



## **CAR Standards for Ultrasound Examination of the Abdomen and Retroperitoneum**

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These Standards have been developed by the Expert Advisory Panel on Ultrasound chaired by Dr. Shia Salem and presented for adoption to Council by Dr. Donal Downey. Members: M. Atri, M.D., J. Buckley, M.D., P. Cooperberg, M.D., D. Downey, M.D., C. Levi, M.D., V. Nicolet, M.D., Shia Salem, M.D., E. Sauerbrei, M.D., Stephanie Wilson, M.D., W. Zaleski, M.D.

*The standards of the Canadian Association of Radiologists (CAR) are not rules, but are guidelines that attempt to define principles of practice that should generally produce radiological care. The physician and medical high-quality physicist may modify an existing standard as determined by the individual patient and available resources. Adherence to CAR standards will not assure a successful outcome in every situation. The standards should not be deemed inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The standards are not intended to establish a legal standard of care or conduct, and deviation from a standard does not, in and of itself, indicate or imply that such medical practice is below an acceptable level of care. The ultimate judgment regarding the propriety of any specific procedure or course of conduct must be made by the physician and medical physicist in light of all circumstances presented by the individual situation.*

### **I. INTRODUCTION**

These standards have been developed to provide assistance to practitioners performing ultrasound examinations and are based on the standards published by the American College of Radiology and the American Institute of Ultrasound in Medicine. In some cases, additional and/or specialized examinations may be necessary. While it is not possible to detect every abnormality, adherence to the following standards will maximize the probability of detecting most of the abnormalities that occur.

Diagnostic Ultrasound is an established, effective, diagnostic imaging technique which employs the use of high frequency ultrasound waves for both Imaging and Doppler examinations.

Extensive experience has shown that ultrasound is a safe and effective diagnostic procedure. While no demonstrable harmful effects of ultrasound have been demonstrated at power levels used for diagnostic studies, quality assurance dictates it is necessary to utilize this imaging technique in the most appropriate and indicated fashion, and that studies be performed by qualified and knowledgeable physicians and/or sonographers using appropriate equipment and techniques. Diagnostic ultrasound examinations should be supervised and interpreted by trained and credentialed physician imaging specialists.

### **II. SONOLOGIST'S CREDENTIALS CRITERIA**

Physicians involved in the performance, supervision and interpretation of ultrasonography should be Diagnostic Radiologists and must have a Fellowship or Certification in Diagnostic Radiology with the Royal College of Physicians and Surgeons of Canada and/or the Collège des médecins du Québec. Also acceptable are equivalent foreign Radiologist qualifications if the Radiologist so qualified holds an appointment in Radiology with a Canadian University.

As new imaging modalities and interventional techniques are developed additional clinical training, under supervision and with proper documentation, should be obtained before radiologists interpret or perform such examinations or procedures independently. Such additional training must meet with pertinent provincial/regional regulations. Continuing professional development must meet with the requirements of the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada.

### **III. SONOGRAPHER'S CREDENTIALS CRITERIA**

Sonographers should be graduates of an accredited School of Sonography or have obtained certification by the American Registry of Diagnostic Medical Sonographers (ARDMS) or the Canadian Association of Registered Diagnostic Ultrasound Professionals (CARDUP). They should be members of their national or provincial

professional organization. Continuing medical education should be mandatory consistent with the requirements of ARDMS or CARDUP.

CARDUP will have a national exam process for sonographers in place by 2004. At that time this will become the accepted standard for sonographers. As an interim measure, individual consideration of training and qualifications by a Task Force consisting of members of relevant societies can be recommended for all those whose training does not fall within appropriate guidelines.

#### **IV. DOCUMENTATION**

Adequate documentation is essential for high quality patient care and such documentation should consist of a permanent record of the ultrasound examination and its interpretation. Appropriate normal and abnormal images should be recorded for each anatomical area together with appropriate measurements. \* Images should be appropriately labelled with the examination date, patient identification and if appropriate image location and orientation. A written report should be included with the patient's medical record.

A permanent record of the ultrasound images and written report shall be retained. The images must be of sufficient quality to record pertinent findings and to be used for comparison with subsequent examinations and enable third party sonologists to confirm the diagnosis. The permanent record of each ultrasound examination should be retained for a statutory period which should be consistent with clinical needs and relevant legal and local health care facility requirements.

Videotape may be a useful supplement to the permanent record of an ultrasound examination. The videotape record of the ultrasound examination should be retained for the similar statutory period as the remainder of the permanent record. The videotape cassette number and counter number (name or time) must be recorded in a log book or on the printed report to allow for future access.

#### **V. SUPERVISION AND INTERPRETATION OF ULTRASOUND EXAMINATIONS**

A sonologist must be available for consultation with the sonographer on a case by case basis. Ideally the sonologist should be on site and available to participate actively in the ultrasound examination when required.

It is recognized however that the geographic realities in Canada do not permit the presence of an on-site sonologist in all locations. Adequate documentation of each examination is critical. A videotape record may be useful as an adjunct to the hard copy images in difficult cases. Despite the geographic isolation of a community the reports must be timely. Furthermore, the sonologist must be available by telephone for consultation with the sonographer and the referring physician. The sonologist should visit the facility on a regular basis to provide on site review of ultrasound procedures and sonographer supervision.

#### **VI. QUALITY IMPROVEMENT PROGRAMS**

Procedures should be systematically monitored and evaluated as part of the overall quality improvement program of the facility. Monitoring should include the evaluation of the accuracy of interpretation as well as the appropriateness of the examination.

Incidence of complications and adverse reactions should be recorded and periodically reviewed in order to identify opportunities to improve patient care.

