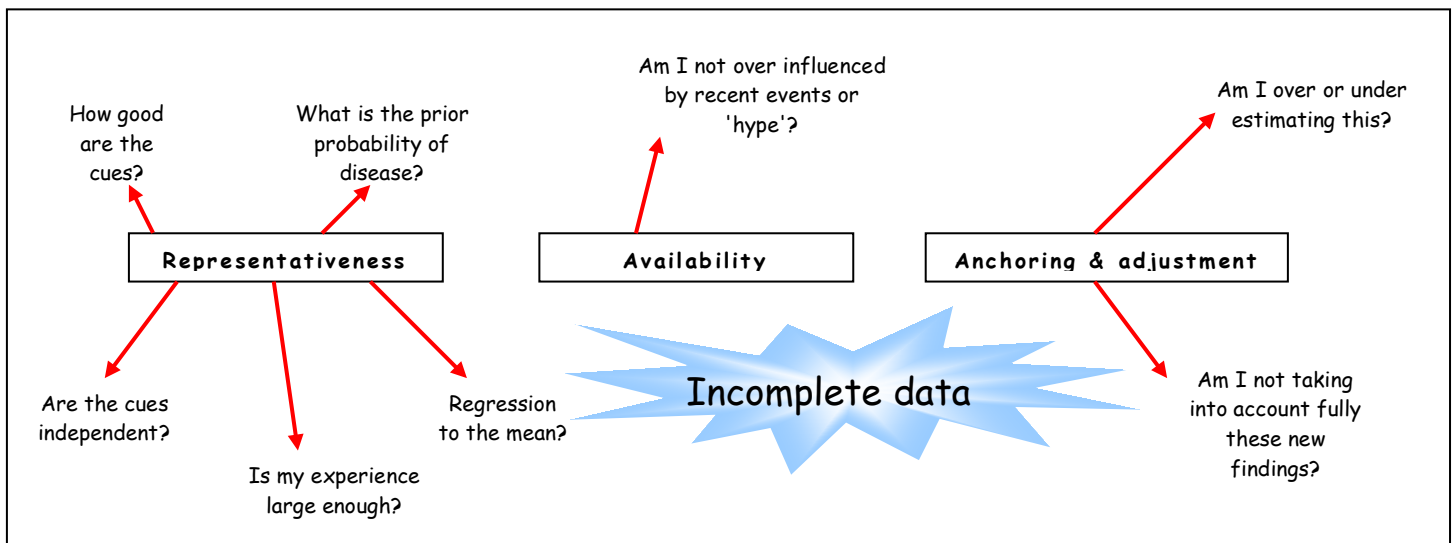


# **Diagnosis and Treatment**

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**Saturday, 21 January 2012**



## **How this chapter should be used:**

This chapter has been designed to be suitable for web based and face-to-face teaching. The text has been made to be as interactive as possible with exercises, Multiple Choice Questions (MCQs) and web based exercises.

If you are using this chapter as part of a web-based course you are urged to use the online discussion board to discuss the issues raised and share your solutions with other students.

## **Who this chapter is aimed at:**

This chapter is aimed to the following types of people:

- Doctors, both in training and those wishing to be involved in some form of Continual Professional Development (CPD) programme
- Pharmacists, both undergraduate and those undertaking courses to enable them to become Supplementary prescribers in the UK
- Nurses who are just starting training as well as those undertaking advanced courses such as Nurse Practitioner training in the UK.

I hope you enjoy working through this chapter.

Robin Beaumont

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# 1. Before you start

## 1.1 Prerequisites

This chapter assumes you have read and worked through the first two chapters in this series 'Basic Communication Skills' and 'Consultation models' at [www.robin-beaumont.co.uk/virtualclassroom/comms/index.htm](http://www.robin-beaumont.co.uk/virtualclassroom/comms/index.htm)

## 1.2 Required Resources

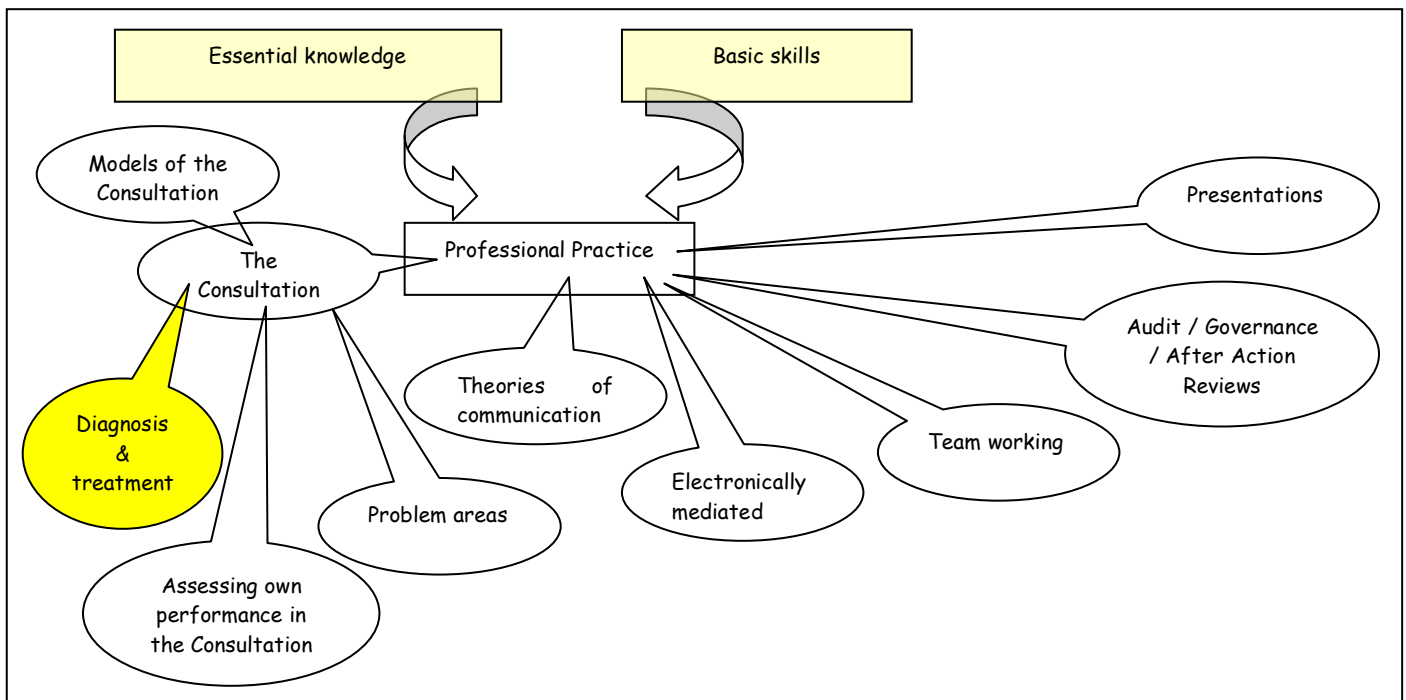
You need the following resources to work through this chapter:

- Active connection to the internet
- Optional ability to print out this chapter

## 2. Introduction

This chapter is the third in a series to help you to learn more about communication and gain some relevant skills as a healthcare professional.

To give you an idea of where this chapter fits in, the diagram below shows the main areas that are covered in the entire course. You may decide to stop before you have completed working through all the chapters or miss out certain strands; it is up to you to choose.



This chapter looks at the consultation in detail, specifically at how consultations are managed and chaptered. It contains a large amount of material and many of the web sites that you are asked to visit contain very detailed material. Several of the sections concentrate on issues relating to Supplementary Prescribing (SP), which was implemented in the UK in 2003 while every effort has been made to provide the most recent information about SP, the DoH SP web site should always be consulted at, this ridiculously long address: <http://www.dh.gov.uk/en/Healthcare/Medicinespharmacyandindustry/Prescriptions/TheNon-MedicalPrescribingProgramme/Supplementaryprescribing/index.htm>

### 3. Introduction - The clinical process

In the previous chapter we looked at various models of the consultation and focused particularly on the degree to which each was centred around either the patient or doctor (I would prefer to use the term 'health worker'). In this chapter the focus will be at a lower level, that of the clinical process. The clinical process can, by and large, be thought of as the traditional 'consultation'. When discussing Bryne & Longs research in the previous chapter we mentioned their division of the consultation into two phases, the 'diagnosis', where the health worker hasn't made up their minds about diagnosis and treatment; and the 'prescribing' phase where the health worker communicates the diagnosis and treatment.

We will start by looking at general definitions of the consultation and then move onto details of both diagnosis and treatment, and finish by looking at ways to enhance the effectiveness of any proposed treatment.

### 4. The consultation

The consultation has been described many ways, Style (1979) provides a succinct description of the consultation process for GPs in the summary to his article:

Style (1979) description of the GP consultation:

"...General practitioners ... in the first few minutes ..from initial hypotheses about their patients' problems. This process is childlike, imaginative qualities based on intuition. It is often outside consciousness and probably based on pattern recognition. It has been neglected from study and analysis because of these 'mystical' qualities."

This short quote contains much to consider. Medical students are taught to carry out a history (i.e. collect data), and possibly investigate (i.e. collect more data), before making a tentative diagnosis. It would appear that this is not the case in practice with experienced GPs. Furthermore the pattern recognition process is considered an important mechanism which you will learn more about in the exercise below.

#### Exercise 1.

Go to the chapter "Information, Knowledge and Wisdom" at <http://www.robin-beaumont.co.uk/virtualclassroom/chap5/s3/data2.pdf>

Review the section in the chapter entitled "modern cognitive theories".

The pattern recognition concept has been introduced in the consultation context, in some guise, by many authors, Schmidt (1990) calls them 'illness scripts' based upon the work of Feltovich and Barrows (1984), Sox & Blatt et al 1988 (p37) calls them 'cognitive heuristics'. Beale 1990 provides a relatively easy introduction to the theory behind pattern recognition.

Most people are taught that the consultation follows a logical flow, firstly collecting data then analysing it and finally suggesting a diagnosis, really a bit like a clinical algorithm, a concept we will look at now before returning to pattern recognition in more detail.

