



# Teaching clinical reasoning in general practice



## About this guide

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Clinical reasoning has been defined as *'the sum of thinking and decision-making processes associated with clinical practice ... it enables practitioners to take ... the best judged action in a specific context.'*<sup>1</sup>

Simply put, clinical reasoning is the process of making sense of the breadth of (often ambiguous and/or conflicting) clinical information regarding a patient's presentation, in order to decide on the optimal plan of management. It is a core skill of the competent general practitioner and a fundamental learning objective of GP training.

Clinical reasoning encapsulates skills in:

- Data gathering
- Data, synthesis and interpretation
- Hypothesis generation, refinement and testing
- Generation of a provisional and differential diagnosis
- Communication and consultation
- Management planning
- Patient-centred care and shared decision-making
- Managing uncertainty
- Evidence-based medicine
- Reflective practice.

Effective clinical reasoning requires a balance of the art and science of general practice. While development of clinical reasoning skills is based on accumulated experience, it is also a skill that can be taught. GP supervisors therefore play a key role in the development of clinical reasoning skills in their registrars, in particular how to *'think like a general practitioner'*.<sup>2</sup>

This guide therefore aims to support supervisors to assess, and facilitate development of, their registrar's clinical reasoning skills in the general practice setting.

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GPSA produce a number of relevant guides for GP supervisors and practices, visit [www.gpsa.org.au](http://www.gpsa.org.au) to view additional guides.

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We acknowledge the Traditional Custodians of the lands and seas on which we work and live, and pay our respects to Elders, past, present and future. We commit to working together in the spirit of mutual understanding and respect for the benefit of the broader community and future generations.



# The 'language' of clinical reasoning

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Clinical reasoning may be tricky to define, but for most supervisors, 'you know it when you see it'.<sup>3</sup> Having a basic understanding of a number of useful clinical reasoning concepts will provide the supervisor with a 'language' to better assess, communicate and facilitate the registrar's development of this skill.

## Diagnostic versus management reasoning

Over the years, the major focus on teaching and learning clinical reasoning has been on diagnostic reasoning. Diagnostic reasoning is primarily a classification task that assigns meaningful labels to a cluster of symptoms, examination findings, and test results.

More recently, there has been a greater emphasis on management reasoning, defined as 'the process of making decisions about patient management, including choices about treatment, follow-up visits, further testing, and allocation of resources'.<sup>4</sup> In contrast to diagnostic reasoning, management reasoning is primarily a task of prioritisation, shared decision making, and monitoring.

Paradoxically, teaching management reasoning may actually be more important than diagnostic reasoning, especially in the general practice context. GPs frequently manage patients before making a definitive diagnosis (if at all), and diagnosis often hinges on management decisions e.g. response to treatment. This guide takes a focus on both diagnostic and management reasoning.

## Dual process thinking

The international literature on clinical decision-making describes a so-called 'dual process' model of thinking and reasoning – an interplay between analytic (type 2) thinking and non-analytic (type 1) thinking.<sup>5</sup> The analytic (or hypothetico-deductive) method of reasoning involves deliberate, often repeated, hypothesis generation and testing, and is more the domain of the novice clinician. In practice, type 2 thinking manifests as detailed history taking, the specific seeking of confirmatory and contradictory information, and a deliberate, conscious analysis of the data.

On the other hand, non-analytic reasoning, or type 1 thinking, is defined by rapid, intuitive, and automatic processing, and relies on the use of cognitive tools – 'pattern recognition', illness scripts (see below) and heuristics (rules of thumb). Examples include 'spot diagnoses' e.g. the herald patch of pityriasis rosea, and 'Murtagh's triads' e.g. dizziness + hearing loss + unilateral tinnitus = acoustic neuroma. Non-analytic thinking is the usual decision-making method of the 'expert', although a challenging or atypical presentation often will lead the experienced clinician to revert back to more deliberate, analytic thinking. Non-analytic reasoning is fast and efficient, but, unsurprisingly, is also prone to error.



## Illness scripts

Illness scripts are mental prototypes, or categorisations, of the important distinguishing features of an illness.<sup>6</sup> They are used by clinicians to compare a current presentation to those in a previously collected 'library' of scripts, to see whether there is a 'match'. Examples of typical illness scripts include the uncommunicative depressed adolescent, or the elderly patient with BPPV.

Classically, the components of an illness script fall into three main categories:

1. the predisposing conditions
2. the pathophysiological insult
3. the clinical consequences.

Illness scripts are developed by a combination of knowledge and experience. They provide the basis for non-analytic thinking and pattern recognition behaviour.

### Illness script

- Key features on history
- Key features on examination
- Red flags
- Key investigations
- Differential diagnosis, including 'probable and not-to-be-missed'

