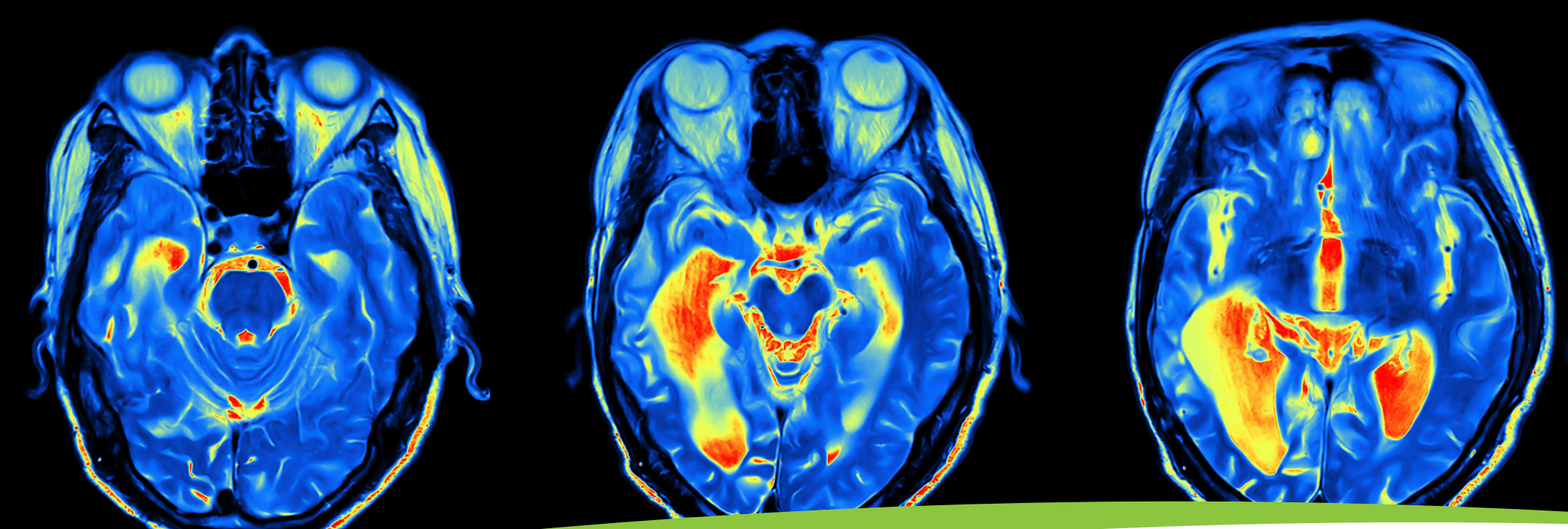

For Providers & Practice Staff

CT and MRI Guide

Indication and Selection of Imaging Modality

bronsonhealth.com

BRONSON

CT and MRI Imaging Tests

The highly trained, subspecialized radiologists at Bronson are dedicated to the safe and efficient use of advanced imaging to help improve the health of patients. When appropriately applied, advances in imaging technology enable the early detection of disease that can lead to improved treatment options and outcomes.

CT and MRI Appointments can be scheduled at Bronson locations throughout Southwest Michigan. For a list of locations with all your imaging needs, go to bronsonhealth.com.

- Battle Creek: (269) 245-8666
- Kalamazoo and Paw Paw: (269) 341-8700 or (888) 741-6415
- South Haven: (269) 639-2828

If you have specific questions about CT or MRI exams, please call (269) 341-6380.

Please note: the information provided in this guide is not intended to be all inclusive. Clinical judgment in an individual case may influence the choice of imaging modality.

Scheduling "Tips and Tricks"

CT

Contrast Options:

- With
  should be ordered as "With" only, not "Without and With"

Common Risk Factors Requiring Labs:

- Diabetes
- 60 Years or Older
- Cardiovascular Disease or High Blood Pressure
- Kidney Problems

GFR Guidelines for Hydration:

- GFR > 30 IV contrast is OK to give IV hydration is up to the discretion of the ordering physician.
- GFR < 30: NO IV contrast unless a discussion with a radiologist determines if IV hydration and IV contrast is needed.