# 5. Clinical Algorithms

You can see below an example of a clinical algorithm taken from <http://www.meningitis.org/health-professionals/hospital-protocols-paediatrics>

**MD1** Estimate of child's weight (1-10 years)  
 Weight (kg) = 2 x (age in years + 4)

**MD2** Observe HR, RR, BP, perfusion, conscious level  
 Cardiac monitor & pulse oximetry.

Conscious Level	Normal Values		
	Age	Heart Rate/min	Resp Rate/min
Alert	<1	110-160	30-40
Responds to Voice	1-2	100-150	25-35
Responds to Pain	2-5	95-140	25-30
Unresponsive	5-12	80-120	20-25
	Over 12	60-100	15-20

Normal systolic blood pressure = 80 + (age in years x 2)  
 N.B. Low BP is a pre-terminal sign in children

**MD3** Take bloods for Glucose, FBC, CRP, Clotting, U&E, Ca++, Mg++, PO<sub>4</sub>, Lactate, Blood cultures, Whole blood (EDTA) for PCR, Blood gas (bicarb, base deficit), X-match.

**MD4** Intubation (call anaesthetist and consult PICU) see **MD5**  
 Consider using: Atropine 20 mcg/kg (max 600 mcg) AND Ketamine 1-2 mg/kg in shock or Thiopental (thiopentone) 3-5 mg/kg in RCP AND Succinylcholine 2 mg/kg (caution, high potassium), ETT size = age/4 + 4, ETT length (oral) = age/2 + 12 (use cuffed ET tube if possible). Then: Morphine (100 mcg/kg) and Midazolam (100 mcg/kg) every 30 min. Do not use Ketamine in children with raised ICP.

**MD5** Inotropes  
 Dopamine at 10-20 mcg/kg/min. Make up 3 x weight (kg) mg in 50 ml 5% dextrose and run at 10 ml/hr = 10 mcg/kg/min. (These dilute solutions can be used via a peripheral vein).  
 Start Adrenaline via a central or IO line only at 0.1 mcg/kg/min.  
 Start Noradrenaline via a central or IO line only at 0.1 mcg/kg/min for 'warm shock'.  
 Adrenaline & Noradrenaline: Make up 300 mcg/kg in 50 ml of normal saline at 1 ml/hour = 0.1 mcg/kg/min.

**MD6** Hypoglycaemia (glucose < 3 mmol/l) 5ml/kg 10% Dextrose bolus i.v.

**MD7** Correction of metabolic acidosis pH < 7.2  
 Give half correction NaHCO<sub>3</sub> i.v.  
 Volume (ml) to give = (0.3 x weight in kg x base deficit ÷ 2) of 8.4%NaHCO<sub>3</sub> over 20 mins, or in neonates, volume (ml) to give = (0.3 x weight in kg x base deficit) of 4.2% NaHCO<sub>3</sub>.

**MD8** If K<sup>+</sup> < 3.5 mmol/l  
 Give 0.25 mmol/kg over 30 mins i.v. with ECG monitoring.  
 Central line preferable. Caution if anuric.

**MD9** If total Calcium < 2 mmol/l or ionized Ca<sup>++</sup> < 1.0  
 Give 0.1 ml/kg 10% CaCl<sub>2</sub> (0.7 mmol/ml) over 30 mins i.v. (max 10 ml) or 0.3 ml/kg 10% Ca gluconate (0.22 mmol/ml) over 30 mins (max 20 ml). Central line preferable.

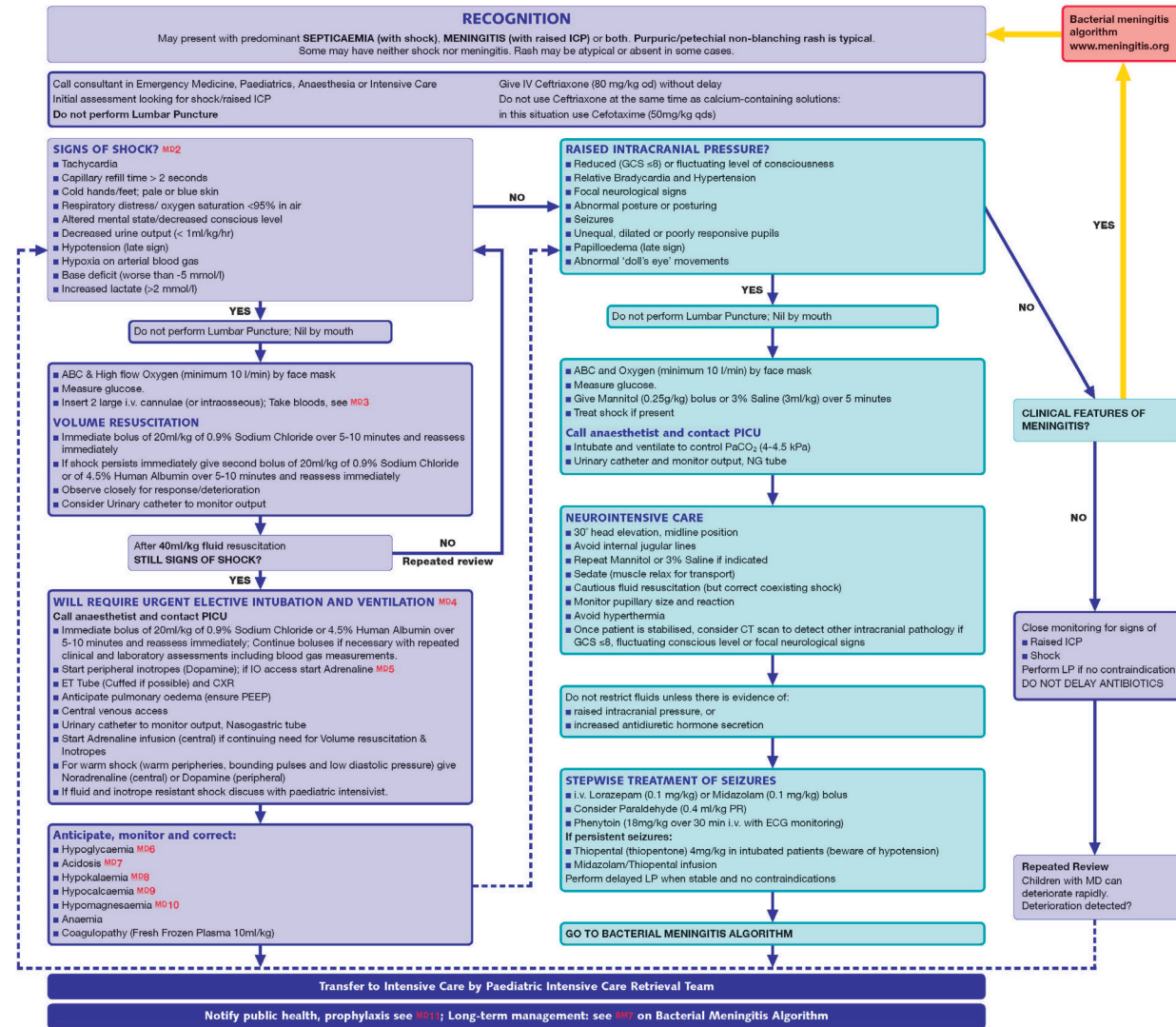
**MD10** If Mg<sup>++</sup> < 0.75 mmol/l  
 Give 0.2 ml/kg of 50% MgSO<sub>4</sub> over 30 mins i.v. (max 10 ml).

**MD11** Urgently notify public health of any suspected case of meningitis or meningococcal disease  
**Prophylaxis of household contacts of MD**  
[http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1194947389261](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947389261)  
 ■ Rifampicin bd for 2 days: < 1yr 5 mg/kg; 1-12yrs 10 mg/kg; > 12yrs 600 mg or  
 ■ Ceftriaxone single im dose: < 12yrs 125 mg; > 12yrs 250 mg or  
 ■ Clprofloxacin single dose (not in children <2 or in pregnancy/breast-feeding) 2-4yrs 125mg; 5-12 yrs 250 mg; > 12yrs 500 mg  
 For index case not treated with Ceftriaxone, prophylaxis when well enough.  
**HB: prophylaxis may be indicated – consult public health**

**MD12** Antibiotics for confirmed and unconfirmed (but clinically suspected) meningococcal disease: i.v. Ceftriaxone for 7 days unless contraindicated **MD3** (see bacterial meningitis algorithm for antibiotics against other pathogens)

## Management of Meningococcal Disease in Children and Young People

Incorporates NICE Bacterial Meningitis and Meningococcal Septicaemia Guideline CG102. Distributed in partnership with NICE 7th Edition



The algorithm highlights many of the problems with such an approach, the writer assumes that the readers understand all the terms used (with a glossary at the left hand side), furthermore they assume that the facilities and drugs etc are available and do not take into account possible rare complex situations. For example would this algorithm work for someone who is immuni-compromised following a transplant of some type?

Most health workers are familiar with clinical algorithms and there are courses devoted to teaching their construction such as the algorithm-oriented psychopharmacology course for residents in psychiatry at Harvard.

The exercise on the following page provides details of different types of algorithms along with tips on how you can develop them.

Based on Early Management algorithm, Dept Paediatrics, Imperial College at St Mary's Hospital as described in Arch Dis Child 1999; 80:290 & 2007; 82:285 & on NICE CG102 <http://guidance.nice.org.uk/CG102/QuickRef/Guidance>  
<http://guidance.nice.org.uk/CG102/QuickRef/Guidance/pdf/English>  
 Authors AJ Pollard (SGD chair), A Cloke, L Glennie, SN Faust, C Haines, PT Heath, JS Kroll, M Lewin, I Macconochie, S McQueen, P Monk, S Nadel, N Nisim, MP Richardson, MJ Thompson, AP Thomson, D Turner.  
 Further copies from [www.meningitis.org](http://www.meningitis.org) or 01454 281811.  
 © Meningitis Research Foundation 10/10

## Exercise 2.

In the past there existed a NHS national library of guidelines at <http://www.library.nhs.uk/guidelinesFinder/> this is no longer available but much of the material is by searching for example the detailed limb trauma guideline published by the University of Warwick, Joint Royal Colleges Ambulance Liaison can be found at: <http://www2.warwick.ac.uk/fac/med/research/hsri/emergencycare/prehospitalcare/jrcalcstakeholderwebsite/>

To get some idea of how guidelines are developed, and the importance of grading evidence have a look at the excellent May 2009 publication by the Scottish Intercollegiate Guidelines Network (SIGN) for Early management of patients with a head injury guideline at: <http://www.sign.ac.uk/pdf/sign110.pdf>

## Exercise 3.

Please read the chapter by David Hadorn Use of Algorithms in Clinical Guideline Development on page 8 of 19 (p93) at: <http://banzai-deim.urv.net/repositories/Bibliography/ClinicalAlgorithm.pdf>

The [http://www.acponline.org/clinical\\_information/guidelines/](http://www.acponline.org/clinical_information/guidelines/) site provides a list of recent guidelines that some of you may be interested in looking at, the breast screening one is particularly interesting concerning the possible harm caused by screening. This is a US site.

