

Schallware Ultrasound Simulator Specification

Hardware/Interfaces

Station-128:

- computer cabinet on wheels
- panel with 23 inches touchscreen
- ultrasound screen with 23 inches screen
- keyboard, trackball
- intel processor i7, 16 GB RAM, 1 TB SSD
- nvidia quadro graphic adapter
- 6 DOF tracking box, electro-magnetical

External interfaces: ssd slot, beamer hdmi , usb , LAN

-wooden table for manikins with integrated transmitter cube
with adjustable back for cardiac application

- dummy probes: convex, sector, linear TV-probe and TEE endoscope
- manikin torso PU foam, PU skin: can be easily put on transmitter cube, no gel:
male manikin with head, oesophagus, chest, hips (or without head and internals)
female manikin 20th week of gestation for abdominal and TV probe
premature/neonatal manikin with cranium, fontanelle, chest and hips
mamma manikin silicone

Content:

-original ultrasound data (full abdomen acquisition), virtual models, additional DICOM data
CT, MRI

3/4D volumes acquired by Schallware optical tracking system or robotic system or data
converter of 4D probes

Optional import of DICOM data as images, cineloops: CT, MRI with review modus (picture
by picture)

Virtual model of abdomen (1 Vol)

Virtual model of abdomen/heart lungs animated (300 Volumes)

About 177 segmented details as vascular tree

Virtual model female abdomen with fetus 12th week of gestation

Virtual model female abdomen with fetus 20th week of gestation

About 70 segmented details as brain development, animated heart

Original ultrasound volumes

Full abdomen acquisition of up to 9 volumes for each patient in different modalities as convex
probe, linear probe, color doppler

Modalities: B-Mode, M-Mode, Color doppler, 4D (fetal and adult heart)

Administration:

define case selection (course), login layout, create and manage study, login layout, QnA
creator as tutorial or examination, instruction creator

Update of software via internet

Internal medicine/paediatrics/emergency medicine/urology: 250 patients

Obstetrics/Gyn/fetal echo/Mamma: 250 patients

Cardiology tte/tee: 80 patients

Software features

- scanning on manikin with dummy probes (convex-linear-sector, TV, TEE endoscope)
- load patients of database (>500 patients), full abdomen, multivolume, 4D, color doppler
- patients are documented with history, pathology, remarks, questions, ROIs, Measurements

- ROI feature, leads you to structures
- Measurement tool: distance ellipse etc. weight estimation for obstetrics, EF cardiology
- Findings writer, saving of measurements (pictures) in pdf document
- Login, define a user group and layout of study content, manage examinations with archive
- 3D window for virtual models (rotate, zoom model)
- Question and Answers, define a QnA script as tutorial or examination with ROI or measurements or multiple choice answers, scoring
- Instructions, creator tool to specify landmarks and target region, start with virtual model and train with real volumes
- administration, access to define ROI, QnA, Instructions, description of cases, import functions, update function

A. male manikin, convex and linear dummy probe

250 patients

up to 9 volumes acquisition to show whole abdomen, documented by ROIs (regions of interest). System can lead you to anatomical and pathological structures.

1. Abdomen General:

- Liver tumors, Peritonitis,
- Liver cysts, Crohn's disease, Adenomyomatosis, Cholecystolithiasis, Nephrolithiasis, Stenosis of ileocecal anastomosis,
- Liver metastasises,
- Polycystis liver and kidneys,
- LTX, NHL (non-Hodkin lymphoma), Gallbladder wall edema,
- Aerobilia, Choledocholithiasis,
- Pancreatic pseudocyst, Chronic pancreatitis, Pancreatic duct dilatation, Necrotizing pancreatitis, Hydronephrosis, Renal pelvic stone, Parapelvic cysts, Ascites,
- Infected splenic cyst,
- Ileus, Peritoneal carcinosis, Skin metastasis, Necrotic liver metastasis,
- Adrenal tumor,
- Appendicitis

2. Abdomen Emergency:

- Thrombus in Vena cava (Budd-Chiari syndrome), Thrombus in middle hepatic vein (renal cell carcinoma),
- Steatohepatitis, Ascites decompensation, HCC (hepatocellular carcinoma),
- Budd-Chiari, Cruveilhier-Baumgarten syndrome, Common bile duct with stones,
- Chronic sclerosing cholangitis (ITBL), LTX,
- Aneurysm of portal and splenic vein with septic thrombus,
- Acute oedematous pancreatitis, Cholecystolithiasis, Biliary duct stones,
- Splenic rupture and necrotizing pancreatitis, Intraperitoneal bleeding,
- Splenic hydatid cyst, Morbus Ormond, Duodeanal stenosis,
- Mechanical small bowel ileus,
- Aortic dissection,
- Acute appendicitis,
- Peritoneal carcinosis by liposarcoma,
- Alveolar echinococcosis

