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Advanced ultrasound training through simulation

# Goals of a simulator

Ultrasound  
realism

Obviously  
simulated



Looks  
“like a patient”

Scanning  
realism

Obviously  
simulated



Feels  
“like a patient”

Cases

Single case



Wide variety of  
clinically relevant  
cases

Learning  
support

“Video  
game”



Can learn without  
a tutor

# ScanTrainer – virtual reality simulation

**Real** patient scans

**Real** feel

**Real** teaching



- 24/7 self-learning
- No need for patients
- Minimises tutor time

**STUDENTS LEARN:**  
FASTER  
BETTER

**HOSPITALS SAVE:**  
RESOURCES  
MONEY

# ScanTrainer - comprehensive learning platform

Real patient scan

The screenshot displays the ScanTrainer simulation interface. At the top, it shows the date and time (Saturday 30 October 2010 12:24:58), the username (Sample Trainer), and the simulation time (00:01:02). The main area features a large ultrasound scan of a real patient, with a green circle highlighting a specific region. Below the scan is a control panel with various settings: Depth Of Field, Zoom, Contrast, Brightness, and Time Gain Compensation. A green circle highlights the Contrast slider. To the right of the scan is a 3D anatomical model of the bladder and probe, with a list of instructions for the first step: '1. Introduce the probe'. The instructions include: 'Introduce the probe in the sagittal plane', 'Keep direction downwards and posteriorly', 'Locate the bladder and position the bladder base in the centre of the field of view, and magnify the image fivefold', 'Freeze the ultrasound image', 'Capture an image', and 'Keep the ultrasound image frozen'. A 'Next' button is visible at the bottom right of the instruction panel.

Generic, user adjustable, ultrasound controls

# ScanTrainer – comprehensive learning process

## STEP 2 - LEARN

The screenshot displays the MedaPhor ScanTrainer interface. At the top, it reads "MedaPhor ScanTrainer" and "Measurement of bi-parietal diameter (BPD) and head circumference (HC)". The main area shows a simulated ultrasound image of a fetal head in a transverse plane. Below the image is a control panel with various icons for functions like "CALIPER", "CALC", "OBS", and "LMS". There are also sliders for "Depth of Field", "Zoom", "Focus", and "Gain", along with a "Time Gain Compensation" section. A "Next" button is visible at the bottom right of the control panel.