Guidelines are similar to algorithms but frequently provide the information in narrative format, some purists say that guidelines often consist of several algorithms. The US National Guideline Clearing House <http://www.guideline.gov/browse/by-topic.aspx> has nearly a thousand guidelines, including, for example the Pain control in Patients with cancer guideline many are produced in both narrative and diagrammatic format I wonder which format you prefer?

As stated in the David Hadron article above, algorithms have been used to allow physicians assistants to take more control, and many years ago when I was an ITU nurse we used them for various drugs regimes, it stopped the doctors having to continually write scripts and supposedly improved care. However any health care professional needs more than just a set of algorithms to be successful as the following article in the BMJ highlights.

## Exercise 4.

Visit the health informatics forum and see what is being said about doctors being more than algorithms at: <http://www.healthinformaticsforum.com/forum/topics/do-we-need-doctors-or-algorithms?page=3&commentId=2068976%3AComment%3A97069&x=1#2068976Comment97069>

The BMJ Soundings article [Growing algorithms from seed](#) (2003; 327 (7413) 28 August) by Colin Douglas, who is a Edinburgh doctor and novelist, presents one personal view of how doctors work, the critical rapid response entitled "Medical decision making" made on the 15 September 2003 by Arthur Felice, Senior lecturer in surgery at the University of Malta is equally as interesting and I have reproduced in below - post your comments on the forum.

**Rapid response to: (SOUNDINGS) Growing algorithms from seed by Douglas C**

*BMJ 2003; 327 doi: 10.1136/bmj.327.7413.509-a (Published 28 August 2003) Cite this as: BMJ 2003;327:509.2*

Medical decision making, 15 September 2003 Soundings: Growing algorithms from seeds. By Douglas C. *BMJ* Vol. 327 P509 2003

Optimal decisions result from the application of a statistical decision-rule to data, as in mathematics. Other methods, including clinical decision-making, are considered sub-optimal because of their inherent uncertain and probabilistic nature. The choice of appropriate clinical management from a wide spectrum of possibilities, variable estimates of probabilities, close-calls and balancing trade-offs, often based on imperfect information, is a basic skill in clinical practice. This is, obviously, not always easy.

Colin Douglas minimalises "the fine-grained probabilistic clinical reasoning" to "subcortical algorithm (s), built up over years of experience."

Algorithms are branching logic flowcharts that lead one through the necessary steps in management, depending on the presence of certain findings or the occurrence of certain events<sup>1</sup>. Algorithms show what should be done in the event of particular clinical situation, usually without choice of alternatives for the specific event, and without involving probabilities ( in contrast to decision trees). One agrees with Colin Douglas in that "subcortical" algorithm form part of an experienced clinician's clinical acumen: By defining clinical data that needs to be collected they avoid wastage of the clinician's time and effort, over investigation and unnecessary expense. They may also define criteria for requesting specific consultations and advising on management. They are also useful in that the results from different algorithmic protocols may be compared. Furthermore, when a clinician is consciously planning an algorithm as a protocol he is actually dissecting and analyzing his own thought processes, which is always a healthy undertaking. This would lead to the conclusion that clinical algorithms should lead to improved patient care, help reduce costs of care and may be effective education tools. I have found, however, hardly any hard evidence for this, whether it does correspond to the truth or otherwise.

Even on a theoretical basis algorithms harbour limitations: They are best suited for simple rather than complex clinical situations, because they do not take into consideration interaction between factors or variables. All variables are weighted equally. Algorithms tend to be deterministic without indicating the level of confidence (i.e. whether it is a clear-cut or a close-call decision) of a recommendation? There is often a subjective element to a clinical algorithm, which is as good as the logic of its designer.

Clinical decisions of usually based on two strategies: The first is mastery of analytical rules or 'formal strategies'. Clinical algorithms together with other logical and statistical techniques e.g. inductive, deductive, hypothetico-deductive and practical reasoning, 2 decision analysis, clinical problem analysis, mechanistic case diagramming (applied consciously or subconsciously), fall under this heading. The second mainstay involves "informal strategies and patterns" e.g. intuition and pattern recognition, which involve rapid, automatic but learned (acquired) behaviour. The latter is acquired through lengthy clinical training and accumulation of experience, moulded by supervision and feedback.<sup>3,4</sup> These processes are applied in different degrees, often in combination, and with varying frequency and emphasis.<sup>2</sup>

Reducing clinical acumen to subcortical algorithms is thus a gross oversimplification. It takes more than just algorithmic seeds to germinate good clinicians.

**References:**

1. Young MJ, Williams SV, Eisenberg JM: The technological strategist: employing techniques of clinical decision making in the The Machine at the Bedside. Cambridge University Press. p 167-174. 1984
2. Felice A: Trains of clinical thought – with special reference to practical reasoning: Xjenza – Journal of the Malta Chamber of Scientists. Vol. 6/7. Nos. 1 and 2. p28-30. 2001/2.
3. Elstein A S: Clinical problem solving and decision psychology: Comments on "The epistemology of clinical reasoning" *Academic Medicine*; Vol 75. No 10 p134-136. 2000
4. Elstein A S, Schwarz A: Clinical problems solving and diagnostic decision making: Selective reviews of the cognitive literature. *MBJ*. Vol 324 p729-732. 2002

Arthur Felice, M.D., F.R.C.S. Ed Senior Lecturer in Surgery, University of Malta agfelice@synapse.net.mt

Gigerenzer 2007 chapter 10 discusses 'frugal trees' which are clinical algorithms which only allow a binary choice at each stage and according to him are more successful in the clinical environment.

We will now move back to pattern recognition and compare it with the traditional algorithmic view.

## 6. Pattern recognition versus rational data collection / decision making

What is the proof that the data collecting side of the process is denigrated while the pattern recognition side assumes greater importance? Schmidt & Norman et al 1990 reference several studies (p612) that provide support for this hypothesis, in particular they cite one study (Marshall, 1977) which demonstrated that "...experts gather less, rather than more data, ..... than relative juniors" furthermore they suggested that the 'extensively documented existence' of four other phenomena add further support. For reference all five are given below:

Aspect	Support of pattern recognition hypothesis (Schmidt & Norman, 1990)
Content specificity in diagnostic performance	Few demonstrations of a positive association between knowledge and problem solving at the level of the individual problem
Typical data collection differences between students and physicians	Experts gather less, rather than more data, ..... than relative juniors
Difficulties involved in standards setting	Problems with consensus. Some physicians did approximately half they said they would do for a simulated patient when a real equivalent was introduced in the practice
Decline in performance on certain measures of clinical reasoning with increasing expertise	Quite often declines in performances on certain measures of clinical reasoning have been demonstrated (Grant & Marsden 1988; Schmidt et al 1988)
Paradoxical association between errors and longer response times in visual diagnosis	"Errors . . . in these [dermatology / radiology casts] are associated with longer, not shorter viewing times. Also, novices appear to recognise abnormalities as frequently as experts; expertise is often associated with recognising normal variations, and with reduced rates of false positives" (Myers-Worsley & Johnson 1988 quoted in Schmidt 1990)

If you find the above table difficult to understand you can freely download the Schmidt & Norman 1990 article at: <http://journals.lww.com/academicmedicine/toc/1990/10000>

One may ask why experts develop pattern recognition over logical data collection cognitive processes. There are probably many reasons for this, firstly pattern recognition is a standard cognitive process and as such is hard wired in, secondly the cognitive demands of using a rational problem solving approach may cause 'information overload' in comparison to the relative ease of pattern recognition. Gerd Gigerenzer a academic turned popular psychologist has published several articles about the problems both the general public and the medical profession have with understanding/ explaining risk and probability (try searching on his name in the BMJ or google)

### 6.1 Methodological problems

There are problems with obtaining information about doctors thought processes particularly when these very processes might be 'outside consciousness' as stated by Style (1979) above. Unfortunately much of the so called 'cognitive' investigations into how medical doctors think, have been carried out by well meaning medical doctors rather than psychologists or neuro-psychologists using the 'talk through' technique, meaning they describe, verbally what they are thinking. In all probability this fails to collect vital information about what they actually would think and do in the 'real' situation. Style (1979, p72) quoting Crombie (1972) also provides another reason why the 'talk through' technique is questionable "It is easy to suspect that the reasons are being constructed after the conclusion".

There are clearly complex methodological issues involved in interpreting the findings in this field, which are often suspect due to the method of data collection used.



## 7. Pattern types

Feltovich & Barrows 1984 suggest that physicians "reorganise their knowledge of pathology, clinical manifestations of disease, variability in signs and symptoms, and the constraints under which certain diseases may occur into scripts that are as much tied together by temporal links as they are by causal relationships. . . . a scenario of events that occur in a certain order" (Quoted by Schmidt 1990 p615).

It is interesting to note that this is the way medicine has been taught from at least the time of Hippocrates. Two examples from him are given below:

"At Larisa, a bald man suddenly had a pain in the right thigh. No treatment which he received did him any good.

First day: high fever of causus type, did not tremble, but the pain continued.

Second day: pains in the thighs were relieved, but the fever increased. The patient became somewhat distressed and did not sleep; the extremities were cold. He passed a lot of urine but this was not of a favourable kind.

Third day: the pain in the thigh ceased. His mind became unhinged and there was much disturbance and tossing about.

Fourth day: died about noon." (p.72)

"Crito in Thasos had a violent pain in the foot which came on while walking; it started from the big toe. The same day he took to his bed with shivering, nausea and slight fever; at night he became delirious.

Second day: the whole foot became swollen; it was reddish about the ankle where there was some contraction and small black blisters appeared. He developed high fever and madness. He passed rather frequent unmixed bilious stools.

He died on the second day from the beginning of his illness." (p50)

Both taken from: Chadwick J Mann W N (trans. & editor) 1950 The medical works of Hippocrates

This is exactly the way most medical records are set out, be it from the traditional paper based notes to the highly ordered 'care pathways' now used in a large number of hospitals.

Sox et al 1988 discusses the term heuristics and provides the following definition.

