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We live in testing times

Teaching rational test ordering in general practice

Background

Pathology, imaging and other tests have an essential role in the diagnosis and screening for disease in medical practice. However, over-testing has recently emerged as a significant issue and has implications for the patient, doctor and health system. Vocational training is arguably the most critical period in the development of future patterns of clinical practice for the GP. This includes the development of test ordering behaviour. The general practitioner (GP) supervisor, therefore, has a key role to play in educating registrars to avoid over-testing.

Objective

In this article, we discuss general approaches and practical strategies for GP supervisors to teach their registrars rational test ordering.

Discussion

Teaching should take a patient-centred focus and an emphasis on fostering a greater tolerance of uncertainty. Role modelling and demonstrated use of relevant clinical guidelines is a strong influence on registrar behaviour. Specific strategies for teaching rational test ordering include random case analysis, investigation audit, topic tutorials and use of targeted resources.

Keywords

diagnostic imaging; vocational education/graduate education; education, medical; evidence-based medicine; pathology

now lists over 750 individual tests.³ The use of laboratory and imaging tests is increasing in many countries.⁴ In Australia, the number of Medicare-funded pathology tests increased by 54% from 2000–2001 to 2007–2008, a volume increase from 62.1 million to 95.7 million tests.⁵ Over this period, pathology costs increased from \$1.2 billion to almost \$1.9 billion. General practitioners (GPs) are responsible for initiating 70% of Medicare-funded pathology tests.⁵

While much of this increase is appropriate, a growing body of evidence suggests that over-testing is a significant problem.^{6,7} Australian data suggest that pathology testing does not always align well with recommended guidelines and 25–75% of tests are not supported by evidence or expert opinion.⁵ Concerns have been raised about the inappropriate use of many common tests, including full blood count (FBC),⁸ liver function tests (LFTs),⁹ B12/folate,¹⁰ thyroid function tests (TFTs),¹¹ vitamin D,¹² prostate-specific antigen (PSA),¹³ screening mammography,¹⁴ lumbar spine X-rays¹⁵ and shoulder imaging.¹⁶

Inappropriate test ordering substantially increases healthcare expenditure, including the opportunity costs of wasted resources. In addition, unexpected abnormal results can be problematic for the GP to interpret and manage. This includes the assessment of increasing numbers of ‘incidentalomas’ (tumours unexpectedly identified during medical imaging), for example, in the kidney¹⁷ and thyroid.¹⁸

Most importantly, over-testing can lead to patient harm. The pre-test probability of disease in general practice is relatively low, meaning false positive tests are common, even in tests with reasonable specificity. For example, if a healthy person is subjected to 10 unnecessary tests, there is a 40% chance of at least one false-positive result.¹⁹ False-positive results and incidental findings can lead to a cascade of further tests,²⁰

If you're facing a screening test for breast or prostate cancer, high cholesterol, or low testosterone, someone is about to turn you into a patient. You need to ask yourself one simple question: Am I ready for all the things that could go wrong? (Alan Cassels)¹

Les gens bien portants sont des malades qui s'ignorent [well people are sick people who simply don't know it—yet] (Jules Romaines).²

Pathology, imaging and other investigations have a critical role in the diagnosis, monitoring and screening for disease in medical practice. Reference books of medical tests are at least as old as the Hippocratic *Corpus*. The number of available tests has risen rapidly in recent decades and the Royal College of Pathologists of Australasia manual

so-called ‘investigation momentum’²¹ (see Case study). This, in turn, leads to a greater risk of complications and patient harm, as well as the potential for significant patient anxiety. Investigations can also cause harm directly: for example, radiation from computed tomography (CT) scanning in children aged <15 years in one year in the USA has been estimated to produce nearly 5000 future cancers.²² Lastly, over-testing may lead to overdiagnosis, the circumstance where people without symptoms are diagnosed with a disease that ultimately will not cause them to experience symptoms or early death.²³ This can lead to unnecessary treatment, adding to the risk of patient harm.

A number of influences have been described on the test ordering behaviour of doctors.^{4,24–26} These comprise doctor factors (eg. demographics, knowledge, prior experience, personality, fear of litigation), patient factors (trust, anxiety), practice factors (billing practices) and systems factors (development of new tests).

