Diagnostic Imaging Appropriateness Tools in Primary Care

Authors

- **Project team**
  - Lilly Whitham, Senior Project Manager, Office of Strategy Management, JDMI
  - Jisla Mathews, Senior Business Analyst, Office of Strategy Management, JDMI
  - Karen Weiser, Business Analyst, Office of Strategy Management, JDMI
  - Dr. Ravi Menezes, Epidemiologist, JDMI Research
  - Dr. Amy Lin, Neuroradiology Fellow, UHN

- **Project Sponsors**
  - Dr. Larry White, Radiologist-in-Chief, JDMI
  - Catherine Wang, Executive Director, JDMI
  - Dr. Jeff Bloom, Family Physician-in-Chief, UHN
  - Dr. Raj Rampersaud, Spine Surgeon, UHN and Clinical Champion, ISAEC Pilot
  - Lee Fairclough, VP Quality Improvement, Health Quality Ontario
Declaration of Conflict of Interest

- The University Health Network has received financial support from the Ontario Ministry of Health and Long-Term Care in the form of one-time funding to complete this project
- Physician sponsors received an honorarium from the University Health Network to provide expertise and direction as a Project Sponsor
- No other relationships with commercial interests exist

Presentation Outline

- Why build appropriateness tools/pathways for imaging?
  - Reason for action
  - Approach
  - Partnerships
- How did we create the pathways?
  - Governance
  - Methodology
- The imaging pathways
  - Headache pathway
  - Low back pain pathway
  - TIA/stroke pathway
  - Knee pain pathway
- Evaluation results
- What’s next
  - Key implementation recommendations
WHY BUILD APPROPRIATENESS TOOLS FOR IMAGING?

Reasons for Action

- **Known issues with variability in what images are ordered** for common clinical scenarios\(^1,2\) *e.g.* right modality, MRI, x-ray, U/S CT and when
- Rapid advances in imaging can create **uncertainty** around what imaging is needed and when
- **Feedback from primary care providers** that robust, Ontario-specific, guidelines, framed in the primary care lens would be valuable\(^3\)
- Opportunity to ease pressure on imaging departments by avoiding **duplicate** and **unnecessary** procedures
- Opportunity to **improve patient experiences** by avoiding unnecessary waits and testing

---

1. In 2011 approximately 800 MRI/CT requisitions were collected across UHN, St. Joseph’s Healthcare Hamilton, Thunder Bay Regional Health Sciences Centre, St. Joseph’s Health Care London and the clinical indications were cross-referenced with the Ontario MRI/CT Referral Guidelines to assess variability with guidelines.
3. Diagnostic Imaging Appropriateness Tool Project Phase 2 implemented an order entry tool with guideline-based decision support in 60 primary care physicians’ clinics around Ontario. Physicians provided strong feedback that guidelines were not applicable to their practice because they were not sufficiently robust and were written in radiology-centric language.
Goals and Deliverables

Project Goals

1. Align clinically relevant, evidence-based diagnostic imaging guidelines focusing on selected clinical scenarios that commonly present to primary care and where there is variability in referral practices.

2. Conduct a feasibility analysis on the methods for dissemination, education and adoption of the guidelines into clinical workflow.

Deliverables

1. Align evidence-based diagnostic imaging guidelines into imaging pathways, that:
   • Reflect the realities of the healthcare system in Ontario
   • Address common clinical scenarios within the central nervous system, head and neck, the musculoskeletal system and the spine
   • Include all imaging modalities
   • Are developed in partnership with primary care, radiologists, specialist physicians

2. Conduct a feasibility analysis to understand barriers to adoption and make recommendations to facilitate integration into clinical workflow

3. Disseminate the pathways to primary care, radiologists and specialist physicians

4. Develop a sustainability plan to continuously review and update the imaging pathways to ensure they act as a reliable resource

Our Approach

• Building imaging pathways to outline if, when and what imaging is needed for common primary care presentations of:
  • Headache
  • Low back pain
  • Knee pain
  • Stroke/TIA

• Ensure pathways are user friendly and applicable to the primary care providers

• Pathways will capture:
  • Common presentations in primary care
  • Realities of clinical experience in Ontario
  • Ontario patient population, healthcare system and resource availability
  • Preferred primary care terminology
  • Best evidence

