## Table A: General Overview of Imaging Modalities

<table>
<thead>
<tr>
<th>Modality</th>
<th>Common Clinical Usage</th>
<th>Comment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain Film</td>
<td>Cancer screen, chest symptoms, weight loss; Severe Abdominal Pain (free air) &amp; Obstruction, Calcifications; Trauma; Osteomyelitis; Arthritis; Joint Replacements</td>
<td>Gall stones and Renal Calculi better evaluated by U/S and CT respectively.</td>
<td>+</td>
</tr>
<tr>
<td>Fluoroscopy</td>
<td>Gastrointestinal studies (UGI/SBFT, BE, Enteroclysis); Arthrography; Interventional Radiology; Genitourinary exams (RUG, VCUG, Antegrade/retrograde Pyelography)</td>
<td></td>
<td>++</td>
</tr>
<tr>
<td>Angiography - Conventional</td>
<td>Peripheral Vascular Disease; AV Shunt Management; Stage Aneurysms and other vascular malformation of CNS; Evaluation of Acute Cerebral Ischemia for Thrombolytic intervention</td>
<td>Multidetector CT Angiography &amp; MR Angiography has largely replaced conventional angiography for diagnostic examinations.</td>
<td>+++</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Abdominal Pain and Pelvic Pain; Visualization of GB stones; Hydronephrosis; Vascular Studies; Testicular Pain and Masses; Breast Imaging; Image guided biopsy.</td>
<td>First choice imaging of RUQ Pain and Female Pelvic Pain</td>
<td>++</td>
</tr>
<tr>
<td>Computed Tomography</td>
<td>Oncologic staging and follow up for chest, abdomen and pelvis. Trauma; Stroke evaluation. Bone tumors; Spine evaluation; Pulmonary Artery CTA and other angiographic applications (aortic aneurysm, dissection and rupture, carotid stenosis and dissection, peripheral vascular disease); Image guided biopsy.</td>
<td>Preferred over MRI for Bone and Lung evaluation, e.g. eval following spinal surgery or HRCT lung</td>
<td>+++</td>
</tr>
<tr>
<td>Magnetic Resonance Imaging</td>
<td>Hyper-acute stroke evaluation (MRI diffusion weighted images); CNS tumors (1º and 2º); Spinal cord compression; Vascular Studies; Musculoskeletal tumors and infections; Hepatobiliary disease; Breast Disease.</td>
<td>Preferred over CT for soft tissue, e.g. for radiculopathy</td>
<td>++++</td>
</tr>
<tr>
<td>Mammography</td>
<td>Screening examinations and Diagnostic Mammography. Comparison exams essential!</td>
<td>For symptomatic patients order a diagnostic study and specify complaint(s).</td>
<td>+</td>
</tr>
</tbody>
</table>

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### Table B: Common Cross-Sectional Studies that may be Performed Without Contrast Agents

