MANITOBA
DIAGNOSTIC IMAGING STANDARDS

September 2011
INTRODUCTION

Pursuant to By-Law No. 3 of the College of Physicians and Surgeons of Manitoba, Council has established standards governing diagnostic imaging facilities, as follows:

Diagnostic Imaging:

1. Quality Management Program
2. Manuals
3. Safety
4. Equipment
5. Computed Tomography (CT)
6. Fluoroscopy
7. Magnetic Resonance Imaging (MRI)
8. Mammography
9. Radiography/Mobile Radiography
10. Ultrasound

Certain standards, namely Quality Management Program, Manuals, Safety and Equipment apply to all diagnostic imaging facilities. Whether the remaining standards are applicable to a facility depends on the type of work done in the facility.
# TABLE OF CONTENTS

1.0 QUALITY MANAGEMENT PROGRAM ................................................................. 5
   1.1 General ........................................................................................................... 5
   1.2 Signage .......................................................................................................... 5
   1.3 Personnel ...................................................................................................... 5
   1.4 Facility Director Reviews ............................................................................ 5
   1.5 Documentation ............................................................................................. 5

2.0 MANUALS ........................................................................................................... 6
   2.1 General .......................................................................................................... 6
      2.1.1 Format of Manuals ................................................................................ 6
      2.1.2 Manual Availability ............................................................................. 6
      2.1.3 Manual Review ..................................................................................... 6
   2.2 Required Manuals .......................................................................................... 6
      2.2.1 Quality Management Program Manual .................................................. 6
      2.2.2 A Safety Manual ................................................................................... 7
      2.2.3 A Personnel Policy Manual ................................................................. 10
      2.2.4 An Operational Policy Manual ............................................................ 11
      2.2.5 An Equipment and Maintenance Manual ............................................. 13
      2.2.6 Procedure Positioning Manual .............................................................. 14
      2.2.7 Computer Radiography and Digital Radiography Manual ..................... 14
      2.2.8 Radiology Information System (RIS) Manual ......................................... 14
      2.2.9 A Picture Archiving and Communications Systems (PACS) Manual ....... 16
      2.2.10 A Site Specific Ward Manual ............................................................... 16
      2.2.11 A Modality Specific Manual ................................................................. 16
      2.2.12 Contrast Media Manual ..................................................................... 17

3.0 SAFETY ............................................................................................................. 18
   3.1 Legislation ...................................................................................................... 18
   3.2 Personnel Training ........................................................................................ 18
   3.3 Physical Space .............................................................................................. 18
   3.4 Site Specific Safety Risks ............................................................................. 19
   3.5 Safety Documentation .................................................................................. 19

4.0 EQUIPMENT ...................................................................................................... 19
   4.1 General .......................................................................................................... 19
   4.2 Emergency Power ........................................................................................ 19
   4.3 Site Specific Equipment ................................................................................ 20
5.0 COMPUTED TOMOGRAPHY ................................................................. 20
  5.1 CT Technologist Qualifications ..................................................... 20
  5.2 General .................................................................................... 21
  5.3 Policies and Procedure ............................................................... 21
  5.4 Radiation Dose Management ....................................................... 22
  5.5 Quality Control Program ........................................................... 23
  5.6 Additional Requirements for Remote Computed Tomography Facilities .... 23

6.0 FLUOROSCOPY/C-ARM ................................................................. 23
  6.1 General .................................................................................... 23
  6.2 Policies and Procedures ............................................................... 24

7.0 MAGNETIC RESONANCE IMAGING (MRI) .................................... 24
  7.1 Technologist Qualifications ........................................................ 24
  7.2 General .................................................................................... 24
  7.3 Safety ...................................................................................... 25
  7.4 Quality Control Program ........................................................... 25
  7.5 Policies and Procedures ............................................................... 25

8.0 MAMMOGRAPHY ........................................................................... 26

9.0 RADIOGRAPHY .............................................................................. 26
  9.1 General .................................................................................... 26
  9.2 Policies and Procedures ............................................................... 27

10.0 MOBILE RADIOGRAPHY .............................................................. 27
  10.1 General ................................................................................... 27
  10.2 Policies and Procedures ............................................................... 27

11.0 ULTRASOUND .............................................................................. 28
  11.1 Sonographer Qualifications ....................................................... 28
  11.2 General ................................................................................... 28
  11.3 Policies and Procedures ............................................................... 28
  11.4 Quality Control Program ........................................................... 29
  11.5 Additional Requirements for Remote Ultrasound Facilities .............. 30
  11.6 Ultrasound Equipment ............................................................... 30
1.0 QUALITY MANAGEMENT PROGRAM

1.1 General
1.1.1 A facility must establish and maintain a quality management program that:
1.1.1.1 defines:
1. the organizational structure,
2. policies,
3. procedures,
4. resources,
5. monitoring required for quality management.
1.1.1.2 at minimum, meets the requirements of Health Canada Safety Code 35: Radiation Protection in Radiology – Large Facilities Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities.
1.1.2 A facility must retain quality management program records on-site for at least two years.

1.2 Signage
1.2.1 A facility must post in the facility:
1.2.1.1 the facility director’s name,
1.2.1.2 only current certificates of accreditation.

1.3 Personnel
1.3.1 A facility must:
1.3.1.1 employ only personnel with registration and/or licensure where registration and/or licensure is required by law for the individual’s scope of practice;
1.3.1.2 employ only personnel with the education, training, competence and experience to perform procedures within the individual’s job description;
1.3.1.3 provide personnel with readily available current modality specific reference material, including positioning textbooks and reference books.
1.3.1.4 establish and maintain an annual program for maintenance of personnel competence, including educating personnel about the contents of policies and procedures relevant to the scope of their job description.

1.4 Facility Director Reviews
1.4.1 The facility director must:
1.4.1.1 at minimum, annually review and update the facility’s quality management program documents.
1.4.1.2 record the changes arising from the annual review and update policies and procedures as required.
1.4.1.3 inform facility personnel of the changes made as a result of the review.

1.5 Documentation
1.5.1 All facility policies and procedures must be in writing and available to personnel.

---

1 A Quality Management Program Manual is required by the Manuals Standard.
2 Organizational Structure defines reporting relationships to include: functional, divisional, and matrix structures.
3 Policy: A policy is a pre-determined course of action that establishes the rules and directives around core processes of the facility. A policy restricts negotiation and legitimizes decision making and actions. A policy is not intended to communicate operating procedures and is not a reiteration of laws and regulations.
4 Procedure: A procedure is an informative process that provides protocols, routines, guidelines and methodologies.
2.0 MANUALS

2.1 General

2.1.1 Format of Manuals

2.1.1.1 A facility must format manuals to include:

1. a table of contents.
2. page headers with the following information:
   a) facility name.
   b) policy/procedure title.
   c) edition, effective and revision date.
   d) author.
   e) facility director approval.
3. a historical coversheet.

2.1.2 Manual Availability

2.1.2.1 A facility must make each manual available to all personnel.

2.1.2.2 The safety manual and procedure/positioning manual must be available to personnel in hard copy format.

2.1.3 Manual Review

2.1.3.1 A facility director must annually review and update all manuals and maintain a written record of the review and of any changes made. If a facility director delegates all the review, the facility director is responsible to sign off on all revisions and the annual review.

2.1.3.2 A facility must have all personnel sign to confirm review of all manuals and individual job descriptions annually.

