

Technical Specifications: Ultrasound Units



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Ultrasound imaging

- Important diagnostic imaging tool
- Non invasive
- No ionising radiation
- Relative inexpensive
- Readily available
- Easier maintenance
- Operator dependent
- Efficacy proven in many disciplines
- Cost-effective solution in health care



CINE

#255

M

[2D] G44 / P100
80dB / FA6
FSI2 / PGC0

0-

5-

2D 10-

1 Auto Run 2 One/Loop 3 Start Cine 4

FIX SOURCE
RS
2D
64%
C 54
P Low
Res

P

-0

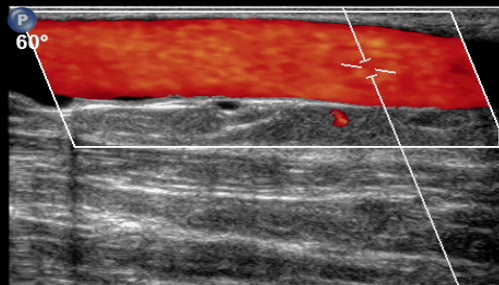
X
-5

17 - WEEK FETAL PROFILE

L17-5/Vasc Art

FR 12Hz
P1

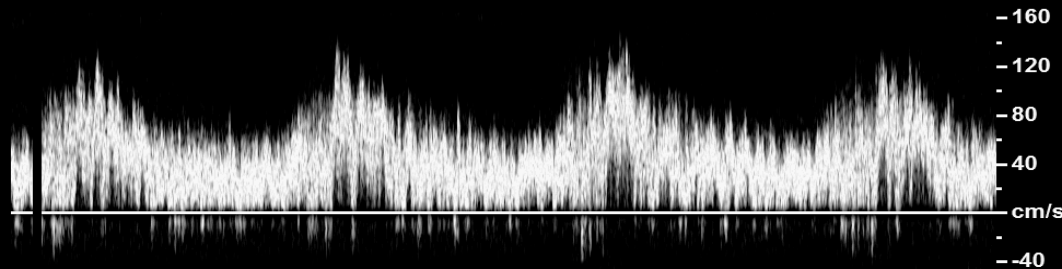
2D
77%
C 52
P Low
Res
CF
68%
7000Hz
WF 280Hz
Med



AGC

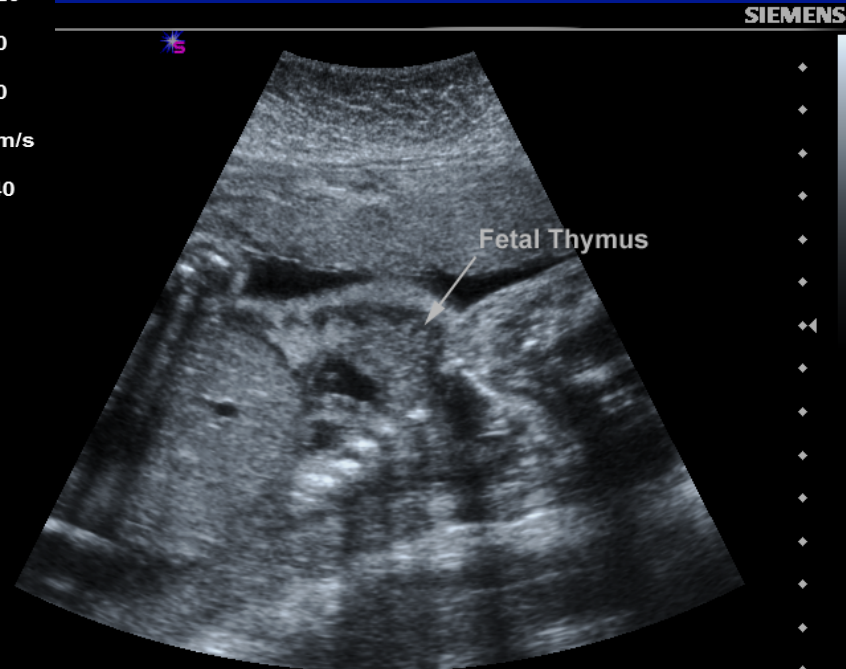
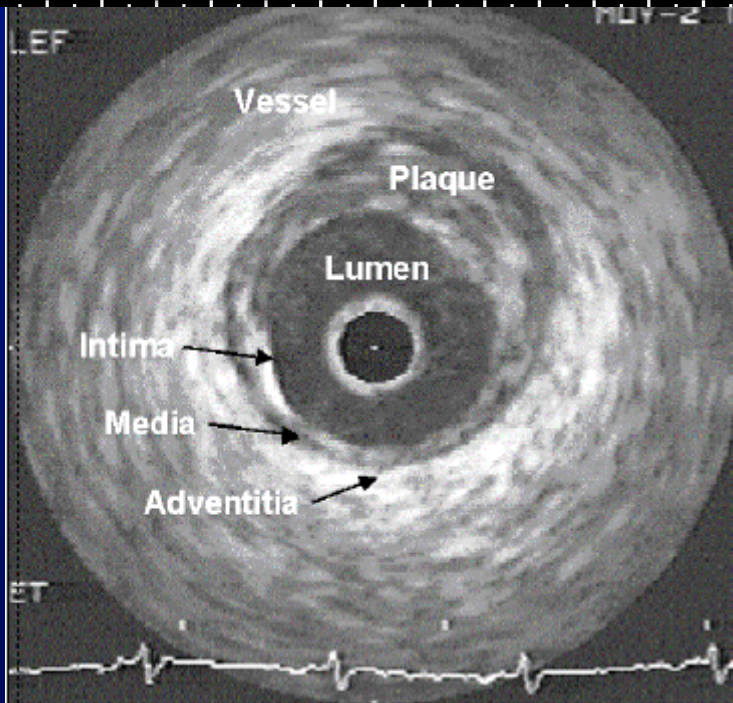
M3 M3
+38.5
-38.5
cm/s