Patient/Equipment Weight Limit:

- 650 lbs. (BMH)
- 500 lbs. (BBC),(BSH)
- 450 lbs. (BARS),(BLH),(BBC-OC)

CT Colonography and CT Coronary procedures:

- Scheduled by the Bronson Hospital CT Dept. staff: Call (269)341-8707 for CT Colonography and CT Coronary procedures

Age Requirements:

- Greater than 10 years old (BLH),(BARS),(BSH) ➢ For BMH:
- 0-2 years old may requires sedation these exams will need to go through pediatric sedation to get scheduled
- 2-18 years old (Pediatric) Sedation **dependent on patient's condition**

performed without contrast and part with contrast.
Note: Any CT to be performed with contrast

MRI

Common Risk Factors Requiring Labs:

- Diabetes
- 60 Years or Older
- High Blood Pressure
- Kidney Problems

Primary reasons to use Without and With Contrast:

- Infection
- Mass
- Lesion

Age Requirements:

- Greater than 10 years old (BARS, BLH, BBC, BSH and mobiles) ➢ For BMH:
  - 0-8 years old requires sedation

Patient/Equipment Weight Limit:

- 550 lbs. (BARS),(BLH),(BMH),(BSH)
- 500 lbs. (BBC),(BBC-OC)
- 350 lbs. (BSH)

Equipment:

- 3T – (BARS),(BBC),(BMH)
- 3T Wide Bore (BARS), 1.5 Wide Bore (BLH)
- 1.5T Wide Bore – (BBC-OC),(BSH)

Key	
BARS:	Bronson Advanced Radiology Services
BBC:	Bronson Battle Creek
BLH:	Bronson LakeView Hospital
BMH:	Bronson Methodist Hospital
BSH:	Bronson South Haven

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
BRAIN *If MRI is contraindicated then CT	• **Acoustic Neuroma (see also Vestibular Schwanomma)**	**MRI**	**Without & With**	Ct more useful in assessing the osseous temporal bone.
	• **Acute Bleed**	**CT**	**Without**	
	• **Brain tumor, metastasis**	**MRI**	**Without & With**	May add perfusion & spectroscopy to better characterize known mass.
	• **Cavernous sinus**	**MRI**	**Without & With**	MRI brain/sella
	• **CNS infection, abscess, meningitis**	**MRI**	**Without & With**	
	• **Cranial nerves**	**MRI**	**Without & With**	Protocols to evaluate either upper or lower cranial nerves
	• **Dementia or Movement Disorders**	**MRI**	**Without**	MRI superior evaluation of white matter changes, patterns of atrophy.
	• **Headache**	**MRI or CT**	**Without**	MRI preferred unless headache suspected due to acute hemorrhage or dissection. Contrast for meningeal disease or suspected mass.
	• **Hearing loss, conductive**	**CT**	**Without**	Assesses mastoids, middle ear, ossicles
	• **HIV**	**MRI**	**?**	
	• **Inflammation, known malignancy**	**MRI**	**Without & With**	
	• **Multiple Sclerosis**	**MRI**	**Without & With**	Consider imaging of both the brain and spine
	• **Neurodegenerative Disorder**	**MRI**	**Without**	Parkinson's Disease etc.
	• **Optic nerves**	**MRI** **CT**	**Without & With** **With**	• **MRI** for evaluation of optic neuritis or orbital mass. • **CT** for calcification in optic nerve meningioma
	• **Orbit-Proptosis**	**CT or MRI***	**With** **Without & With**	No contrast for Graves' Disease
	• **Pituitary tumor**	**MRI***	**Without & With**	MRI better for characterizing sellar mass & assessing extent.
	• **Posterior Fossa, brain stem lesion**	**MRI***	**Without & With**	MRI far superior in this region
	• **Seizure**	**MRI***	**Without & With**	Will require contrast for adults
	• **Stroke**	**CT or MRI**	**Without**	CT typically first exam. MRI more sensitive. Consider vascular imaging with CTA or MRA.
	• **Subarachnoid bleed**	**CT**	**Without**	
	• **Subdural hematoma**	**CT or MRI**	**Without**	CT is first examination. MRI to evaluate for blood of different ages.
	• **TIA**	**MRI**	**Without**	Contrast helpful if sub-acute ischemia suspected.
	• **Tinnitus (pulsatile)**	**CT or MRI**	**With** **Without & With**	CT better for assessing osseous temporal bone, MRI for soft tissue skull base findings.
	• **Vestibular Schwannoma, Sensorineural hearing loss**	**MRI**	**Without & With**	Ct more useful in assessing the osseous temporal bone.

