

Cautionary tales in clinical decision-making

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Overview

- Epidemiology of cognitive error in decision-making
 - missed or delayed diagnoses
 - inappropriate or misapplied treatments
- Cognitive psychology
- Aetiology of decision error
 - using case examples
- Remedial strategies
- Self-evaluation

Rules of engagement

- Humility
- Open-mindedness
- Active listening
- Participation
 - including 'confessionals'
- Resolutions

Decision errors

Incorrect diagnostic decisions

- Correct diagnosis but incorrect management decisions*
- Correct diagnosis and management decisions* but incorrect prognostication

*Errors of management decision-making vs errors of execution or follow-through
eg. slips, lapses, oversights; misapplied rules, protocols, algorithms; technical procedures

Epidemiology of errors in clinical decision-making

- Systematic review of studies of autopsy-detected diagnostic error 1966-2002
- 53 autopsy series
 - Missed primary cause of death (major error)
 - Of these, error affected patient outcome (class 1 error)
 - Median autopsy rate 37% (cf national average 5%)
- Median error rate
 - **24% major error**
 - relative 19% decrease per decade from 34% to 20%*
 - **9% class 1 error**
 - relative 33% decrease per decade from 10% to 6%*
- Current error rates if autopsy rate 5% or 100%
 - 8.4% to 24.4% for major error rate
 - 4.1% to 6.7% for class 1 error

*Adjusted for casemix, country, autopsy rate

Shojania et al JAMA 2003

Epidemiology of errors in clinical decision-making

- 100 cases of diagnostic error based on autopsy discrepancies, QI activities, voluntary reports
- 90% injury; 33% death
- 7 cases regarded as 'no fault'
- Contributory factors in remaining 93 cases (average 5.9 per case)
 - 74% cognitive factors
 - 65% system-related

Epidemiology of errors in clinical decision-making

2: Number of adverse events (AEs) associated with each of the human error categories, and proportion of these AEs leading to permanent disability (including death) and with high preventability. Values are number (%) of AEs

Category	Frequency	Permanent disability	High preventability
Complication of, or failure in, the technical performance of an indicated procedure/operation	1017 (34.6%)	144 (14.2%)	504 (49.6%)
Failure to synthesise, decide and/or act on available information*	465 (15.8%)	114 (24.5%)	355 (76.3%)
Failure to request or arrange investigation, procedure or consultation*	346 (11.8%)	111 (32.1%)	293 (84.7%)
Lack of care or attention, failure to attend*	320 (10.9%)	83 (25.9%)	250 (78.1%)
Misapplication of, or failure to apply a rule; or use of a bad or inadequate rule*	258 (8.8%)	66 (25.6%)	233 (90.3%)
Violation of a protocol or rule*	140 (4.8%)	39 (27.9%)	111 (79.3%)
Unable to code	92 (3.1%)	16 (17.4%)	49 (53.3%)
Other	83 (2.8%)	24 (28.9%)	64 (77.1%)
Acting on insufficient information*	53 (1.8%)	14 (26.4%)	43 (81.1%)
Slips and lapses; errors due to "absentmindedness" in activities in which the operator is skilled*	46 (1.6%)	8 (17.4%)	42 (91.3%)
Failure to continue established management*	43 (1.5%)	7 (16.3%)	37 (86.0%)
Lack of knowledge	33 (1.1%)	10 (30.3%)	33 (100.0%)
Electively practising outside area of expertise	30 (1.0%)	13 (43.3%)	24 (80.0%)
Questionable practice ethics	14 (0.5%)	8 (57.1%)	13 (92.9%)
Total	2940 (100%)†	657 (22.3%)	2051 (69.8%)

* Failure of cognitive function.

† Total is greater than number of AEs (2351) as the categories were not mutually exclusive.

Wilson et al
MJA 1999

Epidemiology of errors in clinical decision-making

- Misdiagnosis in 5% to 14% of cases

Berner & Graber Am J Med 2008

- Common scenarios

United claims data

- Cancer
- Occult infections
- AMI
- VTE

- Diagnosis error rates for specific conditions

- Pulmonary TB	50%	Shojania et al 2002
- PTE	55%	Pidenda et al 2001
- SAH	30%	Edlow 2005
- Atrial fib ⁿ	10%	Bogun et al 2004
- Diabetes	18%	Edelman 2002
- SPs*	13%	Peabody et al 2004

*SP=standardised patients with common conditions

Epidemiology of errors in clinical decision-making

- ?Overconfidence: only 1% admit to diagnostic error in past 12 months
Ely 1995; Graber 2008
- Clinicians 'completely certain' of diagnosis antemortem were wrong in 40% of instances
Podbregar et al Intens Care Med 2001
Landefeld et al N Engl J Med 1988
- Clinicians often stay wedded to an incorrect diagnosis even if correct diagnosis is suggested externally
Berner et al AMIA Annu Symp Proc 2003
- No correlation between perceived and actual adherence to treatment guidelines
Steinman et al Am J Med 2004
Baumann et al Soc Sci Med 1991