• Pathways will not include emergency/acute trauma presentations
Critical Partnerships

Leveraging Best Practices
- Canadian Association of Radiologists (CAR)
- Choosing Wisely Canada
- Toward Optimized Practice Program (Alberta)
- United Kingdom – NHS Evidence
- Western Australian Imaging Guidelines (Diagnostic Imaging Pathways)
- American College of Radiologists (ACR)

Provincial Alignment
- Ontario College of Family Physicians
- Don’t Just Do Something, Stand There
- Inter-professional Spine Assessment and Education Clinics (ISAEC)
- Ontario Association of Radiologists
- Choosing Wisely Canada
- Health Quality Ontario
- Centre for Effective Practice

How did we create the pathways?
**Governance Structure**

- **Ontario Ministry of Health and Long-Term Care**
  - Funding body

- **Sponsorship Team**
  - Project management specialists, neuroradiology fellow, epidemiologist

- **Steering Committee**
  - Provide strategic direction
  - (20 system leaders)
  - Develop pathways
  - (25-28 clinicians per panel)

- **CNS + Head and Neck Clinical Review Panel**

- **Spine + MSK Clinical Review Panel**

- **Adoption Feasibility Advisory Panel**
  - Develop implementation recommendations (14 panel members)

- **Project Team**
  - Project management specialists, neuroradiology fellow, epidemiologist

**Methodology**

**Approach:** Support the pathways with current evidence by leveraging elements of the CAN-IMPLEMENT* framework, a streamlined version of the ADAPTE guideline adaptation methodology

- Panel Work
  1. Clinical Leads Formulate Pathway Skeleton
  2. Online Panel Review of Pathway Skeleton
  3. In-person Panel Meeting to Finalize Pathway Design
  4. Consensus-Building Process around Imaging Recommendations
  5. Final Pathway

- Project Team Work
  1. Guideline Search, Screening and Summary
  2. Critical Appraisal of Guidelines
  3. Addition of Levels of Evidence

---

*M.B. Harrison, RN, PhD and J. van den Hoek, BNSc for the Canadian Guideline Adaptation Study Group, CAN-IMPLEMENT Guideline Adaptation and Implementation Planning Resource, 2012*
THE IMAGING PATHWAYS

- Headache Pathway
- Low Back Pain Pathway
- TIA/Stroke Pathway
- Knee Pain Pathway

Headache Imaging Pathway Summary

<table>
<thead>
<tr>
<th>MORE COMMON</th>
<th>LESS COMMON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary headache disorder normal neurological exam, no worrisome features</td>
<td>Imaging is not routinely indicated</td>
</tr>
<tr>
<td>Headache with red flags</td>
<td>Urgent imaging is usually indicated to rule out serious intracranial pathology</td>
</tr>
<tr>
<td>Headaches with worrisome features</td>
<td>Consider neurology referral and/or imaging in patients with persisting or worsening symptoms</td>
</tr>
<tr>
<td>Headache suspected to be of sinus origin</td>
<td>Imaging is not routinely indicated</td>
</tr>
<tr>
<td>Chronic post-traumatic headache attributed to mild head injury</td>
<td>Imaging is not routinely indicated</td>
</tr>
<tr>
<td>Suspected cluster headache or other trigeminal autonomic cephalalgias (TACs)</td>
<td>Consider neurology referral and/or imaging in patients with recent onset cluster headache or other TACs</td>
</tr>
<tr>
<td>Suspected giant cell arteritis/temporal arteritis</td>
<td>Imaging is not routinely indicated</td>
</tr>
</tbody>
</table>
**Subcategory #1: Primary Headache Disorder**

**Subcategory & descriptors**

- Primary headache disorder
  - Migraine or tension-type headache
  - Normal neurological exam
  - No red flags
  - No worrisome features
  - No neurological signs that may suggest a secondary cause

**Imaging Recommendation**

- Imaging is not routinely indicated

**Additional Considerations**

- Consider trial of standard therapy for headache.
  - If patient demonstrates good response to therapy, continue; and follow-up with primary care.