### **Cognitive heuristic:**

A mental process used to learn, recall, or understand knowledge. In brief, a 'rule of thumb.'  
From Sox 1988 pp37

We can see that Sox's definition of heuristics is similar to that of pattern recognition in this context., he also defines three types of heuristics:

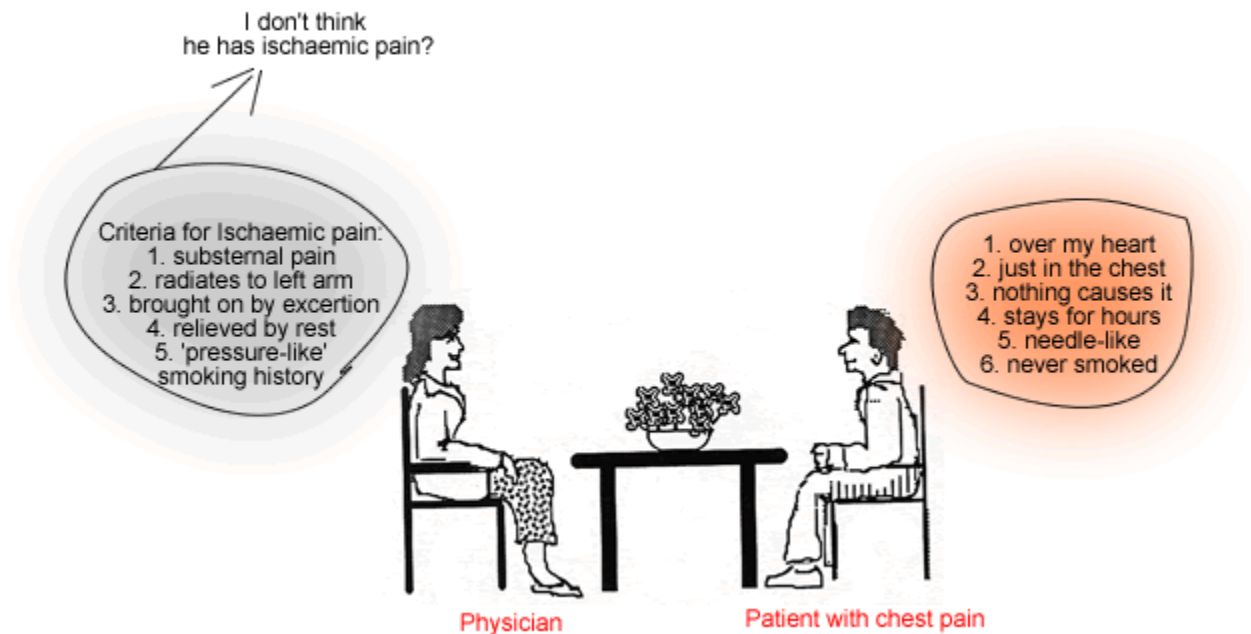
- Representativeness heuristic
- Availability heuristic
- Anchoring and Adjustment heuristic

Lets consider each of these in turn.

## 7.1 Representativeness heuristic

Sox defines this type of heuristic as being "A process by which the probability of an event is classified by how closely its essential features resemble features of the parent population" (p37). In other words how closely does the patient resemble the class of patients with disease X. Sox discusses how a physician diagnoses the possibility that a patient has chest pain by considering how 'representative the patient is to the ideal patient of that type; by thinking about key characteristics, listed below in the diagram.

A clinical using the representativeness heuristic (Sox 1988 p39)



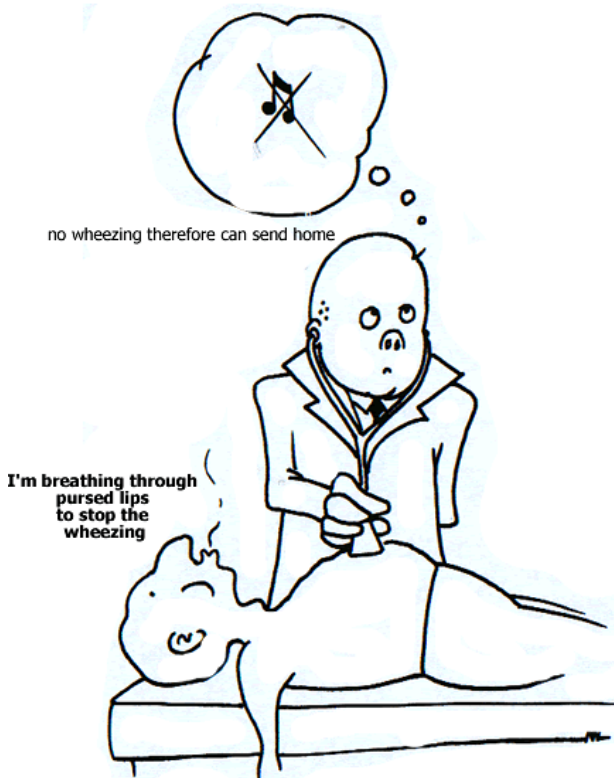
Sox also provides a list of questions, and errors, to consider when using the representativeness heuristic, each of these questions prevents the physician making errors:

- How good are the clues?
  - Are the clues independent
  - Is my experience wide enough?
  - What is the prior probability of disease?
  - Regression to the mean?
- (adapted from Sox 1988)

Lets consider each of these in turn.

### 7.1.1 How good are the clues?

Using clinical cues that do not accurately predict disease  
 (Sox 1988 p39)



"The clues that are used to decide if a patient's findings are representative of a disease are not necessarily all strongly predictive of the disease. Clues that make up the textbook description of a disease are sometimes absent in diseased persons and sometimes present in persons who do not have the disease. One of the marks of an excellent diagnostician is awareness of the frequency of these discrepant findings" (Sox p40).

For example the physician estimating the need for hospitalisation, notes that the patient has no audible wheezes, concluded that the episode should resolve without hospitalisation, and sends the patient home. The next day, the patient returns to the hospital in a moribund state and requires several days in hospital to recover.

Physician assumed that the absence of wheezing was a good exemplar of those type of asthmatic attacks that could cope at home. In fact, the degree of audible wheezing correlates poorly with disease severity in patients with acute asthma and does not predict a good clinical outcome. The physician was reassured when he heard no wheezing when he in fact should have been concerned (Sox 1988, p41).

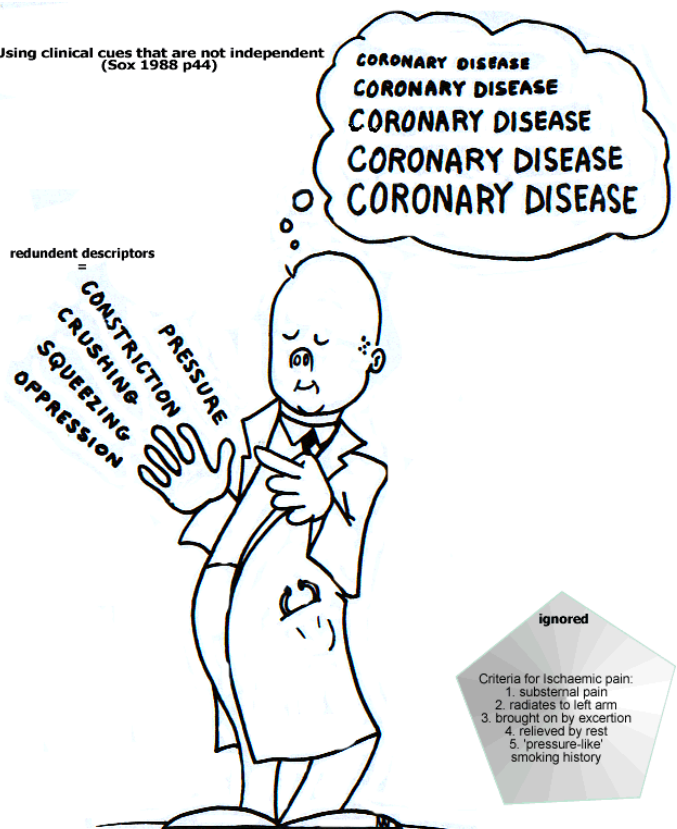
Within this question one can consider test results, particularly their specificity and sensitivity. Sometimes they add nothing to the diagnostic process whereas in others they may be extremely valuable.

### 7.1.2 Are the clues independent

Often several signs, 'classic predictors' appear together. If this is the case they should not necessarily be treated as independent symptoms. Sox provides the example of several descriptors of anginal pain (oppression, squeezing, crushing, constriction and pressure) as being wrongly classed as independent predictors of coronary artery disease whereas the correct ones are:

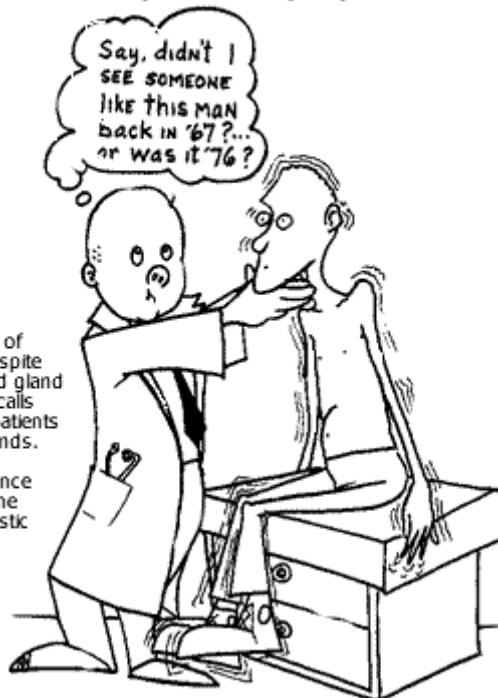
- Pain brought on by exertion and emotional stress
- Pain relieved promptly by rest or nitroglycerin
- Pain so severe that the patient had to stop everything when the pain occurred
- A history of smoking cigarettes for many years

Using clinical cues that are not independent  
 (Sox 1988 p44)



### 7.1.3 Is my experience wide enough?

**Comparing the patient to a small unrepresentative sample (Sox 1988 p48)**



The patient is suspected of having hyperthyroidism despite having a normal-sized thyroid gland because the physician recalls two previous hyperthyroid patients who had normal sized glands.

His small, atypical experience has led him to misuse the representativeness heuristic

There is always a danger that you are comparing the patient to an unrepresentative sample.

Another example of this type of problem is the physician who is constantly reading journals in which the reporting of rare conditions is common but is unable to place their incidence within the population in which she/he is in contact. In other words their academic 'virtual' population does not match their own experience.

