Chest	Occasional B-line (clinically diagnosed with cardiogenic pulmonary edema)	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis; Inguinal lymph node	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Pneumonia-related severe sepsis, cardiomyopathy, and live first trimester intrauterine pregnancy**

## Case 9

**Provide the following case summary** - 38-year-old male with altered mental status following a motorcycle accident.

**Initial Observations:** HR: 110 / RR: 28 / BP: 70/42 / Temp: 37C / SPO2-85% on room air

### Ultrasound Findings:

Ultrasound Window	Fidings	Correct Interpretation Yes/No
RUQ	Positive RUQ window; Marked free anechoic fluid	
Suprapubic	Positive pelvic window; Marked anechoic free fluid in pelvis	
LUQ	Positive LUQ window; Anechoic fluid in subdiaphragmatic space	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Normal aorta; Distally collapsed IVC consistent with hypovolemia	
Parasternal	Normal cardiac function; Tachycardic; No pericardial effusion	
Apical	Normal cardiac function; Tachycardic; No pericardial effusion	
Subcostal	Normal cardiac function; Tachycardic; No pericardial effusion; Proximal IVC imaged in held expiration minimizing respirophasic variation	
Right Chest	Multiple B-lines; Alveolar interstitial syndrome; Trace pleural fluid; No pneumothorax	
Left Chest	Lung pulse noted; No lung point seen; No left-lung sliding or comet-tail artifact seen; Bar-code sign on m-Mode Doppler; Finding suggestive of pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Hemorrhagic shock secondary to blunt trauma**

## Case 10

**Provide the following case summary** - 22-year-old female with Hodgkin's lymphoma, undergoing chemotherapy, who presents with lethargy and fever:

**Initial Observations:** HR: 74 / RR: 32 / BP: 73/38 / Temp: 40C / SPO2-90% on room air

### Ultrasound Findings:

Ultrasound Window	Findings	Correct Interpretation Yes/No
RUQ	Normal RUQ window; No free fluid	
Suprapubic	Normal pelvic window; No free fluid; Echogenic debris along inferior bladder wall	
LUQ	Normal LUQ window; No free fluid	
Proximal IVC	IVC diameter less than or equal to 2.1 cm with more than 50% collapse; Right atrial pressure 0 to 5 mmHg	
Mid-Aorta	Normal aorta; Collapsed distal IVC	
Parasternal	Normal heart with hyperdynamic contractility; Normal ejection fraction; No pericardial effusion	
Apical	Normal heart with hyperdynamic contractility; Normal ejection fraction; No pericardial effusion	
Subcostal	Normal heart with hyperdynamic contractility; Normal ejection fraction; No pericardial effusion	
Right Chest	Multiple groupings of B-lines suggestive of increased fluid content; No pneumothorax	
Left Chest	Normal left-lung sliding; A-line; Several B-lines, No pneumothorax	
Right Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	
Left Groin	Normal femoral and saphenous veins; No evidence of deep venous thrombosis	

**Clinical Diagnosis – Pneumonia-related severe sepsis and disruptive +/- hypovolemic shock**