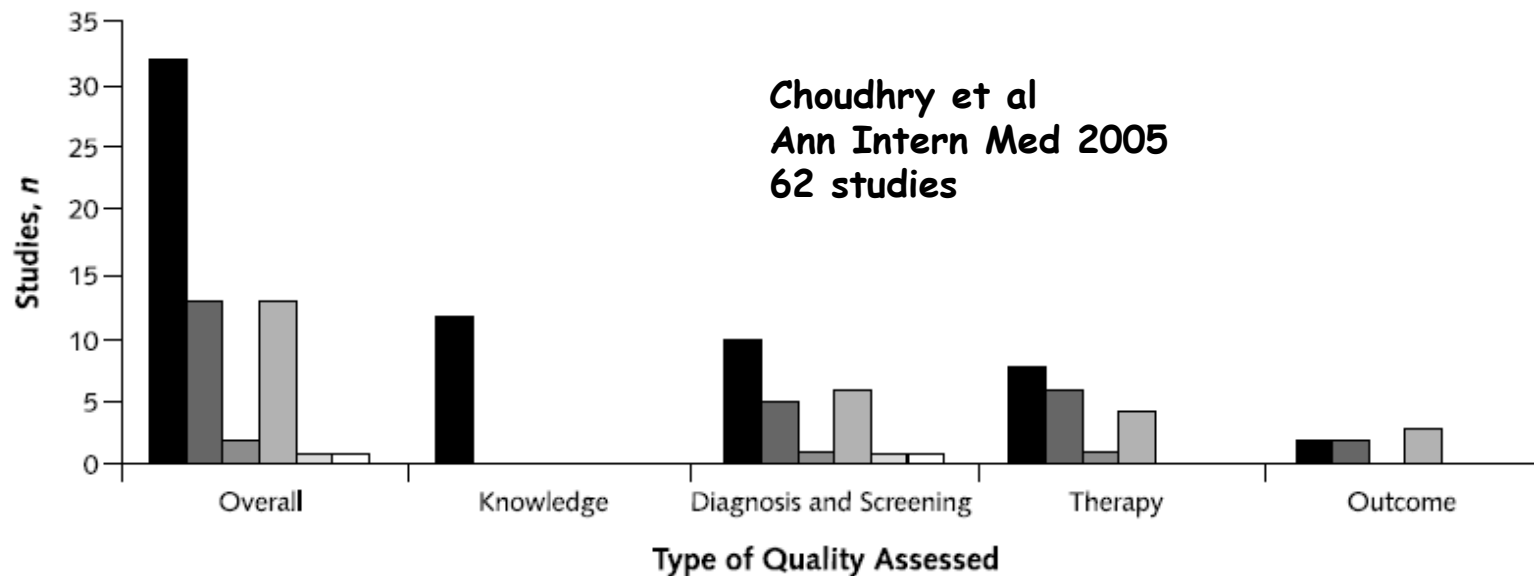
Epidemiology of errors in clinical decision-making

- 216 subjects (students, residents, faculty; n=72 each group) randomly assigned to creating DDX for each of 9 paper-based cases rated as difficult; no CDS or key investigation results provided
- For each DDX subjects rated confidence levels 1 - 4
- Correct defined as DDX containing correct diagnosis
- Interaction between confidence level and correct diagnosis assessed according to training level

Experience level	% all cases correctly diagnosed	% all cases that were non-aligned	Cases where correct Dx but low confidence		Cases where incorrect Dx but high confidence	
			% of non-aligned cases	% of all cases	% of non-aligned cases	% of all cases
Student	26%	22%	75%	17%	25%	5%
Resident	44%	38%	59%	23%	41%	15%
Faculty	50%	36%	64%	24%	36%	12%

Experience and clinical decision-making

Does experience improve quality?



- Studies in which length of time in practice or age was associated with lower performance for all outcomes.
- Studies in which length of time in practice or age was associated with lower performance for some outcomes; no effect was found for other outcomes.
- Studies in which there was a concave relationship between length of time in practice or age and performance.
- Studies in which no association was found between length of time in practice or age and performance.
- Studies in which length of time in practice or age was associated with higher performance for some outcomes; no effect was found for other outcomes.
- Studies in which length of time in practice or age was associated with higher performance for all outcomes.

Cognitive psychology of diagnostic reasoning

Data acquisition



Frame (or contextualise) the problem
within a cognitive representation
(abstract or semantic conceptualisation)



Triggering of one or more diagnostic ideas
(illness scripts, encapsulated schemas)
(inductive process)

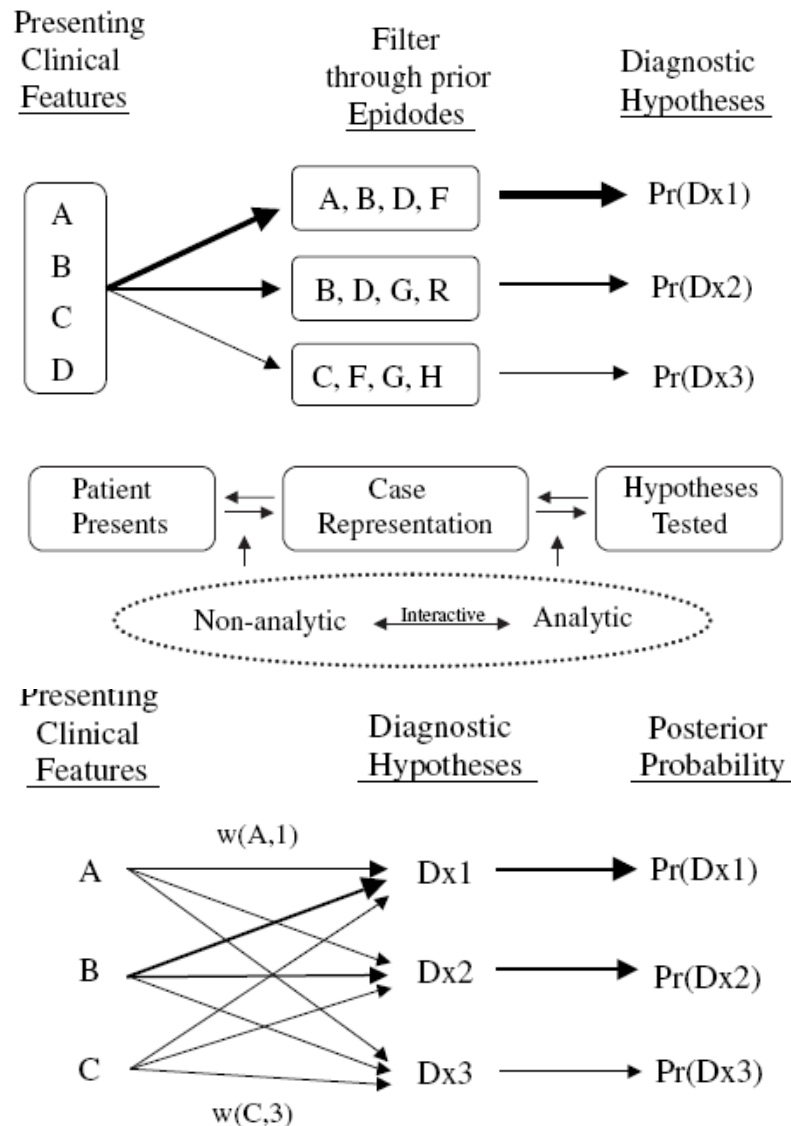


Gather and process information that narrows diagnostic possibilities
(iterative hypothesis-driven deductive inquiry)



Verify the working diagnosis
(with caveat that this may change if
response to treatment is not what is expected)

