PATHOLOGY TESTING - ASSISTING THE CLINICIAN WASTING RESOURCES?

SAMA Conference
Friday, 18 September 2015

Professor WJH Vermaak
Contents

- Recognizing the problem
- Understanding the problem
- Practical proposal to address the issue
Analysing the title:... - *assisting* the clinician *wasting resources*?

- **Two components to the question:**
  - Assisting the clinician …….. (intentionally or unintentionally?)
  - Wasting of resources ………..(does it happen and if so? magnitude)

- **Colin Powell approach:**
  - “First give me the facts and then you may tell me what you think”

- The first part of my talk is based on verifiable facts and the very last slide summarizes what I think.
Perspectives on the Pathology Industry

- “Data generating factories” (requiring financial, operational, management expertise etc.)

- The challenge and professional responsibility is to convert data into clinically meaningful and relevant information to improve clinical outcome. (professional component)

- However, in today’s environment (silo approach to healthcare) there is a lack of room for proper consultation with clinician and this undermines the quality of clinical outcomes
Social (or Pareto) efficiency and wastage

- Exists when no one can be made better off without making someone else worse off.

- Healthcare budgets are finite, thus wastage in one area affects one or more disciplines in other.

- Wastage: money spent that does not improve health outcome.

- Worldwide issue – estimated wastage in USA $700billion p.a.

- Funder response: reduce/constraining reimbursement rates and improve in-house efficiencies.

- Triple aim: 1) reduce or control per capita expenses 2) Improve in-house efficiencies 3) Improve general health.
Improving efficiency and reducing cost of healthcare is also a burning issue in SA

CMS keeping a sharp eye on troubled medical schemes

The Council for Medical Schemes (CMS) has placed seven schemes on close watch due to their solvency levels falling below the statutory requirement of 25% during 2014.

NHI to reduce cost of healthcare

SA is working towards reducing the high cost of private healthcare and ensuring public healthcare is of quality. But it won't happen overnight.

South Africa’s health sector is leaking money: what can be done about it?

Health Minister Aaron Motsoaledi believes good quality private healthcare is no longer affordable in the country and that is why the country needs universal health coverage.
Pathology contributes significantly to overall healthcare cost increases.
Possible levers to reduce costs

- **Pressure on pathology labs to improve analytical and operational efficiencies, service levels and productivity**
  - “The Q.T.C. economic law”
  - *It has potential for reducing costs, but needs to filter through patient savings*

- **Consolidation of laboratories:**
  - Economies of scale
  - Competition will be a determining factor
  - *Has potential for savings but needs to be actively managed and supervised*

- **Remuneration and Coding Structures** (*FFS, ARM, DRG’s, ICD10 and CPT coding*)
  - An all encompassing topic.

- **Biggest single savings opportunity: UTILIZATION MANAGEMENT**
  - Driven by Individual Doctors
  - Not directly controlled by lab
  - Clinical outcome data
Reported wastage as a result of unnecessary pathology testing

- Harvard Medical School and Beth Israel Medical Centre reported that 30% of the 50 most commonly ordered lab tests are on average unnecessary.

- Several studies have shown that between 25% and 40% of all tests sent to the laboratory are unnecessary, yet few laboratories in the UK have managed to reduce these unnecessary tests.\(^3\text{–}^5\)

- 5-50% of all in-patient lab test orders are inappropriate (Van Walraven and Naylor. JAMA 1998)
Misuse and abuse of laboratory tests

- “We think according to nature; we speak according to rules; but we act according to custom” - Francis Bacon

- What are these customs?
  - U&E’s, LFT, RFT, TFT, “Viral Studies”, FBC, TORCH, SMAC etc. etc.
  - Do we really need Chlorides, Total CO2 etc.?
When do Path Tests add value?

- Only when the right test is done on right patient and at right time.

- **Barriers** to achieving this:
  - *New technology, new tests*
  - *Decrease in undergraduate course work in pathology*
  - “What there is to know can be picked up with time”
  - Popular study aids (*“Synopsis of…; Essentials of ….; Primer of…”*) are no longer available.
The elephant is ...

Current “al carte” tick-box pathology test request form:

- Encourages abuse
- Discourages critical thinking

Like ordering food from a menu with somebody else paying the bill!
Cost containment approaches

- The **number, complexity** and **costs** of clinical lab tests are simply overwhelming.