3. Liver Basic:

- Budd-Chiari, Cruveilhier-Baumgarten syndrome, Ascites
- Hepaticojejunostomy, Aerobilia, Renal cyst, Pancreatic pseudo cyst
- Liver cysts, Bright liver tumors
- FNH (Focal nodular hyperplasia)
- NHL (non-Hodkin lymphoma) of liver
- Free fluid, renal cysts
- Fatty liver hepatitis, Cirrhosis

4. **Liver Advanced:**

- Alveolar echinococcosis, Peritonitis
- Hepatic cysts, Enlarged ductus choledochus
- Hydatid cyst WHO CE3a (WHO-IWGE classification)
- Extensive polycystic liver disease
- Hepatitis C, Cholecystolithiasis, normal Lymph nodes in hepatoduodenal ligament
- Toxic liver cirrhosis, Fatty degeneration of the liver, Reopened umbilical vein
- Choledocholithiasis, enlarged Lymph nodes in hepatoduodenal ligament
- Space occupying lesions (metastases of breast cancer), Cavathrombus pars hepatica
- Budd-Chiari, Cruveilhier-Baumgarten syndrome

5. **Liver Emergency:**

- Chronic cholecystitis, CBD stenosis, enlarged lymph nodes
- NET (neuroendocrine tumor), Hepatomegaly
- Big thrombus in Vena cava, Ascites between liver and duodenum
- Steatohepatitis, Ascites, HCC
- Acute cholecystitis with lithiasis, Fatty liver
- Thrombus in hepatic artery stump
- Hydatid cyst
- Bright tumors, Strong dilatation of hepatic ducts, CBD stenosis, Stent implanted
- Peritoneal carcinosis by liposarcoma
- Thrombosis of portal and splenic vein
- Portal vein thrombosis, TIPS, Hypertrophic additional spleen
- Budd-Chiari

6. **Neck:**

- MTC (Medullary thyroid carcinoma)
- Parathyroid gland adenoma
- Medullary hyperplasia
- MEN 2 (multiple endocrine neoplasia type 2)

7. **Emergency / FAST:**

- Acute appendicitis
- Free fluid in Morrison's pouch and Douglas space,
- Perihepatic ascites
- Acute splenic rupture
- Massive left and right pleural effusion
- Aortic dissection type B, Aortic aneurysm and dissection, Marfan syndrome and HTX

ULTRASOUND
SIMULATOR

Internal medicine training

About 350 cases are available for internal medicine, each ready for use with its own data set. This means that each patient represents a single case, consisting of up to 9 volumes. You have the option to switch from one volume to the next and scan the patient's entire abdomen and flanks. All volumes are created with Schallware free-hand technology in high-resolution quality. Because you have access to full-patient data, each case can be used for different diagnostic tasks. You have the option to examine several pathologies in one case, find the cause of a patient's pain or the initial disease that lead to pathological developments. The Schallware Simulator allows real diagnostic training for the entire range of possible pathologies. In addition to this, you can even define your own submodules. Your favourite cases can be found by means of a keyword search machine.



2. Gall module

Gall bladder

1. gall bladder NAD
2. thickened bile
3. sludge
4. microliths

Cholecystolithiasis

1. large stone
2. several medium-sized stones
3. small-particle stones

Bile ducts

1. congested intrahepatic bile duct
2. dilated ductus choledochus
3. cholelithiasis
4. pancreatic tumor



ultrasound window pathology: gall stone



panel window with tutorial



1. Abdomen module

1. liver NAD
2. cholecystolithiasis
3. liver metastases
4. fatty liver with less fatty areas
5. liver cirrhosis
6. liver cirrhosis with ascites

ultrasound window
pathology: cystic liver tumorpanel window
with regions of interest (ROIs)

3. Kidney module

1. kidney NAD
2. Hydronephrosis, ureteral occlusion I-IV
3. renal cyst
4. renal tumor
5. shrunken kidney
6. double kidney

ultrasound window shows resclice according
to convex probe position on manikinpanel window with ultrasound device
controls and patient history.8. **IBD** (Inflammatory bowel disease):

