Radiology of Indiana

Protocols	.7/ 1.2/ 1.5T	3.0 T	Special Instructions/Comments
	**** All Sagittals, please scan from patients Left to Right ****		
Brachial Plexus (bilateral)			
	Coronal T1 TSE (3sk1)	SAME	For Bilateral Brachial Plexus
	Axial T1 TSE (3sk1)		scan shoulder to shoulder
	Axial STIR (3sk1)		FOV= 25cm preferred: 32cm as needed
	Sagittal T1 TSE (3s1)		
	Sagittal STIR (3sk1)		
	Coronal STIR (3sk1)		
	Axial C+T1 fat sat		
	Coronal C+T1 fat sat		
Brachial Plexus (unilateral)			
	Coronal T1 TSE (3sk1)	SAME	For unilateral Brachial Plexus, Scan far transverse process through shoulder (i.e. for
	Axial T1 TSE (3sk1)		LEFT brachial Plexus, Start at RIGHT C7 transverse process)
	Coronal STIR (3sk1)		FOV=25cm
	Sagittal T1 TSE (3sk1)		
	Sagittal STIR (3sk1)		
	Axial STIR (3sk1)		
	Axial C+T1 fat sat		
	Coronal C+T1 fat sat		
Brain Cancer			
	Sagittal T1 TSE (4sk1)	Sagittal T1 FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk1)	Inject contrast , followed immediately by Axial T2
	Axial T2 GRE (4sk1)	SWI (3sk1) with Mis	Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time
	Axial DWI/ADC (3 Direction if possible), reconstruct at 5sk0	Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0	
	Axial FLAIR (4sk1)	Axial FLAIR (3sk1)	Scan through whole brain (skull to skull) on sagittal images
	Axial C+ T2 TSE (4sk1)	Axial C+ T2 TSE (3sk1)	
	Axial C+ T1 TSE (4sk1)	Axial C+T1 FLAIR (3sk1)	FOV=23cm
	Coronal C+ TSE (4sk1)	Coronal C+FLAIR (3sk1)	
	Sagittal C+ T1 TSE (4sk1)	Sagittal C+ T1 FLAIR (3sk1)	
	Axial C+ T1 MPRAGE volumetric	Axial Volumetric (MPRAGE or equivalent) with 3-plane reformat	
	Sagittal and coronal reformats	See if Perfusion/Spectroscopy needed	
	Possible Perfusion/Spectroscopy?		
	Should be done on 3T if possible		
	** Brain Cancer protocol used for patients that have/had a known brain lesion (including post surgical/post treatment lesions), lesion seen on another study (i.e. CT Head), or any patient with a current dx of cancer,		
	suspected cancer, or history of cancer for which metastatic disease to the brain is being evaluated		
MRI Brain (Contrast Clearance Analysis)			
	3D T1-weighted (MPRAGE, FSPGR, VIBE, SPACE, etc.)	:	* It is important that the early time point is at a fixed time post-Gd injection, therefore, it is best to acquire it after a fixed protocol, e.g., after DSCMRI and 2D spin-echo or after DCE-MRI. The timing of the late time point is flexible and can change from one follow-up to the next as long as it is acquired between 60-105 min post Gd.
	3D T1-weighted C+ (MPRAGE, FSPGR, VIBE, SPACE, etc.)	5 minutes post Gad	
	3D T1-weighted C+ (MPRAGE, FSPGR, VIBE, SPACE, etc.)	60 - 105 minutes post Gad (patient can leave between both scans)	
		FOV = 23 all sequences	* IV bolus injection of a Gd-based contrast agent (standard dose, 0.1mmol/kg) is required.
			* T1-weighting of the MRI sequence does not change between the two acquisitions; thus the exact same protocol should be used for both scans (same FOV, slab size, etc.).