Help locating structures

“Watch the expert” ScanTutor videos

Guidance on image optimisation

Structured content covering the curriculum

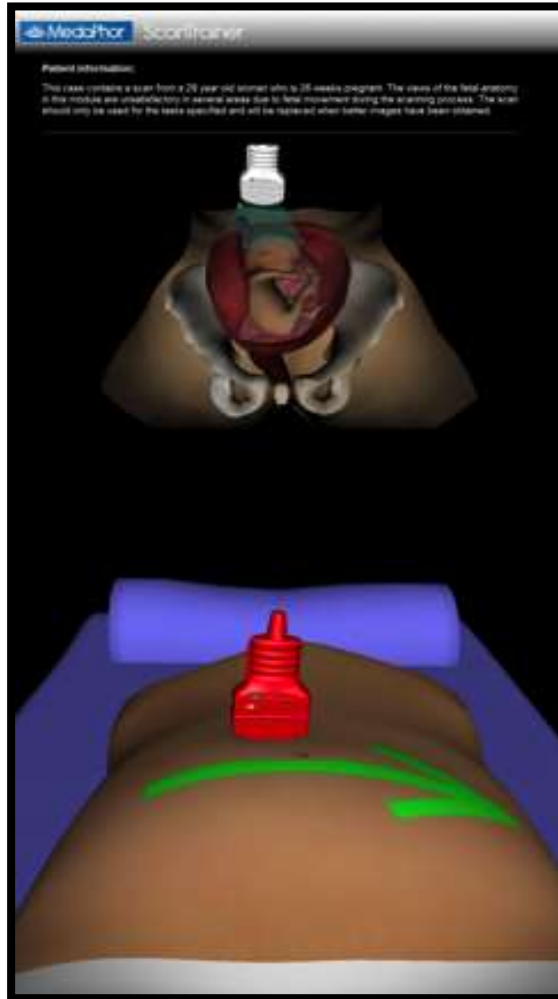
1. Locate the fetal head

- Rotate the transducer to obtain a transverse view of the fetal head in the centre of the field of view.
- Locate and include the following landmarks to demonstrate that you have the correct plane:
  - The **cranial cristum pellucidum**
  - The **posterior horns of the lateral ventricle**
  - The **choroid plexus**
- Optimise the gain and time gain compensation image throughout the depth.
- If necessary, adjust the depth of field then the fetal head occupies between 50 and 75% of the field of view.
- Freeze the ultrasound image.
- Capture your image.

When you have done this, click Next below

# ScanTrainer – comprehensive learning process

## STEP 2 - LEARN



Help  
understanding  
the anatomy

Help orientating  
the transducer

Help placing the  
transducer on the  
abdomen

# ScanTrainer – comprehensive learning process

## STEP 2 - LEARN

The screenshot displays the MedaPhor ScanTrainer software interface. The main window shows a simulated ultrasound scan of a fetal head in cross-section, with a yellow dot indicating the measurement point for the biparietal diameter (BPD). The text "Measurement of bi parietal diameter (BPD) and head circumference (HC)" is visible at the top of the scan area.

Below the scan area is a control panel with several sections:

- Depth of Field:** A row of 10 sliders, with the 4th slider highlighted in green.
- Zoom:** A slider with a minus sign on the left and a plus sign on the right.
- Focus:** A slider with a minus sign on the left and a plus sign on the right.
- Gain:** A slider with a minus sign on the left and a plus sign on the right.
- Time Gain Compensation:** A vertical stack of 8 sliders, with a "Reset" button to the right.

On the left side of the control panel, there is a grid of icons for different scan modes and settings, including "DEFAULT", "Scan Tutor", and "LMS".

On the right side of the interface, there are two 3D anatomical models of a female pelvis. The top model shows a white ultrasound probe positioned over a red and blue fetal head model, with "Off" and "On" buttons above it. The bottom model shows the probe positioned on a flat surface representing the abdomen, with a "Next" button below it.

At the bottom left of the interface, there is a small text string: "System v4.0, Revision 9606, Build Date 2013-09-17 10:55:20 (C), MedaPhor Inc. All rights reserved."



# ScanTrainer – comprehensive learning process

## STEP 3 - ASSESS

Overall Lesson  
Pass/Fail

Every component of the  
scanning skills evaluated

Individual task feedback  
against gold standard

The screenshot displays the MedaPhor ScanTrainer assessment interface. The main content area shows a checklist of tasks for 'Core skills: Gynaecology (TVS-G-CS-001.6)'. The tasks are organized into sections: '4.2. Optimal assessment of the uterine cavity', 'Task 4. Measure the endometrial thickness', and 'Task 5. Withdraw the probe'. Each task is evaluated across four attempts (1st, 2nd, 3rd, 4th). A green circle highlights the overall lesson pass/fail status (a green checkmark), and another green circle highlights a specific task evaluation (a red 'X'). An inset window on the right provides detailed feedback for a task, stating: 'You were 34° from the sagittal plane when placed on the patient but you need to remain within a margin of 30°. The image below is a guide to how the probe should be oriented.' Below the text is an ultrasound image showing the probe orientation.