- Practitioners are often **uncertain which test** and in **what sequence** to order, how to **interpret**, and how to go about **dealing** with that uncertainty.

- Working with GPs and MF in helping them make better use of diagnostic tests has been illuminating.
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75% of out-of-hospital pathology spend is related to five major groups of diagnostic tests

2014 breakdown of top 50 codes of out-of-hospital pathology spend

100% ~ R 2.5 bn (estimate) per year
(No of tests in group)

By investigating each of these groups, and applying diagnostic “common sense” we can identify specific opportunities for utilization optimization
Full blood counts (20% of R2.5bn)

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>% of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>3755 - Full blood count</td>
<td>47%</td>
</tr>
<tr>
<td>3947 - C-reactive protein</td>
<td>18%</td>
</tr>
<tr>
<td>4528 - Ferritin</td>
<td>10%</td>
</tr>
<tr>
<td>3797 - Platelet count</td>
<td>10%</td>
</tr>
<tr>
<td>4144 - Transferrin</td>
<td>6%</td>
</tr>
<tr>
<td>3743 - Erythrocyte sedimentation rate</td>
<td>5%</td>
</tr>
<tr>
<td>4071 - Iron</td>
<td>4%</td>
</tr>
<tr>
<td>3762 - Haemoglobin estimation</td>
<td>1%</td>
</tr>
</tbody>
</table>

Requested by GP
as standard screening

Requested after abnormal result and consultation with pathologist

Closer interaction between GPs and pathologists can result in significant savings
Significant savings opportunities exist in other test groups without sacrificing diagnostic value.

**Liver functions (13% of R2.5bn)**

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>% of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4131 - ALT</td>
<td>17.3%</td>
</tr>
<tr>
<td>4130 - AST</td>
<td>16.4%</td>
</tr>
<tr>
<td>4134 - GGT</td>
<td>14.7%</td>
</tr>
<tr>
<td>4001 - AP</td>
<td>11.4%</td>
</tr>
<tr>
<td>3999 - Albumin</td>
<td>11.4%</td>
</tr>
<tr>
<td>4009 - Bilirubin: Total</td>
<td>10.2%</td>
</tr>
<tr>
<td>4010 - Bilirubin: Conjugated</td>
<td>7.0%</td>
</tr>
<tr>
<td>4531 - Hepatitis: Per antigen or antibody</td>
<td>6.0%</td>
</tr>
<tr>
<td>4117 - Protein: Total</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Only GGT and ALT tests (30% of spend) vs full profile of liver function relevant for outpatients.

**U&E (13% of R2.5bn)**

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>% of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4171 - Sodium + potassium + chloride + CO2 + urea</td>
<td>70.1%</td>
</tr>
<tr>
<td>4032 - Creatinine</td>
<td>20.1%</td>
</tr>
<tr>
<td>4155 - Uric acid</td>
<td>3.8%</td>
</tr>
<tr>
<td>4151 - Urea</td>
<td>2.4%</td>
</tr>
<tr>
<td>4113 - Potassium</td>
<td>2.0%</td>
</tr>
<tr>
<td>4188 - Urine dipstick</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

If we only ask for Creatinine and K the cost would come decrease by 80%.
Similar opportunities in endocrine, lipogram test groups

Endocrine functions (19% of R2.5b)

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>% of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4484 - Thyrotropin (TSH) + Free Thyroxine (FT4)</td>
<td>39.0%</td>
</tr>
<tr>
<td>4507 - Thyrotropin (TSH)</td>
<td>33.2%</td>
</tr>
<tr>
<td>4064 - HbA1C</td>
<td>13.2%</td>
</tr>
<tr>
<td>4482 - Free thyroxine (FT4)</td>
<td>7.3%</td>
</tr>
<tr>
<td>4057 - Glucose: Quantitative</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

- 80% of thyroid pathology spend on both TSH / FT4 as screen, whilst only 25% have TSH abnormality

Lipograms (11% of R2.4b)

<table>
<thead>
<tr>
<th>Procedure Code</th>
<th>% of value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4025 - Chol/HDL/LDL/Trig</td>
<td>37.4%</td>
</tr>
<tr>
<td>4147 - Triglyceride</td>
<td>19.3%</td>
</tr>
<tr>
<td>4027 - Cholesterol total</td>
<td>17.2%</td>
</tr>
<tr>
<td>4028 - HDL cholesterol</td>
<td>17.2%</td>
</tr>
<tr>
<td>4026 - LDL cholesterol</td>
<td>8.8%</td>
</tr>
</tbody>
</table>