- If patient shows poor response to therapy after 8 to 12 weeks, revisit the patient history & presentation for neurological symptoms.

Is the neurological exam normal?

- Yes
  - Consider alternative therapy and referral to neurology.
  - Yield of Neuroimaging
    - The overall yield of neuroimaging studies for headache with a normal neurologic examination is low, ranging from 0.2% to 3.7% in the literature.

- No
  - Consider headache as Red Flag.

**Imaging Modality Recommendation**

- MRI is preferred over CT, except in emergency settings when hemorrhage, acute stroke or head trauma are suspected.

**Evidence Table: Yield of Neuroimaging**

**Subcategory: Primary Headache Disorder**

<table>
<thead>
<tr>
<th>#</th>
<th>Study/Guideline</th>
<th>Study Population</th>
<th>Yield Ratio</th>
<th>Link To Full Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>You et al 2011, Canada</td>
<td>623 patients receiving CT for headache, normal exam</td>
<td>2.1%</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
<tr>
<td>2</td>
<td>Clarke et al 2010, UK</td>
<td>530 patients receiving MRI/CT for headache, normal exam</td>
<td>Migraine: 1.2% Tension: 0.9%</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
<tr>
<td>3</td>
<td>Tempere et al 2004, Spain</td>
<td>1876 patients receiving MRI/CT for headache, normal exam</td>
<td>0.9% ([0.85-1.4])</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
<tr>
<td>4</td>
<td>Toshima et al 2005, Japan</td>
<td>106 patients with normal exam chronic / recurrent headache were examined with MRI</td>
<td>0.7%</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
<tr>
<td>5</td>
<td>Wang et al 2001, US</td>
<td>402 adult patients with chronic headache, received MRI, normal exam</td>
<td>3.7%</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
<tr>
<td>6</td>
<td>Jordan et al 2000, US</td>
<td>128 headache patients referred for MRI, normal exam</td>
<td>1.5%</td>
<td><img src="https://example.com" alt="Link" /></td>
</tr>
</tbody>
</table>
THE IMAGING PATHWAYS

• Headache Pathway
• Low Back Pain Pathway
• TIA/Stroke Pathway
• Knee Pain Pathway

Low Back Pain Imaging Pathway: Summary

<table>
<thead>
<tr>
<th>Subcategory &amp; Descriptors</th>
<th>Imaging Recommendation</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back-dominant pain</td>
<td>Imaging is not indicated*</td>
<td>Link to Reference</td>
</tr>
<tr>
<td>Back-dominant pain with yellow flags</td>
<td>Imaging is not indicated*</td>
<td>Link to Reference</td>
</tr>
<tr>
<td>Leg-dominant pain</td>
<td>Imaging is not indicated*</td>
<td>Link to Reference</td>
</tr>
<tr>
<td>Back Pain with Red Flags</td>
<td>Imager is indicated and Referral for surgical consultation</td>
<td>MRI preferred; if contraindicated or not available, then CT</td>
</tr>
</tbody>
</table>

*Imaging for low back pain without indication of serious underlying conditions is not associated with improved outcome. Such imaging reveals a high prevalence of clinically irrelevant and misleading findings.

No red flags
• No leg symptoms
• Normal neurological exam
• Manageable

No red flags
• Unmanageable; recurrent; progressive
• Chronic (>3 months)
• Normal neurological exam

No red flags
• Yellow flags: psychosocial barriers that may hinder recovery in a patient with low back pain
• Normal neurological exam

No red flags
• Intermittent or constant
• Manageable

No red flags
• Unmanageable due to severity or duration
• Functionally significant neurologic deficit
• Failure to resolve (6-12 weeks)

No red flags
• Suspected cancer
  X-ray & MRI**
• Suspected spinal infection
  X-ray & MRI**
• Suspected fracture
  Fragility X-ray, High-Energy X-ray & CT
• Suspected inflammatory disease
  Rheumatology consultation
• Severe/progressive neurologic deficit
  Emergency management; MRI & consultation to surgery | or immediate referral to ED
• Cauda equina syndrome
  Emergency management; MRI & consultation to surgery | or immediate referral to ED
Subcategory & Descriptors
Back-dominant pain
- No leg symptoms or leg symptoms less severe than back
- Normal neurological exam
- Manageable
- No red flags