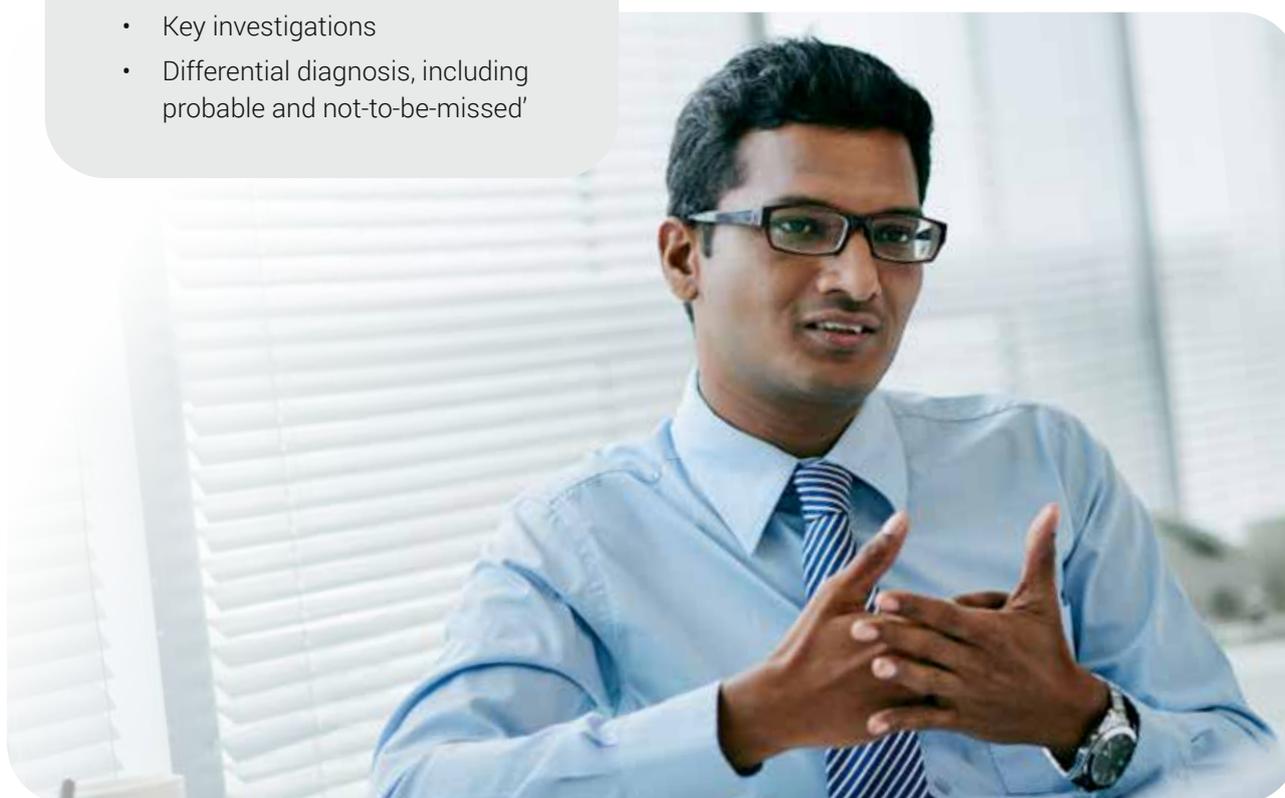
## Management scripts

Mirroring the concept of illness scripts, the term 'management script' has recently been introduced to the clinical reasoning vocabulary. Management scripts have been defined as 'high-level, precompiled, conceptual knowledge structures' of management options and decisions that are learned through study and experience and activated or triggered in specific contexts.<sup>7</sup>

The development of management scripts can be aided using a framework.

### Management script

- Further investigations – pathology, imaging, other tests
- Patient education
- Non-pharmacological treatment options
- Pharmacological treatment options
- Options for referral
- Public health issues e.g. driving and work
- Safety netting and follow-up





## Cognitive biases

Errors in diagnosis more commonly result from flaws in thinking rather than a lack of clinical knowledge.<sup>8</sup> Clinical reasoning and decision-making can be compromised by a myriad of factors, including fatigue and time pressures. Another well-described contributor to diagnostic error, however, is the suite of so-called 'cognitive biases' or 'cognitive dispositions to respond', flawed (and often embedded) patterns of thinking or processing particular to the individual clinician. Dozens of forms of cognitive error and bias have been described, though many are inter-related and more than one often features in a case of diagnostic error.

### Common cognitive biases

Cognitive bias	Description
Premature closure	The tendency to end the decision-making process too early, i.e., the diagnosis is accepted before it has been fully verified.
Availability bias	The tendency to judge things as being more likely if they readily come to mind or have recently been encountered.
Anchoring bias	The tendency to 'fix' key features of the patient's presentation and not adequately consider additional information that may contradict the diagnosis.
Representativeness bias	The tendency to look for prototypical manifestations of a particular disease and fail to accept atypical variants.
Confirmation bias	The tendency to only seek information to support the diagnosis and not look for evidence to counter the hypothesis.
Overconfidence bias	The tendency to believe that we know more, or perform better, than we actually do.
Patient self-labelling	The tendency to favour a diagnosis suggested by the patient rather than entertain other possibilities.
Diagnostic momentum	The tendency to adhere to a previous diagnostic label, despite evidence to the contrary.

Adapted from Croskerry.<sup>9</sup>

Premature closure has been described as the most common cognitive bias leading to diagnostic error.<sup>10</sup>

Availability bias is common in GP registrars with their relatively limited experience in clinical practice, and often narrower scope of practice.<sup>11</sup> Examples include misdiagnosing the coughing child as having pertussis instead of an URTI (registrars see a lot of colds!) or, at the other extreme, diagnosing tension headache as a space occupying lesion and inappropriately referring for imaging.

Self-labelling is also common and occurs when the patient tells the GP what they think is the diagnosis. An example is the young woman with dysuria complaining of 'a urinary tract infection', and in doing so steering the GP away from the correct diagnosis of a chlamydial infection.

A longer list of cognitive biases can be found at <http://lifeinthefastlane.com/cc/cognitive-dispositions-to-respond/>



## Likelihood and probability

Another important clinical reasoning concept that supervisors should discuss with registrars is the 'weighting' of data, be it historical features, examination findings or test results. It is known that clinicians refine their diagnosis by the use of 'key features' whose presence or absence significantly alters the likelihood of a diagnosis and helps differentiate it from another related diagnosis. For example, the presence of a fever in a patient with dyspnoea and chest pain makes a pulmonary embolus less likely (though does not exclude it). Illness scripts are therefore refined by ascribing a predictive value for each key feature of the disease.

## Reflective practice and metacognition

Reflection in medical education has been defined as 'a metacognitive process that occurs before, during and after situations with the purpose of developing greater understanding of both the self and the situation so that future encounters with the situation are informed from previous encounters'.<sup>12</sup> Reflective practice forms part of self-regulation, a deliberate process of professional development and life-long learning.<sup>13</sup> Reflective practice is an important element of the safe and competent GP.

Metacognition can more simply be described as 'thinking about thinking', and refers to the ability to monitor one's own cognitive processes.<sup>2</sup> Reflective practice and metacognition are both critical to effective clinical reasoning, by allowing the clinician to 'step back' from the immediate problem and consider the presentation more broadly.<sup>14</sup>