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
NEURO-VASCULAR *If MRI is contraindicated then CT or CTA	• **Aneurysm**	**MRA or CTA**	**Without With**	• MRA useful for screening. CTA more sensitive, particularly for aneurysms 3 mm in size or less.
	• **Circle of Willis**	**MRA*** **MRV*** **CTA**	**Without** **Without** **With**	• For intracranial circulation • For cervical vessels • For intracranial veins & dural venous sinuses • In general more sensitive than MRA for dissection or aneurysm. Downside is radiation exposure.
	• **Venous sinus thrombosis**	**MRV**	**Without & With**	
FACE & NECK	• **Facial trauma**	**CT**	**Without**	
	• **Neck mass**	**CT 1st then MRI***	**With** **Without & With**	**CT first** examination in most cases, including adenopathy and suspected or palpable mass. **MRI** for perineural disease extension, residual/ recurrent malignancy in some cases, or suspected cartilage invasion.
	• **Salivary gland**	**CT**	**With**	
	• **Sinusitis**	**CT**	**Without**	CT defines ostial obstruction, bone changes
	• **Skull base**	**CT or MRI**	**With** **Without & With**	CT preferred for osseous detail. MRI preferred for skull base mass or soft tissue characterization.
	• **Squamous CA**	**CT 1st then MRI**	**With** **Without & With**	
	• **TMJ**	**MRI**	**Without**	
	• **Vocal chord paralysis**	**CT 1st then MRI**	**With** **With**	
SPINE MRI for patients with previous lumbar surgery - order **without & with contrast.**	• **Compression fx, Possible bone metastasis**	**MRI**	**Without (Fracture)** **Without & With (Mets)**	In most cases, better characterization of focal or diffuse marrow process with MRI. CT adjunctive in some cases.
	• **Cord disease**	**MRI**	**Without & With**	Demyelination, syrinx
	• **Cord tumor**	**MRI**	**Without & With**	
	• **Discitis/Osteomyelitis**	**MRI**	**Without & With**	
	• **Herniated disc, cervical or thoracic**	**MRI**	**Without**	Contrast not necessary for most C or T spine
	• **Herniated disc, lumbar**	**MRI**	**Without (Unless prev. back surgery)**	Contrast essential to distinguish scar from recurrent disc herniation after surgery

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
SPINE Cont'd	• **Metastasis; bone, epidural, intraspinal**	**MRI**	**Without & With**	Non-contrast adequate for bone metastasis. Contrast for epidural or intrathecal tumor
	• **Stenosis**	**MRI**	**Without**	
MUSCULO-SKELETAL	MRI is generally the preferred modality for suspected musculoskeletal pathology and is the preferred study for joint, tendons, ligament, and cartilage pathology. It is also the preferred modality in the detection of most stress injuries and occult fracture in patients with osteopenia or osteoporosis. CT, CT arthrography, and ultrasound can often be substituted if MRI is contraindicated due to pacemaker or other issues and can often be complementary examinations. In specific cases, CT or Ultrasound may be preferred. Contact a musculoskeletal radiologist with any questions at (269) 341-6380			
	• **Ankle - ligament or tendon pathology**	**MRI**	**Without**	
	• **Arthroplasty evaluation**	**CT or MRI**	**Without**	Specific total arthroplasty protocols available for MRI optimal for detecting early synovitis/particle disease.
	• **Avascular necrosis**	**MRI**	**Without**	
	• **Bone lesions -indeterminate on MRI, plain film, or bone scintigraphy**	**CT**	**Without**	May be complementary.
	• **Brachial plexus - suspected pathology**	**MRI**	**Without & With**	
	• **Elbow - suspected ligament pathology**	**MRI**	**Without (intra-articular)**	MR arthrography
	• **Elbow-suspected tendon pathology**	**MRI**	**Without**	Include FABS views for suspected biceps tendon pathology
	• **Fractures and dislocations - articular & peri-articular**	**CT**	**Without**	MRI may detect fractures occult on CT, especially in osteopenic patients.
	• **Hip - Suspected labral pathology**	**MRI**	**Without (intra-articular)**	MR arthrography
	• **Knee-staging of fx about the knee**	**MRI or CT**	**Without**	Consult musculoskeletal radiologist.
	• **Ligament pathology**	**MRI**	**Without**	
	• **Long bone fx - staging and eval. of**	**CT**	**Without**	
	• **Lymphoma & multiple myeloma**	**MRI**	**Without & With**	
	• **Meniscal pathology**	**MRI**	**Without**	
	• **Nerve entrapment (suspected)**	**MRI**	**Without & With**	
	• **Occult joint effusion**	**MRI**	**Without**	