Task	1st	2nd	3rd	4th
<b>4.2. Optimal assessment of the uterine cavity</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uterus correctly imaged	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Probe remained in the sagittal plane whilst examining the uterus	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appropriate pressure applied	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Task 4. Measure the endometrial thickness</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Endometrial thickness	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Endometrial thickness measured in the correct position	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Endometrial thickness measured perpendicular to the endometrium	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Endometrium correctly positioned	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Probe remained in the sagittal plane	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Endometrium correctly imaged	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appropriate pressure applied	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>Task 5. Withdraw the probe</b>				



# Improving realism. Fetal heart

The screenshot displays the MedaPhor 3D/4D Ultrasound simulator interface. The main window shows a 2D ultrasound image of a fetal heart. The top left corner features the MedaPhor logo and '3D/4D Ultrasound'. The top right corner shows 'Dariusz Walecki' and 'Simulation Time: 00:00:00'. Below the main image is a control panel with various icons and sliders. The right side of the interface shows a 3D model of a fetus with a white heart overlay. Below this model is a 'Begin assignment' section with instructions and a diagram of the simulator setup.

**Begin assignment**

- At the start of each assignment, you will be asked to check the transducer.
- Hold the transducer with its yellow coil against a new center in the virtual anatomy pointing towards the patient's head.
- Lift the transducer from its rest location to a position above the patient in 30 seconds.

When you finish, click Next button.

# Improving realism. Rib shadowing

The screenshot displays the MedaPhor ScanTrainer simulation interface. The main window shows an ultrasound image of a rib with a yellow dot indicating the point of interest. Below the main window is a control panel with various settings and a grid of icons. The right side of the interface shows a 3D anatomical model of a back with a rib shadow, and a list of instructions for the user to follow.

MedaPhor ScanTrainer

Depth of the rib using a subcostal approach

Simulation Time: 00:00:10

Depth Of Field

Zoom

Focus

Gain

Time Gain Compensation

Begin assignment

- At the start of each assignment, you will be asked to check the transducer.
- Hold the transducer with its yellow calibration arrow (left) to the virtual anatomy pointing towards the patient's head.
- Lift the transducer head to next location to a position above the patient as shown.

When you have done this, click Next button.

# Improving realism. Rib shadowing

The screenshot displays the MedaPhor 3000 simulator interface. The main window shows a fetal ultrasound image with a yellow crosshair indicating the probe position. Below the main window is a control panel with various settings:

- Depth Of Field:** A slider control.
- Zoom:** A slider control.
- Focus:** A slider control.
- Gain:** A slider control.
- Time Echo Compensation:** A series of horizontal sliders.

On the right side, there is a 3D anatomical model of a human torso showing the spine. Below the model, the following instructions are provided:

**1. Locate the cervical and thoracic portions of the spine in the sagittal plane**

- Rotate the fetal spine to its sagittal plane.
- Follow the natural curve of the spine on the thoracic and thoracic portions of the spine cone into lung.
- Centerize this area, ensuring that the rib cage is visible.
- Optimize the gain and time echo compensation to achieve an even image throughout the depth.
- Push the image back flat with the base of the skull and the umbilicus as points of action across the front of view.
- Freeze the ultrasound image.
- Capture your image.
- Keep the ultrasound image frozen.

When you have done this, click Next button.