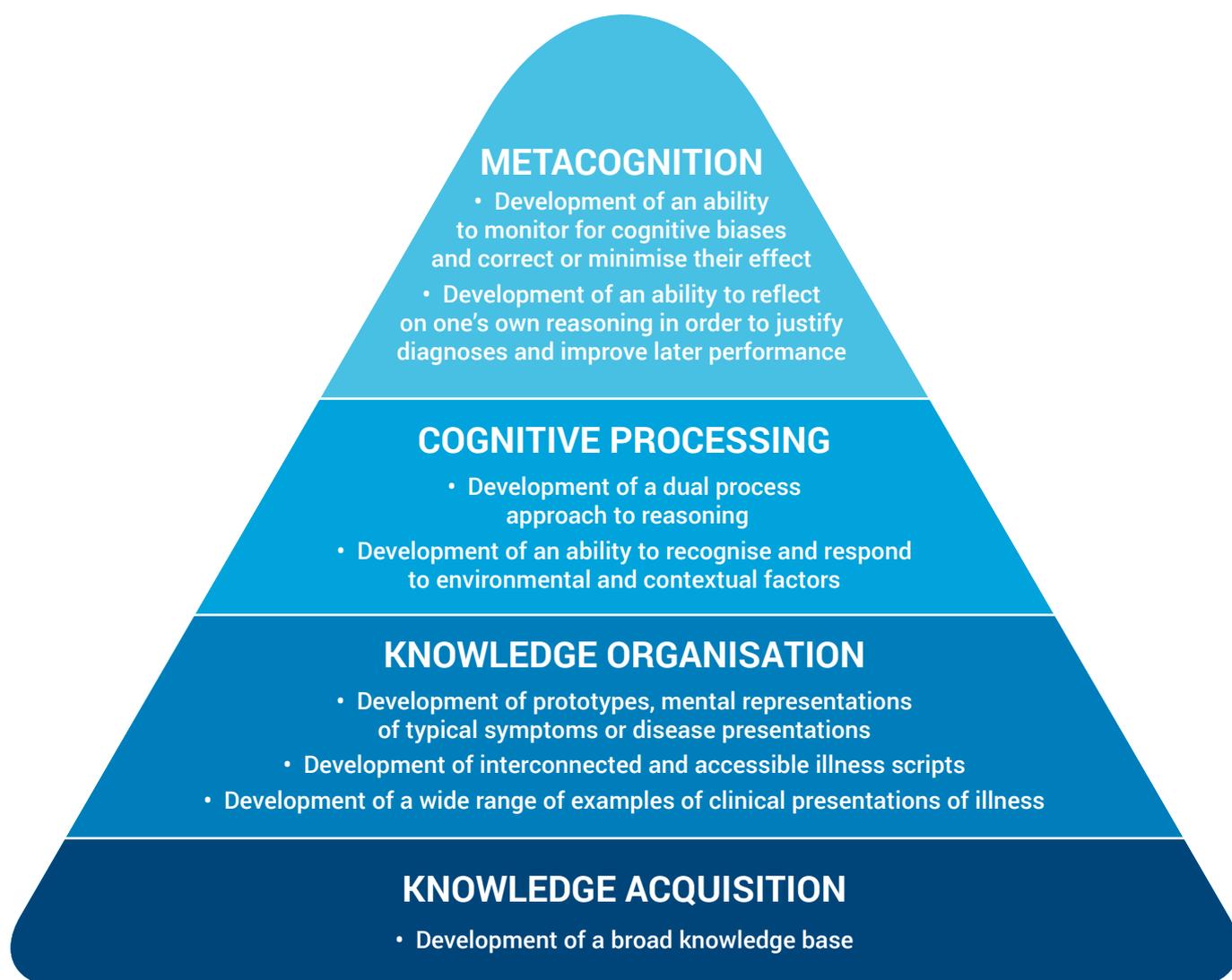


# Development of clinical reasoning skills

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It has been described that effective clinical reasoning involves the development of skills in four broad domains, namely knowledge acquisition, knowledge organisation, cognitive processing and metacognition.<sup>15</sup> The successful development of each skill requires a solid foundation of the previous one in the hierarchy. See figure.

This can be a useful schema for supervisors to use when assessing and teaching their registrars.



Adapted from Young M, Dory V, Lubarsky S, Thomas A. How Different Theories of Clinical Reasoning Influence Teaching and Assessment. *Academic Medicine* 2018. 93(9):1415.



# Strategies for assessing and teaching clinical reasoning skills

## Prototypes of clinical reasoning difficulties

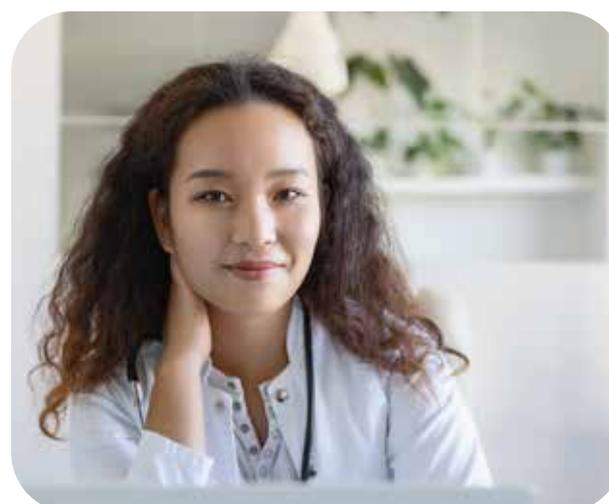
Difficulties with clinical reasoning have been described as falling into five 'prototypes', occurring at different points in the clinical reasoning process.<sup>16</sup> Each has characteristic cues which can aid in identification. That said, the complex nature of clinical reasoning means that the categories and cues are not mutually exclusive and overlap to some extent.

The five clinical reasoning prototypes comprise:

- Difficulties in hypothesis generation, identifying key features and directing data gathering
  - Characterised by failure to identify key features; rigid, prolonged or disorganised consultation
- Difficulties in hypotheses refinement and testing
  - Characterised by premature closure; failure to notice or act on new cues; failure to seek relevant 'negatives'
- Difficulties in prioritising
  - Characterised by failure to identify the chief complaint; pursuit of a less important issue
- Difficulties in 'seeing the whole picture'
  - Characterised by addressing issues in isolation; inappropriate or unrealistic management planning; rigid application of guidelines
- Difficulties in management planning
  - Characterised by failure to incorporate the patient's view; poor explanation; inadequate follow up and/or safety-netting.

## Strategies

Assessment of competence in clinical reasoning and supporting the development of skills are not separate tasks and should be seen as a seamless activity. This next section discusses a wide range of strategies that the GP supervisor can use to assess their registrar's clinical reasoning skills and improve their approach to decision-making.





### Strategies for assessing and teaching clinical reasoning

- Identify learning needs
- Make clinical reasoning an explicit element of teaching
- Ensure broad clinical exposure
- Incorporate clinical reasoning into case discussion
  - Consultation observation (including video review)
  - Problem case discussion
  - Random case analysis
  - Inbox review
  - Scenario-based discussion/ role plays
- Incorporate clinical reasoning into corridor teaching
- Incorporate clinical reasoning into exam preparation
- Encourage the use of specific diagnostic strategies
  - Diagnostic frameworks
  - Clinical prediction rules
  - Judicious use of tests
  - Red flags
  - Diagnostic pause
  - Checklists
  - Gut feelings
- Teach reflection on practice
- Use 'near misses' as a teaching opportunity
- Encourage use of clinical guidelines
- Use specific teaching resources

## Identify learning needs

Sound clinical reasoning relies on a number of effective cognitive processes, including data gathering, generation of a differential diagnosis and negotiation of a management plan. But as above, these tasks rely on a sound knowledge base, built on the identification and addressing of a registrar's learning needs.

It follows that one of the most important roles of the supervisor in supporting the development of clinical reasoning is to help the registrar build their knowledge base by helping them identify their learning needs. A detailed description of learning needs identification is beyond the scope of this guide. We recommend review of the GPSA guide on [Helping your registrar plan their learning](#).

## Make clinical reasoning an explicit element of teaching

The concept of clinical reasoning and its application to general practice may be very unfamiliar to many registrars. The supervisor should therefore explicitly articulate the nature and process of clinical reasoning as an integral part of teaching, including related concepts like dual process thinking and illness scripts. In particular, supervisors need to reflect on, and understand, their own clinical reasoning processes and be able to (or at least attempt to) communicate them to their registrars. This can be considered as 'thinking aloud'.<sup>17</sup> Examples of this include describing the use and transition between type 1 and type 2 thinking, highlighting 'key features' of history and examination, and discussing the 'weighting' of individual items for relevance and importance.

For example, the supervisor could use a form of words like '*When I hear (presentation x), I usually think of (condition y) because...*'. Or '*I always like to ask more about (symptom a) when I am concerned about (condition b)*'.

Similarly, the supervisor should explicitly discuss the nature of undifferentiated illness and support their registrars to better manage uncertainty. A number of practical strategies have been described and are discussed in detail in the accompanying [GPSA Managing Uncertainty guide](#).