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
MUSCULO-SKELETAL CONT'D	• **Osteochondral defects/ osteoarthritis dissecans**	**MRI**	**Without**	
	• **Scaphoid fracture - suspected radiographically occult**	**MRI**	**Without**	Contrast exception: to evaluate for viability – order with contrast
	• **Scaphoid fracture evaluation for suspected AVN/ viability.**	**MRI**	**Without & With**	
	• **Shoulder impingement syndrome/rotator cuff pathology.**	**MRI**	**Without**	MR arthrography is even more sensitive and specific but not required.
	• **Shoulder labral injury**	**MRI**	**Without (intra-articular?**	MR arthrography
	• **Soft tissue masses**	**MRI (usually, see comment)** **CT less often**	**Without & With** **With**	CT is indicated to evaluate certain soft tissue masses such as myositis ossificans and other calcified masses. Consult musculoskeletal radiologist.
	• **Soft tissue masses - peri-and-intraarticular**	**MRI**	**Without & With**	CT or plain films may be complementary.
	• **Sports hernia, pubalgia**	**MRI**	**Without**	Sports hernia protocol
	• **Synovial disease -primary**	**MRI**	**Without and With (Usually-See Comment**	Consult musculoskeletal radiologist or leave to radiologist discretion.
	• **Temporo-mandibular joint pathology**	**MRI**	**Without**	
	• **Tendon pathology**	**MRI**	**Without**	
	• **Thumb gamekeeper's fracture/UCL injury**	**MRI**	**Without**	
	• **Tumors (Primary) and metastatic disease**	**Plain film** **CT** **MRI**	**N/A** **With** **Without & With**	Depending on specific situation, one modality may be preferred. Tests may also be complementary. Consult musculoskeletal radiologist or leave to radiologist discretion.
	• **Wrist - suspected tfc, scapholunate ligament, or lunotriquetral ligament injury**	**MRI**	**Without (intra-articular)**	MR arthrography
	Breast MRI is always ordered bilaterally			

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
BREAST				
	• **High risk screening/surveillance**	**MRI**	**Without & With**	In patient with intermediate or high risk
	• **Pre-Operative Staging**	**MRI**	**Without & With**	
	• **Bilateral implant evaluation**	**MRI**	**Without**	If history of cancer, order without & with contrast.
	• **Clinical breast problem not explained by mammography and/or ultrasound**	**MRI**	**Without & With**	
THORACIC (CHEST)	CT is far superior at visualizing the lungs and organs in the chest cavity between the lungs. Unless directed by a radiologist, MRI is not recommended for initial evaluation of lung or mediastinal pathology. CT is the preferred modality for cancer, pneumonia and abnormal chest x-rays.			
	• **Aortic Aneurysm**	**MRA or CTA**	**With**	MRA preferred for young patients
	• **Interstitial lung disease**	**High Resolution CT**	**Without**	
	• **Mass, infiltrate**	**CT**	**With**	Contrast helpful for hilar disease.
	• **Nodule**	**CT**	**Without**	Peripheral nodules remote from hilum - no contrast. Follow up pulmonary nodules - no contrast.
	• **Pulmonary Embolus**	**CTA**	**With**	Image in hospital if acute or chest pain.
HEART To schedule call Bronson CT Dept.: (269) 341-8707	• **Coronary Artery evaluation**	**CTA**	**With**	
	• **Evaluation of:** ○ **myocardial infarction** ○ **cardiac viability** ○ **cardiac function or morphology**	**Cardiac MRI**	**Without & With**	
ABDOMEN &	• **Abdominal pain-generalized**	**CT**	**With (Oral & IV)**	For more specific concerns other than generalized screening, see individual organs.