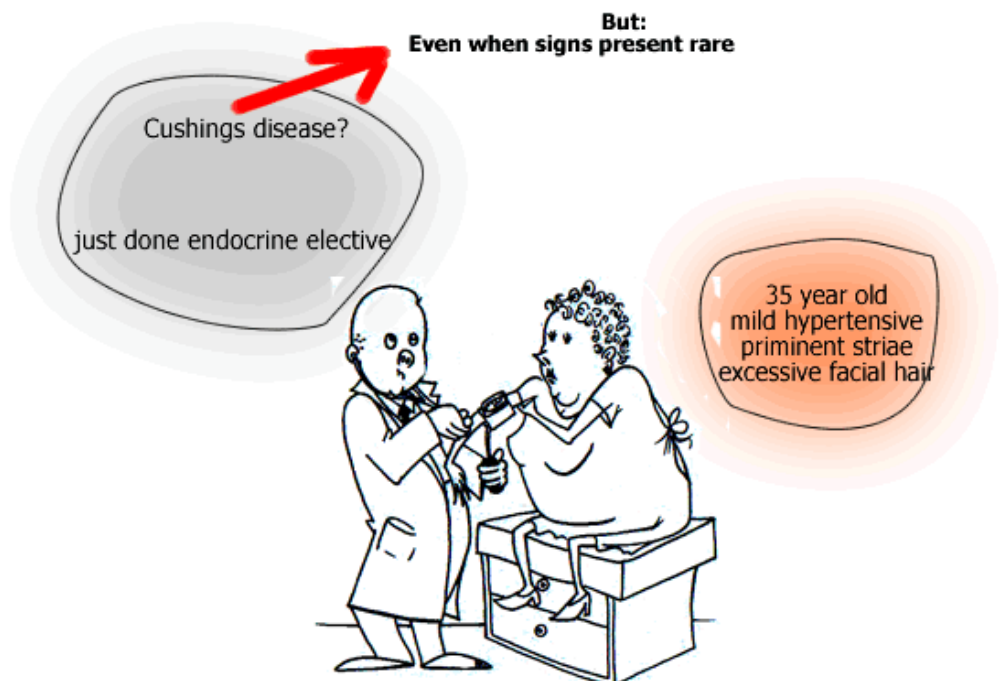
This leads to the next question one should consider.

### 7.1.4 What is the prior probability of disease?

The most important thing to remember is the prevalence of the disease being considered in a relevant parent population. Even if the patient has most of the characteristics of the disease if the disease is rare in the parent population the disease is unlikely.

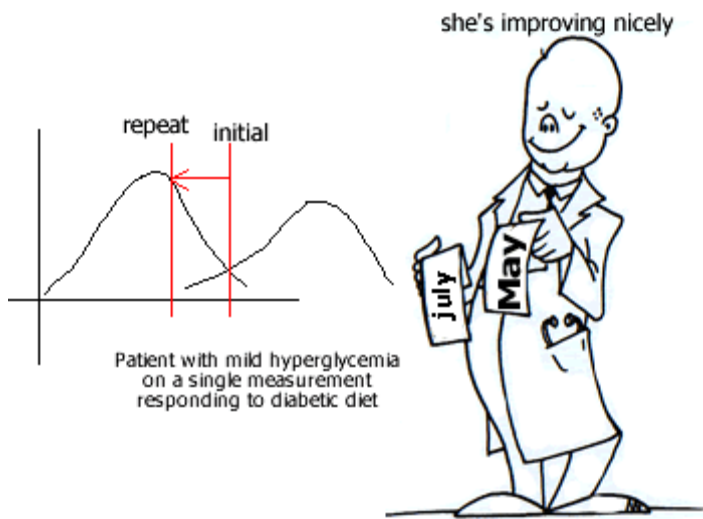
For example a physician who has just been attached to an endocrine department may over diagnose such conditions when returning to the more typical clientele of his general practice (Sox 1988, p41).

**Overestimating prevalence of a rare disease (Sox 1988 p41)**



### 7.1.5 Regression to the mean?

#### Problems with regression to the mean (Sox 1988 p45-46)

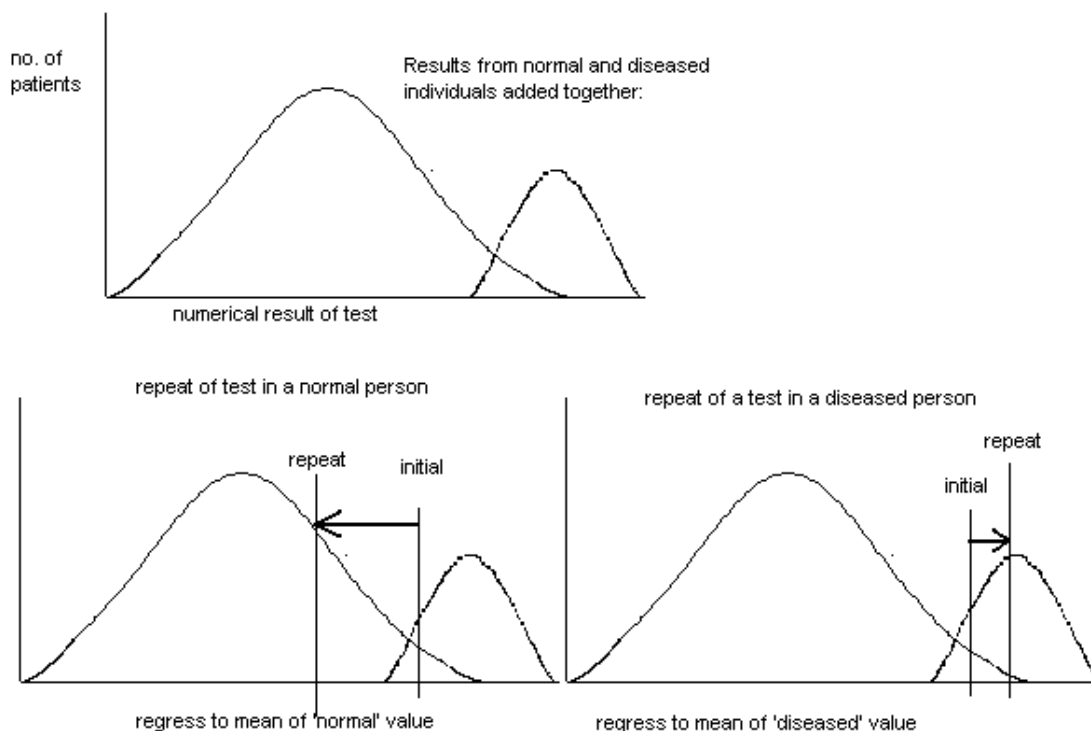


This is best explained by way of an example and some background information concerning test results. Consider a typical set of values for a test that involves measuring a concentration of some substance in the serum. The normal range is usually classed as the mean value  $\pm 2$  standard deviations from the mean. This allows 95% of values to be correctly categorised as normal values. Whereas 2.5% or 5% of the time the results will be 'false positives' dependent upon the decision to class all values outside of the normal range abnormal or those just on one side of it! The situation is shown in the diagram below:

The expression 'regression to the mean' indicates that if you obtain a result away from the mean value the next result is likely, by mere chance, to be nearer the mean value. Therefore for a normal

patient a low or high test value, if repeated, is likely to be nearer the mean for the normal range. Consider the above picture, a physician has taken two blood sugar readings, the initial one was high, so he placed the patient on a diabetic diet, then repeated the test where the second reading was closer to the normal value, so he incorrectly assumes the diet had worked – probably this was just chance variation.

Now lets consider the situation for an actual diseased patient, considering the example in the diagram above, a result which may be bordering on the normal if repeated is likely to be more abnormal (Sox 1988, p46). The situation is shown graphically in the diagram below:



This problem has been known for over a hundred years, and Wikipedia provides an excellent review, [http://en.wikipedia.org/wiki/Regression\\_toward\\_the\\_mean](http://en.wikipedia.org/wiki/Regression_toward_the_mean) Having considered the questions one should ask when wondering how typical ('representative') a patient is of a particular condition we will now briefly consider the two other types of heuristics Sox describes.

## 7.2 Availability heuristic

Sox 1988 uses this term to describe the reliance on 'ease of remembering' previous patients. Clearly this has dangers as the ease of remembering something is related to how recent the event was along with its vividness and context. Seeing a rare case recently can often deflect sensible diagnoses for some time!

## 7.3 Anchoring and Adjustment heuristic

The last type of heuristic that Sox describes is that of making an initial assessment (the anchor in Sox's terminology) and then arriving at a final estimate by adjusting to take into account the individual features of the patient. He presents the following dangers of using this approach:

- People set the anchor incorrectly "Psychological experiments have shown that people's initial probability estimates tend to be too extreme [in very little doubt], either too close to 1 (absolutely certain) or too close to 0 (could never happen).
- People do not adjust their estimates enough when new information becomes available. Basically people dislike changing their minds.

## 7.4 Other Important characteristics of pattern recognition

The above discussion has brought out some of the characteristics of pattern recognition. In addition to those mentioned above a very important one is that of retrieval of patterns from

### Incomplete Data

Expert clinicians often make diagnoses using incomplete data. Filling in the missing data based upon the data available. This clearly has important implications for computer systems.

Other points to remember are listed below.