			* Poor image quality or metal-induced artifacts may affect the interpretation s
Brain With			
	Sagittal T1 TSE (4sk1)	Sagittal T1 FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk1)	Inject contrast , followed immediately by Axial T2
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk1)	Scan Through whole brain (skull to skull) on sagittal images
	Axial T2 GRE (4sk1)	SWI (3sk1) with MIPS	Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time
	Axial DWI/ADC (3 Direction if possible), reconstruct at 5sk0	Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0	
	Axial FLAIR (4sk1)	Axial FLAIR (3sk1)	Scan through whole brain (skull to skull) on sagittal images
	Axial C+ T2 TSE (4sk1)	Axial C+ T2 TSE (3sk1)	
	Axial C+ T1 TSE (4sk1)	Axial C+T1 FLAIR (3sk1)	FOV=23cm
	Coronal C+ TSE (4sk1)	Coronal C+FLAIR (3sk1)	

Brain Without			
	Sagittal T1 TSE (4sk1)	Sagittal T1 FLAIR (3sk1)	Remove eADC from all protocols
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk1)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk1)	Scan Through whole brain (skull to skull) on sagittal images
	Axial T2 GRE (4sk1)	SWI (3sk1) with MIPS	
	Axial DWI/ADC (3 direction if possible), reconstruct at 5sk0	Resolve or 16-direction DWI/ADC reconstruct at 4sk0	FOV=23cm
	Axial FLAIR (4sk1)	Axial FLAIR (3sk1)	
	Coronal T2 TSE (4sk1)	Coronal T2 TSE (3sk1)	
Cervical With			
	Coronal T1 TSE (3sk 0.5)	Coronal T1 TSE (3sk 0.5)	FOV= skull base through upper T-spine on sagittal
	Sagittal T1 TSE (3sk0)	Sagittal T1 TSE (3sk0)	FOV=12cm on Axials: FOV = 20cm on Sagittal
	Sagittal T2 TSE (3sk0)	Sagittal T2 TSE (3sk0)	Scan from C2 through T1
	Sagittal STIR (3sk0)	Sagittal STIR (3sh0)	
	Sagittal T2 oblique (2sk0)	Sagittal T2 oblique (2sk0)	Sagittal oblique T2 = Align perpendicular to the neural foramen
	Axial T2 TSE (2sk0)	Axial T2 TSE (2sk0)	
	Axial GRE (3sk0)	Axial GRE (3sk0)	
	Sagittal DWI (3sk0.3)	Sagittal DWI (3sk0.3)	
	Precontrast Axial T1 TSE (3sk0)	Precontrast Axial T1 FLAIR (3sk0.3)	
	Axial C+ T1 fat sat (3sk0)	Axial C+ T1 fat sat (3sk0)	
	Sagittal C+T1 TSE (3sk0)	Sagittal C+ T1 FLAIR (3sk0)	
Cervical Without			
	Coronal T1 TSE (3sk 0.5)	Coronal T1 TSE (3sk 0.5)	Could do foraminal oblique reformats off axial T2
	Sagittal T1 TSE (3sk0)	Sagittal T1 FLAIR (3sk0)	FOV=12cm on Axials: FOV = 20cm on Sagittal
	Sagittal T2 TSE (3sk0)	Sagittal T2 TSE(3sk0)	Axial images should be from C2 through T1
	Sagittal STIR (3sk0)	Sagittal STIR (3sk0)	
	Sagittal T2 oblique (2sk0)	Sagittal T2 oblique (2sk0)	Sagittal oblique T2 = Align perpendicular to the neural foramen
	Axial T2 TSE (2sk0)	Axial T2 TSE (2sk0)	
	Axial GRE (3sk0)	Axial GRE (3sk0)	
	Sagittal DWI (3sk0.3)	Sagittal DWI (3sk0.3)	
Face			
	Cor T1 (3/1)	SAME	FOV= 16 for Cor and Sag
	Cor STIR (3/1)		FOV= 14 Axial
	Ax T1 (3/1)		
	Ax T2 Fat Sat (3/1)		
	Sag T1 SE (3/1)		
	Ax DWI (3/1)		
IAC			
	Preferably with Brain WITH	SAME	FOV= 15-18cm
	Posterior fossa :		
	Axial T1 (2sk0)		Scan from tip of the dorsum Sella through C1 on axials
	Axial FIESTA 1mm		
	Coronal reformats		Scan from posterior skull through orbital apex on coronals
	Sagittal reformats along IAC		
	Axial T2 (2sk0)		
	Axial C+ T1 fat sat (2sk0)		
	Coronal C+ T1 fat sat (2sk0)		
Kyphoplasty			
	Localizer including cervical and upper thoracic spine	Localizer including cervical and upper thoracic spine	
	Sagittal T1 TSE- thoracic (3sk0.5)	Sagittal T1 FLAIR- thoracic (3sk0.5)	
	Sagittal T2 TSE- thoracic (3sk0.5)	Sagittal T2 TSE- thoracic (3sk0.5)	
	Sagittal T1 TSE -Lumbar (3sk0.5)	Sagittal T1 FLAIR -Lumbar (3sk0.5)	
	Sagittal T2 TSE-Lumbar (3sk0.5)	Sagittal T2 TSE-Lumbar (3sk0.5)	
	Sagittal STIR -thoracolumbar (3sk0.5)	Sagittal STIR -thoracolumbar (3sk0.5)	
	Coronal T1 TSE- thoracolumbar (3sk0.5)	Coronal T1 TSE- thoracolumbar (3sk0.5)	