2.2 Required Manuals

A facility must establish and maintain the following manuals:

2.2.1 Quality Management Program Manual

2.2.1.1 The Quality Management Program Manual must include:

1. table of contents.
2. a description of the facility, ownership of the facility, operator of the facility, resources and main duties.
3. a master list of quality control procedures.
4. requirements for the physical facilities.
5. requirements for personnel education, training and competencies.
6. a quality mission/vision statement.
7. requirement for an appointment of a quality assurance technologist.
8. policies governing each of the following topics:
   a) compliance with The Personal Health Information Act.
   b) delegation of function.
   c) selection criteria for supplies.
   d) referral facilities.
   e) quality assurance/quality control.
   f) document control, as specified in the Operational Policies Manual.
   g) exchange of images/reports.
   h) handling of complaints and remedial actions.
   i) internal audits.
   j) client satisfaction.
   k) risk management.
   l) technical support.
   m) handling ethical dilemmas.

5 See the Quality Management Program Standard.
n) repeat/reject image analysis, which must include:
   (i) specific anatomical areas and specific views along with the reason for rejection.
   (ii) capture of all images.
   (iii) monthly review of the repeat analysis data.
   (iv) monthly personnel education sessions.
o) research and development (if applicable).
p) image and document retention periods, which must include the following minimum retention periods:
   (i) medical hard copy images adults 5 years
   (ii) medical hard copy images pediatrics until 20 years of age
   (iii) mammography 10 yrs
   (iv) PACS archive adults 5 yrs
   (v) PACS archive pediatrics until 20 years of age
   (vi) bone density DXA studies 10 years
   (vii) reports adults 5 years (original and verified final report)
   (viii) reports pediatrics until 20 years of age (original and verified report)
   (ix) request for consultation 5 years in original transcribed form
   (x) quality control/quality assurance 2 years except for bone density which is 5 years
   (xi) repeat/reject 2 years
   (xii) outdated policies/procedures 10 years
   (xiii) accession records 2 years
   (xiv) equipment maintenance equipment maintenance lifespan plus 2 years
   (xv) incident reports 10 years
   (xvi) Material Safety Data Sheets (MSDS) 30 years

9. an emergency preparedness plan. The emergency preparedness plan must include:
   q) definitions of all emergency codes.
   r) emergency contact information (e.g. fan out call list).
   s) directives for personnel regarding emergency preparedness, including any additional precautions required.

2.2.2 A Safety Manual

2.2.2.1 The Safety Manual must be site specific. For all facilities, the Safety Manual must establish and maintain policies and procedures governing:
1. general workplace safety and health.
2. routine practices.
3. waste management.
4. electrical safety.
5. fire safety.
6. radiation safety.

2.2.2.2 If these topics are applicable to the specific facility, the Safety Manual must also have policies and procedures governing safety for:
1. eyewash stations.
2. hazardous materials.
3. carcinogens.
4. chemical hazards.
5. compressed gases.
6. flammables.
2.2.2.3 General workplace safety and health policies and procedures must:
   1. require competency based orientation training.
   2. require use of personal protective equipment where appropriate.
   3. require that personnel secure hair (including beards).
   4. identify suitable facility apparel.
   5. prohibit food in technical work areas.
   6. include processes:
      a) to identify and resolve safety hazards.
      b) to document and investigate any incidents, accidents and adverse events.
      c) regarding incidents and work related injuries.
      d) regarding visitors in the facility.

2.2.2.4 Routine practices/infection control policies and procedures must include:
   1. the use of personal protective equipment, when handling blood and body fluids.
   2. prevention of blood and body fluid exposure.
   3. follow-up for potential exposure to tuberculosis or blood borne pathogens.
   4. hand washing requirements.
   5. use of alcohol based (minimum 70% alcohol) hand rubs.
   6. FIT mask requirements.
   7. sterile techniques.
   8. daily disinfection of work surfaces.
   9. the type and strength of decontamination solution must be expressed in percentage (bleach) or relative concentration (precept).
   10. recognition and safe processing of potential bioterrorism agents.
   11. biohazard sign posting requirements.
   12. infection control, including the following mandatory practices:
      a) using chairs and accessories with a material that may be decontaminated. Cloth chairs are unacceptable.
      b) if pillows are used, changing the pillow covers between each patient.
      c) changing table covers between patients, or disinfecting work surfaces.
      d) designating areas where personal protective equipment is required.
      e) prohibiting laboratory coats that are worn for patient examinations from being worn elsewhere in the facility.

2.2.2.5 Waste management policies and procedures must include: decontamination and disposal of contaminated waste, hazardous waste (unwanted lead), chemical waste and sharps.

2.2.2.6 Electrical safety policies and procedures must include:
   1. checking all equipment for grounding and current leakage at least annually.
   2. using approved extension cords.
   3. checking all cords and plugs for frayed wires and repair where required.
   4. locating all electrical receptacles, switches and controls so they are not subject to liquid spills.
   5. providing a clear access to switches, control devices and meters.
   6. keeping multiple receptacle electrical adapters to a minimum.
   7. labelling each breaker as to the area of the facility serviced.

---

6 See also the Personnel Policy Manual.
2.2.2.7 Fire safety policies and procedures must include:
1. having appropriate fire extinguishers, including non-magnetic fire extinguishers for MRI rooms.
2. having annual documented fire safety, fire extinguisher, fire drill and evacuation training for personnel.
3. having an evacuation plan which includes a process to assist those who are unable to evacuate without assistance.
4. emergency evacuation route posters visible in all patient and public areas.
5. clear and visible signage to indicate the location of the fire alarm pulls, which must be located at the fire exit.
6. lit or photo phosphorescence exit signage.

2.2.2.8 Radiation safety policies and procedures must govern:
1. pregnancy, which must include:
   a) pregnant females patients.
   b) female patients who may be pregnant.
   c) female patients of childbearing age.
   d) pregnant personnel.
2. pediatric imaging, which must include:
   a) strict shielding protocols.
   b) only essential investigations.
   c) posteroanterior projection for scoliosis.
3. compliance with the Canadian Association of Medical Radiology Technologists Risk Management Guidelines.
4. accidental or unintentional doses to patients.
5. testing all lead shielding integrity initially and annually thereafter.
6. inspections by Radiation Protection Services, CancerCare Manitoba and compliance with Radiation Protection Service reports.
7. notification of excessive exposure (i.e. more than one gray) which must include:
   a) the x-ray equipment operator.
   b) a Radiation Protection Services officer.
   c) the facility director.
   d) the patient.
8. exposure control.
9. examination protocols.
10. thermoluminescent dosimeter badge usage; which must be:
    a) specific to the facility.
    b) retained for the lifetime of the facility.
    c) specific to occupational classifications for issuing dosimeters.

2.2.2.9 Eyewash safety policies and procedures must include:
1. having eyewash stations available.
2. flushing eyewash stations weekly.
3. monitoring wall mounted eyewash stations for expiry dates regularly.

