Course objectives related to the BI certificate programs

These objectives are representative of the course content currently under offer by CAMRT (2025). Courses are reviewed for minor updates termly, and will undergo significant review and potential updates on a 5-year cycle. If you require up-to-date and specific course outlines, please contact cpd@camrt.ca. These are copyrighted by the CAMRT. These are subject to change.

Breast Imaging 1, 2 and IBP are under revision in the year 2026.

This document includes objectives for all BI-related certificate courses.

Course Objectives

Breast Imaging 1

- Describe breast embryology
- Explain breast physiology and breast changes that occur in the lifetime of a woman
- Identify gross surface anatomy of the breast
- Identify surrounding structures
- Describe anatomical structures within the breast
- Describe histology of the female breast
- Describe the male breast
- Identify breast pathologies that occur in males
- Outline standard mammographic positions; the craniocaudal and mediolateral views
- Describe patient positioning of the craniocaudal and mediolateral views
- Identify positioning errors and corrective measures
- Specify supplemental views and when they are required
- Describe patient positioning of supplemental views
- Describe the technique when imaging breast implants
- Explain the rational for breast compression and its effect of the image
- List alternate methods for obtaining high-quality images on difficult to position patients
- Describe how patient compliance affects positioning and images obtained
- Identify how variations in body habitus and breast shape can affect imaging
- Describe safe ergonomics and body mechanics for the technologist

- Identify breast anatomy seen on a mammogram
- Discuss patient care in the mammographic setting
- Explain the technical factors used in mammography and why they are specific to breast imaging
- Identify cultural considerations in terms of being sensitive to a patient's needs and beliefs
- Describe how optimal exposure factors affect the digital image
- Describe efforts being made to increase mammographic screening within the Indigenous community
- Identify the relationship between technical factors used and patient dose
- Explain mammographic imaging of the gender diverse community
- Describe radiation protection in mammography
- Summarize the organized approach to breast imaging
- State the function of the Canadian Task Force on Preventive Health Care
- Identify the guidelines for breast screening set out by the Canadian Task Force
- Identify the CAR recommendations for breast imaging
- Explain the difference between guidelines and recommendations
- Describe the technologist's role in obtaining high-quality and diagnostic mammography
- List educational requirements for technologists to perform mammography in Canada
- Identify the purpose of the Mammography Accreditation Program set out by the CAR
- Describe how participation in the Mammography Accreditation Program (MAP) benefits the technologist
- Compare screening and diagnostic protocols
- Identify differences when imaging symptomatic and asymptomatic mammography patients
- Explain the risks and benefits of screening for breast cancer
- Explain breast cancer screening and the rationale behind it
- Describe what a breast screening program is
- Identify participants eligible for provincial breast screening programs
- Identify outcomes from breast screening programs
- Identify the reason(s) screening for breast cancer is considered by some to be controversial
- Describe how the screening controversy can impact patients

- Identify the eight population-based breast screening trials that were instrumental in demonstrating the efficacy of mammography
- Describe the Digital Mammographic Imaging Screening Trial (DMIST) study and its results
- Identify breast cancer statistics in Canada
- Identify breast cancer risk factors:
    - Uncontrollable risk factors
    - Controllable risk factors
- Identify percentages of breast cancer occurrences by their location in the breast
- Describe different types of breast cancer:
    - DCIS
    - Invasive ductal carcinoma
    - Tubular carcinoma
    - Mucinous or colloid carcinoma
    - Papillary carcinoma
    - Medullary carcinoma
    - Cribriform carcinoma
    - LCIS
    - Invasive lobular carcinoma
    - Inflammatory breast cancer
    - Paget's disease of the nipple
- Describe how breast cancer can be diagnosed
- Describe breast cancer staging and grading
- Describe surgical interventions for breast cancer:
    - Lumpectomy
    - Mastectomy
    - Sentinel node biopsy
    - Axillary node dissection
    - Prophylactic mastectomy
- Outline breast cancer treatments:

- Neoadjuvant therapy
- Adjuvant Therapy
- Chemotherapy
- Endocrine Therapy
- Targeted Therapy

- Describe types of breast reconstruction available to patients
- Describe the purpose of post-breast cancer screening including:
  - Benefits
  - Recommendations

Breast Imaging 2

Explain direct digital breast imaging equipment

- Explain components of a full-field digital mammography (FFDM) system
  - X-ray tube
  - Target
  - Filtration
  - Collimators
  - C-arm gantry
  - Face plate
  - Compression paddle
  - Grids
  - Automatic exposure control
  - Detectors
  - Analog to digital converter
  - Control panel
  - Technologist workstation
  - Radiologist review station

- Explain features of a full-field digital mammography (FFDM) system
    - Workflow
    - Information Systems: RIS/MIS/HIS
    - Process
    - Pre-processing/algorithms
    - Post-processing
    - Picture Archiving and Communication System (PACS)
    - Health Level 7 (HL7)
    - Digital Imaging and Communications in Medicine (DICOM)
    - Image storage
- Explain computer aided detection (CAD)
- Explain factors that affect image quality
    - Spatial resolution (detail)
    - Contrast
    - Development of image artifacts
- Explain dose limits and dose reduction
- Explain exposure index values
- Explain digital breast tomosynthesis

Explain the importance and process of quality control (QC) procedures for mammography

- Daily QC procedures
    - Equipment warm-up, if recommended by manufacturer
    - Meter operation
    - Equipment condition
    - Cleanliness of electronic display devices and assessment of viewing conditions
    - Overall visual assessment of electronic display devices
- Weekly QC procedures
    - Visual inspection and cleanliness of imaging systems
    - Imaging quality evaluation with phantom for optical density and absence of artifacts

    - Digital image quality evaluation with phantom, looking for test objects embedded therein
    - Electronic display device performance
    - Compression centimetre test
- Monthly QC procedures
    - Mechanical, electrical and overall safety inspection
    - Extended full-field artifacts evaluation
- Quarterly QC procedures
    - Repeat analysis
    - Reject analysis
- Semi-annual QC procedures
    - Breast compression (force) device
- Annual QC procedures (physicist)
    - Accuracy of tube voltage
    - Reproducibility of tube voltage
    - Radiation output (air kerma) reproducibility and linearity
    - Normalized radiation output
    - X-ray beam filtration
    - Collimation/ beam limiting device
    - Light field and x-ray field alignment
    - Automatic exposure control (AEC)
    - Response function
    - Noise evaluation
    - Image homogeneity and artifact assessment
    - Ghosting
    - Image quality for contrast, detail and artifacts
    - Dosimetry
    - Electronic display device performance
    - General preventive maintenance

Explain QC procedures for Digital Breast Tomosynthesis

- Digital image quality evaluation with phantom
- Geometry calibration

Explain quality assurance (QA) procedures

- Purpose
- Process
- Audit

Explain the CAR Mammography Accreditation Program

Discuss contrast-enhanced digital mammography (DM)

Discuss ultrasound imaging

- Colour Doppler
- Therapeutic ultrasound
- Elastography
- Automated breast ultrasound

Discuss MRI

- Diffusion weighted imaging
- Spectroscopy

Discuss PET and PET/CT

Discuss SPECT and SPECT/CT

- Scintimammography
- Lymphoscintigraphy
- Bone scintigraphy

Discuss experimental techniques for breast imaging

- Mammography-ultrasound fusion
- Cone beam CT
- Methods using light
    - Transillumination
    - Optical imaging/ optical spectroscopy/
    - CT laser mammography

    - Digital optical breast imaging (DOBI)
- Thermography
- Methods measuring electrical impulses
    - Electrical potential measurements
    - Electrical impedance imaging

Microwave imaging

Perform basic interpretation and critique of mammographic images for benign and malignant lesions