PW
56%
WF 150Hz
SV 1.5mm
M3
7.0MHz
0.6cm



ARTERIOVENOUS FISTULA

3.6sec



Ensemble™ tissue harmonic imaging
2nd Trimester Liver - Lung - Heart - Thymus

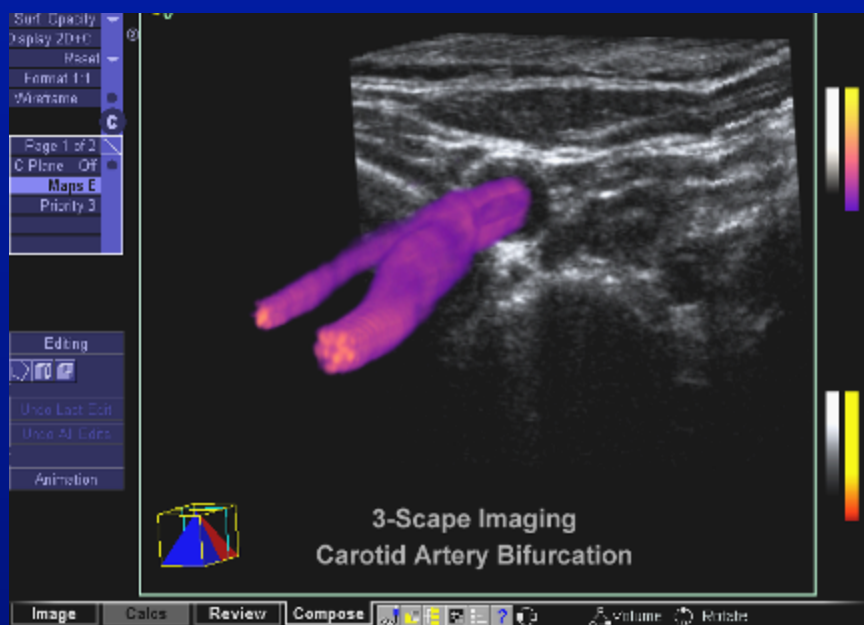
14cm
24fps

Calcs

Review

Compose





Useful resources

- American College of Radiology
www.acr.org
- American Association of Physicists in Medicine www.aapm.org
- Institute of Physics and Engineering in Medicine www.ipem.org.uk

Selection of Equipment

The *clinical applications* and the relative *workload* in each application will determine the specification that is desirable or appropriate:

- An all-purpose general ultrasound scanner in a busy general hospital to cover entire range of common clinical applications (but mainly abdominal work), will require different specs from that is dedicated to musculo-skeletal or vascular imaging.

- A portable machine performing simple investigations will be required to meet basic specs for imaging but will give priority to size and portability, rather than excellent image resolution and sensitivity.