- More selective approach of requesting only TC as initial screening test in patients with no family history or absence of other physical risk factors 80 % of R240m p.a.
Ordering test panels in hospital patients also presents opportunities

- A study of orders for repeat electrolyte panels indicated that 10% were medically unnecessary and in 65% of cases a single test could have substituted for the entire panel

(Baigelman et al, Intensive Care Med, 11(6) 1985)
Contents

▪ Recognizing the problem
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▪ Practical proposal to address the issue
There is a practical way to help address the issue ...
Alternative approach to Tick Boxes: Problem Based Request Form

- Analysis of requesting patterns → relatively limited number of clinical conditions attract majority of pathology testing

- Grounded upon Evidence Based Medicine

- Basic pattern:
  - Initial request: 1st. Stage initiated by GP (look for red flags)
  - 2nd. Stage interaction with Pathologist + selective follow-up

- Changes uncertainty to directed approach and empowers the users
Organized around specific symptoms with guiding questions

Complemented with explanatory compendium
### 9. Diarrhoea (Changed bowel habits) (ICD No R19.40)

- Screening for osmotic diarrhoea: Faecal Na*, K*, osmol
- In seriously ill patients:
  - Faecal culture
  - Parasitic examination
  - FBC
- Does the patient have constant fever? Yes No
- Does the patient have fever peaks? Yes No
- Palpable liver and/or spleen? Yes No
- Uricaria present? Yes No
- Malignancy screening: Faecal occult blood

Three separate specimens at weekly intervals are required.

### 10. Dyslipidaemias (ICD No E78.5)

- Screening:
  - Cholesterol
  - If CHD, or risk factors for CHD, is present:
    - Cholesterol, HDL - cholesterol
    - TSH, ALT, GGT, Glucose, Urine albumin
- Exclusion of secondary causes of dyslipidaemia:
  - TSH, ALT, GGT, Glucose, Urine albumin
- Monitoring of cholesterol lowering therapy:
  - Cholesterol, Fasting glucose
- Fasting glucose required every three years.

### 11. Dysuria (ICD No R30.0)

- Urine microscopy, culture, sensitivity:
  - Yes No
  - Is the sample catheter urine? Yes No
  - Is the patient receiving antibiotic treatment? Yes No
  - Creatinine, PSA

### 12. Fever of unknown origin (ICD No R56.9)

- CRP
- WBC
- Malaria parasites
- Occupation / Travel / Exposure History

### 13. Hypertension (ICD No I10)

- Exclusion of identifiable causes/organ damage:
  - Glucose
  - Urine albumin, Na*, K*, creatinine
- Risk assessment:
  - Cholesterol, HDL - cholesterol
  - Monitoring diuretic therapy:
  - K
  - Monitoring ACE inhibitor therapy:
  - Creatinine

### 14. Iron overload (ICD No E83.4)

- Screening:
  - Hb
  - Iron transferrin saturation
- Confirmation:
  - Genotyping
  - Ferritin, CRP, ALT, GGT

### 15. Kidney disorders (ICD No N28.9)

- Screening/Monitoring:
  - Creatinine
  - Urine protein
  - Urine albumin

If calculated creatinine clearance is required, please supply body mass: kg. Patient height cm.

### 16. Liver disorders (ICD No K76.9)

- Screening:
  - ALT, GGT
- Viral hepatitis diagnostics:
  - Hepatitis A
  - Hepatitis B
  - Hepatitis C
- Immunity assessment:
  - Anti HBsAg, IgG

### 17. Pregnancy (ICD No Q26.9)

- Confirmation:
  - HCG
- Rubella IgG
- Control at 12 weeks:
  - HbsAg
  - Hb
  - Syphilis serology
- Control at 16 weeks:
  - ABO, Rh
  - blood group
- Sonar gestational age: months

### 18. Psychogeriatrics (ICD No Z01.0)

- HIV antibodies (if pos., follow up testing: CD4, Viral Load, ALT+GGT, Hep B + Hep C)
- Urine for Chlamydia trachomatis
- Urine for Gonorrhea
- Syphilis
- Ulcer(s): Y/N Discharge: Y/N PID: Y/N

### 19. STD (ICD No A64)

- HIV antibodies (if pos., follow up testing: CD4, Viral Load, ALT+GGT, Hep B + Hep C)
- Urine for Chlamydia trachomatis
- Urine for Gonorrhea
- Syphilis
- Ulcer(s): Y/N Discharge: Y/N PID: Y/N

### 20. Therapeutic drug monitoring (ICD No Z72.2)

- Lithium therapy: 3monthly:
  - Na*, K*, LIT
  - Creatinine, TSH
  - Dibokide therapy: 1monthly:
  - K, digoxin
  - Anticoagulant therapy:
  - PT (INR)
  - Other drugs:
    - Please supply name of drug as well as hours after previous dose.