- Breast asymmetry/architectural distortion
- Breast masses
- Breast calcifications
- Skin changes
- Nipple changes and discharge
- Lymphadenopathy
- Other changes

Explain the BI-RADS system

Explain breast density classification

- Automated breast density assessment software

Explain where breast cancer comes from

Identify and explain basic pathology

- Cyst
- Fibroadenoma
- Lactational or lactating adenoma
- Hamartoma
- Fat necrosis and oil cysts
- Abscess
- Duct ectasia
- Intraductal papilloma
- Sclerosing adenosis

- Radial scar
- Phyllodes tumour
- Paget's disease
- Pseudoangiomatous stromal hyperplasia
- Atypical ductal hyperplasia
- Ductal carcinoma in situ
- Invasive ductal carcinoma
- Atypical lobular hyperplasia
- Lobular carcinoma in situ
- Invasive lobular carcinoma
- Invasive mixed carcinoma
- Inflammatory breast cancer
- Metastatic breast cancer
- Juvenile breast carcinoma
- Lymph nodes
- Conditions of the male breast

Explain factors pertaining to diagnostic imaging

- Breast changes/ signs and symptoms
- Breast exam
- Clinical history
- Diagnostic imaging
    - Lateral
    - Nipple views
    - Extended or exaggerated CC
    - Spot compression
    - Magnification
    - Rolled
    - Tangential
    - Cleavage

    - Axillary tail
    - Elevated craniocaudal
    - From below caudocranial

Explain procedures and issues with imaging the mastectomy site

Explain triangulation/localization methods

Explain interventional procedures of the breast

- Galactography
- Cyst aspiration
- Abscess drainage
- Biopsies
    - Fine needle aspiration
    - Core biopsy
    - Vacuum assisted biopsy
    - Clip placement
    - Specimen radiography
- Preoperative localizations
    - Needle wire localizations
    - Radioactive seed localization
    - Other localization methods
- Sentinel node biopsy
- Excisional/incisional biopsy
- Ablation and other non-surgical tissue removal techniques

Imaging Breast Pathology

- Describe embryology of the breast
- Describe the breast and surrounding structures
- Describe the anatomy and histology of the female breast
- Describe the physiology of the female breast and the factors affecting breast development, function and mammographic appearances

- Describe the anatomy and physiology of the male breast
- Identify anatomical breast structures as seen on the mammogram
- Describe and identify mammographic anomalies of the breast
- Explain the concept of being breast aware and clinical breast exams
- Describe any physical signs and/or symptoms associated with breast cancer
- List non-modifiable and modifiable risk factors associated with the development of breast cancer
- List breast cancer statistics
- Explain the basic histological changes associated with breast cancer
- Explain the mechanisms involved in the proliferation of breast cancer
- Explain the diagnosis of breast cancer and the pathology report
- Describe the system of staging strategies associated with breast cancer
- Describe breast cancer treatment options
- Describe screening mammography
- Describe diagnostic mammography
- Describe the technologist's role in acquiring two-dimensional (2D) Digital Mammography (DM) and Digital Breast Tomosynthesis (DBT) in both screening and diagnostic settings with imaging strategies used to demonstrate various breast structures and disease processes
- Describe the radiologist's interpretation of screening and diagnostic mammography and the rationale for the various imaging techniques used to demonstrate breast structures and diseases
- Outline the systematic approach from the detection to diagnosis of breast cancer
- State the purpose of the Breast Imaging Reporting and Data System (BI-RADS) as it pertains to the mammography reporting system
- Describe Double Reading of Mammograms, Computer Assisted Detection (CAD) and Artificial Intelligence (AI)
- List and briefly describe adjunctive imaging modalities, such as Breast Ultrasound and MRI, used in diagnosing breast disease and emerging technologies
- State the general principles, indications and benefits of these adjunctive imaging modalities commonly used in Breast Imaging
- List and describe the various interventional procedures utilized in the diagnosis of breast diseases