General Considerations for all equipment

1.1 Clinical applications for which the equipment will be used:

- Adult/paediatric
- General abdomen
- Ob/Gyn/foetal
- Small parts/breast/musculoskeletal
- Vascular/cardiac
- Biopsy/interventional

1.2 Workload in each application:

- Main
- Occasional
- Possible future use

1.3 Transducer/ probe required:

- Linear
- Curved linear array
- Phased array/sector
- Endocavitary
- Intraoperative

- Depth range for each type of transducer:
 - Deep
 - Multiple
 - Superficial
- Footprint size
- Biopsy guidance facility

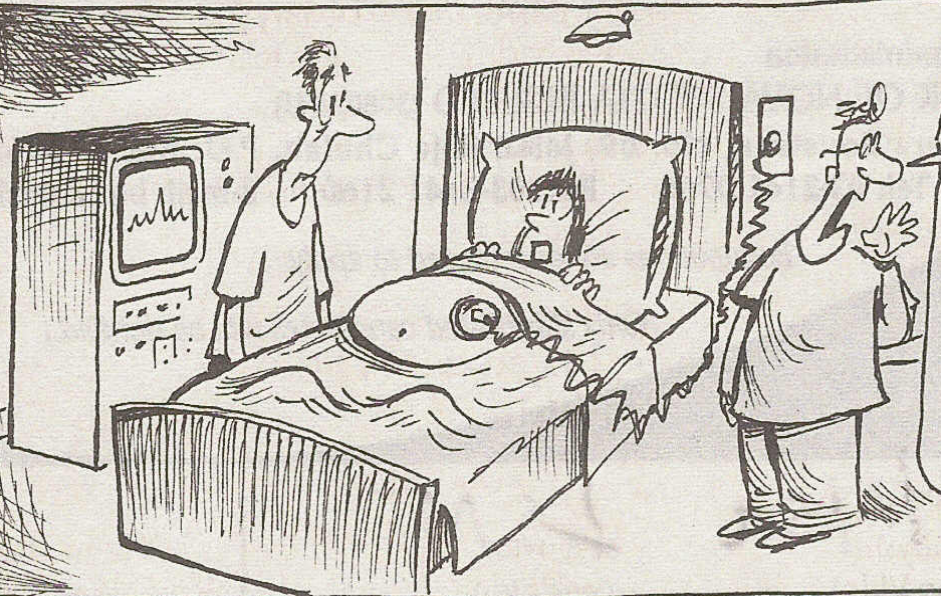
2. Scanning Capabilities required:

- B- and M-mode
- Colour, spectral, power Doppler
- Tissue harmonic imaging
- Contrast agent imaging
- 3-D/ 4-D imaging

3. Physical features:

- Mobility (transportability): static, mobile, portable/emergency
- Screen size, positioning flexibility

THE LAST
THING YOU WANT
TO HEAR WHEN
YOUR WIFE'S
GETTING AN
ULTRASOUND...



BRING
IN THE
WIDE-
SCREEN!

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4-15

SUMMERS

4. Measurement/ analysis facility

- Standard: Distance, area, circumference, volume
- Specialised measurement/ analysis calculations for specific clinical applications such as vascular, obstetric or cardiac work

5. Ultrasound settings

- Magnification facility
- Cineloop review
- Adjustable number and depth of focal zones
- Adjustable signal processing facilities
- Tissue specific pre-sets for individual clinical applications

6. Annotation and documentation

6.1 Display and annotation:

- Patient, centre and date identification
- Text and anatomical site markings
- Ultrasound settings and indices

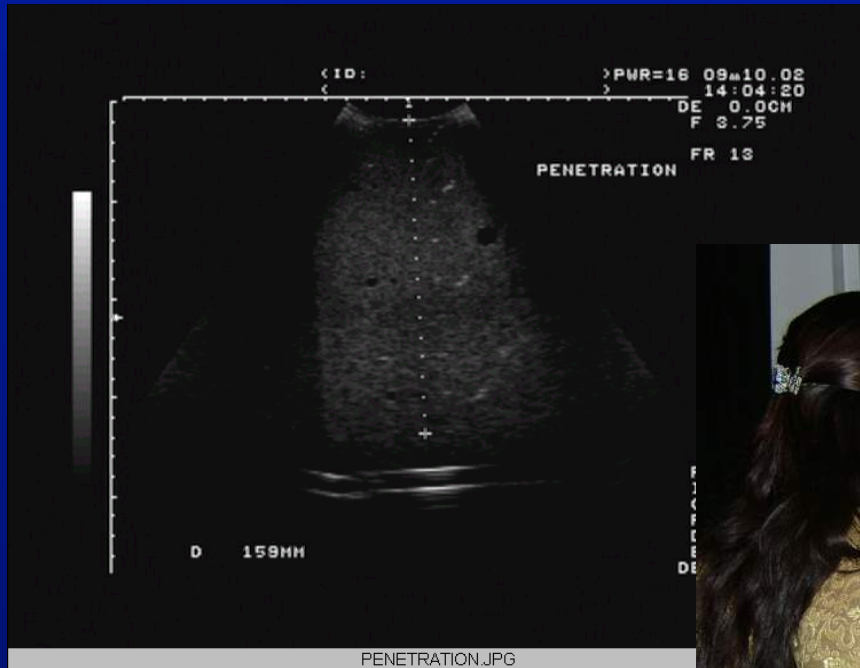
6. Annotation and documentation

6.2 Documentation:

Facility for permanent recording of images:

- Thermal printer (B/W)
- Colour printer
- VHS or digital video recorder
- Connection to local laser printer
- Connection to local imaging network
- DICOM3 compatibility/ print
- MO disk/ DVD

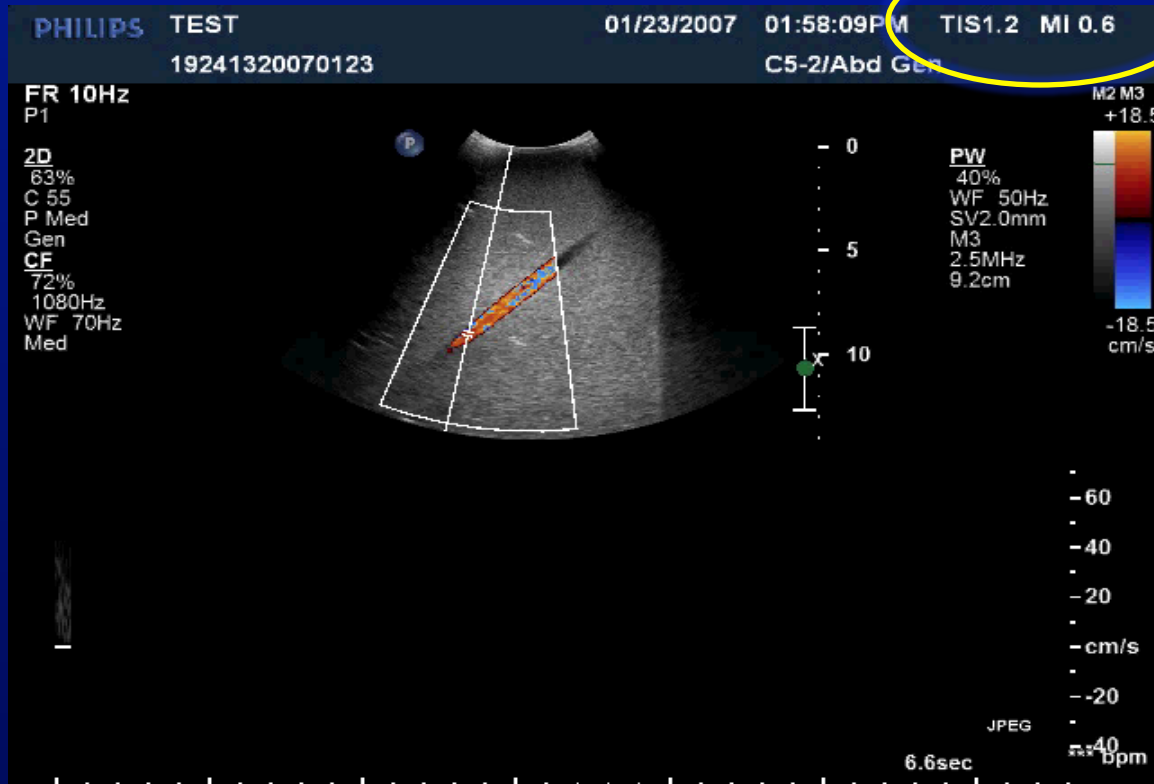
7. Safety, compliance, QA



7. Safety, compliance, QA

AIUM acoustic output/
FDA

Thermal index
Mechanical index



8. Equipment trials and training

- Assess full range of clinical applications
- Evaluate performance
- Application training

9. Equipment review and replacement

- Rapid changes in technology and changing clinical expectations and needs
- Consider upgrade or replacement