Lumbar With			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1 TSE (3sk0.5)	No fat saturation if excessive artifact from metal hardware
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	FOV: 15cm Axials
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (4sk1)	
	Axial T1 TSE (4sk1)	Axial T1 TSE (4sk1)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3/0.5)	Sagittal DWI (3/0.5)	
	Axial C+T1 fat sat (4sk1)	Axial C+ T1 fat sat (3sk0.5)	
	Sagittal C+T1 TSE (3sk0.5)	Sagittal C+ T1 FLAIR (3sk0.5)	
Lumbar Without			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1 FLAIR (3sk0.5)	Axial Images from L1-S1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	FOV=15cm Axials
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3/0.5)	Sagittal DWI (3/0.5)	
Lumbosacral Plexus			
	Obl Axial T1 TSE (3sk1)	Obl Axial T1 TSE (3sk1)	FOV = 25 cm
	Obl Axial T2 TSE mid TE fat sat (3sk1)	Obl Axial T2 TSE mid TE fat sat (3sk1)	Planes should be relative to long axis of the sacrum
	Obl Coronal T1 TSE (3sk1)	Obl Coronal T1 TSE (3sk1)	Axial images L5 - bottom of sacrum
	Obl Coronal STIR (3sk1)	Obl Coronal STIR (3sk1)	
	Obl Cor T1 TSE Fat Sat +C (3sk1)	Obl Cor T1 TSE Fat Sat +C (3sk1)	
	Obl Ax T1 TSE Fat Sat +C (3sk1)	Obl Ax T1 TSE Fat Sat +C (3sk1)	
MR Perfusion			
	Power injection bolus before C+ images in conjunction with		If performing Brain Tumor WITH or MS, spectroscopy, offer MR Perfusion
	Brain Tumor WITH		Inject half the contrast prior to obtainin the DSC perfusion EPI sequence
	Standard color reformats		After perfusion, inject remaining contrast to obtain the standard post contrast
			Bolus injection 4 mL/s
MR Spectroscopy			
	Axial T2 TSE whole brain for localizer		MR Spectroscopy should only be scheduled/
	Single Voxel		Performed with Neuro Rad in house -plan both
	Multivoxel- shim to borders of ROI		Single and multi voxels with Neuro Rad
			Selection of multi voxel send to PACS with Neuro Rad
MRA Brain			
	3D TOF	SAME	
	COW reformats		
	Anterior circulation reformats		
	Posterior circulation reformats		
	Axial, sagittal, and coronal MIPs		
MRA Carotid With			
	Survey	SAME	Contrast MRA should be performed if ordered
	Auto-trigger		Also perform if MRI Brain WITH is ordered in
	Arterial		Conjunction with MRA neck (in addition to TOF)
	Venous		
	Arterial and venous MIP reconstructions		
	Arterial right and left carotid and vertebral reconstructions		
MRV Carotid Without			
	2D TOF	3D TOF multi-slab with recons	Cover aortic arch through basilar on axial images
	Right carotid , left carotid , and vertebral reformats	Axial T1 fat sat (4sk0.5)	
	If dissection possible :		
	Axial T1 fat sat (4sk 0.5)		
MRV			
	Phase contrast MRV (VENC 10-15)	SAME	
	2D TOF axial and coronal		

MS Brain			
	Sagittal T1 TSE (4sk1)	Sagittal T1 FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC
	Sagittal FLAIR (4sk1)	Sagittal T2 FLAIR (3sk1)	Inject contrast , followed immediately by Axial T2
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk1)	Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time
	Axial T2 GRE (4sk1)	SWI (3sk1) with MIPs	
	Axial DWI/ADC (3 Direction if possible), reconstruct at 5sk0	Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0	Scan through whole brain (skull to skull) on sagittal images
	Axial FLAIR (4sk1)	Axial T2 FLAIR	
	Axial C+ T2 TSE (4sk1)	Axial C+ T2 TSE (3sk1)	FOV=23cm
	Axial C+ T1 TSE (4sk1)	Axial C+ T1 FLAIR (3sk1)	
	Coronal C+ TSE (4sk1)	Coronal C+ T1 FLAIR (3sk1)	
MS Brain (Dr. Hermann - JWM)			
	Sagittal volumetric T1 inversion recovery with 3mm	Precontrast Sagittal T1 FLAIR , T2 ,T2 T2 FLAIR	Important to do as close to CMSC protocol as possible ,
	reconstructions (3 plane)	with 3mm reconstructions in 3 planes	this has been specifically requested by JMW Neurology (Dr. Hermann).