2.2.2.10 Hazardous materials policies and procedures must include:
1. reporting and documenting hazardous material spills.
2. having chemical and biological spill kits readily available and establishing procedures for use of the kits.
3. monitoring expiration dates of chemicals and spill kits.
4. requiring personnel to certify in the transport of dangerous goods training, if applicable.
5. required use of designated labels for Workplace Hazardous Material Information Systems controlled products.
6. having a master inventory list of hazardous materials.
7. maintaining current Material Safety Data Sheets, (i.e. not greater than 3 years old).
2.2.2.11 Carcinogen safety policies and procedures must include:
   1. storing and using carcinogens in a safe manner.
   2. using only designated labels for all carcinogenic agents.
   3. specifying:
      a) precautions to be taken to reduce risk of exposure.
      b) steps to be taken should exposure occur.

2.2.2.12 Chemical hazard policies and procedures must include:
   1. educating personnel.
   2. identifying the types of hazards (poison, caustics, skin or eye irritant).
   3. identifying precautions to be taken and instructions if an accident does occur.
   4. storing strong acids in Workplace Hazardous Material Information System approved containers
      in a secure location, and below counter level.
   5. having acid spill kits readily available and establishing procedures for use of the kits, if
      applicable.
   6. using acid/solvent bottle carriers for transportation of hazardous chemicals in excess of 500
      millilitres (ml).
   7. transporting all chemicals in accordance with the Transportation of Dangerous Goods Act
      and Regulations.
   8. having Occupational Health and Safety monitor air for potentially harmful fumes (fixer,
      developer) at least annually. If safety limits are exceeded, extraction systems must be used.
   9. providing a fume hood or chemical filtration unit for when using volatile chemicals.

2.2.2.13 Compressed gas policies and procedures must include:
   1. identifying the contents of compressed gas cylinders.
   2. using, storing and transporting compressed gas.
   3. providing appropriate safety devices for safe handling of compressed gases.
   4. equipping compressed gas cylinders with an approved functional valve system.
   5. securing cylinders.
   6. positioning compressed gas cylinders (e.g.: well away from open flames or other heat sources,
      and not in corridors or outside exhaust canopies).

2.2.3 A Personnel Policy Manual

2.2.3.1 The Personnel Policy Manual must include policies governing:
   1. a job description for each employee.
   2. occupational health records.
   3. competency based orientation training requirements for each employee.\(^7\)
   4. continuing education and maintenance of competence requirements for each employee.
   5. records of personnel qualifications, registration and licensure.
   6. union contract (if applicable).
   7. annual competence appraisals for each employee.
   8. workplace safety and health policies, including working alone, respectful workplace,
      discrimination, harassment and abuse in the workplace.
   9. incidents, work related injuries and near miss reporting.
   10. work schedule.
   11. internet use.

\(^7\) Also found in the Personnel Policy Manual
2.2.4 An Operational Policy Manual

2.2.4.1 The Operational Policy Manual must include policies which govern:

1. document control
   a) maintaining a historical coversheet to record major changes, additions or deletions.
   b) requiring all handwritten changes to be signed and dated by the person making the change and approved in writing by the facility director.
   c) ensuring that any posted material, procedural guideline or direction is current and in compliance with manual requirements.
   d) maintaining all quality control/quality assurance records and reports.

2. management of requests for consultation:
   a) required information must be legible and include:
      (i) the last menstrual period for female patients of child bearing age.
      (ii) a known pregnancy.
      (iii) the weight of the patient.
      (iv) previous imaging examinations.
      (v) history of previous surgeries pertinent to the examination request.
      (vi) the urgency of the examination.
      (vii) the date of referral.
      (viii) identification of patients at high risk for contrast media injections and documentation of previous reactions to contrast media.
      (ix) a history of all allergies.
      (x) known or suspected communicable disease.
      (xi) advanced healthcare directives, if known.
   b) criteria for rejection.

3. required patient demographics:
   a) patient first and last name.
   b) personal health identification number (PHIN).
   c) facility health record number or alternate number (e.g. RCMP, Canadian Forces, other provincial health numbers).
   d) date of birth.
   e) date of examination (and time if applicable) and required examination.
   f) facility name.

4. patient imaging record:
   a) request for consultation.
   b) header for the examination type.
   c) date and time of examination.
   d) technologist initials.
   e) technique used (as required).
   f) reports, which must include:
      (i) addendum reports.
      (ii) corrected reports.
      (iii) preliminary reports.
      (iv) final reports.
      (v) urgent report communication.

---

8 “Document” includes any information or instructions, including policy statements, text books, examinations, specifications, calibration tables, biological reference intervals and their origins, charts, posters, notices, memoranda, software, drawings, plans and documents of external origin such as regulations, standards, or examination examinations.
5. patient management:
   a) notification of cancelled patient examination.
   b) identifying and correcting patient demographics.
   c) temporary patient identification.
   d) examinations with no patient clinical information available.
   e) record management for neonates who have not yet been issued a personal health identification number including at least gender and the following demographics:
      (i) facility health record number (if out of province, provincial health number).
      (ii) date and time of birth.
   f) post invasive examination patient instructions and patient chart recording.
   g) use of restraints.
   h) consent issues:
      (i) informed consent for all invasive examinations (must include explanation, benefits, risks and alternatives).
      (ii) consent obtained by telephone.
      (iii) interpreters for patients who do not speak English (whenever possible).
      (iv) authorized substitute decision makers.
      (v) emergent situations, no substitute decision maker.
      (vi) refusal of examination.
   i) sedation, which must include:
      (i) readily available emergency drugs and supplies.
      (ii) administering sedation.
      (iii) monitoring patients.
      (iv) patient recovery.
      (v) discharging patient.
      (vi) medical record keeping.
   j) chaperone requirements.
   k) mode of transport for patients.
   l) incomplete examinations.
   m) when immediate medical attention is required.
   n) when immediate transfer of patient is required.
   o) adverse events.

6. report management:
   a) turnaround times and investigating of non-conformities.
   b) managing preliminary reports, including labelling, disclosure and retention.
   c) reporting of results, including identification of any referral physician.
   d) amending reports, including notifying of the amendment.
   e) requiring the interpreting radiologist or designate radiologist to proof-read and sign.
   f) disclosing test results to patients.
   g) criteria for verbal reports, unsigned reports or reports not yet proof-read.
   h) identifying and notifying of critical results and documenting notification.
   i) call-back service examination requests (STAT list).
   j) identifying any statutory reporting requirements (e.g. Public Health or child abuse or sexual activity in patients 13 years of age or younger).
   k) traceability of the report to the patient.
7. compliance with The Personal Health Information Act must include:
   a) correcting of personal health information.
   b) transmitting personal health information via facsimile or other electronic means.
   c) record use and disclosure.
   d) disposing of confidential information, including personal health information.
   e) security measures for electronic databases and transferring of personal health information.
   f) reporting of security breaches and corrective procedures.

8. incident management must include reporting and management of critical clinical incidents.

2.2.5 An Equipment and Maintenance Manual

Equipment includes processing equipment/machines, computer hardware and software, primary display work stations, information systems, analytical systems, generators, imaging machines, phantoms and injectors.

The Equipment and Maintenance Manual must be site specific and must include policies and procedures governing equipment maintenance, monitoring and records.

2.2.5.1 The Equipment and Maintenance Manual must include:

1. procedures:
   a) for safe handling, transporting, storing and use of equipment.
   b) for taking equipment out of service when found to be defective. Defective equipment must be clearly labelled as defective until it has been repaired.
   c) decontaminating equipment prior to it being serviced or removed from the facility.
   d) contingency planning to address failure of equipment.
   e) repairing equipment in a suitable location.