#### Key points of pattern recognition:

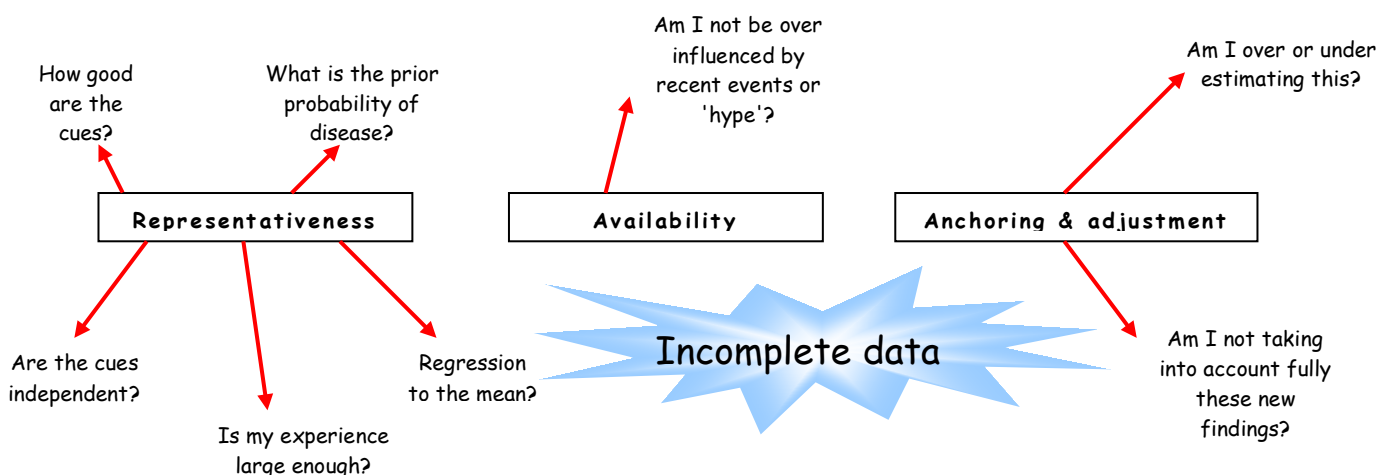
Pattern recognition deals with incomplete data

Most of these processes are unconscious.

The pattern recognition phase is carried out after some type of classification process.

Gradually more patterns are build up - discrimination is increased

The result may not be statistically or logically valid



**Exercise 5.**

Looking at the above summary diagram on the last page redraw it but add your own comments to help you remember the main points

**8. The variability and inaccuracy of medical data**

Anthony Komaroff produced a paper many years ago in 1979 with the above title presenting details of various research findings. He considered the interaction between the doctor and patient as a feedback loop each influencing the other by both verbal and non verbal clues. Variability was considered within the following five areas:

- The medical history
- The physical examination
- Defining the disease.
- Interpretation of pathological data
- Disease definition in the absence of pathological data

Tables of the main findings for each of these areas are presented below:

**1. Variability in the medical history:**

Issue:	Research findings
Patients description of illness	Verbally asking 192 men if they were circumcised demonstrated that 34.6% gave wrong answers when examined. 80% of mothers whose children had developed complications after birth where unaware of the fact. Cultural differences.
Clinicians selection of questions to ask	Motivation bias - Doctors tend to attempt to prove initial hypothesis, disregard conflicting information. Cognitive limitations - these have been discussed in the previous section concerning Sox's work. Situation factors - pressure of work, exhaustion. Borderline results.
Psychological barriers to accurate information	Patients may be too terrified to mention real illness (e.g. VD). 'Ticket of admission for patient' Parents have been found to greatly exaggerate the description of their children's illnesses, in order to convince the surgeon that a tonsillectomy was needed.

(references provided in Komaroff 1979)

**2. Variability in physical examination:**

Issue:	Research findings
Dorsalis pedis pulse	69% agreement
Liver enlarged	54% agreement
Heart enlarged	94% agreement
ECG normal, possibly abnormal, abnormal	84% agreement
Pyelonephritis on kidney X-ray	80% agreement

(references provided in Komaroff 1979)

**3. Variability in defining the disease.**

A disease is often based upon the medical knowledge and diagnostic tests available at one particular point in time. Diseases such as, hysterical paralysis, saint Vitus's dance and neuroasthenia have disappeared being replaced by more specific diseases.

**4. Variability in interpretation of pathological data**

Pathological examination of possible lymph node tissue for Hodgkin's disease only had 54% agreement in 358 cases. Even more worrying when pathologists were asked to interpret the same tissue on two occasions they only agreed in 28% of cases.

**5. Variability in the absence of pathological data**

If direct pathological data is not available the variability of diagnosis is often based upon locally defined criteria which vary from place to place.

## 8.1 Approaches to reducing variability

Komaroff 1979 suggests several strategies for reducing the variability described above:

### **Pre-definition of terms**

#### **Meticulous attention to data collection:**

Questionnaires

Computerised check lists (shown to be more complete and less variable)

Use of technology to provide more accurate data collection (e.g. pulsometer, electronic thermometer etc.)

Komaroff 1979 does not really consider the problems that are due to the patient such as inadequate or incorrect problem definition. In more recent years attempts have been made to tackle these problems including those to develop participative, or 'patient centred' approaches to consultation, such as the expert patient discussed in the previous chapter. Most of these approaches include a large element of patient education.

We will now move into the stage in the consultation where the health care professional has decided upon a diagnosis, or possibly just a 'working diagnosis, and then decides to tell the patient and starts to consider a course of action, what Bryne & Long 1976 call the 'prescribing' phase.



## 9. Treatment

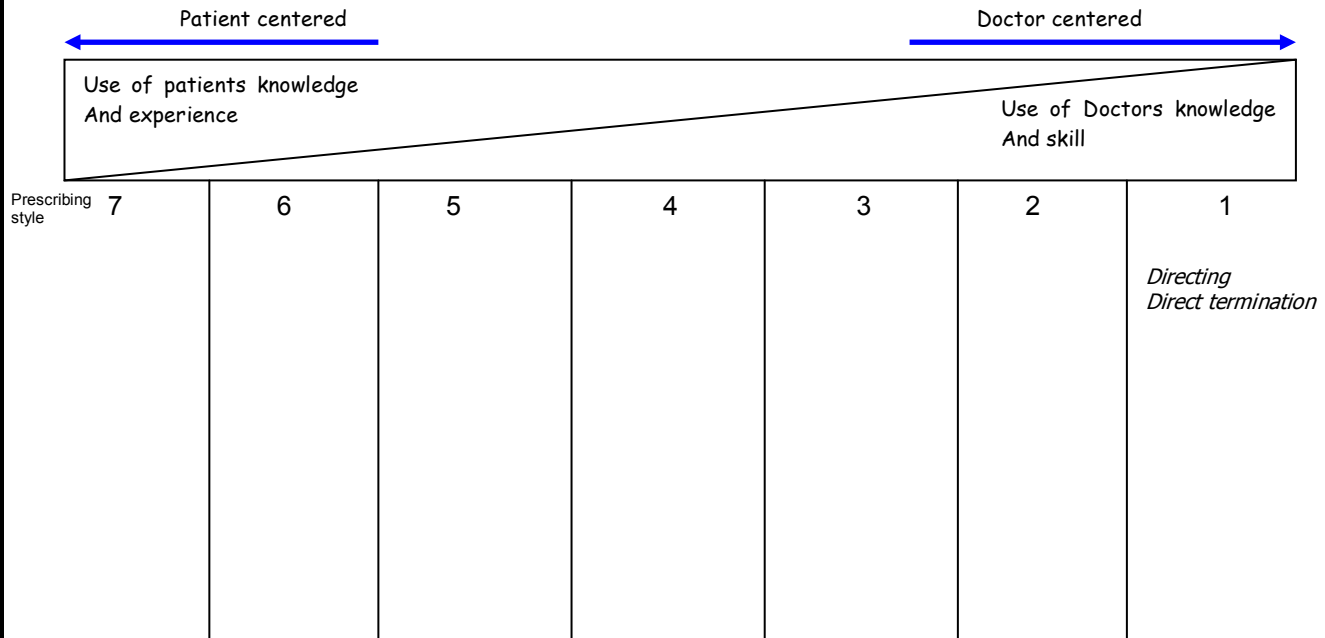
Byrne & Long 1976 devote a whole chapter to the various approaches taken by UK GP's to delivering a diagnosis and treatment (they called it 'prescribing') to patients. They identified seven different styles, on a continuum from being extremely doctor centred to patient centred, they were:

'Prescribing' styles (Byrne & Long 1976 p106)	Incidence in sample ('2000+' p106) N= 1,965 (but some consultations in more than one category)	Example	Additional information	Typical behaviours (definitions & details provided in Byrne & Long 1976)
The doctor makes a decision about the patient and his treatment and then instructs the patient to seek some service. [Style 1]	<b>624</b>	"I want you to take these tablets and come back in two weeks, Bye-bye"	Notice no mention of a diagnosis	Directing Direct termination
The doctor makes his decision and announces it. [Style 2]	<b>680</b>	"This is a infection of the lung. I want you to go upstairs and have an X-ray now. When you have had that come back here and I will detail the treatment"		Giving information Directing Terminating
The doctor sells his decision to the patient. [Style 3]	57 on its own 70 as a back up strategy <b>=127</b>	Now then, I would like you to take this to the chemist. . . .don't worry it is no more serious than last time . . .right them of you go. Cheeribye"	Diagnosis, treatment and reassurance	Giving information Directing Reassuring Seeking patient ideas (but not using them) Direct Termination
The doctor presents a tentative decision subject to change. [Style 4]	<b>279</b>	". . .I think you need a long rest. Now then, how do you think you can cope with that?"  After discussion length and time of rest agreed.	Diagnosis, treatment and mutual understanding.  Danger of 'I will if you will' game (p108).	Giving information or opinion Directing Advising Answering patient questions Reassuring Seeking patient ideas. Indicating understanding Using patient ideas
The doctor presents the problems, seeks suggestions and makes decisions. [Style 5]	<b>159</b>	Similar to the previous style but the doctor directs the patient to come up with suggestions which he takes up.		Giving information or opinion Advising Clarifying Reflecting Exploring Seeking patient ideas Using patient ideas Offering collaboration Terminating (indirect)
The doctor defines the limits and requests the patient to make a decision. [Style 6]	35 primary strategy 39 secondary strategy after failing with styles 1 and 2 <b>=74</b>	". . .this condition is no more than a simple appendicitis. It can be quickly treated by surgery, although at this stage that is not the best possible answer. I can also treat you at home with some drugs. This treatment will take a short time if you rest. If you have to keep working then the treatment will take rather longer, and may not be so effective. The choice is yours."  ". . . .Well you know medical opinion can be a terribly fickle thing. Years ago we would have had it out by now . . .Given what you have , I don't think I would advice an operation . . ."		Giving information Answering patient questions Seeking patient ideas Using patient ideas Summarising to open up Pre-directional probing (i.e. If I said X how would you react?)
The doctor permits the patient to make his own decision. [Style 7]	<b>22</b>	". . . what I want you to think about is what we should do next . . ."	Doctors have very different opinions about this style, as a treatment for hypochondriacs [negative attitude] or when they face a an emotional problem and do not know what to do about it [more positive attitude]	Reflecting Encouraging Seeking patient ideas Using patient ideas

While the research of Bryne & Long, 1976 is old nothing on this scale has been repeated and certainly nothing with such rigor in the nurse practitioner or other health care group that has taken on the role of undertaking consultations. This is a great shame as one would like to think things have moved on towards a more patient centred approach.