## Ensure broad clinical exposure

Development of sound clinical reasoning skills requires exposure to a sufficient number and a wide breadth of clinical presentations.<sup>18</sup> Exposure to prototypical features of specific clinical cases allows the registrar to develop illness and management scripts for future reference and facilitates the development of pattern recognition. However, the incongruity and cognitive dissonance of atypical presentations, e.g., the AMI presenting with epigastric pain, is equally important to experience and learn from.

Practically, supervisors should strive to ensure an adequate number and broad diversity of patient presentations over the course of a training term. Complementing opportunistic clinical exposure, the supervisor can also call their registrar into the consulting room to see typical (or atypical) presentations of common conditions or discuss such presentations as part of teaching.

## Incorporate clinical reasoning into case discussion

The method par excellence to assess and teach clinical reasoning is the discussion of cases. And this should be performed as part of case discussion in all its various forms – direct consultation observation, problem case discussion, random case analysis, inbox review and role plays. These methods are described in detail in the GPSA guide [Practice-based Teaching](#).

The process for incorporating clinical reasoning teaching into case discussion is covered in the '[How to assess and teach clinical reasoning](#)' resource. This describes the 5P model of presentation, probing, posing hypotheticals, problem definition and discussion, and planning follow-up. See appendix.

### Types of case discussion

**Direct consultation observation** allows evaluation of history taking skills including responding to cues, seeking the patient agenda, identifying relevant key features and red flags, and the overall consultation structure and flow. The comprehensiveness and appropriateness of clinical examination can be

assessed as well as appropriate incorporation of additional clinical information, e.g., investigation results, specialist letters, medication list. Finally, the supervisor can assess the appropriateness of the management plan and its relationship to the working diagnosis.

Murtagh lists the first point in patient management as 'Tell the patient the diagnosis'.<sup>20</sup> It is vital for effective clinical care to formulate and deliver a simple and clear explanation, including the provisional and differential diagnosis, their likelihoods, and the clinical reasoning underpinning this. Ideally, the explanation should link the pathophysiology of the disease to the patient's symptoms, and specifically refer back to the patient's ideas, concerns and expectations where possible.<sup>21</sup> Supervisors should specifically assess and give feedback to registrars on the comprehensiveness of explanations to patients, in particular, how well they articulate their reasoning in reaching the diagnosis.

**Video-consultation review** is a particularly powerful technique of consultation observation. Joint review and then pausing the tape at critical points of the encounter allows the learner to directly observe their own practice and the supervisor to facilitate a moment-to-moment 'unpacking' of the registrar's clinical reasoning processes.

Role modelling has a strong influence on registrar behaviour and previously has been described as 'the primary teaching strategy of clinical education'.<sup>22</sup> Clinical reasoning skills can also be effectively taught by having the registrar sit in on the supervisor's consultations, so-called '**reverse direct observation**'. This method provides an excellent opportunity for the supervisor to role model their diagnostic and management approach, demonstrate involvement of the patient in the decision-making process, deal with uncertainty and afterwards, to discuss their own reasoning by 'thinking aloud'.

The most common case discussion method is **problem case discussion** (PCD), where the registrar presents their challenging patients to the supervisor and seeks guidance on diagnosis or management. A framework of performing PCD is discussed in the next section. See also the '[How to do problem case discussion](#)' resource.



Another common case discussion method is **random case analysis** (RCA)<sup>22</sup>. The strength of RCA as a method to assess and teach clinical reasoning skills lies in the random nature of patient selection, unlike problem case discussion where the registrar chooses which patients to discuss. This allows identification and exploration of areas where the registrar does not recognise a clinical knowledge gap, so-called 'unconscious incompetence'. This can be enhanced by asking hypothetical questions as part of the RCA process, so-called '*what if's?*'. As a result, RCA has been described by the RACGP as one of the best ways that a supervisor can help registrars learn clinical reasoning and prepare for their exams.

See the [Random Case Analysis guide](#) and the '[How to do random case analysis](#)' resource for further information.

Reviewing test results by **inbox review** is an effective method to address rational test ordering, a core element of clinical reasoning. Inbox review also provides an 'entry point' for broader case discussion. A framework for analysis of test ordering practice has been developed<sup>23</sup>, called 'test result audit and feedback', or TRAFk. Like RCA, the framework has a specific focus on exploring clinical reasoning and using hypothetical scenarios to extend registrar skills.

Finally, **role play** is an established and highly regarded teaching method in medical education. It has particular strengths in communication skills development but is also well suited to discussion of clinical reasoning.

In all methods of case discussion, supervisors can and should overtly discuss the use, benefits and potential downfalls of pattern recognition and heuristics in diagnosis. As well, supervisors should be on the lookout for cognitive bias, e.g., premature closure, and point these out when they occur.



## TOP TIPS

### Useful questions to explore clinical reasoning as part of case discussion

At the beginning, when the patient first mentioned their symptoms, what were your initial thoughts?

What further key aspects of history should be obtained to support/refute the diagnosis?

What physical examination findings should be sought?

What red flags are important to consider?

What other key features might be useful to establish a diagnosis?

Is this particular piece of data important or irrelevant?

How does this piece of data relate to the other data already gathered?

What is your working diagnosis and differential?

What are the most important investigations to consider at this point?

Considering the most likely cause(s), what management actions should be implemented?

What would you consider if the patient did not improve?

How did you manage the uncertainty in the presentation?

What was the patient's understanding and concerns?

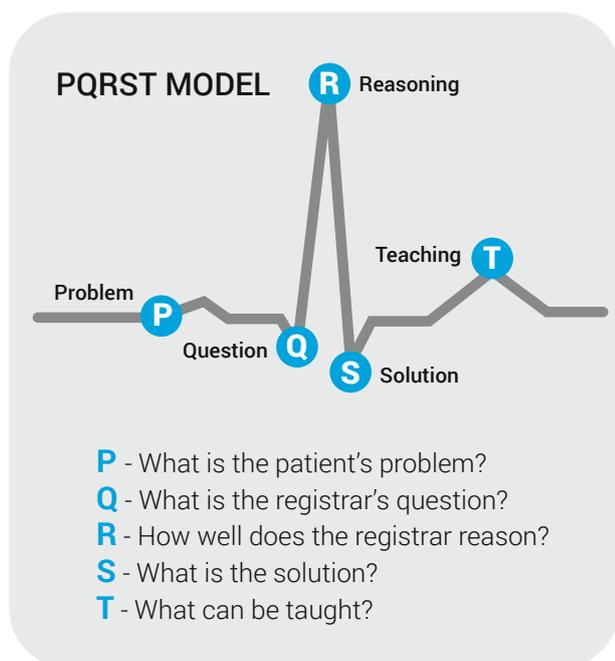
Do you think you relied on pattern recognition here?

Do you think any cognitive biases were at play?