<table>
<thead>
<tr>
<th>Study</th>
<th>Common Indications</th>
<th>Imaging Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head CT</td>
<td>Trauma</td>
<td>Visualize edema, hemorrhage, herniation, and fractures. (N.B. i.v. Contrast can mimic subarachnoid hemorrhage. Noncontrast CT should always precede the administration of i.v. contrast).</td>
</tr>
<tr>
<td>Head CT</td>
<td>Acute Neurological Deficit and AMS, Severe Headache</td>
<td>Visualize edema, hemorrhage, herniation, masses, hydrocephalus</td>
</tr>
<tr>
<td>Brain MRI</td>
<td>Acute Neurological Deficit</td>
<td>Identify Acute/Hyperacute CVA Visualize early and or small lesions (tumor, infection, demyelination) that may be occult at CT</td>
</tr>
<tr>
<td>Spine CT</td>
<td>Trauma</td>
<td>Define fractures that may be occult on plain films and or better visualized by CT. Excellent utility of multiplanar reformations with multidetector CT.</td>
</tr>
<tr>
<td>Spine MRI</td>
<td>Trauma</td>
<td>Visualize edema and hemorrhage of the spinal cord. Visualize extrinsic cord compression</td>
</tr>
<tr>
<td>Spine CT</td>
<td>Radiculopathy, Back Pain</td>
<td>Define bony impingement upon spinal canal and neural foramina. Excellent utility of multiplanar reformations with multidetector CT.</td>
</tr>
<tr>
<td>Spine MRI</td>
<td>Radiculopathy, Back Pain</td>
<td>Visualize disk abnormalities that are subtle or occult on CT. Identify cord lesions that would never be seen on CT: mass, edema, syrinx. Excellent view of marrow infiltrative processes.</td>
</tr>
<tr>
<td>Spine MRI</td>
<td>Cord compression</td>
<td>Define level of cord compression and causative lesion: metastatic bone lesions, epidural versus intra-axial versus intra-thecal extra-axial masses. Gadolinium can assist identification of small leptomeningeal tumors that seed over the cord and cauda equina, eg. Breast CA</td>
</tr>
<tr>
<td>Thorax HRCT</td>
<td>Interstitial lung disease, tumor perilesional staging</td>
<td>Limited sampling of lung tissue used to characterize lung interstitium and identify patients with signs of active alveolitis.</td>
</tr>
<tr>
<td>CT KUB</td>
<td>Renal colic and hematuria.</td>
<td>Characterize size and location of urinary calculi, assess hydronephrosis, hydroureter;</td>
</tr>
<tr>
<td>Musculoskeletal CT</td>
<td>Trauma, Infection and Tumors. Joints.</td>
<td>Define fractures, Characterize bone lesions: location, aggressiveness, biopsy and treatment planning</td>
</tr>
<tr>
<td>Pelvic MRI</td>
<td>Lesions of the female pelvis</td>
<td>Stage parametrial lesions, assess uterine lesions: adenomyomatosis vs. fibroids, dynamic stress studies for cystocele</td>
</tr>
</tbody>
</table>

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Table C: Common Cross-Sectional Studies Utilizing Ultrasound

<table>
<thead>
<tr>
<th>Study</th>
<th>Common Indications</th>
<th>Imaging Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound Neonatal cranial and spine</td>
<td>Depressed infant, A &amp; B’s, sacral dimple/hairy nevus</td>
<td>IVH, hydrocephalus, spinal dysraphism.</td>
</tr>
<tr>
<td>Ultrasound Vascular studies</td>
<td>Extremity swelling, pain, claudication, cold/blue extremity</td>
<td>DVT, Arterial Stenosis, Aneurysms and Pseudoaneurysms. AV fistula, AV malformations</td>
</tr>
<tr>
<td>Ultrasound Pediatric body imaging</td>
<td>UTI, palpable mass</td>
<td>Screening for hydronephrosis, masses. Recommend MRI for paraneoplastic syndromes</td>
</tr>
<tr>
<td>Ultrasound Pediatric hips</td>
<td>Hip clicks and clunks, breech, family hx.</td>
<td>Screening for hip dysplasia, effusion</td>
</tr>
<tr>
<td>Ultrasound Adult Abdomen</td>
<td><strong>RUQ Pain, RLQ Pain, Epigastic Pain, Renal Colic, Distention/Ascites, tumor screening</strong></td>
<td>Excellent visualization of Renal and GB stones. Biliary dilatation, cholecystitis, pancreatitis, hydronephrosis, organomegaly</td>
</tr>
<tr>
<td>Ultrasound Female Pelvis</td>
<td>OB Complications, Ectopic pregnancy, vaginal bleeding, pelvic pain</td>
<td>Fetal viability, identification of IUP/Ectopic, free pelvic fluid, masses and cysts, hydrosalpinx, torsion</td>
</tr>
<tr>
<td>Ultrasound Scrotum</td>
<td>Pain, Mass, Infertility</td>
<td>Orchitis, torsion, hemorrhage and or masses, hydrocele, varicocele</td>
</tr>
</tbody>
</table>

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Table D: Appropriate Use of Contrast Agents for Common Studies