Over-testing and its counterparts, over-diagnosis and over-treatment, are now the subject of dedicated medical journal series such as *Less is More*²⁷ and *Too Much Medicine*,²⁸ and campaigns such as *Choosing Wisely*.²⁹ In Australia, NPS MedicineWise has recently expanded its role into the appropriate use of tests.³⁰

General practice training

Vocational training is arguably the most critical period in the development of future patterns of clinical practice for the GP. This includes the development of test ordering behaviour. Critical use of investigations is one of the core skills of the Royal Australian College of General Practitioners (RACGP) Common Training Outcomes.³¹ However, there is some evidence for lack of training for Australian GP registrars in quality use of pathology.^{32,33}

GP registrars in Australia learn by the apprenticeship model, seeing patients under the supervision of accredited GP supervisors. Supervisors have a core role in assessing learning needs, facilitating learning and providing feedback to registrars.³⁴ Targeted education and feedback around test ordering has been shown to lead to changes in the behaviour of primary care practitioners.^{35,36} The GP supervisor has been identified as having a key role in the teaching of

rational pathology ordering.⁸ This includes the potential to teach registrars when and how not to order investigations.

General approaches to teaching rational test ordering

A number of general supervision approaches help facilitate the teaching of rational test ordering (Table 1). Patient-centred communication has been shown to enhance patient satisfaction and lead to better health outcomes,³⁷ and has also been associated with ordering fewer diagnostic tests.³⁸ Patients expect that their GP will explain the reason for diagnostic tests.³⁹ Supervisors should therefore frame practice-based teaching through a patient-centred approach,⁴⁰ including the need for registrars to identify patients’ concerns and expectations, and provide adequate explanations on the rationale for individual test ordering.

Undifferentiated presentations are common in general practice, and frequently patients will not have a firm diagnosis at the end of a consultation.⁴¹ A low tolerance to uncertainty has been described as a causative factor in over-testing.⁴² This can be exacerbated by a fear of litigation, resulting in the practice of defensive medicine.⁴³ GP registrars, with their relative inexperience and unfamiliarity with managing undifferentiated illness, may be less tolerant of uncertainty. This may be further compounded

by other known factors in driving overtesting: the ‘need to reassure the patient’ and patient pressure to order tests.^{44,45} The GP supervisor, therefore, has a key role in fostering acceptance of uncertainty in their trainees. This includes supporting diagnostic strategies other than test ordering, such as watchful waiting and using ‘gut feelings’.^{46,47} As the pre-test probability of underlying somatic disease is low in patients with unexplained complaints (eg. fatigue), immediate test ordering is often superfluous.⁴⁴ Furthermore, registrars can be advised that requesting diagnostic tests for patients with a low risk of serious illness generally does little to reassure patients or reduce anxiety.⁴⁸

Role modelling has a strong influence on trainee behaviour and indeed has been described as ‘the primary teaching strategy of clinical education’.⁴⁹ Supervisors should therefore model best practice in test ordering for screening and diagnosis, and use appropriate guidelines and evidence sources (eg. the RACGP Red Book⁵⁰).

Lastly, as a general approach, supervisors should focus on the primacy of a thorough history and physical examination in the assessment of patient.⁵¹ It has been described that an ‘excessive reliance on the results of empirical tests’ has replaced clinical acumen.¹⁹ In recent years, the physical examination skills of doctors have declined internationally.⁵² Core clinical skills should be taught and reinforced,

Table 1. Teaching rational test ordering in the practice setting

General approach
Patient-centred approach
Fostering tolerance of uncertainty
Role modelling
Focusing on importance of clinical assessment
Specific strategies
Consultation observation
Problem case discussion
Random case analysis
Pathology/radiology inbox review
Topic tutorials
Use of clinical guidelines
Specific resources
iNvestigate. Available at investigate.med.unsw.edu.au/home.jsf
Common sense pathology. Available at www.rcpa.edu.au/Publications/CommonSensePathology.htm

and investigations framed as an adjunct to a comprehensive clinical assessment.