**Exercise 6.**

Bryne and Long 1976 represent the seven above styles in the form of a table like the one below; please complete it indicating the typical behaviours for each prescribing style. The behaviours for style 1 are completed to give you a start.



**Exercise 7.**

For your particular type of consultation which of the above prescribing styles do you think is the most appropriate? Provide reasons.

**Exercise 8.**

Why do you think some doctors had a negative attitude to prescribing style 7?  
 Can you think of any ways this attitude might be modified and do you think it is still the case?

The above description of how doctors describe various treatment strategies to patients is fascinating and I recommend anyone to read Bryne & Long's 1976 report although it is an academic paper it is written in such a manner as to be extremely exciting at times.

Often the end point of a consultation is the recording of the consultation in the medical notes and the giving of a prescription both of which we will now turn to in more detail. I have not forgotten that the computer, and other none face to face interactions such as e-mail and the telephone, plays an increasingly important part to both these processes but have investigated that in another chapter in this series.

## 9.1 The written prescription

Richard Shader and David M. Benjamin at the Department of Pharmacology and Experimental Therapeutics, Tufts University School of Medicine have produced a excellent PowerPoint slide show discussing good and bad prescriptions at [www.tufts.edu/med/curriculum/RXslides.ppt](http://www.tufts.edu/med/curriculum/RXslides.ppt) which unfortunately is no longer available. As an alternative I am using the onthepharm site.

### Exercise 9.

Please work through the prescriptions and comments at:

<http://onthepharm.net/2007/03/can-you-read-these-prescriptions.html>

<http://onthepharm.net/2007/05/doctors-handwriting-prescriptions.html#comment-78055>

The American Medical Association, at its annual meeting in 1994, recommended the following ways to make prescription writing clearer [http://www.fda.gov/fdac/features/695\\_prescrip.html](http://www.fda.gov/fdac/features/695_prescrip.html).

- If handwriting is illegible, use a computerized medication order system, if available. Otherwise, print or type prescriptions.
- Write out instructions rather than use ambiguous abbreviations. (For example, write "daily" rather than "qd," an abbreviated Latin term for "every day," which could be misinterpreted as "qid," meaning "4 times a day," or "od," meaning "right eye.")
- Avoid vague instructions, such as "take as directed."
- Use the USAN-approved generic drug name, official name, or trademarked name if a specific product is required, rather than a locally coined name or non-established abbreviated drug name. (For example, use "didanosine," the generic name of an AIDS drug, or its trade name, "Videx," instead of the abbreviation "DDI." USAN stands for United States Adopted Names, a non-proprietary designation for any compound used as a drug, established by negotiation between the manufacturer and the USAN Council.)
- Avoid apothecary or chemical symbols, such as "K," the chemical symbol for potassium.
- Use a leading "0" in decimals expressing less than one, as in "0.5 mL" (milliliter), but never an ending "0," as in "5.0 mL."
- Avoid decimals when possible. (For example, prescribe "500 mg" [milligrams], rather than "0.5 g" [grams].)
- Spell out the word "units" rather than write "u."
- Use the metric system.

In the Richard Shader and David Benjamin PowerPoint presentation they mentioned that prescription errors were reduced by about 50% if the process of writing a prescription was computerised (also see Gandhi, Weingart and Seger et al. 2005). More information about this can be found in the clinical decision support systems (CDSS) chapter. Another, less high tech, way of improving the writing of prescriptions is to develop a good paper template that has clearly defined sections and a logical layout.

## Exercise 10.

If you are a health care professional whose professional role involves either writing or dispensing prescriptions attempt to collect several different varieties of empty prescription sheets (not blank prescription pads from a GP this is illegal). Compare each of them and see what characteristics you prefer.

### Hospital pharmacists two case studies:

#### Case study one

Mr Mahmud Ali was prescribed drug x. The pharmacist phoned the prescribing physician to query the use of that particular drug, but the physician said it was what the patient required. Mr Ali subsequently died from an overdose of the medication.

There was no record in Mr Ali's notes that the pharmacist had questioned the prescription and indeed that the physician refused to change the drug.

#### Case study two

Mrs Green, an in-patient, was prescribed 100mg of drug z four times a day. The maximum dose for the drug was 100mg each day. The pharmacist queried the dose and was told by the doctor that the blood levels had been checked that day so it would be acceptable to carry out the prescription.

Mrs Green suffered a cardiac arrest and in the ensuing debate, the doctor stated that he had only requested the drug once a day. The absence of any written records meant the difference in views was one professional's word against another's.

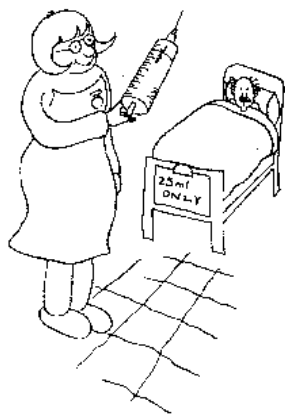
The above case studies were taken from the NHS Personal Health Record guide (IMG 1996).

## Exercise 11.

Considering the above case studies ask yourself:

1. What might the pharmacist have done differently in each case?
2. How might the hospital's system need to be strengthened to avoid such a recurrence?

Considering question 1 since, normally speaking, pharmacists do not write in the medical notes, the pharmacist could have written a formal letter to the senior pharmacist, which might have served as evidence that the prescription had been questioned.



Considering question 2 hospital pharmacists could record their interventions in the patient's medical notes. Doctors and pharmacists work more closely in initial prescribing practice.

There should be clearer understanding of each professional's level of responsibility and accountability in the case of each episode of patient interaction and care and use of clinical guidelines.

For another side of the coin read the article Do hospital pharmacists provide a seasonal safety net for junior doctors? by Zol Gross (The Pharmaceutical Journal vol 269 10th August 2002 p186) at: [http://www.pharmj.com/pdf/news/pj\\_20020810\\_safetynet.pdf](http://www.pharmj.com/pdf/news/pj_20020810_safetynet.pdf)

The huge cost to the NHS of prescribing errors and drug wastage in hospitals should not be underestimated. The audit commissions report entitled "A spoonful of sugar" makes frightening reading at times, see: <http://www.audit-commission.gov.uk/nationalstudies/health/other/Pages/aspoonfulofsugar.aspx>

You will need to register (free) with the above journal to be able to access the articles.

## 9.1.1 Compliance and concordance

While most healthcare professionals believe that their job is done once the patient has been prescribed a treatment, this is not really the best situation given the fact that a large percentage of patients do not take their medications, to help reinforce the idea that it is a joint process the term 'concordance' has been suggested rather than the more passive 'compliance' term.

Below is given some references and debate about these terms, I would suggest that you start by reading the original article, which can also be found at the link below.

Article **Prescribing and taking medicines** BMJ 2003; 327: 819

Rapid response: No concordance on concordance 10 October 2003

from <http://bmj.bmjournals.com/cgi/eletters/327/7419/819#38886>

The recent editorials on concordance (1,2) imply that the concept has not been widely accepted by the healthcare community and identify important conflicts in the theory. From my experience, concordance appears to be little understood outside of the United Kingdom and frequently misunderstood within. It is often spoken of as if synonymous with the terms adherence and compliance when it is supposed to "define the process of successful prescribing and medicine taking, based on partnership"(3). Most of us can accept the transition from a paternalistic model for the health provider-patient relationship to one more of partnership, whether of equal or contractual partners. This shows respect for the patient's rights, experiences and responsibility for their own health as well as recognizing changes in society and the availability of health information. However, concordance requires that a joint agreement is reached on the approach which is going to be followed (3,4). This raises legal and ethical issues, as intimated by Jones (1), should a suboptimal regimen be proposed as this requires redefinition or complete abrogation of professional responsibilities. Since concordance also has the ultimate aim of optimizing the potential of medical care essentially through improved treatment adherence (3) it also give the impression of trying to manipulate the patient to achieve 'a priori' health objectives. Is the emphasis on respect and responsibility of the individual or on what the public health system should be achieving? Partnership is not a new model – what is new in concordance is saying that it is the right approach to use for every patient and that the reason for it is to improve health outcomes. As health professionals we must act appropriately from within our knowledge base and the authority which society accords us, while recognizing the rights and views of our clients. Ultimately the patient takes responsibility for his/her own health and we must learn to accept that – this is the attitude which needs changing.

### References

1. Jones G. Prescribing and taking medicines BMJ 2003;327:819.
2. Ferner R. Is concordance the primrose path to health? BMJ 2003; 327: 821-822
3. Medicines Partnership. What is concordance? <http://www.medicines-partnership.org/about-us/concordance> [accessed 20 October 2003]
4. Concordance Co-ordinating Group. Concordance—partnership in medicine taking, information pack. London: Royal Pharmaceutical Society of Great Britain, 2000.

Rapid response: Reviews on concordance 27 October 2003

We welcome the airing of issues on concordance. However, we wish to expand the definition of concordance used in the articles. In our recent review of the literature on adherence to medication (1) we emphasised the need for shared, informed decision making as a necessary component of concordance. Thus, although we agree with Jones (2) that the health professional needs to give the patient information, and therefore needs to have skills in doing that, we fully endorse Heath (3) in saying that s/he also needs the skills to generate a shared decision. This requires exploration of the patient's feelings and beliefs about their treatment options and choices, as well as negotiation. We therefore suggest that any skills training towards concordance in prescribing should also include these aspects.

A further issue was raised in our minds, by the papers on concordance. The references cited in these papers do not appear to include any papers which appear listed in EmBase but not listed in Medline. In a current Cochrane review on adherence to treatment recommendation for type 2 diabetes, (4) we have found that more than 85% of the included studies were not found in Medline but were found in EmBase. It is possible this could have led to some bias in the interpretation of the literature.