2. maintenance procedures for:
   a) routine operation of equipment.
   b) minor troubleshooting.
   c) equipment maintenance to be scheduled and performed at least annually and more frequently if recommended by the manufacturer or required by the quality management program.

3. requirements for record keeping must include recording and maintaining the following information respecting equipment:
   a) the name, model, serial number and date of purchase.
   b) manufacturer's instructions for equipment operation.
   c) equipment maintenance requirements include maintenance procedures, troubleshooting, breakdowns and repairs.
   d) a list of contact personnel and phone numbers for equipment maintenance support.

4. retention of the following records for the lifespan of the equipment plus two years:
   a) manufacturer's name, type of equipment, identification and serial number.
   b) manufacturer's contact information.
   c) date of receipt and date of commencement of service.
   d) condition when received.
   e) acceptance testing criteria.
   f) acceptance testing reports.
   g) list of equipment location.
   h) manufacturer's manuals.
   i) equipment performance records.
   j) maintenance records/equipment history log.

---

*See also the Quality Management Program Manual.*
5. primary display work station policies and procedures, which must require:
   a) accurate reproduction of the original examination.
   b) minimal technical capabilities as follows:
      (i) image sequence identification.
      (ii) accurate association of the patient and study demographic data with the images.
      (iii) adjustable brightness and contrast.
      (iv) interactive window and level function.
      (v) invert the gray-scale values of the displayed image.
      (vi) zoom (magnification) function.
      (vii) rotating and flipping the displayed images with preservation of orientation of patient
            labelling.
      (viii) calculating and displaying accurate linear measurements and pixel value
            determinations in values appropriate for the modality (e.g. Hounsfield values for CT
            images).
      (ix) displaying prior image compression ratio, processing or cropping.

2.2.6 Procedure Positioning Manual
2.2.6.1 The Procedure Positioning Manual must use a standard format for header information equivalent or
       substantially similar format to the following:
       1. facility name.
       2. title of examination.
       3. date/revision date.
       4. facility director signature.

2.2.6.2 Policies and procedures governing:
       1. a description of each view required for examination type.
       2. positioning regimes to include lead shielding and lowest technical factors while maintaining
          image quality.

2.2.7 Computer Radiography and Digital Radiography Manual
2.2.7.1 The Computer Radiography and Digital Radiography Manual must include:
       1. quality control procedures used to monitor performance.
       2. policies governing:
          a) overriding raw data markers with electronic markers.
          b) image sequencing into PACS.
          c) password protecting logins.
          d) maintaining patient confidentiality on unattended monitors.
          e) performing an electronic repeat/reject analysis.
          f) trouble shooting directions.
          g) equipment failure management.

2.2.8 Radiology Information System (RIS) Manual
2.2.8.1 The Radiology Information System Manual must include:
       1. a list of personnel who have access to information and software security codes.
       2. a list of contact personnel and phone numbers for system maintenance support.
       3. schedule for and location of back-up disks.
       4. backup system for computer failure.
       5. policies governing:
          a) requirements for RIS competency, training, orientation and evaluation for new personnel
             who will be required to use RIS. Training is required when updates or new versions are
             implemented.
          b) adequate technical support.
          c) validating alterations to the RIS hardware or software by authorized personnel.
d) controls to protect computer applications from unauthorized adjustments or tampering or destruction.

e) changing of passwords at least quarterly and confidentiality of passwords.

f) who may use the RIS, and who may access or change patient information or application/configuration of data.

g) a transmission system that has error checking capabilities.

h) periodic reviewing and approval by the facility director of content and formatting of RIS generated patient reports.

i) the archive retrieval system, which must include:
   (i) the ability to provide high importance flags, technologist comments and validation of radiologist electronic signature.
   (ii) accurate association of the patient study with the images.
   (iii) consultation request.
   (iv) prior examinations and retrievals.
   (v) online retrieval of patient results and images.

6. procedures:

a) respecting scheduled maintenance downtime or electronic failure management, including:
   (i) recovery of the RIS.
   (ii) replacing or updating data files.
   (iii) notifying users of interruption and restoration of service.
   (iv) maintaining written records of scheduled downtime, unscheduled downtime, the reasons for any failure and particulars of corrective action taken.

b) specifying requirements for protecting confidentiality of patient results.

c) governing personnel use of RIS, including:
   (i) routine logout of the RIS when not actively working on it.
   (ii) prohibiting use of another personnel member's login to perform work.

d) verifying and validating the RIS when first installed and after any alterations are made.

e) comparing original input with all types of end user reports to detect errors in data transmission, processing or storage, whenever there has been a change to the RIS.

f) verifying transfer of Digital Imaging and Communications in Medicine (DICOM) transfer.

g) verifying DICOM modality work list and RIS.

h) validating measurement tool accuracy.

i) approving any auto-verification of radiologist signoff on final reports.

j) maintaining controls to ensure that data storage media is properly labelled, stored and protected from damage and unauthorized use.

k) governing documentation of other significant events that could effect clinical care.

l) governing portable media process when exchanging images/reports on portable media, which must include:
   (i) the media must be labelled with required patient demographics.
   (ii) the appropriate program to open the images must be included.
   (iii) the media must be delivered in a secure manner.
2.2.9 A Picture Archiving and Communications Systems (PACS) Manual

2.2.9.1 The Picture Archiving and Communications Systems Manual must have policies governing:

1. retrieving prior examinations in a timely manner to be available for comparison at the time of interpretation.
2. uniform collection of patient demographics.
3. monthly test image capture, transmission, archival, retrieval and display.
4. acquisition requirements:
   a) patient name.
   b) Personal Health Identification Number (PHIN).
   c) facility number/accession number.
   d) date and time of examination.
   e) image markers.
   f) name of facility or institution of origin.
   g) type of examination.
   h) degree of compression (if any).
5. inter-facility PACS systems requirements.

2.2.10 A Site Specific Ward Manual

2.2.10.1 The Site Specific Ward Manual must include:

1. list of examinations performed on-site.
2. list of referral facilities for outsourced examinations.
3. instructions for filling out consultation requests.
4. ordering STAT examinations.
5. requirements for patient transport.
6. requirements for consent.
7. telephone consultation requests.
8. patient preparations.
9. laboratory results required.
10. sedation requirements.
11. chart review post-procedure.
12. post-procedure care.
13. examinations offered during non-core hours.
14. call-back arrangements.

2.2.11 A Modality Specific Manual

2.2.11.1 The Modality Specific Manual must set out procedures for each examination performed in the facility. The Modality Specific Manual must include:

1. each examination beginning on a new page, with the following information at the top of the first page:
   a) facility name.
   b) title of manual.
   c) procedure or policy title.
   d) page number.
   e) authorized/approved by.
   f) date of approval.
2. a list of examinations the facility offers.
3. a list of referred-out examinations and the referred facility name.
4. patient instructions for each imaging examination offered.
5. each examination written in a standard format equivalent to or substantially similar to the following format:
   a) title of examination.
   b) author.
   c) principle/purpose of the examination.
   d) booking examination.
   e) patient preparation.
   f) positioning regimes.
   g) examination protocols.
   h) deviations from routine positioning views.
   i) deviations from coded protocols.
   j) appropriate shielding usage.
   k) pre-examination screening.
   l) consent requirements.
   m) equipment/supplies needed.
   n) special equipment cleaning/sterilizing.
   o) special precautions (when applicable).
   p) post-examination care.
   q) patient instructions for each imaging examination offered.

