Imaging Appropriateness: 
What’s out there

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Outline

• Why are we talking about this?

• Excerpts from Choosing Wisely Canada

• Resources including the ACR Appropriateness Criteria

• Additional thoughts
"If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas."

- George Bernard Shaw

Conversation between Radiology and Family Medicine

- 50% of imaging referrals in Ontario come from primary care
- Busy office practices with need for helpful diagnostic reports
- Our languages can be different
- Consultants to patients and referring doctors
Rules versus Real Life

• We get it. You’re busy.

• Helpful reports.

• Resources.

Rules versus Real Life

• Criteria, rules, guidelines

• Patient factors
  – Psychological
  – Family

• Value of a normal x-ray
Why are we talking about this?

In Canada, $2.2 billion on imaging

How did we get here?

- Availability of technology
- Inappropriate imaging referrals
  - Education
- “Follow-up imaging”
- Incidental findings
- Vague reports
- Increasingly busy practices
- Lack of resources and guidelines
Why are we talking about this?

- Are we overimaging?
- Sometimes it seems there is no end in sight to imaging...

- Or are we just not imaging appropriately?
  - Some patients are overimaged...
  - But some patients are probably underimaged!
Appropriate imaging?

Do family physicians request ultrasound scans appropriately?

Landry et al., Can Fam Phys 57:e299, 2011

Abstract

Objective: To review family physicians' requests for abdominal, thyroid, pelvic, soft tissue, and carotid ultrasound (US) scans, and to determine whether 5% or more of these tests were not clearly indicated based on the clinical history provided.

Design: Analysis of 460 randomly chosen requests for US scans.

Setting: The radiology department at the capital district health authority in Halifax, NS, between October 1, 2006, and June 30, 2006.

Participants: Two radiologists and 2 family physicians with clinical expertise and familiarity with the Canadian Association of Radiologists' 2006 guidelines.

Main outcome measures: Whether US requests were "indicated," "not clearly indicated," or "not indicated" according to the Canadian Association of Radiologists' 2006 guidelines. Those that were illegible were discarded and replaced.

• Most estimates: 30% of studies inappropriate
• Self-referral
‘Appropriate’ thyroid imaging

• Appropriate indications
  – Nodular palpable thyroid disease
  – Incidental thyroid nodule with suspicious features
  – To guide FNA for suspicious nodule

• Inappropriate indications
  – Biochemical thyroid dysfunction
  – Follow-up of benign or small nodules

Suspicious thyroid nodule features

• Microcalcifications
• Markedly hypoechoic
• Lobulated or irregular margins
• Taller than wide
• > 1 cm size (under 35 yrs)
  – >1.5 cm size (over 35)
### Thyroid: ACR imaging guidelines

**Incidental Thyroid Nodule Detected on Ultrasound for Extra-thyroidal Structures**

<table>
<thead>
<tr>
<th>Suspicious sonographic findings</th>
<th>No suspicious sonographic findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited life expectancy and comorbidities</td>
<td>General population</td>
</tr>
<tr>
<td>Age &lt;35 years</td>
<td>Age ≥35 years</td>
</tr>
<tr>
<td>&lt;1 cm</td>
<td>≥1 cm</td>
</tr>
<tr>
<td>Evaluate with thyroid ultrasound</td>
<td>No further evaluation</td>
</tr>
<tr>
<td>≥1.5 cm</td>
<td>&lt;1.5 cm</td>
</tr>
<tr>
<td>Evaluate with thyroid ultrasound</td>
<td>No further evaluation</td>
</tr>
<tr>
<td>≥1.5 cm</td>
<td>Evaluate with thyroid ultrasound</td>
</tr>
</tbody>
</table>

Hoang JK et al. JACR 2015; 12:143

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**Choosing Wisely Canada**

[Image of Choosing Wisely Canada logo]
### Specific Topics

- Five physician recommendations from 18 different subspecialty organizations:
  - Things physicians and patients should question

- At least 12 recommendations from CAR and other organizations involve imaging

### CAR Recommendations

- Don’t image for lower back pain unless red flags are present
CAR Recommendations

• Don’t image for minor head trauma unless red flags are present

• Don’t image for uncomplicated headache unless red flags are present
CAR Recommendations

• Don’t do CT for suspected appendicitis in children unless ultrasound is considered

CAR Recommendations

• Don’t do an ankle X-ray series in adults for minor injuries
Additional pearls from CWC

- Ultrasound imaging for cryptorchidism
- Frequency of DEXA scans for BMD measurement
- Don’t order imaging routinely in the workup of syncope with a normal neurologic clinical examination

Additional pearls from CWC

- Avoid admission or pre-operative chest x-rays for routine low risk surgeries
- Don’t order an upper GI series to investigate dyspepsia
- Don’t order screening chest x-rays in asymptomatic or low risk outpatients
- Don’t do screening mammography in low-risk women 40-49
American College of Radiology Appropriateness Criteria

• Evidence-based guidelines to assist referring physicians in making the best imaging decision for a specific clinical condition
• Scientific evidence, clinical judgement and expert consensus
• Input from radiology plus 20 medical societies
ACR Appropriateness Criteria