Cognitive psychology of diagnostic reasoning



Intuitive (non-analytical) approach

- Pattern recognition
- Data-driven, bottom-up

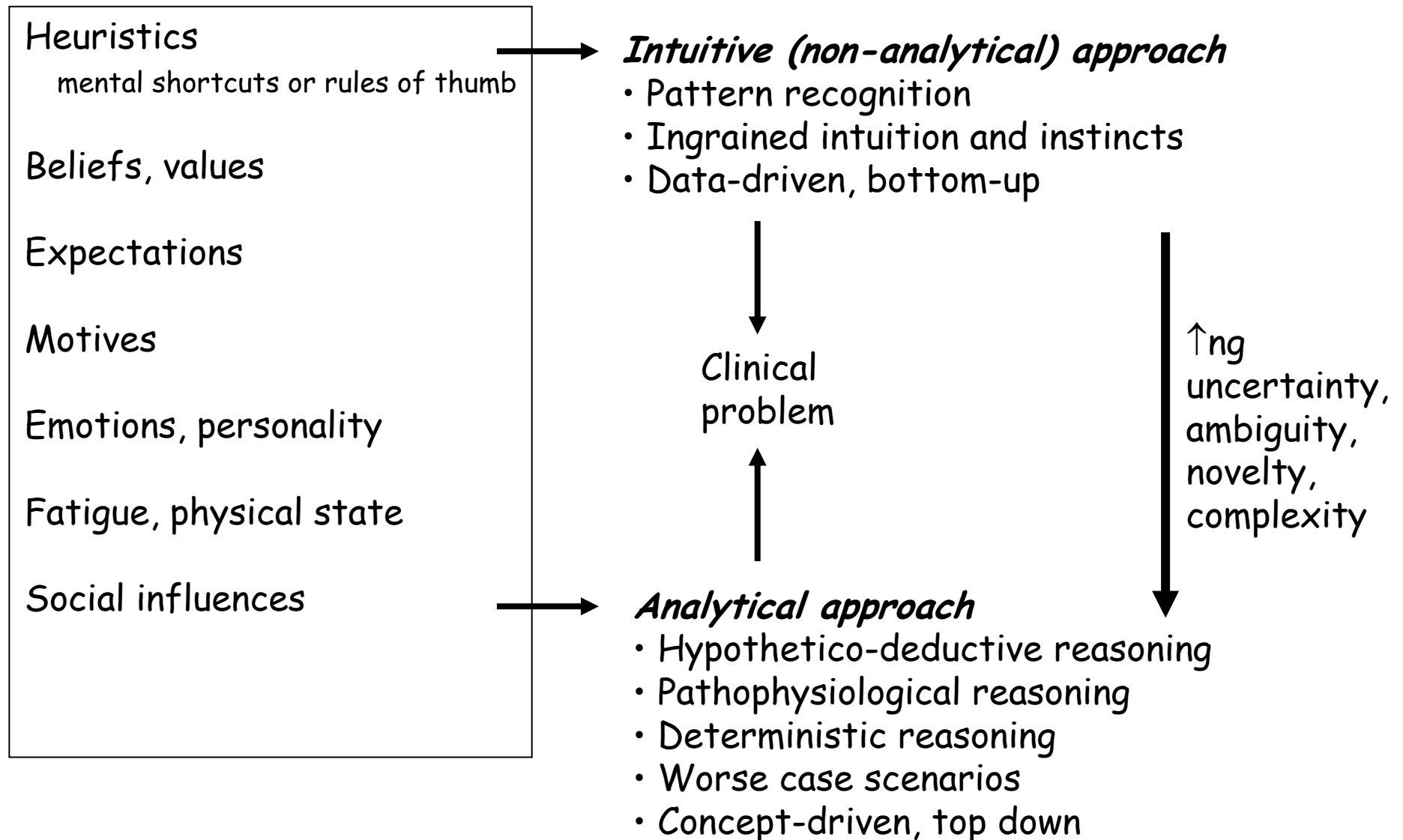
Clinical problem

↑ng
uncertainty,
ambiguity,
novelty,
complexity

Analytical approach

- Hypothetico-deductive reasoning
- Pathophysiological reasoning
- Deterministic reasoning
- Worse case scenarios
- Concept-driven, top down

Cognitive psychology of diagnostic reasoning



Cognitive psychology of management reasoning

Diagnostic formulation



Frame (or contextualise) basic management goals



Trigger one or more management options
(inductive process)