2.2.12 Contrast Media Manual

2.2.12.1 The Contrast Media Manual must include policies governing:
   1. patient screening.
   2. managing high risk patients.
   3. consent.
   4. venipuncture competencies.
   5. post-examination patient care.
   6. medical emergencies/adverse reactions.
   7. extravasations of contrast media.
   8. reporting severe reactions to the Canadian Adverse Drug Reaction Monitoring Organization Program.
   9. documenting reactions in the final report.
   10. requirements for a physician on-site to oversee the contrast media injection if a radiologist is not available.
   11. multi-dosing.
   12. patient charting requirements.
   13. emergency preparedness:
       a) having oxygen and suction available and checked weekly.
       b) having emergency drugs and resuscitation equipment and checking drug expiration dates monthly.
       c) inspecting battery operated emergency devices weekly.
3.0 SAFETY

3.1 Legislation

3.1.1 A facility must establish and maintain workplace health and safety policies and procedures that adhere to applicable legislation. Applicable legislation includes:

3.1.1.1 Federal
1. the *Transportation of Dangerous Goods Act* and Transport Canada TDG Regulations.
2. the National Fire Code of Canada, including NFPA 10: “Portable Fire Extinguishers”.
3. the Canadian Electrical Code Part 1 and 2.
4. the National Plumbing Code of Canada.
5. the *Canadian Environmental Protection Act*.
9. the *Nuclear Safety and Control Act* and Regulations.

3.1.1.2 Provincial
1. *The Workplace Safety and Health Act* and Regulations.

3.1.2 A facility must comply with Manitoba’s Workplace Safety and Health Act requirements. These requirements include:

3.1.2.1 safety inspections.
3.1.2.2 safe work procedures, which include:
   1. having an ergonomic environment to minimize repetitive strain injuries, stress injuries, back injuries and poor posture.
   2. having available appropriate patient transfer devices.
   3. providing lifting assistance where the workload includes the transfer of heavy or immobile patients or equipment.

3.2 Personnel Training

3.2.1 A facility must:

3.2.1.1 provide competency based safety training for all new employees as part of the orientation process.
3.2.1.2 have documented orientation and annual updates in training for facility personnel in:
   1. general safety.
   2. fire safety.
   3. WHMIS.
   4. handling medical emergencies.
   5. CPR training for high risk patient examinations.

3.3 Physical Space

3.3.1 A facility must:

3.3.1.1 post clear signage to direct patients and indicate areas of restricted access.
3.3.1.2 provide a secure and private location for personnel to change clothing and store personal items.
3.3.1.3 provide separate storage space for patient consumables.
3.3.1.4 provide sufficient work space for functionality of examinations.

---

10 See the Manuals Standard, Safety Manual, Fire Safety.
3.4 Site Specific Safety Risks

3.4.1 A facility must establish and maintain policies and procedures governing the following risks:

3.4.1.1 General Workplace Safety and Health.
3.4.1.2 Routine Practices.
3.4.1.3 Waste Management and Disposal.
3.4.1.4 Electrical Safety.
3.4.1.5 Eyewash Safety.
3.4.1.6 Fire Safety.

3.4.2 A facility must establish and maintain policies and procedures governing the following risks, as applicable to the specific site:

3.4.2.1 Hazardous Materials.
3.4.2.2 Carcinogens Safety.
3.4.2.3 Chemical Hazards.
3.4.2.4 Compressed Gas.
3.4.2.5 Contrast Media Safety.
3.4.2.6 Radiation Safety.
3.4.2.7 Nuclear Medicine Safety.

3.5 Safety Documentation

3.5.1 The Safety Manual must be available to personnel in hard copy format.
3.5.2 All safety records, including records of monitoring and quarterly checks, must be retained for at least 5 years.

4.0 EQUIPMENT

“Equipment” includes processing equipment/machines, computer hardware and software, information and analytical systems, generators, imaging machines, phantoms and injectors.

4.1 General

4.1.1 A facility must:
4.1.1.1 have the equipment necessary to perform the scope of testing and examinations offered by the facility and suitable for that purpose.
4.1.1.2 keep equipment clean and maintained in good working condition.
4.1.1.3 operate equipment only as intended by the manufacturer.
4.1.1.4 safeguard equipment from unauthorized adjustments or tampering.
4.1.1.5 permit only authorized and trained personnel to operate equipment.
4.1.1.6 situate equipment as required for safe operation.
4.1.1.7 uniquely identify equipment.
4.1.1.8 schedule quality control testing and maintenance as specified by the manufacturer and the quality management program.
4.1.1.9 protect wires and cables that are located in traffic areas.

4.2 Emergency Power

4.2.1 A facility must maintain critical equipment:
4.2.1.1 on an emergency power system, if available.
4.2.1.2 on a robust uninterrupted power supply (UPS), if an emergency power system is not available.

Requirements in relation to specific types of risks are found in the Manuals Standard, Safety Manual.
4.3 Site Specific Equipment

4.3.1 A facility must establish and maintain policies and procedures governing equipment:
   4.3.1.1 maintenance.
   4.3.1.2 monitoring.
   4.3.1.3 record creation and retention.
   4.3.1.4 quality control/quality assurance.

4.3.2 A facility must establish and maintain policies and procedures governing the following equipment, as applicable to the specific site:
   4.3.2.1 CT.
   4.3.2.2 MRI.
   4.3.2.3 fluoroscopy/C-arm.
   4.3.2.4 radiography/mobile radiography.
   4.3.2.5 ultrasound.
   4.3.2.6 electronic display devices.

4.3.3 A facility must:
   4.3.3.1 ensure that the primary monitor (i.e. the monitor used by radiologists to interpret images) meets the following specifications:
      1. for small-matrix systems (CT, MRI, ultrasound and nuclear medicine): primary monitors with at least 0.5K x 0.5K (0.3 mega pixel) resolution and luminance rating of at least 171 cd/m².
      2. for large-matrix-systems (CR, digitized film, DR): primary monitors with at least 1.6K x 1.2K (1.9 mega pixel) resolution and luminance rating of at least 171 cd/m².

4.3.3.2 check the performance of all electronic display devices used to view images from digital systems and from scanning of radiographic films:
      1. using a test pattern such as the SMPTE or a TG18 test pattern, or if a suitable test pattern is not available, an equivalent test pattern generator.
      2. service any monitor which does not pass all tests.

4.3.3.3 annually test all video monitors for:
      1. luminance and uniformity.
      2. manual brightness and contrast setting.
      3. calibration.

5.0 COMPUTED TOMOGRAPHY

5.1 CT Technologist Qualifications

A CT technologist must be a member in good standing with the Canadian Association of Medical Radiology Technologists (CAMRT) and have successfully completed the didactic component of Computed Tomography Imaging Certificate Program (i.e. CT Imaging 1, CT Imaging 2 and CT Imaging 3) or an equivalent nationally recognized CT certificate course.

