iNvestigate
An online tool to promote rational test requests

Dr Anne Eastwood
GPET 2012
Acknowledgements

**UNSW:**
- *Prof Rakesh Kumar*
- Clayton Gilbert and programming team
- Kate Webber

**RCPA:**
- Dr Wendy Pryor

**GP Synergy:**
- Dr Geetha Kunjithapatham
- A/Prof Rosa Canalese
Diagnostic testing: the problem

- Requesting of both pathology tests and diagnostic imaging continues to rise
- Up to $\frac{1}{3}$ of common test requests may be avoidable
- Inappropriate requests often reflect lack of awareness of evidence base
- Evidence/guidelines may be lacking (e.g., fatigue) or contradictory (e.g., PSA)
Also many non-evidence based variables
  – Experience, knowledge, belief systems
  – Awareness of cost
  – Defensive practice
  – Availability of new technology
  – Patient demand
  – Fear of being criticised for neglecting a test
GPs and tests

- 70% of pathology service claims to Medicare are generated by GPs
- Increasing rate of test ordering
  eg From 2000-2008, in investigation of weakness/tiredness, FBC↑20.4%, TFT↑35%, Ferritin↑64% LFT↑33%, B12↑105%, CRP↑281%, “Other” ↑600%

Bayram, C Evidence-practice gap in GP pathology test ordering. BEACH report to QUPP
GP registrars and tests

- Little consistency in how and what pathology is covered in GP vocational training\(^1\)
- Younger GPs order more tests\(^2\)
- Rheumatology, menopause/infertility, vague Sx (tiredness) and mildly abnormal tests the most challenging

1. Buebner T, Laurence C. QUPP- Enhancing the quality use of pathology for GP Registrars and IMGs- assessing the need. Final Report
2. Charles J, Britt H, Valenti L. The independent effect of age of GP on clinical practice. MJA 2006;185:105-9
Influencing test ordering behaviour

• Few interventions with long-term impact
  – Education and feedback possibly the most effective
  – Rules/agreements to restrict requests also useful
  – Others include re-design of request forms, computerised systems with decision support, funding models

• Most test ordering in hospitals is by junior doctors

• DoHA/QUPP workshop emphasised need for intervention at critical training points
  – PGY1 and PGY2 curriculum
  – GP registrar training program
A QUPP-funded educational resource for Australia: *iNvestigate*

- Result of a partnership between UNSW and RCPA
- Based on PathCAPS, an award-winning simulation created by Prof Fred Dee, University of Iowa
- Linked to key resources
  - RCPA Manual for Pathology test information
  - Inside Radiology for general information about diagnostic imaging
  - MBS Online for progressive feedback on costs
- Initially targeted at PGY1 graduates, consistent with ACF competencies
- Now extended to GP registrars and specialist trainees
Case Selection

- 14 Cases
- Based on review of BEACH data
- Some adapted from existing cases in RCPA Common Sense pathology
- Remainder created from scratch
<table>
<thead>
<tr>
<th>Cases - Presenting Sx</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fatigue</td>
</tr>
<tr>
<td>2. Arthritis</td>
</tr>
<tr>
<td>3. Diarrhoea</td>
</tr>
<tr>
<td>4. Check up</td>
</tr>
<tr>
<td>5. Abnormal LFTs</td>
</tr>
<tr>
<td>6. Haematuria</td>
</tr>
<tr>
<td>7. Leg swelling</td>
</tr>
<tr>
<td>8. Hypertension</td>
</tr>
<tr>
<td>9. Chronic cough</td>
</tr>
<tr>
<td>10. Bruising</td>
</tr>
<tr>
<td>11. Antenatal</td>
</tr>
<tr>
<td>12. Abnormal LFTs</td>
</tr>
<tr>
<td>13. Dysuria</td>
</tr>
<tr>
<td>14. Parasthesiaeae</td>
</tr>
</tbody>
</table>
Resource selection

Where possible, resources were chosen which were:

• Australian
  – Heart Foundation
  – RACGP guidelines
  – AFP articles

• Primary care focused
Issues for “expert” comment

• Needs to be justifiable

• Experience level of target audience

• RACGP exams
Murtagh’s diagnostic strategy

• What is the probability diagnosis?
• What are the serious diagnoses not to be missed?
• What are the conditions commonly missed?
• Could it be one of the masquerades?
• Is the patient trying to tell me something?
Relevant history and physical findings are presented on this page (note that image links may be available at the bottom of the page). Plausible differential diagnoses are provided on the next page. Use the tabs at the top or arrows at the bottom of the page, as available, to progress through the case. Do not use the back/forward buttons in your browser as these may yield unpredictable results.

Title: GP02
Age: 50
Gender: F
Group: General Practice Registrars

Clinical scenario:

**History**

**Presenting complaints**

Andrea is a 50-year-old-woman who presents with swelling of the right wrist that has been present for less than a week.

She also reports reduced grip strength in both hands and sore “balls of her feet” on most mornings for about an hour, both of which have been present for some weeks. She also mentions that her hands become very sore after prolonged activities such as knitting. Although fatigued, she denies fever or chills. Her eyes have been dry and irritated recently, but she has attributed this to hayfever.

She has been using paracetamol regularly for several weeks with suboptimal relief of her symptoms. She occasionally takes Panadeine at night if her pain is severe.

She has no other symptoms of note, and in particular has no gastrointestinal or respiratory symptoms.

**Other history**

**Past medical history**

Andrea has a history of hypertension which is well controlled with medication. She had a cholecystectomy 12 years ago for gallstone disease and had a tonsillectomy as a child.
Clinical scenario:

History

Presenting complaints

Andrea is a 50-year-old-woman who presents with swelling of the right wrist that has been present for less than a week. She also reports reduced grip strength in both hands and sore “balls of her feet” on most mornings for about an hour, both of which have been present for some weeks. She also mentions that her hands become very sore after prolonged activities such as knitting. Although fatigued, she denies fever or chills. Her eyes have been dry and irritated recently, but she has attributed this to hayfever.

She has been using paracetamol regularly for several weeks with suboptimal relief of her symptoms. She occasionally takes Panadeine at night if her pain is severe.

She has no other symptoms of note, and in particular has no gastrointestinal or respiratory symptoms.

Other history

Past medical history

Andrea has a history of hypertension which is well controlled with medication. She had a cholecystectomy 12 years ago for gallstone disease and had a tonsillectomy as a child.

Medications

1. amlodipine 5mg daily
2. paracetamol 1g QID prn
3. paracetamol/codeine nocte prn

Social history

Andrea is married with 3 children aged in their 20s. Only her youngest child is still living at home. She works part-time in retail and has an active social calendar. She and her family live in Sydney and have not travelled recently. She is a lifelong non-smoker and drinks 1-2 glasses of wine on 3 days per week on average.

Family history

Andrea's mother is alive and well at 75 and her father died last year at age 78 from a myocardial infarct. Her older brother has ankylosing spondylitis. Her children are in good health.
You can drag and drop to select and prioritise your initial (provisional) diagnoses.

Available diagnostic hypotheses

Probable diagnoses
- osteoarthritis
- rheumatoid arthritis

Possible diagnoses
- psoriatic arthritis
- systemic lupus erythematosus

Low probability diagnoses
- ankylosing spondylitis
- chronic fatigue syndrome
- gonococcal arthritis
- septic arthritis
You can search for and order investigations from this page. Note that the initial screen only shows a limited list of COMMON tests. To search for other tests, you can simply type the name/abbreviation of the test into the search box, search by section/category, or uncheck the "Common" box to show the full list. Remember to scroll down to view test information. Click on "Order test" to add to the list of orders and see the indicative cost.