## Frameworks for case discussion

Applying a framework can make case discussion a much richer educational experience. For problem case discussion, we recommend the PQRST model. This framework was developed for this purpose in the Australian GP training context and explicitly incorporates exploration of clinical reasoning (the R of PQRST) (see figure below).<sup>24</sup>



A number of other formal frameworks have been developed for assessment and teaching of clinical reasoning as part of case discussion, though none specifically for GP training. In the one-minute preceptor model, the registrar is asked to 'commit' to a diagnosis and outline their reasoning, before the supervisor teaches general rules<sup>25</sup>. The IDEA framework is another model that was developed for assessment of a learner's clinical reasoning from assessment of the clinical notes.<sup>26</sup>

Another model of case presentation, SNAPPS, was developed for use in the ambulatory care setting to foster 'a collaborative conversation' between learner and preceptor.<sup>27</sup>

The **SNAPPS** key steps are:

- S**ummarise briefly the history and findings
- N**arrow the differential (2-3 relevant diagnoses)
- A**nalyse the differential (compare and contrast the possibilities)
- P**robe supervisor about uncertainties
- P**lan management
- S**elect case-related issues for self-study

## Problem representation

The common approach across all these models is to ask the learner to summarise the clinical scenario into two or three sentences, including the most important positive and negative features and the working diagnosis.<sup>29</sup> This is known as a 'problem representation'.

Ideally the problem representation should comprise:

1. A description of the patient demographics and risk factors
2. The temporal pattern of illness
3. The clinical syndrome.

It should also include 'semantic qualifiers', e.g. acute/chronic; severe/mild; localised/diffuse; previously healthy/significant PMH.

For example:

*A previously well, 2-year-old unimmunised girl presents with an acute history of respiratory distress. She is febrile, looks unwell, and is drooling.*

The problem representation format allows the supervisor to briefly appraise critical elements of the reasoning process – data gathering, weighting, and synthesis. It is also a useful way of seeking the GP registrar's understanding of the most discriminating items of the clinical assessment and mirrors the college examination processes (especially the FRACGP Key Feature Paper)<sup>27</sup>.



## Incorporate clinical reasoning into corridor teaching

Clinical reasoning skills can also be appraised as part of ad hoc, or corridor teaching. Most simply, the supervisor should ask the registrar what they think is going on and why, before proffering their own thoughts. This can be remembered as 'ask before tell'.

The PQRST model is appropriate for ad hoc teaching. Another model, 'WWW-DOC', has been specifically developed for use in GP training, especially for the situation when the supervisor enters the registrar's consulting room while the patient is still present.<sup>30</sup> This model emphasises the importance of leaving the registrar in control of the consultation and centres on the use of 'thinking aloud' to explore clinical reasoning.

## Incorporate clinical reasoning into exam preparation

The supervisor plays an important role in helping the registrar prepare for their exams, and this is detailed in the GPSA guide on [study skills](#). One important element of this is to encourage the registrar to study using a clinical reasoning approach to study, the so-called 'script' approach. Another tip is to incorporate representative exam questions assessing clinical reasoning into teaching.



## Encourage the use of specific diagnostic strategies

A number of specific strategies in diagnosis have been recognised and described.<sup>31</sup> These provide very useful teaching tips on clinical reasoning and supervisors can refer to them in their teaching.

### Diagnostic frameworks

There are a number of diagnostic frameworks that have been described that help in the generation of a broad differential diagnosis. The restricted rule-out, or Murtagh's PROMPT diagnostic strategy, is a diagnostic strategy based on identifying the most common cause of the presenting problem and a list of serious diagnoses that must be 'ruled out'.<sup>32</sup>

#### Murtagh's PROMPT diagnostic strategy

- P**robability diagnosis
- R**ed flags - infection, infarction, malignancy, metabolic (serious disorders)
- O**ften missed (pitfalls)
- M**asquerades
- P**atient **T**elling me

This formulation is the basis of Murtagh's popular textbook. Supervisors can use this model in teaching, in particular, elaborating on differential diagnoses and 'worst case scenarios' and how these can be excluded.

Other frameworks include lists based on anatomical sites or pathophysiology. These include the 'systems model' based on body systems, 'anatomical model' ('outside in') and the 'pathological model' or surgical sieve e.g. VINDICATES.

### Clinical prediction rules

There are a number of well validated clinical prediction rules that can support the diagnostic process. Clinical prediction rules are essentially formal versions of intuitive pattern recognition processes, based on research evidence and validated scales. Commonly used examples include the Ottawa ankle<sup>33</sup> and knee<sup>34</sup> rules for exclusion of fracture, Wells criteria for diagnosis of pulmonary embolus<sup>35</sup> and streptococcal sore throat rules.<sup>36</sup>



## Judicious use of tests

Ordering investigations is an important element of the diagnostic process. Tests can also be unhelpful and on occasion, even harmful to the patient.<sup>37</sup>

A low tolerance to uncertainty has been described as a causative factor in over-testing.<sup>38</sup> Registrars should be discerning in the tests they order and avoid a 'scattergun' approach, particularly in the context of the undifferentiated presentation. Indeed, time has been described as the 'best investigation in general practice'. Supervisors can encourage registrars to substitute watchful waiting for test ordering where appropriate.<sup>39</sup>

## Red flags

Red flags are specific symptoms or signs that can help to identify or rule out a serious condition (for example, night pain in patients with back pain).<sup>40</sup>

They are a critical element of comprehensive clinical assessment and sound clinical reasoning. Supervisors should identify whether red flags are comprehensively sought, and appropriately weighted, in their registrar's clinical assessment and decision-making.

## Diagnostic pause

The diagnostic pause, or diagnostic time-out, has been described as a useful tool to improve clinical reasoning and help minimise diagnostic error.<sup>41</sup>

The diagnostic pause means deliberately taking time out from the encounter, by pausing for a short period in order to synthesise the clinical information and reflect on the likely diagnoses. The diagnostic pause is particularly useful to overcome the inherent biases of type 1 thinking. Practical ways of implementing a diagnostic pause are to 'excuse' oneself from the encounter to take some notes or look something up, or to ask the patient to collect a urine specimen. One useful question to pose as part of the diagnostic time-out is 'Why can't this be something else?'

## Checklists

Checklists have been used for decades in high-risk professions like the airline industry but only recently have become commonplace in clinical medicine.

Checklists have been described as a valuable tool in clinical reasoning and reducing diagnostic error, in particular to reduce the reliance on intuition and force the consideration of 'competing hypotheses'.<sup>42</sup>

Three types of checklists have been described – general checklists to enhance the clinician's cognitive approach, differential diagnosis checklists for particular clinical scenarios, and checklists of pitfalls.

### EXAMPLE OF A GENERAL CHECKLIST

- Obtain your own medical history
- Perform a focused physical exam
- Generate initial hypotheses and differentiate these with additional history, physical exam, and diagnostic tests
- Pause to reflect – take a diagnostic time-out
  - Was I comprehensive?
  - Did I consider the inherent flaws of heuristic thinking?
  - Was my judgement affected by any other bias?
  - Do I need to make the diagnosis now, or can I wait?
  - What is the worst-case scenario?
- Negotiate a management plan with the patient
- Acknowledge uncertainty
- Ensure a pathway for follow-up

Adapted from Ely.<sup>42</sup>



## Gut feelings

Responding to gut feelings (a 'sense of reassurance' or 'a sense of alarm') has been described as playing an important role in managing uncertainty.<sup>43</sup>

Supervisors can foster the use of such 'gut feelings' in their registrars and encourage appropriate action. For example, if the registrar feels a sense of unease or alarm, even in the setting of an unremarkable clinical presentation, they should be encouraged to act on this by seeking appropriate advice.