### 21. Thyroid disorders (ICD No E07.9)

- Screening/Diagnosis:
  - TSH
- Monitoring of therapy:
  - TSH, FT
- Monitoring every 6 weeks until stable, thereafter annually.

### Clinical indication

**OTHER INVESTIGATIONS:** Sample and test required
1. Fatigue/Tiredness ( >1 Month)

**Patients under 50 years without other risk factors:**
Tests: CBC, Ferritin
Comments: Searching for iron deficiency, macrocytosis, significant infections and leukaemias.

**Patients under 50 years with risk factors for the following conditions may require extra tests:**
- Type 11 diabetes: Fasting glucose
- Liver disorders: Liver function tests
- Thyroid dysfunction: TSH
- Renal impairment: Creatinine and eGFR, Electrolytes, Urinalysis
- Body fluid transfer: HIV, Hepatitis B & C serology

**Patients over 50 years OR tiredness lasting over one month**
Tests: CBC, CRP, Ferritin, Iron saturation, LFT, Creatinine and eGFR, Electrolytes,
Calcium, Phosphate, TSH, Fasting Glucose, Urinalysis

**Comments:**
This wide range of tests reflects the increased risk that older people have of many diseases and the difficulty of reaching a diagnosis in chronic tiredness.
### 1. General Investigation:
**Vague complaints (Persisting > 1 month)**
- ESR
- ALT
- Hb
- Creatinine
- TSH
- Glucose (random)

### 2. Anaemia (ICD Nr 0000)
**Screening:**
- FBC

**Suspected chronic inflammation present?**
- Yes
- No

**Diagnosis:**
- Microcytic/Normocytic anaemia:
  - FBC
  - Ferritin
- Macrocytic anaemia:
  - FBC
  - LDH
  - γGT
  - Homocysteine

**Monitoring of therapy:**
- FBC

### 3. Appendicitis, exclusion of - (ICD Nr 0000)
**Screening:**
- FBC
- CRP

### 4. Arthritis (ICD Nr 0000)
**Screening:**
- ESR
- RF
- Uric acid, creatinine

**Six monthly monitoring of RA:**
- Hb, ESR

**Follow-up of sulfasalazine therapy:**
- FBC
- Urine protein
- ALT, γGT, creatinine

**Therapy decision:** Newly diagnosed gout:
- 24h urine uric acid

### Anaemia
#### Macrocytic
- Alcohol
- Folate/B₁₂ deficiency
- Haemolytic anaemia
- Hypothyroidism
- Liver disease
- Myelodysplasia

#### Microcytic
- Iron deficiency: blood loss (GI [e.g. peptic ulcer, malignancy], urogenital [e.g. menorrhagia, haematuria]), hookworm (Ancylostroma duodenale)
- ↓ absorption (gastrectomy, small bowel disease),
- ↑ demands (growth, pregnancy), ↓ intake (e.g. vegans)
- Thalassaemia
- Sideroblastic anaemia: congenital (X-linked), alcohol, drugs (isoniazid, chloramphenicol), lead, myelodysplasia
- Lead poisoning
- Anaemia of chronic disease (often normocytic, but may be microcytic)

### Normocytic
- Anaemia of chronic disease (chronic infection, inflammatory/connective tissue diseases, malignancy)
- Haemolytic anaemia (may also cause macrocytic anaemia)
- Hypothyroidism (may also cause macrocytic anaemia)
- Pregnancy
- Renal failure
- Bone marrow failure

### Haemolytic
#### Hereditary
- Haemoglobinopathies: sickle cell anaemia, thalassaemia
- Membrane defects: spherocytosis, elliptocytosis
- Metabolic defects: pyruvate kinase deficiency, glucose6-phosphate dehydrogenase deficiency
Comments: Rather than requesting “arthritis panels” of tests, it is better to perform a careful history and physical examination to assess whether the arthritis is: monarticular/oligoarticular or polyarticular. Pathology testing that pertains to mono/oligoarticular disorders are uric acid and creatinine or synovial fluid for M/C/S in septic arthritis. Polyarticular disorders involve the determination of Rumatoid Factor and Antinuclear Factor. Rumatoid patients on sulphasalazine/methotraxate therapy need to be carefully monitored to detect possibility of bone marrow suppression.