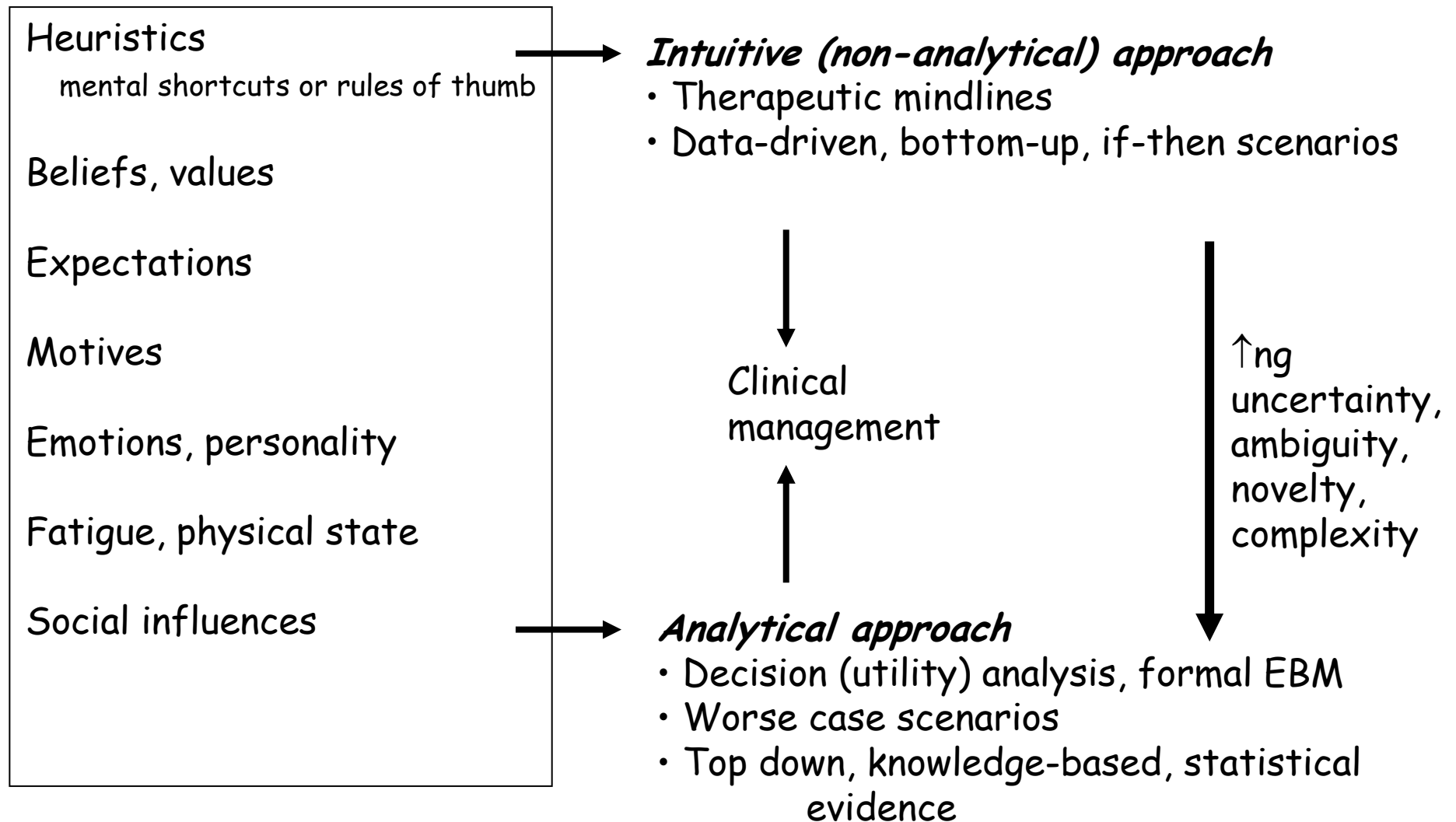


Gather and process information that particularises options to
circumstances of the individual patient
Assess overall risks and benefits of each option
(iterative goal-directed inquiry)



Discuss, affirm and execute the management plan
in participation with patient

Cognitive psychology of management reasoning



Successful decision-maker

One who:

- Has an ergonomically optimised workplace
- Is well rested and well slept
- Is not driven by throughput pressures
- Is not subject to constant distractions or interruptions
- Has access to appropriate decision support which frees up working memory
- Is aware of various cognitive and affective biases
- Is able to safely blend intuitive and analytical styles according to task at hand
 - Situational awareness
 - Knowing what has gone before
 - What is happening now
 - Anticipating what is coming
 - Having one's cognitive engine in right gear

Successful decision-maker

- Static vs dynamic decision problems
 - *Static:*
 - Only one decision needs to be made
 - The situation does not change
 - The alternatives are clear
 - *Dynamic*
 - Series of interdependent decisions and/or actions required to reach goal
 - Situation changes over time, sometimes very rapidly
 - Goals shift or are redefined

Aetiology of cognitive error

- The role of heuristics

mental rules of thumb or shortcuts

- Occam's razor

- Choosing the simplest diagnosis that explains a set of observations

- Sutton's Law

- Try a common diagnosis to explain symptoms before resorting to an uncommon one (because that's where the money is)

Aetiology of cognitive error

- The role of heuristics
 - mental rules of thumb or shortcuts*
 - Reduce cognitive overload
 - Help keep multiple 'plates spinning on the sticks'
 - Processing limit 7 ± 2
 - Have high predictive value
 - Seem to have worked well in many past instances
 - Are easy to access and apply
 - Reconcile competing imperatives
 - Codify accepted modes and schools of thinking
 - Compensate for lack of scientific data
 - Subconscious and latent, await right conditions for activation

Aetiology of cognitive error

Heuristics

mental shortcuts or rules of thumb

Heuristic bias

Beliefs, values

Value bias

Expectations

Expectation bias

Motives



Third agency bias

Emotions, personality

Affective bias

Fatigue, physical state

Reduced attention span

Social influences

Social bias

Environmental influences
(resources, time, logistics)

Externality bias

Cognitive dispositions to respond

> 35

Group exercise

- What modes of reasoning would account for most of the decisions you make in routine practice, and why?
- What circumstances prompt you to change reasoning modes?
- What heuristics do you commonly use?
- What environmental factors impinge most frequently on your decision-making?

Diagnostic decision-making

Causes of diagnostic error

- It never crossed my mind
- I paid too much emphasis to one finding, especially laboratory results
- I didn't listen enough to the patient's story
- I was too much of a hurry
- I let the consultant/senior reg convince me
- I didn't reassess the situation but instead accepted the impressions of others
- The patient had too many problems at once
- I was influenced by a similar case
- I let the patient talk me out of further investigation
- I was in denial of an upsetting diagnosis

Kassirer & Kopelman 1989
Bordage 1999

Cognitive error in diagnostic reasoning

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Availability heuristic	Tendency for diagnosis to be judged more frequent if it comes readily to mind	Clinician immediately considers a specific diagnosis having recently encountered a very similar case which is vividly recalled
<i>Example:</i> Clinician sees a 40 year old woman with left calf pain which is ultimately diagnosed as secondary to myosarcoma. He subsequently evaluates all patients with calf pain for myosarcoma		
Representativeness heuristic	Tendency to select diagnosis which most closely matches the clinical syndrome	Clinician may neglect to consider the rarity of specific diagnoses and the atypical but more common variants of the classic (prototypical) disease or syndrome
<i>Example:</i> 80 yr old frail woman with fever, diarrhoea, abdominal pain, arthralgias, confusion, and subtle lymphadenopathy develops congestive heart failure after receiving fluids. She is given a diagnosis of Whipple's disease rather than viral gastroenteritis and fluid overload.		
Anchoring heuristic	Tendency to fixate on first impressions	Clinician may fixate on selected symptoms or signs as predictors of specific diagnosis
<i>Example:</i> 72 yr old woman with back pain is diagnosed with compression fracture based on x-rays. Normocytic anaemia attributed to myelodysplastic syndrome. Subsequently diagnosed as having multiple myeloma with bony involvement		

Cognitive error in diagnostic reasoning

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Confirmation bias	Selective acquisition or filtering of information that supports first impressions but fails to test competing diagnoses	Clinician may seek redundant information that appears to confirm favoured diagnosis (but really does not) and ignore disconfirming data
Premature closure	Acceptance of a diagnosis before it has been fully verified	Clinician ceases consideration of alternative diagnoses and/or search for more data that may jeopardise the provisional diagnosis

Example: 55 yr old smoker with known diabetes presents with protracted vomiting. His clinician orders HbA_{1c} and plain abdominal X-ray to evaluate for suspected diabetic gastroparesis. The HbA_{1c} of 8.2% confirms poor diabetic control and the x-ray shows a somewhat large gastric air bubble. He fails to consider CNS causes of vomiting in a man at risk of cerebrovascular disease or disseminated malignancy and does not perform a neurological examination which reveals bilateral papilloedema and central ataxia with subsequent CT head scan revealing enhancing lesions suggestive of metastases in the posterior fossa.