<table>
<thead>
<tr>
<th>Common</th>
<th>Section</th>
<th>Category</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-Select-</td>
<td>-Select-</td>
<td></td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Chemical Pathology</td>
<td>Amylase - plasma or serum</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Immunology</td>
<td>Antinuclear antibodies (ANA)</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Microbiology</td>
<td>Blood culture</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Chemical Pathology</td>
<td>Blood gases - arterial blood (ABG)</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Haematology</td>
<td>Blood group and antibody screen</td>
</tr>
<tr>
<td>✔</td>
<td>Imaging/Nuclear Medicine</td>
<td>Diagnostic Imaging</td>
<td>Bone densitometry</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Chemical Pathology</td>
<td>C-Reactive protein (CRP) - serum</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Chemical Pathology</td>
<td>Calcium Magnesium Phosphate (CMP)</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Chemical Pathology</td>
<td>Cholesterol (HDL and LDL) - plasma or serum</td>
</tr>
<tr>
<td>✔</td>
<td>Clinical Laboratory</td>
<td>Haematology</td>
<td>Coagulation studies</td>
</tr>
</tbody>
</table>
Click on a panel bar to view information.

Your test costs: $101.30
Expert test costs: $365.60

Your test ordering encounters: 1
Expert test ordering encounters: 1

Expert choices that you ordered

Expert choices that you did not order

Tests you ordered that the expert did not
You can review the results of the investigations you ordered (including in previous encounters if applicable) on this screen. Abnormal values are in **bold**. To review information about a test, click on the test name. If appropriate, you can continue to order further investigations, or else proceed to finalise your test ordering and select your final diagnoses.

Your test ordering encounters: 1/5

<table>
<thead>
<tr>
<th>Encounter</th>
<th>Result</th>
<th>Reference Interval</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C-Reactive protein (CRP) - serum</strong> [Clinical Laboratory &gt;&gt; Chemical Pathology]</td>
<td>8 mg/L</td>
<td>&lt;5 mg/L</td>
<td><strong>$9.75</strong></td>
</tr>
</tbody>
</table>

**Coagulation studies** [Clinical Laboratory >> Haematology]

- Prothrombin time: 13 seconds
- Activated partial thromboplastin time: 29 seconds

Prothrombin time: 11-15 seconds (reagent dependent)
Activated partial thromboplastin time: 25-35 seconds (reagent and method dependent) | **$35.75** |

**Duplex scanning, lower limb veins** [Imaging/Nuclear Medicine >> Diagnostic Imaging]

DVT involving the right posterior tibial vein extending into the distal popliteal vein. | **$169.50** |

**Full blood count (FBC)** [Clinical Laboratory >> Haematology]

<p>| Hb: 135 g/L | MCV: 85 fL | MCH: 30 pg | MCHC: 320 g/L | Haematocrit: 0.47 | RCC: 4.7 x 10^12/L | RCDW: 12 | Hb: female: 115-165 g/L, male: 130-180 g/L (adult) | MCV: 80-100 fL (adult) | MCH: 27-32 pg (adult) | MCHC: 300-350 g/L | Haematocrit: female: 0.37-0.47, male: 0.40-0.54 (adult) | RCC: female: 3.8-5.8 x 10^12/L, male: 4.5-6.5 x 10^12/L (adult) | RCDW: 11-15 | White cell count (WCC): 4.1-11 x 10^9/L | <strong>$17.05</strong> |</p>
<table>
<thead>
<tr>
<th>Encounter 1</th>
<th>Reference Interval</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C-Reactive protein (CRP) - serum</strong> [Clinical Laboratory &gt;&gt; Chemical Pathology]</td>
<td>8 mg/L &lt;5 mg/L</td>
<td>$9.75</td>
</tr>
<tr>
<td><strong>Coagulation studies</strong> [Clinical Laboratory &gt;&gt; Haematology]</td>
<td>Prothrombin time: 11-15 seconds (reagent dependent)</td>
<td>$35.75</td>
</tr>
<tr>
<td>Activated partial thromboplastin time: 25-35 seconds (reagent and method dependent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Duplex scanning, lower limb veins</strong> [Imaging/Nuclear Medicine &gt;&gt; Diagnostic Imaging]</td>
<td>DVT involving the right posterior tibial vein extending into the distal popliteal vein.</td>
<td>$169.50</td>
</tr>
<tr>
<td><strong>Full blood count (FBC)</strong> [Clinical Laboratory &gt;&gt; Haematology]</td>
<td>Hb: female: 115-165 g/L, male: 130-180 g/L (adult)</td>
<td>$17.05</td>
</tr>
<tr>
<td></td>
<td>MCV: 80-100 fl (adult)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MCH: 27-32 pg (adult)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MCHC: 300-350 g/L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Haematocrit: female: 0.37-0.47, male: 0.40-0.54 (adult)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCC: female: 3.8-5.8 x 10^12/L, male: 4.5-6.5 x 10^12/L (adult)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RCDW: 11-15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White cell count (WCC): 4-11 x 10^9/L</td>
<td></td>
</tr>
</tbody>
</table>
Summary of this case