- Normal terminal ileum and appendix
- Ulcerative colitis with stenosis, Pan-ulcerative colitis
- Diverticulitis
- Terminal ileum with stenosis and interloop abscess
- Crohn's disease (with many recordings within a 6 months treatment) with stenosis and fistula, with enterocutaneous fistula and with involvement of cecum, colon and ileum
- Infiltrated appendix
- Colon carcinoma

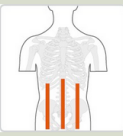

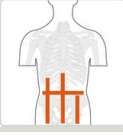
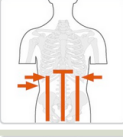
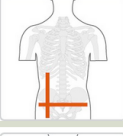

Internal medicine courses:

- a.) Beginner with QnA
- b.) Abdomen general, pathologies advanced
- c.) liver beginner
- d.) liver advanced
- e.) liver
- f.) internal medicine
- g.) Darmsonographie (CED) inklusive Pädiatrie

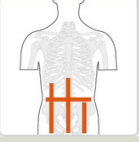



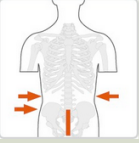
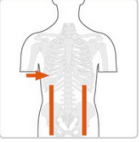
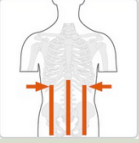
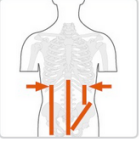
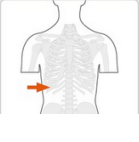
Module: Abdomen Basis ▾

Count of patients: 21

Last Update: 2015-06-17

Name	Ort	Schlagworte	Technologie	Sonde	
Patient 159		Stenotic tumor of Asc.colon, Lymph node metastasis		convex, linear, color	Details
Patient 158		Liver metastasis, Gallbladder cancer, Lymph node metastasis		linear, color	Details
Patient 157		Thrombosis of V.cava, Aneurysm		convex, linear, color	Details
Patient 153		Liver cirrhosis, portal hypertension, cholecystolithiasis, partial portal vein thrombosis		convex	Details
Patient 147		Psoas abscess, Cholecystolithiasis, chronic cholecystitis		convex, linear	Details
Patient 145		Adrenal tumor, CEUS		convex,	Details

Picture shows list of patients with keywords of pathologies (multimorbid patients)
Find out more details under www.schallware.de/cases (ROI images accessible via details-button)

Name	Ort	Schlagworte	Technologie	Sonde	
Patient 157		Thrombosis of V.cava, Aneurysm		convex, linear, color	Details
Patient 151		Hepatic Echinococcus alveolaris, dilated hepatici, purulent peritonitis		convex	Details
Patient 131		Infrarenal aortic aneurysm		convex, color	Details
Patient 126		Acute appendicitis		convex, linear	Details
Patient 125		Free fluid, renal cysts, arteriosclerosis		convex	Details
Patient 124		Hepatic hemangioma, cholecystolithiasis, dilated CBD, ureteral stenosis		convex	Details
Patient 118		Liver cysts, M.Crohn, Adenomyomatosis, cholecystolith., nephrolith., stenosis of ileoc. anastomosis		convex, linear	Details
Patient 116		Left pleural effusion		convex	Details
Patient 115		Right pleural effusion		convex	Details

Another course example: emergency medicine (organ by organ), advanced

B female manikin convex and TV probe, virtual models 12th and 20th week of gestation with animated fetal heart

250 patients, as single volumes, multivolumes, 4D fetal heart volumes

- normal / pathological cases (male formation of organs)
- abdominal, transvaginal and fetal echo examinations
- gynaecological cases with convex and transvaginal probe (TV)

Schallware


Obstetrics training

ULTRASOUND SIMULATOR




Obstetrics training

Pathological vaginal and abdominal cases are available with the use of a normal pregnant female dummy. The obstetrics module allows foetometry of trimenon I, II and III including weight estimation. Different examination types such as 'abdominal' or 'vaginal' enable measurement of correct parameters. Foetal heart cases show several congenital heart defects in motion (4D).




Various virtual foetus models are available for nuchal translucency measurement in the 12th week of gestation and foetometry as of the 20th week of gestation.