### Diagnosis of RA
- ESR
- Rheumatoid Factor

### Control of RA (six monthly)
- Hb, ESR

### Control of Sulphasalazine therapy
- (2 weekly 1st 3 months; then monthly)
- Hb, Leucocytes, thrombocytes, GGT, ALT, Creatinine
- Urine Albumin
### 4 Arthritis (ICD Nr 00000)

<table>
<thead>
<tr>
<th>Increased uric acid production</th>
<th>Decreased uric acid excretion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary</strong></td>
<td><strong>Secondary</strong></td>
</tr>
<tr>
<td>Specific enzyme defects</td>
<td>Specific enzyme defects</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>Chronic renal mass</td>
</tr>
<tr>
<td><strong>Primary</strong></td>
<td><strong>Secondary</strong></td>
</tr>
<tr>
<td>myelo or lymphoproliferative disorders</td>
<td>Familial juvenile gouty nephropathy</td>
</tr>
<tr>
<td>Infectious mononucleosis</td>
<td>Kidney injury</td>
</tr>
<tr>
<td>Chronic haemolytic anaemia</td>
<td></td>
</tr>
<tr>
<td>Gaucher's disease</td>
<td></td>
</tr>
<tr>
<td>Severe proliferative psoriasis</td>
<td></td>
</tr>
<tr>
<td>Down's syndrome</td>
<td></td>
</tr>
<tr>
<td>Beryllium or lead poisoning</td>
<td></td>
</tr>
<tr>
<td>Cystinuria</td>
<td></td>
</tr>
<tr>
<td>Drugs like diuretics, low dose aspirin</td>
<td></td>
</tr>
</tbody>
</table>
7. Cardiac Conditions

**Pathophysiology**
The afferent visceral input of the heart, lungs, oesophagus, and great vessels are through the same thoracic autonomic ganglia. A painful stimulus in these organs is typically perceived as originating in the chest, but because afferent nerve fibres overlap in the dorsal ganglia, thoracic pain may be felt (as referred pain) anywhere between the umbilicus and the ear, including the upper extremities.

Some Causes of Chest Pain:

*Some disorders are immediately life threatening:
• Acute coronary syndromes (acute MI/unstable angina)
• Thoracic aortic dissection
• Tension pneumothorax
• Oesophageal rupture
• Pulmonary embolism (PE)*

**Overall, the most common causes are**
• Chest wall disorders (ie, those involving muscle, rib, or cartilage)
• Pleural disorders
• GI disorders (eg, esophageal reflux or spasm, ulcer disease, cholelithiasis)
• Idiopathic
• Acute coronary syndromes and stable angina
Cardiac Conditions

New Ischemic Symptoms

Arrive at Emergency Department

Triage

Clinical Suspicion for Acute MI

Evaluate cTn

Evaluate EKG

No ST elevation

ST elevation

Timeframe to Rule-in or Rule-out

Contemporary cTn Assays

hs-cTn Assays

99th Percentile URL

Time From First Blood Draw (h)

0
3
6
9

rule-out MI (@3h hs-cTn, @6h contemporary), outpatient management upon discharge

rule-out MI (@3h hs-cTn, @6h contemporary), discharge home

rule-in NSTEMI, (rising pattern), assay independent

rule-in NSTEMI (rising pattern), assay independent

rule-in acute MI (STEMI), assay independent

Suggested Efficient Use of cTn Assays for Diagnosis
10. Cholesterol (ICD No E78.5)

Very high-risk individuals do not require risk scoring. Subjects considered to be at very high risk of cardiovascular events.