# ScanTrainer modules



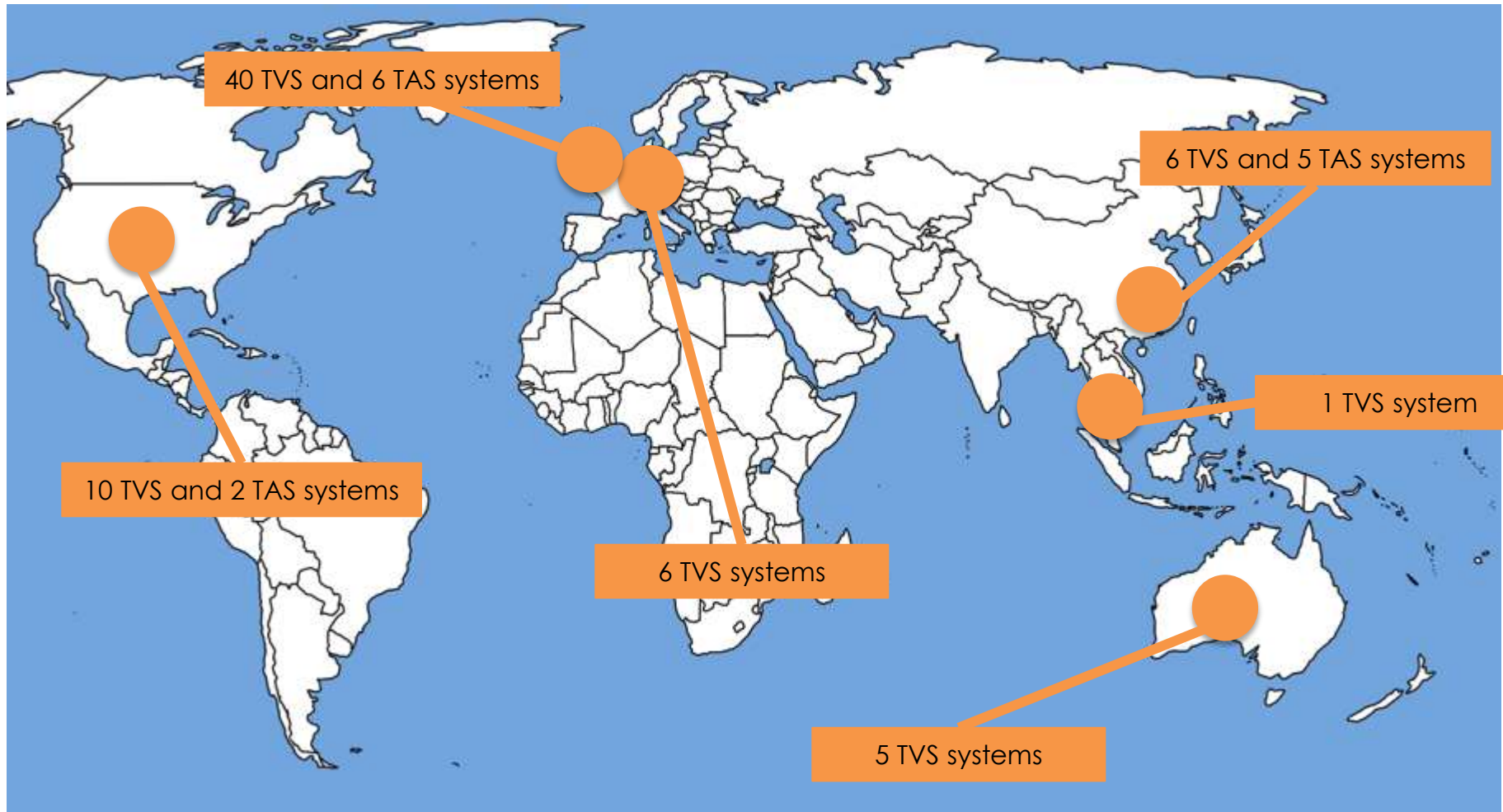
- Core gynae
- Core obstetrics (8, 12 weeks)
- Advanced gynae
  - eg fibroid, cysts, bicornuate uterus, ...
- Advanced obstetrics
  - eg ectopic pregnancy
- Emergency medicine

Advanced ultrasound training through simulation



- Core gynae
- Core obstetrics (12, 20, 30 weeks)
- Upper abdomen
  - Liver, kidneys, spleen, gall bladder, ...
- FAST
- Emergency medicine
- MSK

# Validation worldwide



# ScanTrainer – summary

- **Revolutionary ultrasound simulator**
  - Real feel, real patient scans and real feedback
  - Curriculum-based learning now with ScanTutor
- **Transvaginal & transabdominal systems target multiple clinical areas**
  - Obs & Gynae, Emergency Medicine and Upper Abdomen
- **Over 80 systems installed worldwide**
  - In the UK, ScanTrainer is now considered the gold standard education device
  - Transabdominal system now expanding into many new areas



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