1. Obstetrics example trimenon I



long volume acquisition
triplets
measurement of CRL




ultrasound window with reslice image (triplets)




panel window with tutorial


2. Obstetrics foetometry example



long volume acquisition
foetus profile




ultrasound window with reslice image



panel window with tutorial

3. Obstetrics foetometry example 20th week of gestatio






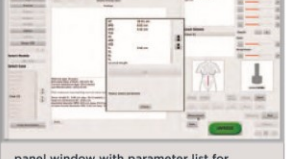
measurement of abdominal diameter (ATD)



measurement of head (HC, BPD)



measurement of femur length (FL)



panel window with parameter list for weight estimation


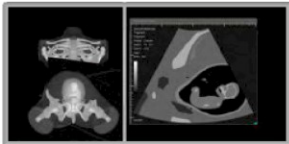
- **Chapter Gemini**
 - Abortion
 - Club feet
 - NT (nuchal translucency)
 - 2 to 12 -multiples
 - Dichorial / diamnial Gemini
- **Chapter umbilical cord, placenta**
 - Breus Mole (massive subchorial thrombohaematoma)
 - Knot or looping
 - Hernia
 - Placenta bipartita, Placenta vacuols, Placenta cysts
 - Extrachorealis
 - Singular artery

Schallware Ob/Gyn TV probe

ULTRASOUND SIMULATOR



Ob/Gyn TV probe

In addition to abdominal convex probe the Schallware simulator provides also transvaginal probe. Besides virtual female model there are transvaginal cases available for obstetrics (trimester I) and gynecology training.





Various virtual foetus models available for nuchal translucency measurement in the 12th week of gestation and foetometry as of the 20th week of gestation.

2. Ob TV example






first trimester screening




list of regions of interest

1. Obstetrics example trimester I

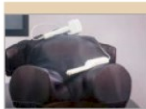




first trimester screening




list of regions of interest

3. Gyn TV example

tumor of right ovary



list of regions of interest

- **Chapter neuro sonography**
 - Blake' Pouch Cyst
 - Corpus-callosum-Agenesie
 - Plexus chorioideus cyst
 - Ventricle-megaly dangling plexus

- White spots
- Holoprosencephalocely








- **Chapter skeleton**
 - Spina bifida
 - Arthrogryposis multiplex congenita
 - Pes equinovarus
- **Chapter urogenital**
 - Potter 2A
 - Kidney cysts
 - Sponge kidney
- **Chapter echocardiography**
(4D STIC volumes implemented in freehand high resolution volumes)
 - VSD (ventricular septum defect)
 - Turner syndrome
 - DORV (double outlet right ventricle)
 - Aortic stenosis
 - D-TGA
- **Chapter abdomen**
 - Gastroschisis
 - Omphalocele
- **Chapter thorax**
 - CCAML Type 1, 2
 - Hernia
 - Diaphragmatica

Following courses are available for ob/gyn:

Obstetrics basis (pathologies, guidelines), first semester screening, prenatal diagnosis (advanced), fetalecho, nuchal translucency measurement

Schallware
 ULTRASOUND SIMULATOR

Fälle	Support	SimCenter	Kalender
Inflammatory Bowel Diseases 2017			
Liver Beginners	ER ZUR VERFÜGUNG STEHENDEN KASUISTIKEN AM SCHALLWARE SIMULATOR FÜR HANDS-ON NG MIT PUPPE UND DUMMY-SONDE ken entsprechen schallbare Aufnahmevolumen. Pfeile zeigen interkostale Fächer-Volumen (fans) an. den zum Beispiel mit Konvex-, Linearsonde und im Farbdopplermodus zu verschiedenen Zeitpunkten chnet. Unter Details finden Sie eine Liste von Bildern, die die Regions of Interest (ROIs) des Falles anzeigen. Der r kann Sie zu einer solchen Struktur (ROI) automatisch führen (bubble in space).		
Lebersonographie			
Abdomen Basis			
Notfallsonographie organspezifisch			
Emergency medicine A and B			
Liver Emergency			
Liver Advanced	Basisultraschall Geburt	Count of patients: 39	Last Update: 2020-08-12
Basisultraschall Geburtshilfe			
ETS, Organscreening und Pränataldiagnostik			

Name	Ort	Schlagworte	Technologie	Sonde	
Case 43		35w, Ventriculomegaly		convex	Details
Case 30		19w, Mega cisterna magna septa		convex	Details
Case 20		12w, Gastroschisis, Dandy Walker complex, Club feet of both legs		convex	Details
Case 68		19w, Ventriculomegaly, Hydrocephalus		convex	Details
Case 34		27w, Diaphragmatic hernia		convex	Details
FH 8		24w congenital cystic adenomatoid malformation of the fetal lung, normal fetal heart		convex	Details
Case 80		27w CDH left (Congenital Diaphragm Hernia)		convex	Details