Imaging Recommendation
Imaging is not indicated

Future Considerations
Clinical reassessment to rule out progression or change in pattern of pain

Additional Recommendations
Patient Education
Multidisciplinary Approach
Supportive Resources

Additional resources:
Recommended Exercises
Other Supportive Material
Communication tips:

Low Back Pain Imaging Pathway

Back-Dominant Pain, Manageable

Low Back Pain Imaging Pathway

Additional Resources

<table>
<thead>
<tr>
<th>Recommended Exercises</th>
<th>Source</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISARC Illustrated Exercises for Patients</td>
<td>Inter-professional Spine Assessment and Education Clinics (ISARC) (2015)</td>
<td><img src="#" alt="Link" /></td>
</tr>
<tr>
<td>ISARC Positions of Relief, Stretches and Exercises</td>
<td>Inter-professional Spine Assessment and Education Clinics (ISARC) (2015)</td>
<td><img src="#" alt="Link" /></td>
</tr>
<tr>
<td>Spine Assessment and Treatment: Back Exercises</td>
<td>Saskatchewan Spine Pathway (2010)</td>
<td><img src="#" alt="Link" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supportive Resources for Physicians</th>
<th>Source</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Minute Primary Care Low Back Examination Video</td>
<td>Institute for Work &amp; Health (IWH) &amp; University of Toronto, Division of Rheumatology</td>
<td><img src="#" alt="Link" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Supportive Material</th>
<th>Source</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging tricks for lower back pain: When you need them—and when you don’t.</td>
<td>Choosing Wisely Canada (2014)</td>
<td><img src="#" alt="Link" /></td>
</tr>
<tr>
<td>Primary Care Focus on Low Back Pain Primary Care Toolkit</td>
<td>Low Back Pain Strategy Centre for Effective Practice (2013)</td>
<td><img src="#" alt="Link" /></td>
</tr>
</tbody>
</table>
THE IMAGING PATHWAYS

- Headache Pathway
- Low Back Pain Pathway
- TIA/Stroke Pathway
- Knee Pain Pathway

TIA/Stroke Imaging Pathway: Summary

1. Patients with Symptoms Suggestive of TIA/Stroke Event

   - Assessment of TIA/stroke should be based on patient presentation in combination with ABCD2 score

     1A. Active/evolving stroke
     - Immediate transfer to the closest ED with neuroimaging facilities and stroke expertise

     1B. High risk of stroke recurrence following a recent TIA/stroke event
     - Same-day assessment at the closest Stroke Prevention Clinic or ED

     1C. Moderate risk of stroke recurrence following a recent TIA/stroke event
     - Referral for urgent CT Brain + CT Angiography (if available) or Carotid Doppler within 48 hours

     1D. Low risk of stroke recurrence following a recent TIA/stroke event
     - CT Brain + CT Angiography (if available) or Carotid Doppler & additional investigations/referral

2. Patients with Previous History of TIA/Stroke Event Presenting in Primary Care for Follow-up

   - Conduct risk assessment based on patient presentation in combination with ABCD2 risk stratification tool & follow same recommendations as Category #1

   2A. Patients presenting in primary care for follow-up with:
       • NEW NEUROLOGICAL SYMPTOMS

   2B. Patients presenting in primary care for follow-up with:
       • NO NEW NEUROLOGICAL SYMPTOMS

   Imaging is not indicated
Subcategory 1D: Low Risk of Stroke Recurrence Following a Recent TIA/Stroke Event

Low risk of stroke recurrence following a recent TIA/Stroke event

- Onset of compelling symptoms more than 2 weeks ago, with no persistent symptoms or deficits, OR
- ABCD2 score of 1-3 (low risk)

Note: The associated recommendation is applicable for patients who had compelling symptoms highly suggestive of TIA/stroke (such as motor weakness or speech disturbance).

Patients with only non-specific sensory symptoms (such as patchy numbness or tingling) may be generally considered as less urgent, and may be seen by a healthcare professional with stroke expertise as required.