Established atherosclerotic disease, i.e.
- Coronary artery disease
- Cerebrovascular disease
- Peripheral arterial disease

Type 2 diabetes
- Type 1 diabetes with micro-albuminuria or proteinuria
- Genetic dyslipidaemia, e.g. familial hypercholesterolaemia
- Chronic kidney disease (GFR <60 ml/min/1.73 m2)

Individuals who do not fall into the very high-risk category

Risk scoring using well-documented key risk factors is appropriate to estimate the total cardiovascular risk in asymptomatic adults. Furthermore, risk scoring is especially important in individuals with the following:
- Hypertension and/or on antihypertensive medication
- Smoking: cigarette smoking is defined as any cigarette smoking in the past month or a history of 20 cigarettes per day for 10 years (10 pack years)
- BMI ≥30 kg/m2 or waist circumference >94 cm for men, >80 cm for women
- Family history of premature CVD (male before 55 years of age, female before 60 years)
- Auto-immune chronic inflammatory disease, e.g. rheumatoid arthritis, systemic lupus erythematosus, psoriasis.
### 11. Dysuria  (ICD Nr 0000)
- Urine microscopy, culture, sensitivity:
  - Is the sample catheter urine?  Yes  No
  - Is the patient receiving antibiotic treatment?  Yes  No
- Creatinine  PSA

### 12. Fever of unknown origin  (ICD Nr 0000)
- CRP  WBC  Malaria parasites

### 13. Hypertension  (ICD Nr 0000)
- Exclusion of identifiable causes/organ damage:  Glucose  Urine albumin  Na⁺, K⁺, creatinine
- Risk assessment:  Cholesterol, HDL-cholesterol
- Monitoring diuretic therapy:  K⁺
- Monitoring ACE inhibitor therapy:  Creatinine

### 14. Iron overload  (ICD Nr 0000)
- Screening:  Hb  Iron, transferrin saturation
- Confirmation:  Genotyping  Ferritin, CRP, ALT, γGT

### 15. Kidney disorders  (ICD Nr 0000)
- Screening/Monitoring:  Creatinine  Urine protein  Urine albumin
  - If calculated creatinine clearance is required, please supply body mass: ____________ kg

### 16. Liver disorders  (ICD Nr 0000)
- Screening:  ALT, γGT
- Viral hepatitis diagnostics:  Hepatitis A  Hepatitis B  Hepatitis C
- Immunity assessment:  Anti-HBsAg, IgG

### 17. Pregnancy  (ICD Nr 0000)
- Confirmation:  β hCG
- Control at 12 weeks:  HBsAg  Hb  ABO+Rh blood group
- Control at 16 weeks:  Down syndrome screen
  - Sonar gestational age ____________ months
### 18. Psychogeriatrics (ICD Nr 0000)

**Screening:**
- □ Hb, ESR
- □ Fasting glucose
- □ TSH, creatinine
- □ Homocysteine

**If indicated:**
- □ Na⁺, K⁺, ALT, γGT

### 19. STD (ICD Nr 0000)

- □ HIV antibodies
- □ Lues
- □ HBsAg
- □ Urine for Chlamydia trachomatis
- □ Swab: Gonorrhea

### 20. Therapeutic drug monitoring (ICD Nr 0000)

**Lithium therapy:**
- 3-monthly: □ Li⁺
- Annually: □ Na⁺, K⁺, Li⁺, creatinine, TSH

**Digoxine therapy:**
- 3-monthly: □ K⁺, digoxin

**Anticoagulant therapy:**
- □ PT (INR)

**Other drugs:**

*Please supply name of drug as well as hours after previous dose.*

### 21. Thyroid disorders (ICD Nr 0000)

**Screening/Diagnosis:**
- □ TSH

**Monitoring of therapy:**
- □ TSH, fT₄

*Monitoring every 6 weeks until stable, thereafter annually.*

**Thyroiditis, (De Quervain):**
- □ fT₄, FBC
To make a difference …

- Focus on the **Big Five** categories (Haematology, Endocrinology, Liver, U & E, Lipogram).

- Make a difference to ~ 50% of pathology spent and simultaneously improve patient care.

- Empower yourselves through a “problem based approach” based on best available information.
Take-home message: 5 questions to ask yourself before ordering a test

1. **Why** is the test being ordered?
2. What are the consequences of **not** ordering a test?
3. How good is a test in **discriminating** between health vs. disease?
4. How are the test results **interpreted**?
5. How will the test results influence patient management and **outcome**?
Summary

Take home message for pathologists:

... for now:
There is nothing as useless as doing efficiently that which should not be done at all”

...and for the future:

...it belongs to prepared minds.

I sincerely hope we shall see each other there!