	*If possible , Sagittal volumetric 3D T2 FLAIR with 3mm	DWI/ ADC- Resolve or 6- direction (4sk0)	It may not be possible to do this protocol on the open magnets (specifically the 0.7)
	reconstructions (3 plane)	SWI	(specifically the 0.7) or the older 1.5
	* If possible volumetric 3D T2 with 3mm	Post-contrast Sagittal T1 non-IR with 3mm reconstructions in 3 planes	This section imaging is required , however .
	reconstructions (3 plane)	Please image following 5 min delay to allow for contrast circulation	
	*If volumetric imaging not possible , axial T2 and axial and		Label these studies / sequences in PACS as CMSC Protocol?
	Sagittal and FLAIR (3sk0)		
	Axial T1 spin echo (3sk0)		FOV=23cm
	Axial GRE (3sk))		
	DWI/ADC (5sk0)		
	Sagittal volumetric T1 non-IR post-contrast with 3mm		
	reconstructions (3 plane)		
	Axial C+ T1 (3sk0)		
	Coronal C+ T1 (3sk0)		
Neck With			
	Sagittal T1 TSE (3sk0.3)	SAME	FOV=25cm sagittal and coronal
	Coronal T1 TSE (3sk0.3)		FOV=18cm axial
	Axial T1 TSE (3sk0.3)		
	Axial T2 fat sat (3sk0.3)		Scan from pituitary through clavicles (lower if substernal extension of Thyroid) on axial
	Axial DWI - 3mm		Scan from posterior neck through nose/ chin on coronals
	Axial T2 (3sk0.3)		Scan to lateral sides of neck on sagittal
	Coronal STIR (3sk0.3)		
	Axial C+T1 fat sat (3sk0.3)		
	Coronal C+T1 fat sat (3sk0.3)		
Neck Without			
	Sagittal T1 TSE (3sk0.3)	SAME	FOV=25cm sagittal and coronal
	Coronal T1 TSE (3sk0.3)		FOV=18cm axial
	Axial T1 TSE (3sk0.3)		
	Axial T2 fat sat (3sk0.3)		Scan from pituitary through clavicles (lower if substernal extension of Thyroid) on axial
	Axial DWI - 3mm		Scan from posterior neck through nose/ chin on coronals
	Axial T2 (3sk0.3)		Scan to lateral sides of neck on sagittal
	Coronal STIR (3sk0.3)		
Orbits			
	Preferably with Brain WITH	SAME	Orbit images should extend from the lens to mid-pons coronal and maxillary teeth to above
	Orbits:		and maxillary teeth to above orbits on axial
	Coronal T1 (3sk0.5)		
	Coronal STIR (3sk0.5)		FOV=18cm
	Axial T1 TSE (3sk0.5)		
	Axial T2 fat sat (3sk0.5)		
	Axial C+T1 fat sat (3sk0.5)		
	Coronal C+ T1 fat sat (3sk0.5)		
	DWI (3sk0.3)		

Peds Routine			
	Sag T1 SE (5/1)	SAME	FOV= 24 and Sag FOV=18 Axial
	Ax IR (4/1)		
	Ax DWIRTFA (4/1)		
	Ax Prop FLAIR (4/1)		
	Ax T2 Prop (4/1)		
	Ax EPI GRE (4/1)		
	Ax T1SE (4/1)		
Pituitary			
	Optionally with Brain WITH	SAME	FOV=13cm (cone to pituitary)
	Pituitary		
	Sagittal T1 TSE (2sk0)		Sagittal scan from mid-orbit through mid-orbit
	Coronal T1 TSE (2sk0)		Coronal scan from anterior margin of pons through orbital apex
	Coronal T2 TSE (2sk0)		
	Coronal C+T1(2sk0)		
	Sagittal C+ T1 (2sk0)		
	Dynamic contrast enhanced sequence (Coronal)		
Sacrum			
	Cor STIR FSE Global (6/1)	SAME	FOV=44 for global FOV =20 for Sag & Axial FOV=24 Coronal
	Cor T1 FSE Global (6/1)		
	Sag T2 FS (4/1)		
	Sag T1 FSE (4/1)		
	Cor STIR (4/1)		
	Cor T1 (4/1)		
	Ax STIR (4/1)		
	Ax T1 FSE (4/1)		
Seizure			
	Sagittal T1 TSE (4sk1)	Sagittal T1 FLAIR (3sk1)	Remove eADC from all protocols, should only do ADC
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (3sk1)	Inject contrast , followed immediately by Axial T2