Data should be collected in a manner which complies with the statutory and regulatory peer review procedures in order to protect confidentiality of the peer review data.

##### **1. EQUIPMENT**

Studies should be conducted with a real time scanner, preferably using sector or curved linear transducers. The transducer or scanner should be adjusted to operate at the highest clinical appropriate frequency. With modern equipment, these frequencies are usually between 3.5 and 5.0 MHZ. Occasionally, large patients may require 2.25 MHZ transducers. For pediatric patients higher frequency transducers (5 MHZ or greater) usually provide more optimal images.

##### **2. TECHNIQUE**

A complete examination of the abdomen includes assessment of the liver, gallbladder, biliary tract, pancreas, spleen, kidneys, aorta, inferior vena cava and retroperitoneum. A limited examination of any organ or area may be done if specifically indicated or in emergency situations or for followup.

#### A. LIVER

The liver examination should include long axis (coronal or sagittal), transverse, and subcostal views. Liver size, shape and contour should be assessed with appropriate attention to lobar distribution. Liver parenchyma should be assessed for overall echogenicity as well as the presence of focal or diffuse abnormality. Assessment should include evaluation of the liver fissures (the main lobar fissure, fissure for the ligamentum venosum, and the falciform ligament) and the regional vascular structures (the portal veins, hepatic artery, hepatic veins, and the intrahepatic portion of the inferior vena cava) and the right hemidiaphragm and right pleural space. Abnormalities should be documented.

Duplex and colour Doppler may be used to document blood flow and direction of blood flow in the hepatic artery, hepatic veins and portal veins, as well as to identify collateral venous pathways. Analysis of wave forms may be useful.

#### B. GALLBLADDER AND BILIARY TRACT

Gallbladder examination is optimally performed when the patient has been fasting for at least 8 hours. Gallbladder evaluation should include long axis (coronal or sagittal) and transverse views obtained in the supine position. Left lateral decubitus, erect, or prone positions may also be necessary for complete evaluation.

The gallbladder should be assessed for the presence of sludge, stones or masses and their mobility. The gallbladder wall thickness and tenderness to transducer compression should be assessed.

Biliary tract assessment includes evaluation of the intrahepatic and extrahepatic bile ducts. The intrahepatic ducts are best evaluated in the periphery of the liver as well as in the region of the porta hepatis adjacent to the right and left branches of the portal vein. Duplex and colour Doppler may be used to differentiate hepatic artery and portal vein from bile ducts. The extrahepatic bile ducts should be evaluated in the region of the common hepatic duct, the suprapancreatic bile duct, and along the dorsum of the pancreatic head. Supine, left lateral decubitus, and semi-erect positions are helpful. Assessment should include bile duct calibre, bile duct wall thickness and bile duct content.

#### C. PANCREAS

Long axis (coronal or sagittal) and transverse projections should be obtained utilizing erect, supine and left lateral decubitus positions, as necessary. The pancreatic head, uncinate process, body and tail should be evaluated for size, contour, echogenicity and the presence of diffuse or focal disease. The pancreatic duct may be visualized and if so, its calibre, content and margination should be assessed.

The peripancreatic region should be assessed for adenopathy, fluid collections and vascular abnormalities.

#### D. SPLEEN

Long axis (coronal or sagittal) and transverse projections should be obtained in the supine and/or right lateral decubitus positions. Splenic size, location, contour, and hilar orientation should be assessed. The splenic parenchyma should be assessed for echogenicity as well as the presence of focal or diffuse abnormality. An attempt should be made to demonstrate the left hemidiaphragm and left pleural space.

Duplex and colour Doppler may be used to determine the presence and direction of blood flow in the splenic vein and artery.

#### E. KIDNEYS

Long axis (coronal or sagittal) and transverse images should be obtained. Prone or upright position may be used when necessary to provide more optimal images. Renal size, mobility, contour and location should be assessed. A maximum measurement of renal length should be recorded for each kidney. Renal parenchymal assessment should include evaluation of both the cortex and medulla. The renal sinus area should be evaluated and focal or diffuse abnormality documented. The renal collecting system should be evaluated for focal or generalized dilatation, appearance of the uroepithelium and content.

The perirenal region should be assessed for abnormality.

Duplex and colour Doppler may be used when clinically indicated to assess renal arterial and venous patency. Doppler may be of value in differentiating minor degrees of dilatation of the collecting system from blood vessels.

If the examination is being done to specifically investigate the urinary system, the bladder should also be assessed. Long axis (coronal or sagittal) and transverse images should be obtained. The bladder lumen should be assessed for stones or other abnormalities. The bladder wall should be assessed for thickness and the presence of focal lesions. Dilatation or other abnormalities of the distal ureters should be recorded. Any post-void bladder residual may be recorded.

#### F. AORTA AND INFERIOR VENA CAVA

The aorta and inferior vena cava should be imaged in long axis (coronal or sagittal) and transverse planes. Both vessels should be evaluated from the diaphragm to the bifurcation (usually at the level of the umbilicus) if possible. The adjacent common iliac vessels should be assessed.

Aortic study should include assessment of vessel size and documentation of thrombus, as well as any obvious flow abnormalities. Aneurysmal dilatation of the aorta should be measured in anteroposterior and transverse dimensions. The inferior vena cava should be assessed for location, size, and luminal filling defects.

Duplex and colour Doppler may be of value in evaluating luminal flow in the aorta and inferior vena cava.

#### G . RETROPERITONEUM

Retroperitoneal evaluation includes assessment of the abdominal great vessels, the aorta and inferior vena cava, the pancreas, kidneys, adrenal glands, regional lymph nodes, retroperitoneal musculature, and the potential retroperitoneal spaces. Images should be obtained in the long axis (coronal or sagittal) and transverse planes.