More information under: www.schallware.de/cases

C. cardiology TTE/TEE

- Virtual heart as idealization to learn standard views
- Standard positions available for clinical data (original ultrasound data):
parasternal, apical, subcostal
- volumes with up to 30 fps
- color doppler volumes

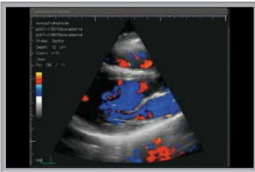
Schallware
Cardiology training TTE and TEE

ULTRASOUND
SIMULATOR

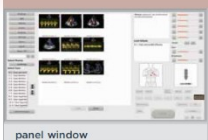


Cardiology training TTE

The cardiology modules are available as an add-on to the internal medicine simulator. They are equipped with an extra tool for left ventricle measurements in B and M modes (EF). All cardiac cases facilitate scans from a parasternal, apical or subcostal perspective. The case database includes the following: kinetics, right ventricle, hypertension in combination with mitral regurgitation and stenosis as well as aortic insufficiency combined with stenosis. What is more, all cases offer extra data in the form of colour cine loops and spectral doppler images.




clinical data: 4D color doppler volumes



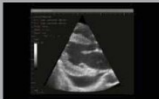
panel window

Pericardial effusion example

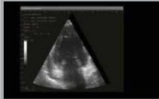
The left picture shows the panel screen displaying ultrasound device controls such as gain and brightness, position of volume, type of probe, freeze button and measurement tool. The two lower right pictures show the distribution of image slices on the ultrasound simulator's screen, reflecting the probe's position on the dummy and the type of probe used. This technology enables you to examine the heart, save cine loops and measure the ventricle's EF.




parasternal short axis




Parasternal view, long axis



jump to apical 4D volume with 2 chamber view



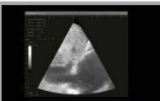
jump to subcostal perspective: right and left ventricles are visible




panel window

Right ventricle example

The image on the left shows a panel screen with additional data as colour doppler cine loops. The pictures below show different perspectives.



subcostal view with congestion



parasternal view with huge right ventricle

26 © 2018/19 Schallware GmbH, Berlin Germany

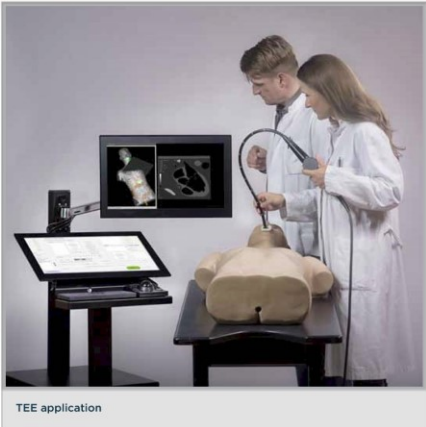
© 2018/19 Schallware GmbH, Berlin Germany 27

TTE case database (40 cases)

- Normal cardiac cases
- Pericardial effusion
- Kinetics
- Mitral stenosis and mitral regurgitation
- Right ventricle
- Aortic regurgitation
- Aortic stenosis

Schallware
Cardiology training TTE and TEE

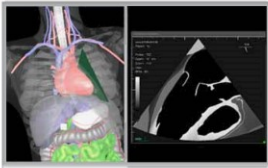
ULTRASOUND SIMULATOR



TEE application


The Schallware Simulator has an inbuilt transesophageal echocardiogram (TEE) application comprising a real endoscope (translation, rotation, flexion and transducer-rotation wheels and buttons) and a dummy with chest and oesophagus. The endoscope allows for all familiar movements, thanks to its two wheels and two electronic buttons (plus and minus) for scanning plane rotation.

The TEE application is based on a virtual model of an animated heart. Pathology data is available in clinical form (4D volumes on fixed positions along oesophagus and stomach).




TEE application and virtual model

The second screen shows the resulting plane of the virtual model or loaded clinical data.



TEE application and clinical data

Select patient and activate clinical data volumes, switch from model to real ultrasound data.



clinical data: 4D color doppler volumes

TEE Application with original endoscope, manikin with oesophagus. In addition to virtual heart model you can load real ultrasound volumes

Schallware

ULTRASOUND SIMULATOR



The Schallware Simulator is based on clinical ultrasound data offering pathological findings as well as variants of anatomical textures and structures in real patients (advanced).

In addition, virtual models of an animated heart, foetus or abdomen are available for continuous scanning around organs to help beginners better understand the body's anatomy.