Cognitive error in diagnostic reasoning

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Framing effect	Swaying of thought processes by subtle contextual influences	Clinician may opt for candidate diagnoses based on how the problem is perceived or 'framed' according to past history, clinical setting, previous diagnostic labels, etc

Example: A 30 yr old woman with past history of personality disorder and bulimia is referred from the mental health team with intermittent diarrhoea and abdominal pain. Physical examination is unremarkable. The provisional diagnosis is irritable colon and anxiety disorder. The clinician fails to appreciate the significance of recent weight loss, no prior history of IBS, and decreased serum albumen. Subsequent investigations including colonoscopy disclose a diagnosis of Crohn's disease

Blind obedience	Undue deference to authority or technology	Clinician acquiesces in thinking to assertive colleagues or to seemingly objective test results even if they invoke cognitive dissonance
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Example: An 80 yr old woman with past history of temporal arteritis is admitted following a mechanical fall. She has been taking 5mg/day Prednisone for the last 12 months and has been warned by her treating rheumatologist to increase the dose if she were to develop headaches or worsening vision. While in hospital she develops unilateral lancinating headache and hyperaesthesia of the right side of the face associated with ESR 40. The clinician accedes to increasing the steroid but 2 days later she develops classical shingles

Group exercise

- Recall cases of missed or delayed diagnosis
- Which types of bias or error were intrinsic to these cases?
- Where there any factors which you felt predisposed to these errors?
- What lessons did you learn from these experiences?

Remedial strategies: cognitive error in diagnostic reasoning

<i>Cognitive error</i>	<i>Corrective strategy</i>	<i>Clinical maxims</i>
Availability heuristic	Verify prevalence based on proper statistics	Pay attention to base rates 'If you hear hoof beats, think horses not zebras'
Representativeness heuristic	Compare probability of atypical variant against probability of rare alternative diagnosis	Atypical variants of common conditions occur more commonly than uncommon conditions
Anchoring heuristic	Reconsider in light of new data that does not support initial diagnosis or second opinion at variance with first opinion	Think beyond the most favoured 'If the patient was to suddenly deteriorate or die, what might it be from?'

Remedial strategies: cognitive error in diagnostic reasoning

<i>Cognitive error</i>	<i>Corrective strategy</i>	<i>Clinical maxim</i>
Confirmation bias	Avoid gathering irrelevant data that appears to support a given diagnosis and seek data that challenges it	Look for highly sensitive features that are not present and take note of the presence of specific features suggestive of other diagnoses that should be absent
Premature closure	Reconsider the case when refreshed and less distracted	Give consideration to extremes 'What's the diagnosis that I don't want to miss?'
Framing effect	Examine case from alternative perspectives	Deliberately consider the case from different angles 'Let's play devil's advocate..'
Blind obedience	Reconsider the case when authority is more remote; re-appraise the accuracy of the test	Tactfully reconfirm the human work; do a vote count on clinical features vs test result

Therapeutic decision-making

Causes of management error

- I thought I should be doing something rather than simply observing
- The drug rep made this drug sound pretty impressive and relatively safe
- The treatment seemed to work well on other patients with the same problem
- I didn't pick up on certain attributes about this patient that might complicate the management
- I opted for a more conservative approach as this patient seemed not to be receptive to my recommended treatment
- I did not want to intensify the treatment in this patient because of my concerns he would find it all too much and not come back
- The patient was very keen for me to continue the treatment she had received from Doctor X so I did not make any changes even though I wanted to

Aetiology of cognitive error in management decision-making

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Framing effect	Tendency for benefits and risks to be perceived differently if expressed in relative versus absolute terms, or death versus survival	Clinician may be more tempted to offer treatment on basis of reduction in relative risk compared to absolute risk, or on basis of mortality reduction compared to survival increase

Example: Clinicians are more likely to prescribe a drug if it is said to reduce the risk of an adverse event by 30% than if they were told that it reduces the absolute risk from 5% to 3% or that 100 people would have to be treated with the drug to prevent one event

Commission bias	Tendency to want to be doing something (or seen to be doing something)	Clinician may undertake actions which are not supported by robust evidence and may in fact do harm
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Example: An 18 year old girl is brought to the ED by her worried parents with severe headache and fever. In the last 2 days she had symptoms of a viral upper respiratory tract infection. Her physical examination reveals no evidence of meningitis and routine blood tests are normal with no neutrophilia. Her parents are very keen for a lumbar puncture because of the high mortality associated with delayed treatment of meningococcal disease. Reluctantly the clinician accedes to their wish with CSF analysis being normal. Subsequently the patient develops severe post-LP headache and stays in hospital for another 4 days, eventually requiring a blood patch to relieve symptoms.

Aetiology of cognitive error in management decision-making

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Omission bias	Tendency towards inaction through fear of being held directly responsible for an adverse outcome (natural history bias)	Clinician may temporise or procrastinate in situations where delay in effective treatment worsens prognosis or leads to a potentially preventable adverse event

Example: An active 82 yr old man with atrial fibrillation and mitral valve disease is not offered warfarin because his clinician is concerned about the risk of traumatic intracerebral bleeding given his past history of ischaemic stroke and one mechanical fall 6 months ago. Subsequently the patient presents with a massive hemispherical stroke and dies.

Multiple alternative bias	Tendency to stick to the status quo when multiple management options are available but whose relative efficacy is uncertain (stick with what you know)	Clinician may choose to administer treatments with which he/she is familiar but which have now been superseded by more efficacious regimens
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Example: A 64 yr old female with type 2 diabetes presents with urosepsis and poor sugar control (HbA_{1c} = 9.4%). She has been on full dose glimeperide and metformin for the last 4 years and is compliant with diet. She is intolerant of acarbose. Her clinician is wondering whether to add pioglitazone, or convert her to insulin. If he chooses the latter he also has to decide between pre-prandial short-acting insulin (Lispro), twice-daily intermediate-acting insulin (Novomix 30/70) or once-daily long-acting insulin (Lantus). He opts for pioglitazone as he is familiar with this drug and favours its low risk for hypoglycaemia. Evidence would suggest once-daily Lantus may be the best option.