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
PELVIS	• **Appendicitis**	**CT**	**With (Oral & IV)**	
	• **Bowel Obstruction**	**CT**	**With (Oral & IV)**	
	• **Cancer patients**	**CT Abdomen & Pelvis; may need Chest CT**	**With (Oral & IV)**	Chest CT usually follows an Abd/pelvis CT for optimum IV contrast timing.
	• **Diverticulitis**	**CT**	**With (Oral & IV)**	
	• **Inflammatory Bowel Disease**	**CT Enterography or MRI Enterography**	**With (Oral & IV)** **Without & With**	
	• **Hemochromatosis/Iron Overload**	**MRI**	**Without**	MRI Liver Iron Quantification orderable should be used for this diagnosis.
	• **Pancreatitis**	**CT**	**With (Oral & IV)**	
LIVER/ BILIARY	• **Initial evaluation**	**CT**	**With**	
	• **Liver or biliary system lesion - known**	**MRI/MRCP**	**Without & With**	It MRI contraindicated, order a CT with contrast, Liver protocol.
	• **Cavernous Hemangioma**	**CT** **MRI**	**With** **Without & With**	**CT**-Initial evaluation **MRI**-Confirmation
	• **Metastatic disease-initial eval.**	**CT**	**With**	
PANCREAS	• **Initial evaluation**	**CT**	**With (Oral & IV)**	Pancreatic protocol CT Abdomen. MRI of the pancreas may be recommended by the radiologist as indicated for further evaluation
SPLEEN	• **General Screening**	**CT**	**With**	
	• **Splenic Lesion – Known**	**MRI**	**Without & With**	
	• **Hematuria - painless**	**CT Abdomen & Pelvis**	**With (No Oral)**	

BODY PART	CLINICAL PROBLEM	PREFERRED STUDY	CONTRAST	COMMENTS
KIDNEYS, URETERS & BLADDER	• **Hematuria – Painful, r/o kidney stone**	**CT Abdomen-Stone Protocol**	**Without**	If negative, may need F/U CT Abdomen and Pelvis with IV Contrast.
	• **Renal Mass**	**CT Abdomen & Pelvis**	**With (No Oral)**	Useful for indeterminate renal cysts/lesions on ultrasound Consider MRI without & with contrast if indeterminate
	• **Urothelial malignancy**	**CT Urogram** **MRI**	**With** **Without & With**	Screening for patient with hematuria and for more complete evaluation of the renal collecting systems, ureters and bladder. If there is a known lesion for which follow up or further evaluation is needed, an MRI with contrast may be indicated.
ADRENAL GLANDS	• **Initial evaluation**	**CT**	**With**	Order Adrenal protocol. If inconclusive, radiologist will recommend follow up with an MRI with contrast, which should be definitive.
UTERUS/ OVARIES	• **Evaluation of uterus and ovaries**	**MRI**	**Without & With**	MRI used in problem solving ultrasound cases
	• **Uterine Fibroids**	**MRI**	**Without & With**	For determining the size, presence and location of uterine fibroids (after US).
AORTA/ VASCULAR	• **Aortic Aneurysm, dissection or follow up of aortic endograft placement**	**MRA or CTA**	**Without & With With**	MRA preferred for young patients
	• **Aortic Dissection**	**MRA or CTA**	**Without & With With**	
	• **Aortic Endograft Placement**	**CTA**	**Without & With**	
	• **Vascular Imaging**	**MRA or CTA**	**Without & With With**	For upper and lower extremity vascular imaging
	• **Evaluation of mesenteric or renal arteries**	**MRA or CTA**	**Without & With CTA: With**	CT Preferred. In special cases MRI can be done without contrast (renal failure).