Specific teaching and learning strategies

Rational test ordering can be assessed and taught using a range of traditional methods, including consultation observation and problem case discussion. However, a number of strategies are ideally suited to teaching the effective and appropriate use of laboratory testing in the practice setting (*Table 1*).

Random case analysis (RCA) is a powerful tool for clinical supervision, assessment and teaching.⁵³ In RCA, the registrar's clinical notes are randomly selected and the case analysed in detail. Its particular strength is in identifying unconscious incompetence, or the 'unknown unknowns', of the learner. Test ordering can be reviewed in the context of the actual clinical case, but hypothetical scenarios can also be posed to further challenge the registrar.

A more specific teaching method is regular auditing of test results.⁵⁴ This can be readily performed by reviewing the inbox of incoming test results in the computerised medical record. This inbox review is an efficient and straightforward method of appraising a registrar's overall test ordering behaviour. It provides an opportunity for focused teaching on specific tests and a means of evaluation of the effectiveness of teaching. *Table 2* outlines a suggested framework for analysis.

RCA and inbox review may help identify commonly identified causes of overtesting in the registrar. These include (potentially unknown) clinical knowledge gaps, the desire to be complete, and indiscriminate use of disease-specific test panels (eg. diabetes check) in the computer software.⁵⁵

Some evidence shows that test ordering is reduced when providers are made aware of the cost of the test.⁵⁶ Such information can form part of a dedicated topic tutorial on rational test ordering, which may also include important concepts such as sensitivity, specificity and predictive value of tests; pre-test probability of disease; principles of screening; common drivers to over-testing; and the potential for harm as a result of over-testing. Supervisors can target their teaching on clinical scenarios where evidence-based clinical guidelines exist for testing (eg.

Table 2. Framework for analysis of test ordering

Why did you order this test?
How will the result alter your management?
What are the risks of ordering/not ordering this test?
Is there a risk of overdiagnosis?
What is the likelihood of a positive result?
What is the prevalence of the provisional diagnosis?
Did any other factors influence your decision to order the test?
Does this presentation have any guidelines for testing?

investigation of acute musculoskeletal pain,⁵⁷ fatigue⁵⁸ and screening⁵⁹). A number of specific resources have been developed on rational test ordering (*Table 1*), useful in both practice-based teaching or as a self-directed learning resource.

Conclusion

Over-testing is a significant issue and has implications for the patient, doctor and healthcare system. The GP supervisor has a key role in educating registrars on rational test ordering. A number of general approaches and specific teaching strategies are ideally suited to teaching this topic in the general practice setting. Future research should focus on teaching of rational test ordering by GP supervisors in the practice setting, including evaluating effectiveness.

Case study. Illustration of investigation momentum

Michael Hildred, aged 51 years, presented to his GP (a term 1 registrar) for a '50,000 km service'. He was well, with no significant past medical history or family history, but felt he should have a health check. The registrar examined him and requested 'routine screening bloods' from the computer software program: FBC, electrolytes urea creatinine (EUC), LFT, blood glucose levels (BGL), lipids, thyroid-stimulating hormone (TSH), iron studies, PSA, B12, folate and vitamin D**. The results were all normal apart from mildly elevated transaminases on the LFTs. The registrar recalled Michael and suggested repeating the LFTs in one month. The repeat tests remained abnormal and Michael was referred for hepatitis serology and autoantibodies (normal) and an upper abdominal ultrasound. The ultrasound was normal apart from an incidental 2.5 cm lesion 'suggestive of focal nodular hyperplasia

(FNH)', with a recommendation for further investigation. The registrar recalled Michael again, causing great anxiety about a possible malignant cause. Michael was referred for a CT scan, which confirmed FNH, but with a recommendation for follow up in 12 months 'to monitor size'. Repeat LFT returned to normal.

**For routine screening of a man aged 51 years, the only tests recommended by the RACGP 'Red Book'⁶⁰ are lipids, urinalysis, faecal occult blood test (FOBT) and, if high risk, BGL.

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Competing interests: None.

Provenance and peer review: Not commissioned; externally peer reviewed.

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