Aetiology of cognitive error in management decision-making

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Outcome bias (value bias, regret bias, wishful thinking)	Tendency to offer (or not offer) treatment in the hope that certain events will (or will not) happen rather than on what statistically is most likely	Clinician may under-treat or over-treat in the hope of avoiding an outcome which he may feel regretful for, even though it is statistically rare
<i>Example:</i> Adjuvant chemotherapy in patient with metastatic melanoma; withholding HRT in women with severe peri-menopausal symptoms and osteoporosis because of perceived breast cancer risk		
Attribution error	Tendency to pursue less aggressive management in patients whose behaviour is attributed to disposition rather than situational circumstances beyond their control	In certain groups of patients (alcoholics, drug-seekers, frequent flyers, somatisers) judgemental attitudes may lead to patients not receiving appropriate care
<i>Example:</i> Patient with past panic attacks has a diagnosis of PTE delayed by several weeks		
Contextual error	Failure to recognise or elicit patient attributes or concerns that may complicate management and lessen the chances of favourable outcomes	Management options may be recommended which could likely fail as a result of counter-balancing physical or psychosocial factors

Example: Patient with strong Islamic beliefs who is of limited means is discovered not to be taking medicines for rheumatoid arthritis because of out-of-pocket expenses, and refuses physiotherapy because his faith forbids him from being touched by females other than his wife

Aetiology of cognitive error in management decision-making

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Extrapolation error	Tendency to generalise treatment experiences and clinical trial results to groups of patients in whom the treatment has not been properly evaluated	Treatments may be offered to a wider spectrum of patients with precautions and relative contraindications who may suffer harm if not closely monitored

Example: A 70 yr old patient with ischaemic cardiomyopathy (EF=35%) and chronic renal failure (Se Cr 350 mmol/l) is prescribed spironolactone in addition to ACE inhibitor and b-blocker on the basis of trials showing survival benefit in heart failure. He present 2 weeks later with cardiac arrest secondary to hyperkalaemia. The original trials had excluded patients with renal insufficiency or who had EF >30%.

Clinical inertia	Tendency to forego aggressive treatment to achieving well validated targets out of deference to patients or over-emphasis on possible toxicity	Failure to attain desired treatment targets around control of blood pressure, blood glucose or serum cholesterol is rationalised as being 'close enough' and not worth the risk of toxicity or side-effects
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Example: An 85 yr old diabetic lady with Parkinson's disease and past CVA resulting in mild hemiparesis is seen at clinic with blood pressure readings of 170/100mmHg on two separate visits. The treating clinician notes she is already on several other medications and is concerned about the risk of postural hypotension if he were to treat the hypertension. This is despite her cardiovascular risk profile and recent trials showing survival benefit with active treatment of hypertension in elderly patients

Aetiology of cognitive error in management decision-making

<i>Cognitive error</i>	<i>Description</i>	<i>Consequences</i>
Novelty bias (surrogate bias)	Tendency to want to change to 'new and better' treatments on the basis of purportedly improved surrogate outcomes or side effect profile prior to outcome trials	More costly treatments are substituted for well established older treatments before their relative efficacy is fully known

Example: Much was made in the 1990s of the benefits of COX-2 inhibitors such as Vioxx in having a putatively lower risk of GI bleeding compared to conventional NSAIDs. Consequently many patients were switched over to these agents and many more, who had never been offered a NSAID because of past peptic ulcer disease, now received these agents. It was not until 2003 that excess CV mortality was noted as well as increased total numbers of GI bleeds. Vioxx has now been withdrawn from the market.

Blind obedience (or hands off)	Undue deference to authority or technology	Clinician acquiescence to assertive colleagues or to technological momentum even if the appropriateness of care is considered doubtful
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Example: A 74 yr old man who underwent CABG for IHD 4 years ago is scheduled for elective colectomy for colon cancer. He is receiving treatment for hypertension and is a past smoker. He has had no angina since being revascularised. The attending clinician requests a stress ECG and resting echocardiograph to assess perioperative coronary risk. The stress test is equivocal; the echo shows inferior wall hypokinesis. A stress echo is undertaken which induces mild inferior hypokinesis. A cardiology consultation is sought by which time surgery has now been postponed by 5 weeks.

Group exercise

- Recall cases of inappropriate management
- Which types of bias or error were intrinsic to these cases?
- Where there any factors which you felt predisposed to these errors?
- What lessons did you learn from these experiences?

Remedial strategies: cognitive error in management decision-making

<i>Cognitive error</i>	<i>Corrective strategy</i>	<i>Clinical maxim</i>
Framing effect	Consider both relative and absolute risk reduction and number needed to treat.	The patient at highest absolute risk of an event is the one that has most to benefit from treatment and should be accorded first priority in administration and adherence
Commission bias	Consider the evidence for prescribing treatments (including non-pharmacological and non-device treatments)	Am I treating the patient or myself?
Omission bias	Consider the worst case scenario that may result from inaction	Don't put off to tomorrow what needs to be done today if you cannot be reasonably sure things will not be worse
Multiple alternative bias	Seek out evidence of relative efficacy and toxicity in regards to specific patient circumstances	Be decisive; be prepared to step outside your comfort zone; be open to new treatments while maintaining a healthy skepticism

Remedial strategies: cognitive error in management decision-making

<i>Cognitive error</i>	<i>Corrective strategy</i>	<i>Clinical maxims</i>
Outcome bias (value bias, regret bias)	Be realistic in expectations for therapeutic success without extinguishing all hope; do not offer treatment in futile or near-futile situations	Am I treating the patient or myself? Am I giving into emotion or reason? Am I getting too close to this patient?
Attribution error	Question whether expending less effort on pursuing treatment is driven by sound reasoning or personal bias	If this patient was a relative or close friend of mine, would I think my management plan was sufficient?
Contextual error	Systematically assess for patient attributes and environmental characteristics that may mitigate against successful therapy	Treat the whole patient, pay attention to real-world constraints in acceptance of therapy and put yourself in their shoes when making specific recommendations

Remedial strategies: cognitive error in management decision-making

<i>Cognitive error</i>	<i>Corrective strategy</i>	<i>Clinical maxims</i>
Extrapolation error	Ensure the treatment (or class of treatments if of the same physiologic class and mode of action) has been evaluated in different patient subgroups	'Show me the evidence' of efficacy and safety of this treatment in this group of patients
Clinical inertia	Be aware of common conditions whose prognosis strongly correlates with therapy-induced change in surrogate measures eg BP, cholesterol, BSL, etc	'Treat to target where the evidence says we should and where there is no clear and present danger to doing so'
Novelty bias (surrogate bias)	Beware of unsubstantiated hype and unjustified hope in regards to new therapies that are strongly promoted but yet to prove superior to existing therapies	'Show me the evidence' of similar or better efficacy and/or less toxicity than existing therapies
Blind obedience	Question the logic and evidence of the recommendation whilst maintaining mutual professional respect	Have confidence in your own knowledge and experience and ask: Why do you believe that? What's your evidence for saying that?