## Teach reflection on practice

There is strong evidence that effective reflection is most likely to occur when it is well supported by good supervision.<sup>44</sup> Supervisors can play a role in encouraging registrars to 'slow down' and build reflection into their daily practice in the form of diagnostic pauses, structured medical record-writing, regular case review, or portfolio use. 'Mindful practice' has been postulated to give doctors the capacity to observe the patient while also observing themselves during the clinical encounter.<sup>45</sup>

## Use 'near misses' as a teaching opportunity

Diagnostic error is common in general practice and has the potential to cause significant harm to patients.<sup>46</sup> Diagnostic error can also lead to significant emotional responses including guilt, for the GP.<sup>47</sup> There is evidence, however, that diagnostic error and 'near misses' provide valuable teaching and learning opportunities.<sup>48</sup> Supervisors can facilitate an environment of 'open disclosure' around near misses and diagnostic error in the practice and use critical incidents as teaching opportunities, in particular, to discuss how clinical reasoning may have played a role.

## Encourage use of clinical guidelines

Clinical evidence is an essential plank of quality decision-making. Clinical information in the form of evidence summaries and guidelines, can and should be sought during the consultation where appropriate. Junior doctors overestimate the negative effect on patient confidence of information seeking – indeed, there is evidence that looking up appropriate sources of information in front of the patient is not only acceptable but positively regarded in some cases.<sup>49</sup> As well, registrars should be encouraged to seek help through their supervisor, specialist colleagues or laboratory staff to discuss diagnostic challenges.

## Use specific teaching and learning resources

There exist a wide range of resources that are particularly suited to assessing and teaching clinical reasoning. These include:

- GPSA [teaching plans](#) and [flash cards](#)
- [IM Reasoning podcasts](#)
- Books of clinical cases
- Textbooks like JAMA 'The rational clinical examination – evidence based clinical diagnosis'

GPSA highly recommends playing '[Clinical Reasoning: the game](#)' as a fun tool to help teach clinical reasoning. The aim of the game is to take a randomly generated presentation and practice clinical reasoning by considering the symptoms, signs or results using different reasoning methods to generate a broad list of differential diagnoses. As more cards are drawn, more information becomes available, and this list will be refined.



## Putting it into practice

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### CASE STUDY

Hamish is a GPT2 registrar and has been at his current practice for 3 weeks. His primary supervisor is Genevieve. As part of their discussions at the commencement of the term, they talked about clinical reasoning and how Genevieve could best facilitate Hamish learning this key skill.

Genevieve stated that she would make this an explicit aspect of her teaching, including trying to use the 'language' of clinical reasoning whenever possible. They discussed case discussion in all its forms, and flagged RCA as a particularly effective method of assessing and teaching reasoning skills. Hamish committed to using a problem representation format when presenting cases, and they agreed to employ the PQRST framework for problem case discussion and ad hoc teaching. Genevieve mentioned the 'diagnostic pause' which Hamish had not heard about and was keen to try out. As well, they planned on playing 'Clinical reasoning: the game' at an upcoming teaching session.

At a direct observation session at week 6, Genevieve sat in with Hamish and observed him consult with a 34-year-old female teacher. The patient complained of being 'tired all the time' over the past six weeks. She described lack of energy and fatigue, but was not overly sleepy.

She described frequent headaches and occasional abdominal pain. Hamish identified that she had lost about 2kg of weight over the past few months that was unintentional.

There are no other significant symptoms but Hamish did not explore the patient's mood in any detail.

Hamish checked the patient's BP and HR, and performed a brief CVS, respiratory, ENT and abdominal examination, including dipsticking the urine.

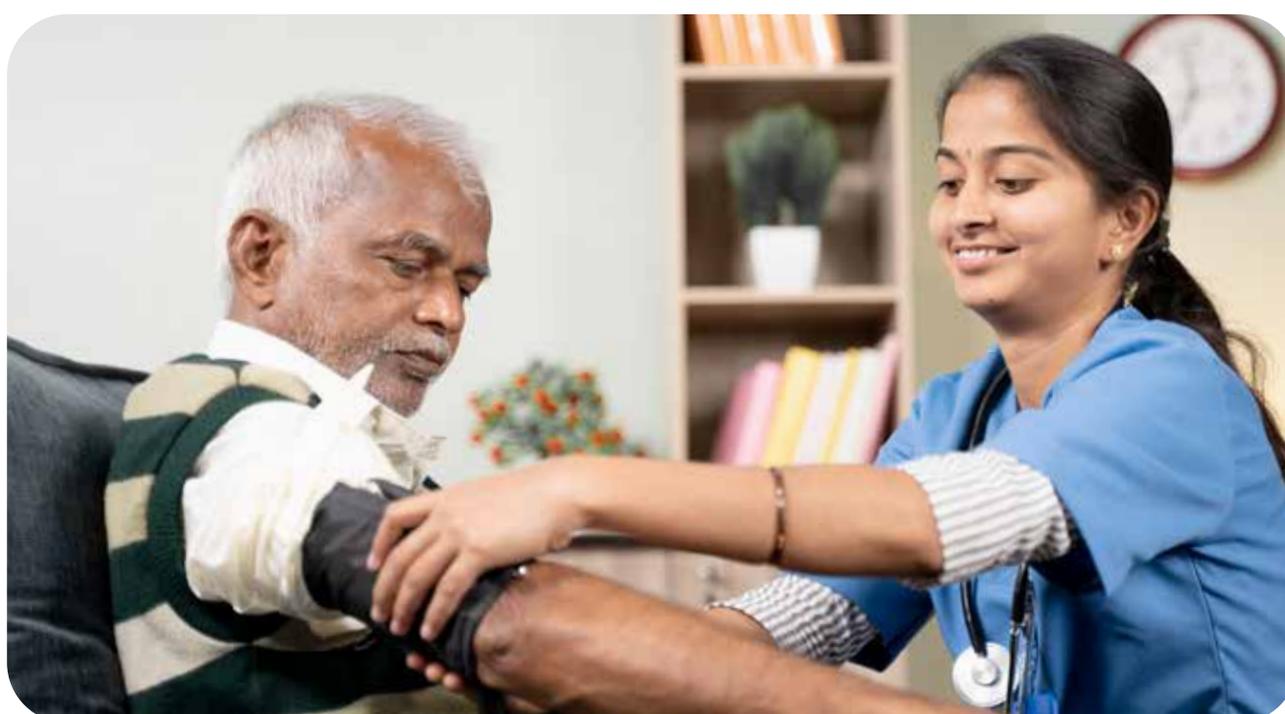
Hamish then told the patient that the tiredness is 'non-specific' and that he needs to order 'some blood tests' to 'exclude serious disease'. Follow-up is made for one week.

At the end of the consultation, Genevieve explored Hamish's reasoning.



