The 11th Commandment – Thou Shalt Not Order Inappropriate Investigations

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An anecdote about inappropriate investigations

I found myself on the second day of an orthopaedic term confused about which investigations were required for particular post-operative patients. The challenge came with a man day one post-ACL reconstruction. I had noted that some consultants requested a full blood count after this operation to ensure there was no significant bleeding. This patient was otherwise fit and healthy, with an uncomplicated operation BUT had a significant needle-phobia. He was outraged that he had to have a blood test and made this very vocal to the team (threatening to stab us with a needle himself). My seniors informed me that this was not the type of post-operative ACL patient who needed a blood test. I had blindly followed a precedent that did not apply to this patient. Perhaps if I had thought this through a little more...

The facts around inappropriate investigations

With the increasing number and accessibility of laboratory, imaging and other investigations, we have seen a steady increase in the number of inappropriate investigations being ordered. In fact, in Australia the number of Medicare-funded pathology tests increased by 54% (or 33.6 million tests) from 2000/01 to 2007/08. [1] Whilst these tests may improve diagnostic accuracy, the evidence suggests that up to 50% of tests are being ordered inappropriately! [2] Reasons contributing to inappropriate test ordering, besides "My consultant requested this," include [1,4,5]:

- **To cater to an increasing demand for care with a rise in the ageing and chronically ill patient population**
- **To make use of new technology and the increased availability of tests**
- **To avoid patient criticism of medical inaction**
- **To alleviate patient anxiety and to instil trust**
- **To avoid missing a potentially sinister pathology**
- **To avoid litigation**
- **Test ordering based on prior experience (usually negative) and level of knowledge**

In one study by Mijakis et al, [6] it was suggested that the overuse of tests was independently associated with patient age ≥65, hospitalisation beyond one week and increased case difficulty (e.g. diagnostic difficulty). It was also found that junior doctors ordered a higher proportion of avoidable tests. That's us!

So, what are the harms of inappropriate test ordering [1,3]?

- **Wasted money**
- **Wasted time – including the time spent following up these test results**

- The discovery of unexpected but benign abnormal results or “incidentalomas” leading to a cascade of further investigations
- Increased patient harm in the form of:
    - Discomfort
    - Investigation-related side effects (e.g. radiation exposure with CT or X-rays)
    - Anxiety when a false positive result is found
    - A false sense of reassurance when a false negative result is found
- Perpetuating a culture where doctors feel pressured to order investigations because other patients are having these tests completed, albeit inappropriately

Crunching the numbers around inappropriate investigations

There is evidence to suggest that inappropriate ordering of investigations may be avoided by educating the provider about the cost of the test. [7] Here is a breakdown of the costs associated with some of the most frequently ordered investigations.

Common investigations	Average cost per test (AUD)*
Full blood count (FBT)	$13.71
Electrolytes, urea and creatinine (EUC)	$12.61
Blood cultures	$28.56
Blood gas	$15.13
Blood group	$24.29
Calcium/phosphate/magnesium/albumin	$12.00
Chem20 (a panel consisting of EUC + LFT)	$15.13
Coagulation panel	$18.96
C-reactive protein (CRP)	$12.61
D-Dimer	$35.65
Iron studies	$16.03
Liver function test (LFT)	$12.61
Sputum MC&S	$35.38
Thyroid function tests (TFT)	$26.81
Troponin I/T	$13.71/$35.00
Urine MC&S	$22.69

**Costs are based on Pathology Queensland public price list, effective July 2017*

An approach to avoiding ordering inappropriate investigations

Here are our 10 commandments to avoid inappropriate testing:

1. Focus on a good history and physical examination

This is hammered into us in medical school and for good reason. With a thorough work-up we can truly justify which investigations are warranted with evidence.

2. Put yourself in the patient’s shoes

This can be combated through a patient-centred approach to testing. If a patient asks you why a particular test is being ordered, can you provide an adequate explanation on the rationale of each individual test? Are these tests worth an extra jab?

3. Don't be afraid to question inappropriate investigations

This can be easier said than done when you're a junior doctor at the bottom of the pecking order. Be tactful in asking your consultants or registrars the specific reason for ordering a test or reminding them if the same test has been completed recently. They may have forgotten.

4. Know the indications and shortcomings of the test you want to order

Have a general appreciation of the usefulness (sensitivity, specificity, false positive, false negative, etc.) of your test in the setting you wish to order it (to diagnose, to rule out a diagnosis, to monitor, to prognosticate, etc.) Also know what the test may be impacted by such as infection, inflammation, renal failure, etc. Guidelines can be helpful. They provide algorithms for the work-up of particular clinical presentations, coupled with scoring tools to support your thinking with what investigations are required.

5. Think about how often a test needs to be ordered and how it changes your management

There are certain investigations for which daily ordering is imperative e.g. daily EUC testing in a patient with acute renal failure. However, frequently we will order "daily FBC and chem20 (EUC and LFT)" in all generally unwell patients, almost as a reflex. Daily ordering of CRP is particularly common on the surgical ward. Think about how a daily test may change your management before ordering the test as a reflex.

6. Where tests are ordered in clusters, consider if you can order an individual component

A classic example of this is writing chem20 (EUC and LFT) versus the individual ordering of these tests. Often a patient will not require all components of a test so specify what you want where possible. You could even write a specific electrolyte like potassium if this is your primary cause for investigation.

7. Obtain prior investigations where possible

This is pertinent with imaging. Often a patient will present to the ED having already been worked up with a CT or MRI. Save time and resources by having their scans sent to your department. This can take longer than expected so get the process started early. In frequent flyers to the ED, check your imaging system to view when their last scan was. Often the findings will be unchanged with a repeat scan.

8. Non-urgent incidental findings can be followed up with the GP or as an outpatient

Notorious incidental findings you may discover are deranged LFTs, deranged TFTs, ovarian cysts and adrenal masses. If it does not relate to the presenting problem and the patient is asymptomatic, often it can be followed up as an outpatient. Whilst this may not change the NUMBER of tests being ordered, it does change the SETTING in which they are ordered, reserving hospital resources for patients who need it most. All non-urgent follow-up tests should be included in the patient's discharge summary.

9. Don't order a test that you will not be able to follow-up

I had a psychiatric patient with a family history of prostate cancer request a PSA test. Firstly, the PSA is not recommended as a stand-alone screening test for prostate cancer. Secondly, I explained that this was inappropriate to complete as I would not be able to follow this up when the patient left hospital. This goes for a lot of tests. Think about whether it will change your acute management in the hospital.

10. Remember the "add on"

One of the most frustrating moments is sending off blood and forgetting to include a particular test on the request. If you've collected the right tubes, you can always call the pathology lab and ask them to add this on. This trick can last for quite a few days!

Conclusion

The ordering of inappropriate testing is on the rise with consequences to both the patient and health system. However, this can be combated with the practice of evidence-based medicine, an awareness of how much these tests cost and most importantly, an added moment to think about why you are ordering a particular test.

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- Avoiding harms of too much medicine: lessons for the junior doctor
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