<table>
<thead>
<tr>
<th>Contrast Agent</th>
<th>In Neuro Imaging</th>
<th>In Chest Imaging</th>
<th>In Abd/Pelvis Imaging</th>
<th>In Musculoskeletal Imaging</th>
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<tbody>
<tr>
<td><strong>Intravenous Iodine</strong></td>
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<tr>
<td></td>
<td>CT:</td>
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<td></td>
<td>Screening for</td>
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<td></td>
<td>masses and</td>
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<td></td>
<td>infection.</td>
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<td>(Lesion</td>
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<td>enhancement is</td>
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<td>contingent on</td>
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<td></td>
<td>breakdown of the</td>
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<td></td>
<td>blood brain</td>
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<td></td>
<td>barrier.</td>
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<td></td>
<td>Higher-grade</td>
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<td></td>
<td>masses enhance</td>
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<td>more than</td>
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<td></td>
<td>lower grade</td>
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<td></td>
<td>lesions).</td>
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<td></td>
<td><strong>CTA:</strong></td>
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<td>for carotid/</td>
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<td>vertebral and</td>
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<td>circle of Willis.</td>
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<tr>
<td><strong>Intravenous Gadolinium</strong></td>
<td><strong>MRI:</strong></td>
<td><strong>MRA:</strong></td>
<td><strong>MRI:</strong></td>
<td><strong>MRI:</strong></td>
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<tr>
<td></td>
<td>1º 2º Tumor;</td>
<td>Aorta and</td>
<td>Not usually indicated</td>
<td>Tumors.</td>
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<tr>
<td></td>
<td>Infection</td>
<td>Pulmonary Arteries</td>
<td>(but is visible when</td>
<td>Viability of tissue in</td>
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<td></td>
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<td>concentrated in</td>
<td>diabetic feet/PVD</td>
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<td>urine). Use for iodi-</td>
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<td></td>
<td></td>
<td>ne contrast allergy.</td>
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<tr>
<td><strong>Intra-articular contrast</strong></td>
<td><strong>NA</strong></td>
<td><strong>NA</strong></td>
<td><strong>NA</strong></td>
<td>Iodine conventional</td>
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<td></td>
<td></td>
<td>arthrography, hip,</td>
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<td>shoulder and wrist.</td>
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<td>Gad for hip &amp;</td>
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<td></td>
<td>shoulder.</td>
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<td>Characterize derangement</td>
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<td>of articular cartilage</td>
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<td>injuries of the joint</td>
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<td></td>
<td></td>
<td>capsule and ligaments,</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>labral injuries.</td>
</tr>
</tbody>
</table>

Pre-procedure creatinine is desirable for diabetics and hypertensives and other vasculopathies.

NPO 2-4 hours (aspiration rare).

CT: Screening for masses and infection. (Lesion enhancement is contingent on breakdown of the blood brain barrier. Higher-grade masses enhance more than lower grade lesions).

CTA: for carotid/vertebral and circle of Willis.

CT and Aortography: Contrast is mandatory for all vascular studies. Contrast assists in the identification of lymph nodes. Identify lung and pleural enhancement related to metastases and infection.

CT: Usually desirable. Pre/post contrast studies for liver mets and evaluation on unexplained weight loss.

Contrast timing is critical in certain instances. Pancreas and liver are optimally studied with a three-phase protocol: noncontrast, pancreatic/arterial phase, portal venous phase.

CT: Can help for soft tissue masses to evaluate vessel patency and relationship to major vessels (surgical roadmap), and to provide lesion enhancement, define extent of the lesion.

Intravenous Gadolinium MRI: 1º 2º Tumor; Infection

MRA: Aorta and Pulmonary Arteries

MRI: Not usually indicated (but is visible when concentrated in urine). Use for iodine contrast allergy.

MRI: Tumors. Viability of tissue in diabetic feet/PVD

To speak with Dr. Jonathan Goldin, Chief of Radiology at Santa Monica Hospital 310-319-1259

To speak with Dr. Ed Zaragoza, Clinical Director 310-319-4320

Revised & Approved by UCLAMG May 2006

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