This patient has arthritis, as demonstrated by the swelling and tenderness of the wrists. The hand and foot symptoms ("polyarthritis") and the presence of swelling and tenderness on examination of the wrists reinforces this suspicion.

There are two major types of arthritic pain -- non-inflammatory and inflammatory -- which, in addition to the clinical history, help establish the pathogenesis.

Non-inflammatory pain, often due to osteoarthritis, is made worse by activity and often improves with rest. It may be associated with bony spurs (Heberden's nodes: small nodules over the distal interphalangeal joints of the hands), and is often associated with osteoarthritis in other joints and knees. Osteoarthritis is the most common cause of arthritis associated with non-inflammatory joint pain.

Inflammatory pain refers to pain that is most pronounced after a period of rest (often associated with "early morning stiffness") and used as a rough marker of inflammatory severity. In contrast to degenerative joint pain, inflammatory pain often relates to local characteristics suggestive of local inflammation (eg, redness, synovial swelling) or, occasionally, systemic inflammation (eg, fever). Inflammatory conditions are inflammatory in nature.

Andrea has an inflammatory arthritis in the wrists, metatarsalgia, and hand pain suggestive of non-inflammatory osteoarthritis; this can be described as an "undifferentiated polyarthritis", or "early arthritis", with mixed features. Our tests will lead us to suspect a condition requiring specialist management to reduce possible long term complications. The RACGP Guidelines for Early Rheumatology in Primary Care recommends the testing of all patients with persistent swelling of more than 6 weeks (whether or not RF or CCP is positive) as very early signs of RA and other disease.

At this early stage (before referral) investigations are indicated for clarification of the diagnosis and, once the diagnosis is confirmed, indices which will be monitored in relation to disease progression, drug side effects and co-morbidities.

Diagnostic strategy

What is the probability diagnosis?

The most likely diagnoses in this case are osteoarthritis and rheumatoid arthritis.

Inflammatory markers are reasonable tests in the investigation of arthritis, but it should be noted that they are acute phase markers of inflammation and are generally more helpful in guiding response to treatment than making a diagnosis. CRP is the preferred acute phase marker because of its ease of measurement, faster response to inflammatory change, greater specificity for inflammation, and availability in most laboratories. However, ESR is a useful disease marker in giant cell arteritis/polymyalgia rheumatica and certain conditions (including the RA), so in these circumstances ESR testing can be requested. Many clinicians request both tests as a rule to follow as a guide to treatment success.

RF and CCP. Where RA is a possibility (as with Andrea), testing for both rheumatoid factor (RF) and antibodies to cyclic citrullinated peptide (CCP) in patients with RA may be positive for one and not the other. Anti-CCP antibodies have emerged as the best single test for RA, with a high positive predictive value. Most clinicians now prefer to order both tests to confirm the clinical suspicion of RA.
A QUPP-funded educational resource for Australia: *iNvestigate*

- Case-based simulation environment for requesting tests (~280 Pathology, ~120 others available)
- Provides a high-quality educational resource
  - Opportunities to compare own knowledge, understanding and approach with that of experts
  - Practice without adverse consequences of error
  - Convenient access, easy to use, interactive
- Allows easy addition of useful cases by educators
- Planned improvements include feedback questionnaire
Try it at:

http://investigate.med.unsw.edu.au