A facility director may exempt a CT Technologist from the foregoing requirement if the facility director performs a competency assessment and is satisfied that the CT technologist has the core competencies of one who has successfully completed the didactic components of the Computed Tomography Imaging Certificate Program.
5.1.1 A facility director may allow general duty technologists to perform non-contrast CT examinations for a limited scope of practice provided:

5.1.1.1 threshold volumes are established
5.1.1.2 refresher training is available.
5.1.1.3 dose reduction strategies are practiced.
5.1.1.4 appropriate shielding is used.
5.1.1.5 protocol assignments are provided.
5.1.1.6 image assessments are performed for each study to monitor image quality, reference slice selection, gantry angle, technical parameters, and pathology inclusion.
5.1.1.7 a reassessment of competency is performed if any examination does not meet quality standards

5.2 General

5.2.1 A facility must:

5.2.1.1 establish and maintain:
1. a list of procedures which may be done during non-core hours.
2. for referring physicians, a list of procedures performed at the facility.

5.2.1.2 require a radiologist to:
1. screen CT consultation requests for appropriateness, contrast media usage, and priority.
2. code the requisition with the required protocol, including the appropriate use of radiation shielding, before performing the examination.
3. review images after each examination.

5.2.1.3 transmit images to a radiologist after each examination.

5.3 Policies and Procedure

5.3.1 A facility must establish policies and procedures governing:

5.3.1.2 control booth monitoring which must include:
1. direct view of the patient or a television monitor.
2. communication with the patient.
5.3.1.3 patients who exceed the table weight limit.
5.3.1.4 alternate imaging or diagnostic testing.
5.3.1.5 postponing examinations.
5.3.1.6 requests for additional information.
5.3.1.7 technologists performing venipuncture.
5.3.1.8 repeating an image or select images.
5.3.1.9 pregnant patients.
5.3.1.10 biopsies.
5.3.1.11 interventional examinations.
5.3.1.12 documenting CT dose-length product in the patient record.
5.3.1.13 image display in a Picture Archiving and Communications System (PACS).
5.3.1.14 management of potential artifacts, which must include:
1. piercings.
2. dental appliances.
3. surgical hardware.
4. metallic foreign bodies.
5.3.1.15 radiologist availability; the radiologist must be:
1. on-site to code consultation requests, supervise CT examinations and provide interpretations during core hours of operation.
2. available to the technologist when CT examinations are performed during non-core hours of operation.
3. available for consultation for remotely supervised facilities as required; see Additional Requirements for Remote Computed Tomography Facilities\textsuperscript{12}.

5.3.1.16 examination protocols for each examination to include:
1. appropriateness of the clinical history relative to the examination ordered.
2. detector configuration.
3. field of view (FOV), technique parameters.
4. cranial-caudal extent.
5. table speed.
6. phase of respiration.
7. cross-reference images.
8. cross-sectional anatomy requirements.
9. window width and window length.
10. slice thickness.
11. reconstruction interval.
12. reconstruction algorithm.
13. appropriate shielding.
14. assessing clinical history.
15. appropriate contrast media utilization
16. intravenous contrast media injection rate and scan delay.
17. positioning and set scan parameters.
18. repeat images.
19. post-processing for reconstructions and retrospective image manipulation.
20. dose reduction strategies, which must evaluate the associated risks regarding long-term radiation effects.
21. cardiopulmonary resuscitation.
22. technique parameters.
23. pathology variances.
24. necessity for preliminary non-contrast scans.
25. post-processing image generation
26. when a radiologist review of examination prior to ending the patient examination is required.

5.4 Radiation Dose Management
5.4.1 A facility must:
5.4.1.1 establish and maintain Diagnostic Reference Levels (DRLs) for routine examination protocols for average sized patients.
5.4.1.2 adopt dose reduction strategies to minimize patient dose, which must include:
1. the “As Low As Reasonably Achievable” (ALARA) principle.
2. providing radiation shielding to all vulnerable body areas that are not included in the examination.
3. dose reduction technologies.
4. examination protocols which take into account body habitus, body mass index or lateral width.

\textsuperscript{12} Remote facilities are facilities that do not have an on-site radiologist and which involves the electronic acquisition, storage and transmission of examinations from one location to another for the purpose of consultation and interpretation.
5.5 Quality Control Program
5.5.1 A facility must:
  5.5.1.1 consult a medical physicist to:
    1. establish a quality control program.
    2. perform acceptance testing upon installation of a CT scanner, retrofitting equipment or relocation of an existing scanner.
  5.5.1.2 provide appropriate quality control phantom and test tools.

5.6 Additional Requirements for Remote Computed Tomography Facilities
5.6.1 A facility must:
  5.6.1.1 limit procedures to the competency of the CT technologist.
  5.6.1.2 stipulate when additional requirements to procedure protocols are required.
  5.6.1.3 make the radiologist’s contact information available to the CT technologist and referring physician.
  5.6.1.4 use a digitization and display system with a minimum bit array of 0.5 k x 0.5 k x 8 to transmit direct capture images after each examination to a radiologist.
  5.6.1.5 provide each CT technologist with direct training at least annually and more frequently if required by the facility director; a documented competency assessment is required.
  5.6.1.6 monitor report turnaround times at least monthly and more frequently as required
  5.6.1.7 establish and maintain policies for governing:
    1. weekly test image process evaluation.
    2. delivery of urgent results.
    3. the scope of emergent examinations and the mechanism to convey emergency results.
    4. referral of complex or out of scope examinations.
  5.6.1.8 establish policies and procedures governing radiologist availability; the radiologist must be:
    1. on-site to code consultation requests, supervise CT examinations and provide interpretations during core hours of operation.
    2. available to the technologist when CT examinations are performed during non-core hours of operation.

6.0 FLUOROSCOPY
6.1 General
6.1.1 A facility must:
  6.1.1.1 limit the performance of fluoroscopy procedures to:
    1. a radiologist.
    2. a radiology technologist student or medical student under the direct supervision of a radiologist.
    3. a radiology resident physician approved by the facility director.
    4. a physician who has satisfactorily completed didactic training by Radiation Protection and Imaging Physics Division of Manitoba.
    5. a radiology technologist delegated by the facility director.
  6.1.1.2 establish and maintain:
    1. a list of procedures which may be done during non-core hours.
    2. for referring physicians, a list of procedures performed at the facility.
  6.1.1.3 provide protective lead aprons to all persons present in the fluoroscopy room during exposure.
  6.1.1.4 use lead curtains on a stationary radioscopic unit during fluoroscopy.
  6.1.1.5 provide a radiologist interpretive report on all fluoroscopic examinations.
  6.1.1.6 provide the operator with a clear line of sight to the output display at all times.
6.2 Policies and Procedures

6.2.1 A facility must establish and maintain policies and procedures governing:

6.2.1.1 examination protocols, which must include:
1. positioning regimes for general duty radiography.
2. technical factors for positioning regimes.
3. lead shielding, dose reduction initiatives and coning requirements.
4. intravascular contrast media examinations.
5. contrast media examinations.

6.2.1.2 technique parameters.

6.2.1.3 testing fluoroscopy equipment prior to performing patient examinations at the beginning of each day.

6.2.1.4 required overhead views.

6.2.1.5 barium preparation/contrast preparation.

6.2.1.6 barium enemas:
1. rectal.
2. colostomy.

6.2.1.7 private access to washroom facilities for barium enema patients.

6.2.1.8 oral contrast media.

6.2.1.9 non-intravascular contrast media.

6.2.1.10 intravascular contrast media.

6.2.1.11 intra-arterial contrast medical.

6.2.1.12 swallowing difficulties.

6.2.1.13 operating room examinations.

6.2.1.14 sterile field examinations.

6.2.1.15 required examination accessories.