Table 1: Specifications for general abdominal ultrasound

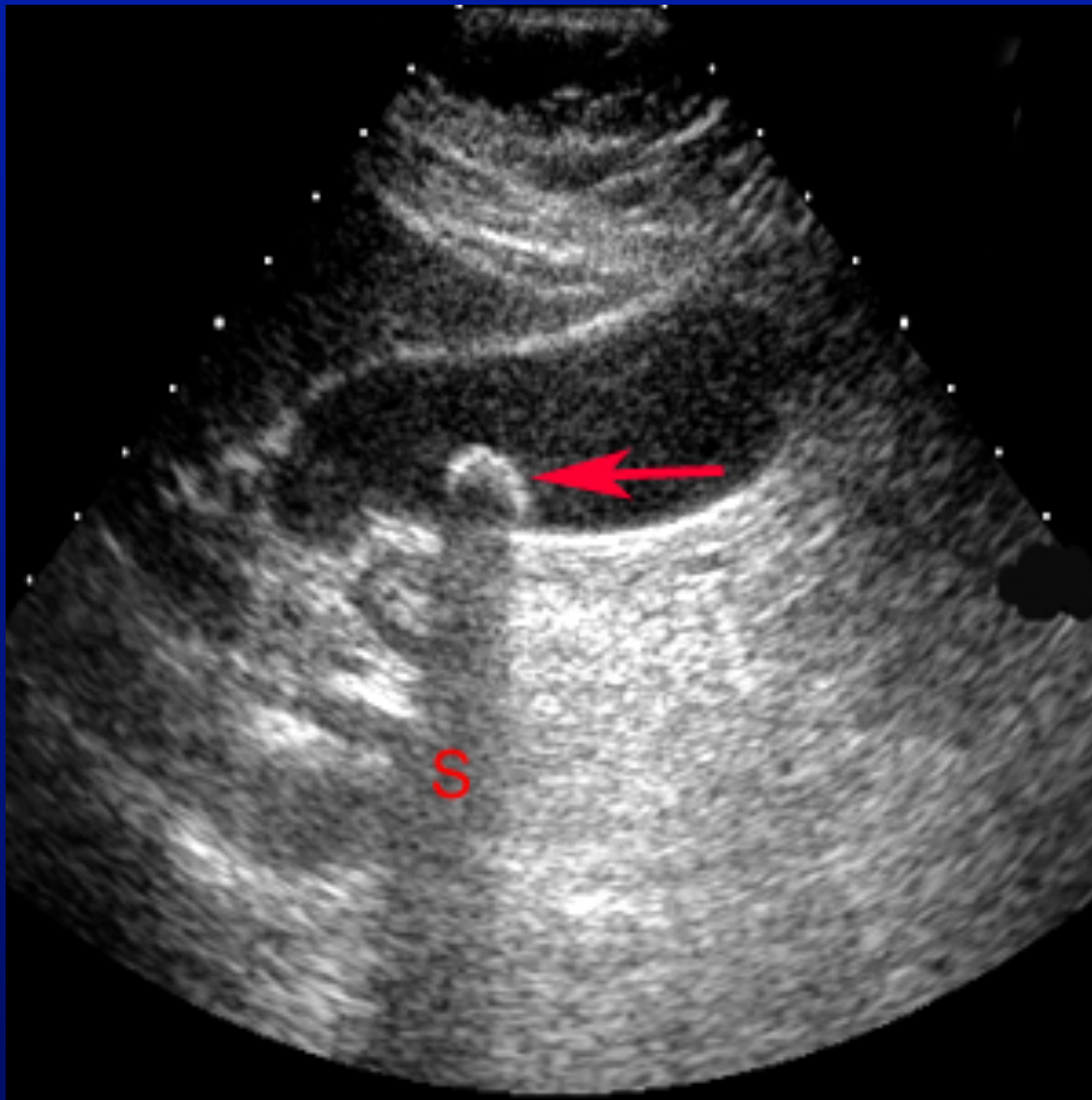
SPECIFICATION	ABDOMINAL	
	Min.	Des.
B-mode Imaging:		
Transducer : linear array (LA), curved linear array (CLA), phased array (PA)	CLA or PA	LA, CLA or PA
Frequency range (MHz)	2-7	2-10
Penetration (cm)	15	18
Spectral Doppler		
Transducer (linear array (LA), curved linear array (CLA), phased array (PA)	CLA	LA, CLA PA
Frequency range (MHz)	2-5	1.5-4
Calculation of waveform indices	manual	auto. & manual

Accuracy of range gate registration (mm)	<1	<1
Penetration (cm)	10	15
Flow imaging:		
Transducer linear array (LA), curved linear array (CLA), phased array (PA)	CLA	LA, CLA, PA
Frequency (MHz)	2-5	1.5-4
Penetration	10	15

Frequency and type of array should be appropriate for depth and penetration.

Take Home Points -1

- Ultrasound imaging is an indispensable imaging tool in diagnosis
- Non-invasive, no ionising radiation
- Readily available
- Easier maintenance
- Efficacy proven in many disciplines
- Cost-effective solution to health-care



Take Home Points - 2

Selection of equipment and technical specs depend on the *clinical applications* and the relative *workload* in each application.