## Suggested questions

- **Overview**
  - Can you please summarise the patient's presentation and your differential diagnosis in two or three sentences?
- **Data gathering**
  - What other aspects of history might have been worth pursuing?
  - What are the key features of the history that reassure/worry you?
  - Are there any other red flags that you could have sought?
  - Why did you choose to do the blood tests that you did? How will they change your management?
- **Weighting**
  - Does 2kg of weight loss make serious disease significantly more likely?
  - Do the headaches make a depressive illness more likely?
- **Synthesis**
  - Have you seen this type of presentation before? How does fatigue typically present in this type of patient?
  - What is the most likely diagnosis?
  - What diagnoses are important to rule out?
  - Do you think that your explanation adequately conveyed your understanding of the likely causes of her tiredness?
  - Where might you seek guidance on how to investigate and manage this patient?
- **Alternate scenarios**
  - What if the patient were 70 years of age?
  - What if the weight loss had been 5kg?
  - What if you hadn't seen that lady with pernicious anaemia a couple of weeks previously?
- **Uncertainty**
  - Fatigue is a typical undifferentiated illness. What strategies did you use in this case to manage the uncertainty of the presentation?
  - How do you think you could involve the patient more in the decisions around testing?



# Assess and teach clinical reasoning

Clinical reasoning has been defined as *'the sum of thinking and decision-making processes associated with clinical practice... it enables practitioners to take... the best judged action in a specific context.'*

The method par excellence to assess and teach clinical reasoning is the discussion of cases, including direct consultation observation, problem case discussion, random case analysis, inbox review and simulated patients.

Assessment and teaching of clinical reasoning during case discussion can be facilitated by using the 5Ps model.

## 5Ps MODEL

**P**resentation of the case

**P**robe for further information

**P**ose hypotheticals

**P**roblem definition and discussion

**P**rioritise and plan learning

### **P** Presentation of the case

Ask the registrar to present the patient using a 'problem representation' format.

Assess the registrar's case summary, including the key positive and negative features.

#### TIPS

- Ensure the problem representation comprises 1. a description of the patient demographics and risk factors, 2. the temporal pattern of illness, and 3. the clinical syndrome
- Ensure the registrar also includes 'semantic qualifiers', e.g. acute/chronic; severe/mild; localised/diffuse; previously healthy/significant PMH

### **P** Probe for further information

Probe the registrar for further information using relevant questions.

Assess the registrar's data gathering, synthesis, weighting, and interpretation; communication; patient-centredness; diagnostic processes; investigation ordering; management planning; hypothesis generation; incorporation of evidence; and reflection on practice.

#### EXAMPLE QUESTIONS

##### DATA GATHERING

- When the patient first mentioned their symptoms, what were your initial thoughts?
- What further key aspects of history could have been obtained?
- What physical examination findings could have been sought?
- What red flags symptoms and signs were important to consider?

##### SYNTHESIS AND INTERPRETATION

- What other key features might have been useful to establish a diagnosis?
- How important was this particular piece of data?
- How did this piece of data interrelate with the other data already gathered?
- Did you use a diagnostic pause?
- Did you recognise a 'pattern' in the way this patient presented?
- What was your working diagnosis and differential?
- Did you use a diagnostic framework to generate a differential?
- Did you have any 'gut feelings', either reassurance or alarm?
- Do you think that you were prone to any cognitive bias?
- How well did your explanation incorporate your reasoning?
- What do you think was the patient's understanding of the problem and specific concerns?

<b>EXAMPLE QUESTIONS CONT.</b>	<p><b>MANAGEMENT PLANNING</b></p> <ul style="list-style-type: none"> <li>• What other key investigations could have been considered?</li> <li>• What other management actions could have been considered?</li> <li>• What would you consider if the patient failed to improve?</li> <li>• How did you manage the uncertainty in the presentation?</li> <li>• How well do you think the patient contributed to the management plan?</li> </ul> <p><b>EVIDENCE-BASED MEDICINE</b></p> <ul style="list-style-type: none"> <li>• What evidence did you seek in managing this case?</li> <li>• What other guidelines or clinical information may have been of value?</li> </ul>
<b>TIPS</b>	<ul style="list-style-type: none"> <li>• Take notes as you go.</li> <li>• Be selective in which areas to pursue in order not to overwhelm the registrar.</li> <li>• Ask the registrar to role play key areas to reinforce learning.</li> </ul>

**P Pose hypothetical scenarios**  
 Pose hypothetical questions to further explore the registrar's reasoning skills.  
 Assess the registrar's responses.

<b>EXAMPLE QUESTIONS</b>	<ul style="list-style-type: none"> <li>• What if the patient was older/younger?</li> <li>• What if the patient was Aboriginal or Torres Strait Islander?</li> <li>• What if the patient had a fever/cough etc.?</li> <li>• What if you were practicing in a rural setting?</li> </ul>
<b>TIPS</b>	<ul style="list-style-type: none"> <li>• Avoid posing hypothetical questions if the registrar is struggling.</li> </ul>

**P Problem definition and discussion**  
 Define any problem areas of reasoning  
 Give feedback to the registrar, including suggestions for development.

<b>TIPS</b>	<ul style="list-style-type: none"> <li>• Categorise identified clinical reasoning difficulties into one of five areas:       <ul style="list-style-type: none"> <li>– Hypothesis generation, identifying key features and data gathering</li> <li>– Hypotheses refinement and testing</li> <li>– Prioritising</li> <li>– 'Seeing the whole picture'</li> <li>– Management planning</li> </ul> </li> <li>• Use a best practice approach to delivery of feedback</li> </ul>
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**Prioritise and plan**  
 Prioritise the key learning areas from the case discussion and plan how these will be learnt.  
 For example, clinical knowledge gaps, incomplete history taking, failure to explore red flags, flawed weighting and synthesis, limited differential, communication issues etc.

<b>TIPS</b>	<ul style="list-style-type: none"> <li>• Ask the registrar 'How will you apply what you have learnt to future practice?'</li> <li>• Use specific teaching and learning resources e.g. practice-based teaching, role play, 'Clinical reasoning: the game', IM reasoning podcasts</li> <li>• Follow up to ensure learning</li> </ul>
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## References