6.2.1.16 lead shielding, which must include required use of:
1. thyroid protectors fluoroscopy if near the intensifier.
2. gauntlets during palpation.
3. lead glasses when the lenses of the eyes could receive a dose of 150 mSv.

6.2.1.17 documenting technical factors, fluoroscopy time and technologist initials in the patient record.

6.2.1.18 capture at least one fluoroscopic image in the patient record.

7.0 MAGNETIC RESONANCE IMAGING (MRI)

7.1 Technologist Qualifications

An MRI technologist must be a member in good standing with the Canadian Association of Medical Radiology Technologists (CAMRT) and have successfully completed the MRI and Spectroscopy course in order to perform an MRI examination.

A facility director may exempt an MRI technologist from the foregoing requirement only if the MRI technologist was performing MRI examinations in Manitoba before 1996 and if the facility director is satisfied that the MRI technologist is competent to perform MRI examinations.

7.2 General

7.2.1 A facility must provide three magnet zones defined as:

7.2.1.1 Zone A: Zone A is uncontrolled and outside the MRI environment. Zone A must have a radiofrequency radiation caution sign.

7.2.1.2 Zone B: Zone B is the interface between the Zone A and Zone C, and must be strictly controlled to prohibit entry into Zone C. In Zone B, patients are screened and prepped for their MRI procedure. Zone B must have a radiofrequency radiation warning sign.

7.2.1.3 Zone C: Zone C is the MRI scanner room. All access to Zone C must be strictly restricted and controlled by trained MRI personnel or securely locked when not in use. Zone C must have a radiofrequency radiation danger sign.
7.3 Safety

7.3.1 A facility must:

7.3.1.1 comply with Health Canada Safety Code 6: Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz (including Errata Section 2.3, page 19).

7.3.1.2 comply with the Health Canada's Technical Guide for Interpretation and Compliance Assessment of Health Canada's Radiofrequency Exposure Guidelines.

7.4 Quality Control Program

7.4.1 A facility must consult a medical physicist:

7.4.1.1 to establish a quality control program for MRI.

7.4.1.2 to perform acceptance testing upon installation of an MRI scanner.

7.5 Policies and Procedures

7.5.1 A facility must establish and maintain policies and procedures;

7.5.1.1 establishing a screening process by a radiologist to:

1. determine if an MRI examination is the best option for the patient.
2. assess magnet safety for the patient.
3. establish priority of the consultation.

7.5.1.2 establishing protocol assignments for each examination offered which includes:

1. radiologist approval
2. appropriate scanning sequences.
3. imaging parameters.
4. motion in molecular suppression options and averages that produce the maximum Signal to Noise Ratios (SNR).
5. the shortest scan possible for optimal resolution.
6. use of appropriate coils and techniques for optimal SNR as well as spatial and/or temporal resolution.

7.5.1.3 governing access to the MRI room, which includes screening for:

1. patients who cannot complete the MRI screening form.
2. patients who are claustrophobic.

7.5.1.4 taking into account the requirements of the magnet strength.

7.5.1.5 complying with vendor directives.

7.5.1.6 immediate access to current reference manuals.

7.5.1.7 identifying MRI safe equipment and accessories.

7.5.1.8 providing appropriate hearing protection.

7.5.1.9 requiring monitoring of patients who are sedated or unable to communicate.

7.5.1.10 requiring emergency call systems in patient areas.

7.5.1.11 addressing emergencies including:

1. evacuating patients from the MRI scanner room to a pre-determined magnetic safe zone where cardiac or respiration intervention is required.
2. if safe, quick evacuation cannot occur, monitoring of the magnet room to ensure that only pre-screened personnel are allowed access into the room.
3. only MRI compatible emergency response equipment may enter the magnet room.
4. MRI personnel training in cardiopulmonary resuscitation.
5. MRI technologists with competence in quenching the magnet.

7.5.1.12 requiring the MRI technologist operator be able to visibly and verbally monitor the patient from the control booth.
7.5.1.13 governing procedures to be followed when screening detects a high risk patient:
   1. ferromagnetic items.
   2. potential metallic foreign object penetration.
   3. in women of child bearing age, pregnancy.
   4. examinations that require immediate medical attention.
   5. implants.

7.5.1.14 governing pre-examination screening for ferromagnetic objects which must include:
   1. acquiring scout radiograph(s), if required.
   2. a mandatory requirement to acquire orbit radiographs or computed tomography whenever there is a risk of an orbital foreign body.
   3. a radiologist interpretation.
   4. acquiring previous imaging.

7.5.1.15 removing a patient from the MRI scanner when an unanticipated implant or foreign body is discovered.

7.5.1.16 establishing a protocol for quenching the magnet, which must include:
   1. a clearly marked magnetic field emergency rundown switch.
   2. evacuation procedures for patients and personnel.
   3. a fail-safe ventilation path for vented helium.
   4. an immediate restricted access.

7.5.1.17 establishing a protocol for cryogenic gasses.

7.5.1.18 having a warning and abort scan alert when radiofrequency power deposition limits are exceeded.

7.5.1.19 governing image display in a Picture Archiving and Communications System (PACS).

7.5.1.20 radiologist availability; the radiologist must be:
   1. on-site to code consultation requests, supervise MRI examinations and provide interpretations during core hours of operation.
   2. available to the technologist when MRI examinations are performed during non-core hours of operation.

8.0 MAMMOGRAPHY

Each facility which offers mammography services must hold a valid certificate of accreditation and adhere to the most recent standard requirements set out by the Canadian Association of Radiologists Mammography Accreditation Program.

9.0 RADIOGRAPHY

9.1 General

9.1.1 A facility must:
   9.1.1.1 comply with recommendations made in Radiation Protection Services reports.
   9.1.1.2 provide calipers for patient measurements.
   9.1.1.3 provide the following immobilizers:
      1. infant immobilizers, if infant x-rays are performed.
      2. upright bucky stabilizers.
      3. pediatric skull immobilizers.
   9.1.1.4 provide lead shielded walls for stationary control booths.
   9.1.1.5 provide radiology rooms with stationary x-ray equipment.
   9.1.1.6 not use mobile machines as a fixed installation.
9.2 Policies and Procedures

9.2.1 A facility must establish and maintain policies governing:


9.2.1.2 a list of routine views provided for each examination.

9.2.1.3 positioning regimes.

9.2.1.4 lowest achievable technical factors while maintaining image quality, which must include:
   1. caliper measurement variations.
   2. each view.
   3. ionization chamber selection.
   4. body habitus selection.
   5. backup times.
   6. documentation of variation from routine.
   7. appropriate focal spot.
   8. carry out radioscopic examinations with the smallest x-ray field size.
   9. have as large as possible focal spot-to-skin distance.
  10. taking a single preliminary image prior to performing a long series of images.

9.2.1.5 exposure control, which must include:
   1. only a radiology technologist or other approved x-ray equipment operator may take an exposure.
   2. an irradiation exposure may only be taken:
      a) for diagnostic purposes when requested by a physician or other approved referrers.
      b) for quality purposes.
      c) for testing purposes.
   3. holding patients during exposure.
   4. presence of individuals in the room during exposure.

9.2.1.6 technologist initials in the patient examination record.

9.2.1.7 use of markers; changing electronic markers or lead markers on images must include technologist initials.

9.2.1.8 lead shielding, dose reduction initiatives and coning requirements.

9.2.1.9 intravascular contrast media examinations.