	Axial T2 GRE (4sk1)	SWI (3sk1) with Mis	Axial and coronal contrast enhanced T1s to follow T2 to allow contrast circulation time
	Axial DWI/ADC (3 Direction if possible), reconstruct at 5sk0	Resolve or 6-Direction DWI/ADC, reconstruct at 4sk0	
	Axial FLAIR (4sk1)	Axial FLAIR (3sk1)	Scan through whole brain (skull to skull) on sagittal images
	Axial C+ T2 TSE (4sk1)	Axial C+ T2 TSE (3sk1)	
	Axial C+ T1 TSE (4sk1)	Axial C+T1 FLAIR (3sk1)	FOV=23cm
	Coronal C+ TSE (4sk1)	Coronal C+FLAIR (3sk1)	
	Sagittal T1 MPRAGE with 2mm recons	Sagittal T1 MPRAGE with 2mm recons	Added coronal seizure sequences perpendicular to the temporal lobe
	Coronal T2 TSE (2sk0.5)	Coronal T2 TSE (2sk0.5)	Sagittal volumetric cover scalp to scalp
	Coronal FLAIR (2sk0.5)	Coronal FLAIR (2sk0.5)	FOV=23cm
Spine Survey			
	Separate acquisitions for cervical , thoracic, and lumbar spine	Separate acquisitions for cervical, thoracic, and lumbar spine	
	Sagittal T1 TSE (3sk0.5)	Sagittal T1 FLAIR (3sk0.5)	
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Sagittal C+ T1 fat sat (3sk0.5)	Sagittal C+ T1 fat sat (3sk0.5)	
Stealth/ Treatment Plan *			
	Ax FSPGR 3D (2/-1)	SAME	FOV=24 for 3D : FOV= 22 for FLAIR
	Ax Prop FLAIR (5/1)		* If no Brain MRI completed within last 7 days, please complete Brain with contrast protocol
			in addition to Stealth/Treatment Plan protocol sequences.
Thoracic With			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1FLAIR (3sk0.5)	Axial images from C7-L1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (4sk1)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3sk0.3)	DWI sagittal (3sk0.3)	
	Axial C+ T1 fat sat (4sk1)	Axial C+ T1 fat sat (4sk1)	
	Sagittal C+ T1 FSE (3sk0.5)	Sagittal C+ T1 FLAIR (3sk0.5)	

Thoracic Without			
	Sagittal T1 TSE (3sk0.5)	Sagittal T1FLAIR (3sk0.5)	Axial images from C7-L1
	Sagittal T2 TSE (3sk0.5)	Sagittal T2 TSE (3sk0.5)	
	Sagittal STIR (3sk0.5)	Sagittal STIR (3sk0.5)	
	Axial T1 TSE (4sk1)	Axial T1 FLAIR (4sk1)	
	Axial T2 TSE (4sk1)	Axial T2 TSE (3sk0.5)	
	Coronal T1 TSE (3sk0.5)	Coronal T1 TSE (3sk0.5)	
	Sagittal DWI (3sk0.3)	DWI sagittal (3sk0.3)	
TMJ			
	Localizer (coronal and sagittal)	SAME	FOV=12cm
	Sagittal PD oblique Right Closed (2sk0)		
	Sagittal PD oblique Left Closed (2sk0)		Could do axial or coronal T1 of head (4sk1) instead of localizer
	Sagittal T2 oblique Right Closed (2sk0)		
	Sagittal T2 oblique Left Closed (2sk0)		
	Coronal T1 Right Closed (2sk0)		
	Coronal T1 Left Closed (2sk0)		
	Sagittal PD oblique Right Open (2sk0)		
	Sagittal PD oblique Left Open (2sk0)		
	Sagittal T2 oblique Right Open (2sk0)		
	Sagittal T2 oblique Left Open (2sk0)		
Trigeminal			
	Complete Brain MRI protocol	SAME	Whole brain FOV= 22cm
	Posterior fossa :		Posterior fossa FOV=18cm
	Axial T1 (3sk0.5)		
	Axial T2 fat sat (3sk0.5)		Scan from the suprasellar cistern to the C1 level on axials, cover through posterior fossa
	Coronal T1 (3sk0.5)		and orbital apex on coronals
	Axial Fiesta w/coronal reformats		
	Axial C+T1 FS (3sk0.5)		
	Coronal C+T1 FS (3sk0.5)		
	Coronal C+ T1 whole head (4sk1)		