Effective teaching

- Encourage to think and question in a democratic (not authoritarian) style
- Think out loud
 - Acknowledge uncertainty, blind alleys, false starts
 - Discuss pivotal steps in making correct diagnoses
 - Articulate problem representations
 - Demonstrate strategies for comparing and contrasting diagnostic possibilities and management options
 - Highlight pivotal or 'forceful' features in diagnosis or management
 - Elaborate on CDRs and how they can mislead
 - Demonstrate judicious application of EBM and decision support
 - Combine confidence and optimism with humility

Effective teaching

- Listen to the trainee's learning and give constructive feedback
 - Assess trainee presentations on patients you know
 - Inquire into their rationale for favouring diagnoses or management plans
 - Ensure feedback is specific, detailed and timely
- Give simple explanations and reinforce simple-to-use maxims where appropriate; encourage useful reading habits
- Avoid judgements in hindsight; reconstruct the reasoning process from the beginning and see whether you might have done the same
(*'prospective hindsight'*)

System strategies for reducing error

- Good training programs aimed at developing and assessing expertise
 - Both didactic and experiential
- Second opinions/consult with experts
- Educational outreach
- Clinical decision support systems
- Feedback
 - M&M meetings
 - Clinical practice audits
 - Rapid follow-up of patients
 - Continuity of care from same provider

Cognitive forcing strategies

- Universal

Understanding of basic error theory and metacognition
(thinking about thinking)

- Being aware of requirements of learning process
- Recognising limitations of memory
- Stepping back from the pushes and pulls of the immediate situation - 'de-anchoring'
- Appreciating clinical problem in a wider perspective than that dictated by obvious presentation (representativeness error)
- Reminding oneself of specific lapses or failures in the past (availability)
- Being able to self-critique own reasoning and activate cognitive debiasing strategies

Cognitive forcing strategies

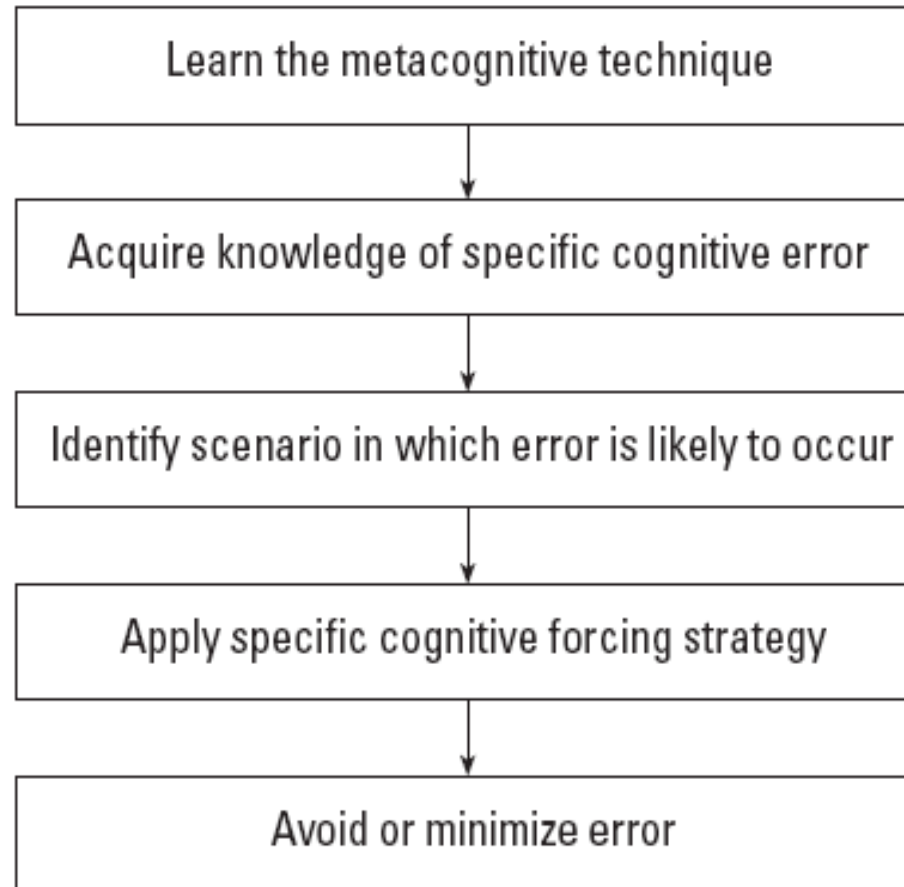
- **Generic**

Familiarisation with major classes of heuristics (and their associated bias) used in physician decision-making

- **Specific**

Awareness of specific scenarios in which classical errors are predictably made

Using a cognitive forcing strategy



Specific scenarios in diagnostic reasoning

- Back pain in patient with malignant disease
- Seemingly minor and non-specific infection in the immunocompromised patient
- Mimics of acute stroke in patients with odd neurological signs
- Mimics of congestive heart failure in patients with elevated JVP and peripheral oedema
- Coeliac disease in patients with diagnosed as having eating disorders or benign dyspepsia
- Inflammatory bowel disease in patients with 'irritable colon' symptoms
- Thyroid disease (hyper- or hypo-) in elderly patients
- Abdominal pain and diarrhoea in elderly patients

Specific scenarios in management reasoning

- Warfarin in patients with atrial fibrillation
- Assessing peri-operative cardiac risk
- DVT prophylaxis in at-risk patients
- Management of TIA
- Management of poorly controlled type 2 diabetes, diabetic foot ulcers
- Palliative care; palliative care teams; advance care planning
- Management of geriatric syndromes
- Management of syncope
- Management of first unprovoked seizures