9.2.1.10 operating room radiology examinations.

9.2.1.11 sterile field examinations.

10.0 MOBILE RADIOGRAPHY

10.1 General

10.1.1 A facility must limit use of mobile equipment to cases where the condition of the patient makes it inadvisable for the examination to be carried out with a stationary unit in the x-ray department.

10.2 Policies and Procedures

10.2.1 The facility must establish and maintain policies governing:

10.2.1.1 a technical factor list for routine mobile examinations must accompany the mobile equipment.

10.2.1.2 document technical factors for each examination.

10.2.1.3 technologist initials in the patient record for each examination performed.

10.2.1.4 mobile exposures:
   1. Provide a verbal warning that an exposure will be taken.
   2. Provide lead shielding for individuals who are present during exposure.

10.2.1.5 operating room.

10.2.1.6 sterile field examinations.
11.0 ULTRASOUND

11.1 Sonographer\textsuperscript{13} Qualifications
A sonographer must hold an active registration status with the Canadian Association of Registered Diagnostic Ultrasound Professionals (CARDUP) in the appropriate practitioner category or at the discretion of the facility director; an exemption may be granted for sonographers who hold active registration status with the American Registry for Diagnostic Medical Sonographers (ARDMS) in the appropriate speciality.

11.2 General
11.2.1 A facility must:
\begin{enumerate}
\item establish and maintain:
  \begin{enumerate}
  \item a list of procedures which may be done during non-core hours.
  \item for referring physicians, a list of procedures performed at the facility.
  \end{enumerate}
\item require a sonologist\textsuperscript{14} to:
  \begin{enumerate}
  \item screen consultation requests for appropriateness and priority of examination.
  \item promptly review each examination image taken.
  \end{enumerate}
\end{enumerate}

11.3 Policies and Procedures
11.3.1 A facility must establish and maintain policies governing:
\begin{enumerate}
\item demographic requirements which must include:
  \begin{enumerate}
  \item the name of the sonographer performing the examination.
  \item the date and time of examination.
  \item relevant clinical information.
  \item a record of the quantity of data (e.g. number of images or clips).
  \end{enumerate}
\item ergonomic requirements for personnel, which must include:
  \begin{enumerate}
  \item properly designed scanning chairs,
  \item height adjustable stretchers,
  \item support cushions, and
  \item adjustable footrests.
  \end{enumerate}
\item use of Doppler ultrasound in obstetrics.
\item biopsies.
\item interventional procedures.
\item image display in a Picture Archiving and Communications System (PACS).
\item examinations that require immediate medical attention.
\item gel usage meeting Health Canada Safety Guidelines\textsuperscript{15}.
\item contrast media.
\item sonographer modification of the examination due to relevant findings, which must include sonographer documentation of rationale for any deviations.
\item structures not well visualized.
\item availability of spill kits when endocavity transducers are used.
\item transducer cleaning.
\item transducer cover usage.
\item endocavity transducer disinfection.
\item transducer disinfection with high-level disinfectants requiring fume hoods.
\item transducer usage in a sterile field.
\end{enumerate}

\textsuperscript{13} A sonographer is an ultrasound technologist.
\textsuperscript{14} A sonologist is an ultrasound radiologist.
\textsuperscript{15} Health Canada Health Products and Food Branch NOTICE TO HOSPITALS Important Safety Information on Ultrasound and Medical Gels. Retrievable from http://www.hc-sc.gc.ca/dhp-mps/medeff/advisories-avis/prof/_2004/ultrasound_nth-ah-eng.php
11.3.1.18 annual competency evaluations of sonographers, which must include:
   1. scan skills
   2. interpretative skills.
   3. appropriateness of technical impressions.

11.3.1.19 governing when a sonologist must be:
   1. on-site for consultation, interpretation and supervision of ultrasound examinations.
   2. on call for consultation, interpretation and supervision of ultrasound examinations.
   3. available for consultation and report delivery to a remote ultrasound facility.

11.3.1.20 procedure protocols for each examination, which must include:
   1. providing a list of required images.
   2. optimizing the image
   3. monitoring output display indices and adjust power output in accordance with the As Low As Reasonably Achievable Principle.
   4. the anatomic region examined with the patient positioned as appropriate.
   5. measuring structures as required.
   6. documenting a summary of sonographic findings as required.

11.4 Quality Control Program

11.4.1 A facility must consult a medical physicist:
   11.4.1.1 to establish a quality control program.
   11.4.1.2 to perform acceptance testing upon installation of an ultrasound machine.

11.4.2 A facility must:
   11.4.2.1 provide appropriate quality control phantom and test tools.
   11.4.2.2 perform weekly quality control tests for:
      1. the brightness and contrast on the machine monitor.
      2. the entire gray bar.
      3. vertical shadows and streaks on images.
   11.4.2.3 perform annual quality control tests for:
      1. transducer uniformity.
      2. transducer element integrity.
      3. maximum depth of visualization.
      4. target detection and imaging.
      5. distance measurement accuracy.
      6. lateral and axial resolution.
      7. dead zone.
   11.4.2.4 sonologist availability; the sonologist must be:
      1. on-site to code consultation requests, supervise ultrasound examinations and provide interpretations during core hours of operation.
      2. available to the sonographer when ultrasound examinations are performed during non-core hours of operation.
      3. available for consultation for remotely supervised facilities as required; see Additional Requirements for Remote Ultrasound Facilities.
11.5 Additional Requirements for Remote Ultrasound Facilities

11.5.1 A facility must:

- 11.5.1.1 limit procedures to the competency of the sonographer.
- 11.5.1.2 stipulate when additional requirements to procedure protocols are required.
- 11.5.1.3 make the sonologist’s contact information available to the sonographer and referring physician.
- 11.5.1.4 use a digitization and display system with a minimum bit array of 0.5 k x 0.5 k x 8 to transmit direct capture images after each examination to a sonologist.
- 11.5.1.5 provide each sonographer with direct training at least annually and more frequently if required by the facility director; a documented competency assessment is required.
- 11.5.1.6 monitor report turnaround times at least monthly and more frequently if required.
- 11.5.1.7 establish and maintain policies governing:
  1. weekly test image process
  2. delivery of urgent results.
  3. emergent examinations.
  4. referral of complex or out of scope examinations.
- 11.5.1.8 establish policies and procedures governing sonologist availability; the sonologist must be:
  1. on-site to code consultation requests, supervise ultrasound examinations and provide interpretations during core hours of operation.
  2. available to the technologist when ultrasound examinations are performed during non-core hours of operation.

11.6 Ultrasound Equipment

11.6.1 A facility must operate, maintain and monitor ultrasound equipment in accordance with the manufacturer performance specifications for:

- 11.6.1.1 real-time, 2D grey–scale imaging.
- 11.6.1.2 M-mode imaging.
- 11.6.1.3 color, pulsed, and power Doppler.
- 11.6.1.4 harmonic imaging.
- 11.6.1.5 a range of transducer frequencies appropriate for the patient population.
- 11.6.1.6 an endocavity transducer for prostate or rectal imaging.
- 11.6.1.7 an endovaginal transducer with a frequency of ≥ 7 MHz for early obstetric and gynecologic imaging.
- 11.6.1.8 a linear transducer with a frequency of ≥7.5 MHz For superficial structures.
- 11.6.1.9 operator adjustable acoustic power output.