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1. Higgs J, Jones M. Clinical decision-making and multiple problem spaces. In: Higgs J, Jones M, editors. *Clinical reasoning in the health professions*, 3rd ed. Oxford, UK: Butterworth-Heinemann Ltd; 2008.
2. Atkinson K, Ajjawi R, Cooling N. Promoting clinical reasoning in general practice trainees: role of the clinical teacher. *Clinical Teach* 2011; 8:176-80.
3. Linn A, Khaw C, Kildea H, Tonkin A. Clinical Reasoning. A guide to improving teaching and practice. *Aust Fam Physician* 2012; 41:18-20.
4. Cook DA, Sherbino J, Durning SJ. Management Reasoning: Beyond the Diagnosis. *JAMA*. 2018;319(22):2267–2268.
5. Croskerry P. Clinical cognition and diagnostic error: applications of a dual process model of reasoning. *Adv Health Sci Educ* 2009; 14: 27-35.
6. Charlin B, Boshuizen H, Custers E, Feltovich P. Scripts and clinical reasoning. *Med Educ* 2007; 41: 1178-1184.
7. Parsons, A et al. The Management Script: A Practical Tool for Teaching Management Reasoning. *Academic Medicine* 2020. 95; 8 :1179-1185.
8. Scott I. Errors in clinical reasoning: causes and remedial strategies. *BMJ* 2009; 339:22-25.
9. Croskerry P. The importance of Cognitive Errors in Diagnosis and Strategies to Minimize Them. *Acad Med* 2003; 78:775-780.
10. Graber ML. Diagnostic error in internal medicine. *Arch Int Med* 2005; 165: 1493-9.
11. Morgan S, Henderson K, Tapley A et al. Problems managed by Australian general practice trainees: results from the ReCEnt (Registrar Clinical Encounters in Training) study. *Educ Prim Care* 2014; 25: 140-148.
12. Sandars J. The use of reflection in medical education: AMEE Guide 44. *Med Teach* 2009;31 :685-695.
13. Boekaerts M. Self-regulated learning: where we are today. *Int J of Ed Research* 1999; 31: 445-457.
14. Mamede S, Schmidt H, Rikers R. Diagnostic errors and reflective practice in medicine. *J Eval Clin Pract* 2007; 13: 138-45.
15. Young M, Dory V, Lubarsky S, Thomas A. How Different Theories of Clinical Reasoning Influence Teaching and Assessment. *Academic Medicine* 2018. 93(9):1415.
16. Audetat M-C et al. Clinical reasoning difficulties. A guide to educational diagnosis and remediation. Found at <https://muhc.ca/sites/default/files/micro/m-PT-OT/2%20Clinical%20reasoning%20reading.pdf>
17. Bowen J. Educational strategies to promote clinical diagnostic reasoning. *N Engl J Med* 2006; 355:2217-25.
18. Eva K. What every teacher needs to know about clinical reasoning. *Medical Education* 2004; 39: 98-106.
19. Murtagh J. *John Murtagh's General Practice* 4th ed. Sydney: McGraw-Hill, 2007.
20. Kenny D. A consultation navigation tool: an aid for teaching consultation skills. *Ed Prim Care* 2012;23:41-55
21. Irby DM. Clinical Teaching and the Clinical Teacher. *J Med Educ* 1986;61:35-45.
22. Morgan S, Ingham G. Random case analysis. A new framework for Australian general practice training. *Aust Fam Physician* 2013; 42: 69-73.
23. Morgan S, Saltis T, Coleman J, Tapley A, Magin P. Test result audit and feedback (TRAFk) as a supervision method for rational test ordering in general practice training. *Aust Fam Physician*. 2016 Jul;45(7):518-22.
24. Morgan S. PQRST: A framework for case discussion and practice-based teaching in general practice training. *Aust J Gen Pract* 2021 Aug;50(8):603-606.
25. Neher JO, Gordon KC, Meyer B, Stephens N. A five step "microskills" model of clinical teaching. *Clin Teach* 1992;5: 419–24.
26. Baker EA, Ledford CH, Fogg L, Way DP, Park YS. The IDEA Assessment Tool: Assessing the Reporting, Diagnostic Reasoning, and Decision-Making Skills Demonstrated in Medical Students' Hospital Admission Notes. *Teach Learn Med*. 2015;27(2):163-73



27. Wolpaw T, Papp KK, Bordage G. Using SNAPPS to facilitate the expression of clinical reasoning and uncertainties: a randomized comparison group trial. *Acad Med* 2009; 84: 517-24.
28. Audetat M-C, Laurin S. Supervision of clinical reasoning. Methods and a tool to support and promote clinical reasoning. *Can Fam Physician* 2010; 56: e127-29.
29. Wearne S. The RACGP Fellowship examination: 10 tips for answering key feature problems. *Aust Fam Physician* 2008; 37: 559-561.
30. Ingham G. Avoiding 'consultation interruptus'. A model for the daily supervision and teaching of general practice registrars. *Aust Fam Physician* 2012; 8:627-29.
31. Heneghan C, Glasziou P, Thompson M et al. Diagnostic strategies used in primary care. *BMJ* 2009; 338: 1003-6.
32. Murtagh J. Common problems: a safe diagnostic strategy. *Aust Fam Physician* 1990; 19:733.
33. Bachmann LM, Kolb E, Koller MT, et al. Accuracy of Ottawa ankle rules to exclude fractures of the ankle and mid-foot: systematic review. *BMJ* 2003;326:417.
34. Bachmann LM, Haberzeth S, Steurer J, et al. The accuracy of the Ottawa knee rule to rule out knee fractures: a systematic review. *Ann Intern Med* 2004;140:121-4.
35. Wells PS, Anderson DR, Rodger M, et al. Excluding pulmonary embolism at the bedside without diagnostic imaging: management of patients with suspected pulmonary embolism presenting to the emergency department by using a simple clinical model and D-dimer. *Ann Intern Med*. 2001; 135(2):98–107.
36. Ebell MH, Smith MA, Barry HC, Ives K, Carey M. The rational clinical examination. Does this patient have strep throat? *JAMA* 2000; 284: 2912-8.
37. Morgan S, van Driel M, Coleman J, Magin P. Rational test ordering in family medicine. *Can Fam Physician* 2015;61(6): 535-7.
38. van der Weijden T, van Bokhoven M, Dinant G et al. Understanding laboratory testing in diagnostic uncertainty: a qualitative study in general practice. *Br J Gen Pract* 2002; 52:974-80.
39. Morgan S, Coleman J. 'We live in testing times' – teaching rational test ordering in general practice. *Aust Fam Physician* 2014;43:273-6.
40. Henschke N, Maher CG, Ostelo RW et al. Red flags to screen for malignancy in patients with low-back pain. *Cochrane Database Syst Rev* 2013; (2):CD008686. doi: 10.1002/14651858.CD008686.pub2.
41. Trowbridge R. Twelve tips for teaching avoidance of diagnostic error. *Med Teach* 2008; 30: 496-500.
42. Ely JW, Graber ML, Croskerry P. Checklists to Reduce Diagnostic Errors. *Acad Med* 2011; 86: 1-7.
43. Stolper E, Van Royen P, Van de Wiel M et al. Consensus on gut feelings in general practice *BMC Fam Pract* 2009; 10: 66.
44. Mann K, Jordan J, Macleod A. Reflection and reflective practice in health professions education: a systematic review. *Adv Health Sci Educ* 2009;14:595-621.
45. Epstein RM. Mindful practice. *JAMA* 1999; 282(9):833-839.
46. Kostopoulou O, Delaney B, Munro C. Diagnostic difficulty and error in primary care – a systematic review. *Fam Pract* 2009; 25: 400-13.
47. O'Beirne M, Sterling P, Palacios-Derflingher L et al. Emotional Impact of Patient Safety Incidents on Family Physicians and Their Office Staff. *J Am Board Fam Med* 2012; 25: 177-83.
48. Goyder C, Jones C, Heneghan C, Thompson M. Missed opportunities for diagnosis: lessons learned from diagnostic errors in primary care. *Br J Gen Pract* 2015; 65: e838-844.
49. Kahane S, Stutz E, Aliarzadeh B. Must we appear to be all-knowing? Patients' and family physicians' perspectives on



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