CT Brain + CT Angiography (if available) or Carotid Doppler is indicated, generally within one-month

Additional Considerations

- 2015 Canadian Stroke Best Practice Recommendations recommend that patients receive comprehensive clinical evaluation generally within one-month of symptom onset
- Additional evaluation:
  - Obtain ECHO, ECG, lab tests, including lipid profile
  - Referral for other arterial imaging including MRA & CTA
  - Start antiplatelet therapy, if no contraindications

Consider referral within 1 month to a designated Stroke Prevention Centre or a physician with stroke expertise

List of Stroke Prevention Centres in Ontario

To access the pathway references, please click the evidence table icon

THE IMAGING PATHWAYS

- Headache Pathway
- Low Back Pain Pathway
- TIA/Stroke Pathway
- Knee Pain Pathway
Knee Pain Imaging Pathway | Starting Points

1. History of Trauma/Injury

Any of the following? New:
- Effusion, or
- Bony tenderness, or
- Decreased range of motion, or
- Soft tissue swelling, or
- Difficulty weight-bearing

- Yes → X-Ray indicated
- Imaging not initially indicated

2. No History of Trauma/Injury

Suspected:
- Pathological fracture or
- Inflammatory arthritis or
- Tumour
- Infection

- Yes → X-Ray indicated
- Imaging not initially indicated (Consider possible referred pain or bony/soft tissue overuse injury)

Suspected Degenerative Changes/Disease

- New/acute onset
- Ongoing, severe
- Sudden exacerbation
- Functional Impairment

- Yes → X-ray not routinely indicated
- MRI not routinely indicated

- No → Consider X-ray (bilateral standing)

Please note: This summary includes starting points only.
For MRI and other imaging recommendations and considerations, see FULL knee pain imaging pathway.

References: 1,8
Primary Care Provider Assessment of Imaging Pathways

Survey audience: Primary care providers not involved in the project

Review of the Low Back Pain Imaging Pathway

Question: Based on your review of the low back pain pathway, please rate your agreement with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pathway includes clinical presentations that I frequently encounter in my practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway includes clinical presentations that are clinically important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway reflects best practices and evidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway recommendations are relevant and applicable to my patient population</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway recommendations themselves are applicable in my local setting, based on the healthcare resources available to me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway can help facilitate communication with patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The pathway can help change my practice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of responses = 58
Primary Care Provider Assessment of Imaging Pathways
Survey audience: Primary care providers not involved in the project

Review of the Headache Imaging Pathway

**Question:** Based on your review of the headache pathway, please rate your agreement with the following statements:

- The pathway includes clinical presentations that I frequently encounter in my practice
- The pathway reflects best practices and evidence
- The pathway recommendations are applicable in my local setting, based on the healthcare resources available to me
- The pathway can help change my practice

Factors influencing adoption

**Question:** What factors would help you and your primary care colleagues use these pathways? Please rate the importance of the following options:

- Very Important
- Important
- Moderately Important
- Of Little Importance
- Unimportant

Number of responses = 50

Number of responses = 59
WHAT’S NEXT

Key Implementation Recommendations

- **IT Integration**
  - Pursue integration of pathways with Ontario’s major EMRs to support primary care providers’ workflow.

- **Integrated Implementation**
  - Investigate alignment of pathways with existing primary care best practice implementations: HQO Communities of Practice, Choosing Wisely Canada recommendations, Quality-Based Procedures, etc.

- **Data to Support Practice Change**
  - Create imaging indicators to give clinicians insight into their imaging referral patterns relative to peer groups. Leverage existing tools like the HQO Primary Care Practice Reports.

- **Tools for Patient Conversations**
  - Develop tools to support the imaging-decision conversations between primary care providers and their patients.

- **Communication and Dissemination**
  - Pursue incorporation of pathways into OCFP courses and distribution via Chiefs of family medicine, radiology and the other specialties at academic hospitals.
Contact Information

Lilly Whitham, MSc, PMP
Senior Project Manager, JDMI, UHN
Email: lilly.whitham@uhn.ca

Karen Weiser, MBA
Business Analyst, JDMI, UHN
Email: karen.weiser@uhn.ca