- Rigorous process of topic selection
- Each topic:
  - Narrative with variant tables + score
  - Evidence table
  - Literature search summary
- Variant table score (out of 10)
  - 1-3: usually not appropriate
  - 4-6: may be appropriate
  - 7-9: usually appropriate

ACR AC Example

<table>
<thead>
<tr>
<th>Clinical Condition:</th>
<th>Liver Lesion—Initial Characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variant 1:</td>
<td>Indeterminate &gt;1 cm lesion on initial imaging with ultrasound or CT (without or with contrast) or noncontrast-enhanced MRI. Normal liver. (No suspicion or evidence of extrahepatic malignancy or underlying liver disease.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRI *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesion Initially Identified on US</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRI abdomen without and with contrast</td>
<td>8</td>
<td>MRI is the best test for characterizing liver lesions. See statement regarding contrast in text under &quot;Anticipated Exceptions.&quot;</td>
<td>O</td>
</tr>
<tr>
<td>MRI abdomen without contrast</td>
<td>6</td>
<td>Consider this procedure if MRI with gadolinium is contraindicated.</td>
<td>O</td>
</tr>
<tr>
<td>CT abdomen without and with contrast</td>
<td>7</td>
<td>Consider this procedure if the lesion is not cystic on US and MRI is not available or contraindicated.</td>
<td>4 4 4 4</td>
</tr>
<tr>
<td>CT abdomen without contrast</td>
<td>3</td>
<td>Consider this procedure if there is a contraindication to MRI and CT contrast agents.</td>
<td>3 3</td>
</tr>
<tr>
<td>CT abdomen with contrast</td>
<td>7</td>
<td>Consider this procedure if the lesion is not cystic on US and MRI is not available or contraindicated.</td>
<td>3 3 3 3</td>
</tr>
</tbody>
</table>
ACR AC: URL


Additional Thoughts
Resources and additional thoughts

- Guidelines available for your use
  - CAR and ACR appropriateness criteria
- Decision Support and Imaging Pathways
- High impact reporting
  - Definitive reports
  - ‘Recommendations’ sections
- CT and MRI in Ontario

Guidelines and Resources

- CAR Guidelines
- ACR Appropriateness Criteria
- Choosing Wisely (USA and Canada)
- U.S. Preventive Services Task Force
  - Screening Recommendations
The 2012 CAR Diagnostic Imaging Referral Guidelines are intended for physicians and are aimed at assisting them in making decisions in regard to appropriate imaging studies for specific cases. These Referral Guidelines are not intended as a means of restricting the physician’s role in the process of deciding which imaging studies to request. They should not be used to diminish in any way the freedom of attending physicians to determine and order imaging studies for their patients for whom they have ultimate responsibility. Discussion between the radiologist and the physician, particularly during multidisciplinary team meetings, must always take precedence.

A full reference guide will soon be available to outline the recommendations, level of evidence and dose.

Each set of guidelines below was prepared by an expert advisory group. The CAR gratefully acknowledges the many individuals that were consulted in the revision of these guidelines.
Published Recommendations

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Year</th>
<th>Age Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal Aortic Aneurysm: Screening</td>
<td>Screening</td>
<td>2014</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Alcohol Misuse: Screening and Brief Interventions to Reduce Harm</td>
<td>Screening</td>
<td>2009</td>
<td>Adult</td>
</tr>
<tr>
<td>Asbestos Exposures: Screening and Management</td>
<td>Screening</td>
<td>2014</td>
<td>Adult</td>
</tr>
<tr>
<td>Aspirin for the Prevention of Cardiovascular Disease: Preventive Medication</td>
<td>Preventive medication</td>
<td>2009</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Asymptomatic Bacteriuria in Adults: Screening</td>
<td>Screening</td>
<td>2008</td>
<td>Adolescent, Adult</td>
</tr>
<tr>
<td>Bacterial Vaginosis in Pregnancy to Prevent Preterm Delivery: Screening</td>
<td>Screening</td>
<td>2008</td>
<td>Adolescent, Adult</td>
</tr>
<tr>
<td>Bladder Cancer in Adult: Screening</td>
<td>Screening</td>
<td>2011</td>
<td>Adult</td>
</tr>
<tr>
<td>Blood Pressure in Adults (Hypertension): Screening</td>
<td>Screening</td>
<td>2007</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Blood Pressure in Children and Adolescents (Hypertension): Screening</td>
<td>Screening</td>
<td>2013</td>
<td>Pediatric</td>
</tr>
<tr>
<td>Breast Cancer: Medications for Risk Reduction</td>
<td>Preventive medication</td>
<td>2013</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Breastfeeding: Counseling</td>
<td>Counseling</td>
<td>2008</td>
<td>Adolescent, Adult</td>
</tr>
<tr>
<td>Carotid Artery Stenosis: Screening</td>
<td>Screening</td>
<td>2014</td>
<td>Adult</td>
</tr>
<tr>
<td>Cervical Cancer: Screening</td>
<td>Screening</td>
<td>2012</td>
<td>Adolescent, Adult</td>
</tr>
<tr>
<td>Child Maltreatment: Primary Care Interventions</td>
<td>Counseling, Screening</td>
<td>2013</td>
<td>Adolescent, Pediatric</td>
</tr>
<tr>
<td>Chronic Kidney Disease (CKD): Screening</td>
<td>Screening</td>
<td>2012</td>
<td>Adult</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease (COPD): Screening</td>
<td>Screening</td>
<td>2008</td>
<td>Adult</td>
</tr>
<tr>
<td>Cognitive Impairment in Older Adults: Screening</td>
<td>Screening</td>
<td>2014</td>
<td>Senior</td>
</tr>
<tr>
<td>Colorectal Cancer: Screening</td>
<td>Screening</td>
<td>2008</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Congenital Hypothyroidism: Screening</td>
<td>Screening</td>
<td>2008</td>
<td>Pediatric</td>
</tr>
<tr>
<td>Coronary Heart Disease: Screening Using Non-Traditional Risk Factors</td>
<td>Screening</td>
<td>2009</td>
<td>Adult, Senior</td>
</tr>
<tr>
<td>Coronary Heart Disease: Screening with Electrocardiography</td>
<td>Screening</td>
<td>2012</td>
<td>Adult</td>
</tr>
<tr>
<td>Dental and Periodontal Disease: Counseling</td>
<td>Counseling</td>
<td>1996</td>
<td>Adolescent, Adult, Pediatric, Senior</td>
</tr>
</tbody>
</table>