Advantages of learning meta-cognition and CFS

- Transfers CFS to wide variety of clinical problems
- Provides cognitive bridges or scaffold between apparently dissimilar problems
- Provides insight into what constitutes expertise
- Assists trainees to minimise errors in decision-making

Challenges to using CFS

- Under-appreciation (or denial) of role of cognitive error in decision-making
 - Many errors go undetected
 - Adverse outcomes are attributed to chance or natural history
 - Cognitive biases deeply ingrained with lack of insight
- Reliance on systems and technology
 - Cognitive deskilling

Challenges to using CFS

- Doubts about efficacy (and unintended consequences) of CFS
 - Takes more time
 - Can lead to extra testing
 - May change patient-physician dynamic
 - Patient preference for certainty over ambiguity
 - Increase in cognitive error
 - Degrading in decision quality if subject to conscious inspection (or second guessing)

Evidence of effectiveness in teaching cognitive de-biasing

- ???
 - Lack of universally accepted theoretical constructs
 - Most research directed at students, interns
 - Few RCTs
 - Fidelity of teaching and evaluation methods
 - Content specificity
 - Sustainability of effects

Group exercise

- Discuss the feasibility and utility of cognitive de-biasing
- What do you regard as the pros and cons?
- How might you apply it in routine clinical environment?
- How might you evaluate its effectiveness in reducing cognitive error?
- Are there any other educational strategies that might be useful in reducing cognitive error?

Self-evaluation

Characteristics of 'Mindful Practice'

- Active observation of oneself, the patient, and the problem
- Peripheral (vs tunnel) vision
- Pre-attentive processing (situational awareness)
- Critical curiosity
- Courage to see the world as it is rather as one would have it be
- Willingness to examine and set aside categories and prejudices
- Adoption of a beginner's mind
- Humility to tolerate awareness of one's limitations
- Connection between the knower and the known
- Compassion based on insight
- Presence

Epstein JAMA 1999

Other issues to be considered

- **Context**
 - In what situations and under what conditions are decision errors most and least prevalent
- **Team influences**
 - How does distributed nature of patient care foster or prevent decision error
- **System influences**
 - What system-level practices foster decision quality
- **Individual differences**
 - What defines the 'expert' decision-maker

Ageing and clinical decision-making

- Inverse relation between age and competence

Norman et al 1993; McAuley & Henderson 1984; Norcini et al 1985

- But considerable inter-individual variation
 - Loss of 'testmanship' skills
 - Faculty loss (hearing, vision, etc)
 - Not keeping up to date (assimilation of knowledge)
- Greater reliance on non-analytic reasoning
 - Better than young in preliminary diagnostic accuracy (ability to generate correct diagnosis on first contact based on little information)
 - But less well with new & more complex cases with conflicting data within comprehensive patient descriptions
- Aetiology
 - Loss of memory (of some things but not others)
 - Reasoning processes
 - » Loss of 'fluid' intelligence (eg reasoning through a maze) vs 'crystallised' intelligence (eg vocabulary tests)
Fluid reasoning: overcomes first impressions by recognising alternative solutions are plausible; retards primacy or order effects and lessens risk of premature closure
 - » Greater infusion of personal experience into problem representations
 - » Loss of comprehension of messages (length or complexity of messages and when inferential processing is required)

The role of the patient

- Encourage patients (and their families/carers/significant others) to:
 - Be aware of circumstances which may predispose their clinicians to making decision errors
 - Sound the warning bell if they feel at risk
 - Participate in the decision-making, accept a certain level of uncertainty, and stay in touch

**Questions, comments
(and thank-you)**

Clinical judgement

A good decision is one that:

- Leads to a good outcome
- Takes into account all of the relevant information known at the time and does not depend on irrelevant information
- Can be justified or defended to others
- Is arrived at through a deliberate process
- Is consistent with the way the decision maker wants to live his or her life

A Case

58 year old farmer presents to ED at Roma Hospital with 5/7 history of sore throat, fever, myalgia, upper back pain

PMH

- Hodgkin's disease IIA 10 yrs ago presenting as cervical lymphadenopathy Rx combined chemo-radiotherapy → oncology F/U: cured
- Moderately severe lichen planus → topical steroids, phototherapy, creams; no regular F/U; recent worsening pruritus
- Hypertension

Rx Betnovate ung

Perindopril 5mg mane

A Case

O/E

Afebrile

Oropharyngeal erythema

Lichen planus left leg

Remainder of examination normal

Ix

Hb 123, MCV 85, WCC 11.3 N 7.1 plt 450; MBA normal; ESR 40

Urinalysis 12 RBC/hpf; <10 leuk/hpf

CXR: tortuous aorta but otherwise normal

ECG: normal

X-rays cervical and lumbar spine: degenerative changes; no lucencies

Throat and blood c/s taken

Dx: viral URTI

Rx: Ibuprofen, fluids

Review by local GP

A Case

14 hours later micro lab: + B/c 2/3 bottles tentative: *S. aureus* → pt. recalled → no change in symptoms

O/E

Mildly flushed; T 36.9°C; normal oropharynx and teeth/gums

BP 170/90; PR 88 bpm; CVS and resp exams N

Soft, non-tender abdomen; no h/splenomegaly

Spinal exam normal

No needle-tracks, purulent skin lesions

Scaling, erythematous wrist papules; hyperpigmentation and hypertrophic plaques on anterior legs; scattered excoriations arms and trunk consistent with recent scratching

A Case

PD

S. aureus bacteraemia ?skin source

Rx IV Flucloxacillin

Following day

Soft systolic murmur; no other stigmata BE

TTE - normal valves, mild LVH, good LV function

Symptoms improved; remains afebrile

Completed 5 days IV A/B → oral dicloxacillin for 2/52

Review GP with repeat blood cultures

A Case

On review in 2 weeks

- Recurrence of generalised fatigue with neck and back pain
- Difficulty with urination
- Paraesthesia fingers both hands
- Mild tenderness over lower cervical spine

Transferred to Toowoomba Hospital

- MRI spine: epidural abscess and osteomyelitis C6-7
- TOE: normal valves
- Pt declines neurosurgery
- 6/52 IV Flucloxacillin

Persistent paraesthesia fingers both hands

Repeat blood cultures negative

What went wrong?

- Inadequate triggering
 - Representativeness heuristic
 - Anchoring heuristic
 - Confirmation bias
- Incorrect framing
- Insufficient search
 - Premature closure
 - Blind obedience

Cognitive error

Practice alters the error type