- Describe the method used to select an appropriate interventional procedure
- State the importance of radiological/pathological correlation
- State how radiological/pathological correlation is attained
- Define a breast mass
- Describe the evaluation of breast masses using BI-RADS Breast Imaging Lexicon – Mammography
- Describe the evaluation of breast masses using BI-RADS Breast Imaging Lexicon – Ultrasound
- List the various benign breast masses
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various benign breast masses
- Identify benign breast masses on the mammogram
- List the various malignant breast masses
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various malignant breast masses
- Identify malignant breast masses on the mammogram
- Describe and identify architectural distortion of the breast on the mammogram
- Describe and identify asymmetries of the breast on the mammogram
- Describe mammographic imaging of calcifications

Describe mammographic evaluation of calcifications

- List, describe and identify typically benign calcifications as they appear on a mammogram
- List, describe and identify suspicious morphology of calcifications as they appear on a mammogram
- List, describe and identify the distribution of calcifications as they appear on a mammogram
- List and describe the various processes of calcifications, how they appear on a mammogram and their treatment plan if necessary.
- List the various interventional/surgical procedures performed on the breast.
- State the reason tissue core biopsy is performed and describe the mammographic findings seen after this interventional procedure.
- State the reason open surgical biopsy is performed and describe the mammographic findings seen after this interventional procedure.

- State the reason lumpectomy is performed and describe the mammographic findings seen after this surgical procedure.
- State the reason mastectomy is performed and describe the mammographic findings seen after this surgical procedure.
- State the reason sentinel node biopsy or axillary dissection is performed and describe the mammographic findings seen after this surgical procedure.
- State the reason reduction mammoplasty is performed and describe the mammographic findings seen after this surgical procedure.
- State the reason augmentation mammoplasty is performed, describe the mammographic findings seen after this surgical procedure and possible complications.
- State the reason breast reconstruction is performed and describe the mammographic findings seen after this surgical procedure.
- State the reason mastopexy is performed and describe the mammographic findings seen after this surgical procedure.
- Define and describe the findings of associated features using BI-RADS Breast Imaging Lexicon – Mammography
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various benign associated features
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various malignant associated features
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various special topics
- Describe the terminology, clinical findings, mammographic findings and treatment plans of the various special conditions

Exam Blueprints

CAMRTBreast Imaging 1 Exam blueprint

Item presentation - % of question types	
Multiple Choice: 100%	
Exam structure	
Exam length: 2:0 hours Number of questions: 100	
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapters**
1 – Breast Anatomy	16-20%
2 – Mammographic Positioning	24-28%
3 – Patient Care in Mammography	11-14%
4 – Organized Approach to Breast Imaging	4-8%
5 – Breast Cancer Screening	11-15%
6 – Breast Cancer	24-28%

CAMRT Breast Imaging 2 Exam blueprint

Item presentation - % of question types	
Multiple Choice: 100%	
Exam structure	
Exam length: 2:0 hours Number of questions: 100	
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapters**
1 – Mammographic and Digital Breast Tomosynthesis Equipment	12-15%
2 – Quality Control / Quality Assurance with Mammographic and Digital Breast Tomosynthesis Equipment	12-15%
3 – Adjunctive Breast Imaging Modalities	12-15%
4 – Differentiation of Benign and Malignant Breast Abnormalities	17-21%
5 – Basic Breast Pathology	17-21%

6 – Diagnostic Imaging and Interventional Procedures of the Breast	17-21%

CAMRT Imaging Breast Pathology Exam blueprint

Item presentation - % of question types	
Multiple Choice 70% True or False: 30%	
Exam structure	
Exam length: 2.5 hours Number of questions: 100	
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapters**
1 – Anatomy & Physiology and Development & Treatment of Breast Cancer	12%
2 – Mammographic Interpretation, Adjunctive Modalities & Interventional Procedures	22%
3 – Masses, Architectural Distortion & Asymmetries	28%
4 – Calcifications	14%
5 – The Surgically Altered Breast	14%
6 – Associated Features & Special Topics and Conditions	10%