Efficient imaging pathways

- Breast imaging
- New work on hepatic imaging pathway
Decision support

- Breast imaging
- New work on hepatic imaging pathway
- Electronic decision support software
  - Office electronic medical records
  - Hospital information systems (order entry)

High impact reporting

- “This is benign.”
- “This requires no further imaging follow-up.”
- If something requires imaging follow-up, we should tell you WHY.
- Recommendations section
Common Imaging Tests

<table>
<thead>
<tr>
<th>Modality</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray</td>
<td>Cheap, Accessible</td>
<td>Comfort level of radiologists</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Cheap, Accessible, No radiation</td>
<td>Operator dependent, Variable supervision, Not good for everything!</td>
</tr>
<tr>
<td>CT</td>
<td>Anatomic detail, Accurate, Comfort level of radiologists, Low dose technology</td>
<td>Ionizing radiation, Availability, Somewhat expensive</td>
</tr>
<tr>
<td>MRI</td>
<td>Excellent soft tissue contrast</td>
<td>Availability, Expensive</td>
</tr>
</tbody>
</table>

Availability of CT & MRI in Ontario

- Imaging volume in hospitals
  - 50% of all imaging
  - 95% of CT and MRI
- Hospitals are not convenient for outpatients
- No MOH technical fee, constantly under budgetary risk
- Wait times constant fluctuating
- Impacts appropriateness!
Availability of CT & MRI in Ontario

If you chose to image for sinonasal disease, what test would you choose?

<table>
<thead>
<tr>
<th>Clinical Condition: Sinonasal Disease</th>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute (&lt;4 weeks) or subacute (4-12 weeks) uncomplicated rhinosinusitis.</td>
<td>CT paranasal sinuses without contrast</td>
<td>5</td>
<td>Most episodes are managed without imaging, as this is primarily a clinical diagnosis. Imaging may be indicated if acute frontal sphenoid sinusitis is suspected, or if there are atypical symptoms, or if the diagnosis is uncertain.</td>
</tr>
<tr>
<td>MRI head and paranasal sinuses without contrast</td>
<td>4</td>
<td>May be useful as part of a general workup for headache.</td>
<td></td>
</tr>
<tr>
<td>MRI head and paranasal sinuses with contrast</td>
<td>2</td>
<td>May be useful as part of a general workup for headache.</td>
<td></td>
</tr>
<tr>
<td>CT paranasal sinuses with contrast</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT paranasal sinuses without and with contrast</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-ray paranasal sinuses</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8 Usually appropriate  | Relative Radiation Level |

Availability of CT & MRI in Ontario

If you chose to image for nontraumatic knee pain, what test would you choose?

<table>
<thead>
<tr>
<th>Clinical Condition: Nontraumatic Knee Pain</th>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child or adolescent: nonpatellofemoral symptoms. Initial examination.</td>
<td>X-ray knee</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X-ray hip/spinal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT knee without contrast</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT knee with contrast</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT knee without and with contrast</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT arthrography knee</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MRI knee without contrast</td>
<td>1</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MRI knee without and with contrast</td>
<td>1</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MR arthrography knee</td>
<td>1</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>US knee</td>
<td>1</td>
<td>O</td>
</tr>
</tbody>
</table>

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8 Usually appropriate  | Relative Radiation Level |
Summary: Take home points

• Imaging appropriateness is important and should be balanced with real world practice

• Resources available include Choosing Wisely Canada and American College of Radiology

• Take guidance and recommendations from radiologists who know imaging best!

Questions?

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