1. Vermeire E, Hearnshaw H.M., Van Royen P, Denekens J, Patient adherence to treatment: three decades of research. A comprehensive review. J Clinical Pharmacy and Therapeutics, 2001;(5):331-342.
2. Jones G, Prescribing and taking medicines, BMJ 2003;327:819-20.
3. Heath I, A wolf in sheep's clothing: a critical look at the ethics of drug taking, BMJ 2003;327:856-8.
4. Vermeire E, Wens J, Van Royen P, Hearnshaw H, Interventions for improving adherence to treatment recommendations in people with type 2 diabetes mellitus (protocol for a Cochrane review). In: The Cochrane Library, Issue 2, 2002. Oxford: Update Software

## 10. The medical record

*"Good records safeguard your patients / clients and yourself"*

Medical records come in many different varieties, some of which are listed below. As you can see from the list there are many separate chapters containing partial information about the patient. Because this seems so illogical and to the untried eye such a mess several projects have attempted to integrate these, barely more than scraps of paper, into a coherent whole. Unfortunately this has met with varying degrees of success. More detailed qualitative research has suggested that these disparate collections may serve a purpose and that superficial rationalisation may remove some of the richness of the original method, fortunately no one would disagree that the traditional method, involving a bundle of papers is not working (see Audit commission 1995, 1999). Alternatives / enhancements such as integrated medical records, clinical management plans, patient encounter forms, computerised records, Care pathways etc. have all been met with different degrees of success. We will look at three, patient encounter forms, Clinical management plans and care pathways but first lets quickly look at some of the problems of traditional medical records.

### Some examples of health records:

- Medical histories
- Initial assessments/examinations
- Care or treatment plans
- Triage
- Progress notes
- Outpatient correspondence
- Prescriptions
- Blood results
- Drug charts
- TPR charts
- Accident/incident forms
- Discharge summaries
- Transfer records
- Referrals
- Lloyd George envelopes
- Child health records
- Health visitors' diaries

Source: IMG 1996

### Some Descriptors of poor of records:

- Ineffective
- Illegible
- Inaccurate
- Incomprehensible
- Inconsistent
- Irrelevant
- Inappropriate
- Incomplete
- Unreliable
- Rambling

### Good characteristics of medical records:

- Accurate
- Concise
- Complete
- Efficient (record it once concisely)
- Effective (clarity)
- Contemporaneous (do it now, logical progression)

Over the last few years the UK NHS has been involved in the largest IT project in the world (there is even a book with this title about it) in an attempt to develop a electronic health care record, most would now (July 2009) admit that this has been a failure, with the main deliverable not materialising. The topic of the electronic health care record will be discussed elsewhere.

### Exercise 12.

Some problems for you to think about:

You fail to record that a client is HIV positive?

Someone steals your car overnight, complete with client records from the previous day?

The numerous problems associated with medical records is frightening, you have issues concerned with care, confidentiality and quality all need to be considered. The greatest problem with medical records is their quality, of often lack of it!

### Communication problems and medical records an aside

Dr X, a senior partner in a GP practice, was supervising Dr Schon, a GP trainee. During a round at the local GP-run community hospital, the two doctors discussed the medication for several patients.

Dr Fisher was called away, leaving Dr Schon to change the prescription sheets accordingly. On reading his notes, he noticed that Tribufen had been prescribed for one of the patients. Despite a lengthy search in the BNF and Mins, he couldn't find Tribufen or recommended doses.

When he asked Dr Fisher about it later, it transpired that she had in fact suggested 'try Brufen'!

From IMG 1996

Research suggests that patient-held records are less likely to be lost than hospital records. But this has implications for the content of such records (see IMG 1996).

The use of inappropriate abbreviations and insensitive derogatory comments in medical notes is often a source of amusement. A article in the BMJ (Dobson, 2003) discussed the use of slang and gave examples of where inappropriate abbreviations would be misinterpreted to mean something more important, for example, GOK, or "God only knows," could, when written in the notes, be confused with the more conventional abbreviation GOR, or gastro-oesophageal reflux (<http://bmj.com/cgi/content/full/327/7411/360-f>).

While it is now acceptable for patients to have access to their medical records except in some rare exceptions, access to medical records is otherwise rightly strictly limited. However, the development of supplementary prescribers in the UK has presented problems concerning access to medical records, which the Pharmaceutical journal has discussed in detail in a series of articles published in June to August 2003. If you are a supplementary prescriber I recommend that you read these excellent articles by Kenneth Mullan at:

[http://www.pharmj.com/pdf/articles/pj\\_20030628\\_supplementaryprescribing1.pdf](http://www.pharmj.com/pdf/articles/pj_20030628_supplementaryprescribing1.pdf)

[http://www.pharmj.com/pdf/articles/pj\\_20030705\\_supplementaryprescribing2.pdf](http://www.pharmj.com/pdf/articles/pj_20030705_supplementaryprescribing2.pdf)

## 10.1 Patient encounter forms

This is a way of obtaining detailed structured data from a consultation. Please look at the following PEFs (see next page), it was designed for collecting information from a clinic for pregnant diabetics.

Notice the following:

- Use of sub-headings
- Multiple entry boxes for some items
- Tips for collecting data
- Positioning of data on the page:
  - **General:** You may not realise it, but the presentation of the information on the form mimics the way most of the physicians naturally collect the data during the consultation within the particular department where the forms were developed.

**Outer edge** for test results for the review form. The test results are placed on the outer edge so that clinicians can easily browse through the forms and compare results.

**Booking form for Pregnancy Diabetes Database**

To be filled in after entering data into computer. Important: Always check first to see if patient is on database.

Computer id (=clientid)

Names in brackets '()' refer usually to database field names.

Pregnancy id (=pregid)

**First visit**

**First name**  **Surname**   
**Occupation**  **Hospital number (ID)**   
**DOB**  **Source (ring one)** NDC=1 Other DC=2 IUT=3  
 Other =4 Not known=5  
**Pre-pregnancy Diabetes Consultant**   
**Diabetes Consultant ( during pregnancy)**   
**Consultant Obstetrician**  **Date seen**

**Obstetric Data**

**Previous pregs (number)**  **LMP (date)**   
**Previous live births (number)**  **Gestation at booking (weeks)**   
**Stillborns post 24 weeks (number)**  **Estimated Deliv. Date**   
**Miscarriages (number)**  **Estimated Deliv. Date by scan**

Infertility treatment (ring one) Yes No

Fetus:	Gestation at Fetal echo <input type="text"/>	Gestation at anomaly Scan (weeks) <input type="text"/>
1	Fetal heart at fetal echo (ring one) Normal=1 Abnormal=2	Structure (ring one) Normal=1 Abnormal=2 Type of abnormality (ring one) Cardiac=1 GI=2 CNS=3 Skeletal=4 Other=5
2	Fetal heart at fetal echo (ring one) Normal=1 Abnormal=2	Structure (ring one) Normal=1 Abnormal=2 Type of abnormality (ring one) Cardiac=1 GI=2 CNS=3 Skeletal=4 Other=5
3	Fetal heart at fetal echo (ring one) Normal=1 Abnormal=2	Structure (ring one) Normal=1 Abnormal=2 Type of abnormality (ring one) Cardiac=1 GI=2 CNS=3 Skeletal=4 Other=5

**Diabetes Data**

**DATE of onset of Diabetes (Year if exact date not known)**   
**Type of Diabetes Mellitus (ring one)** Type 1 pre-pregnancy=1; Type 2 pre-pregnancy=2; Diabetes diagnosed during pregnancy=3  
**Eye complications (ring one)** None=1; Early NPDR =2; Mod NPDR=3; Severe NPDR=4; Proliferative=5; Maculopathy=6; Other=7  
**Renal problems (ring one)** None=1; Microalbuminuria=2; Proteinuria=3; Abnormal creatinine=4; Other=5  
**Other medical problems (ring one)** None=1; Cardiac=2; Respiratory=3; CNS=4; GI=5; Multiple=6; Other=7  
**Contraception (ring one)** None=1 COCP =2 POP=3 IUCD=4 Barrier=5 Depo=6 Other=7 **Cigs per day (number)**

**Pre-Pregnancy Data**

Data set completed for pregnancy (completed) To be filled in at end of visits following delivery

Yes No

**Other (optional):**   
**HbA1c**   
**Date of observation:**   
**Pre-preg. advice given** Yes No  
**Systolic BP**   
**Diastolic BP**   
**Date of observation:**

**Insulin**  
**name:** (Units) short Intermediate (int)  
 am    
 noon    
 pm    
 bed    
**Date of observation:**

**Comments**



## 10.2 Clinical management plans (CMP)

*This section is written for those who are Independent or Supplementary Prescribers in the NHS*

The Department of Health has adopted the term Clinical Management Plan to (CMP) to specify a particular type of patient encounter form with the following characteristics:

"The Clinical Management Plan is the foundation stone of supplementary prescribing. Before supplementary prescribing can take place, it is obligatory for an agreed CMP to be in place (written or electronic) relating to a named patient and to that patient's specific condition(s) to be managed by the supplementary prescriber. This should be included in the patient record.

Regulations specify that the CMP must include the following:

- The name of the patient to whom the plan relates;
- The illness or conditions which may be treated by the supplementary prescriber;
- The date on which the plan is to take effect, and when it is to be reviewed by the doctor or dentist who is party to the plan;
- Reference to the class or description of medicines or types of appliances which may be prescribed or administered under the plan;
- Any restrictions or limitations as to the strength or dose of any medicine which may be prescribed or administered under the plan, and any period of administration or use of any medicine or appliance which may be prescribed or administered under the plan;  
**[NB The CMP may include a reference to published national or local guidelines. However these must *clearly* identify the range of the relevant medicinal products to be used in the treatment of the patient, and the CMP should draw attention to the relevant part of the guideline. Any guideline referred to also needs to be easily accessible]**
- Relevant warnings about known sensitivities of the patient to, or known difficulties of the patient with, particular medicines or appliances;
- The arrangements for notification of:-
  - a) Suspected or known reactions to any medicine which may be prescribed or administered under the plan, and suspected or known adverse reactions to any other medicine taken at the same time as any medicine prescribed or administered under the plan, and
  - b) Incidents occurring with the appliance which might lead, might have led or has led to the death or serious deterioration of state of health of the patient
- The circumstances in which the supplementary prescriber should refer to, or seek the advice of, the doctor or dentist who is party to the plan. "

Based on: [http://www.dh.gov.uk/en/Healthcare/Medicinespharmacyandindustry/Prescriptions/TheNon-MedicalPrescribingProgramme/Supplementaryprescribing/DH\\_4123030](http://www.dh.gov.uk/en/Healthcare/Medicinespharmacyandindustry/Prescriptions/TheNon-MedicalPrescribingProgramme/Supplementaryprescribing/DH_4123030),

### Exercise 13.

If you are an Independent or supplementary prescriber, attempt to design a form that would include the above characteristics.

The DoH web site (see the front of this chapter for details) provides two templates for possible CMP's, one for where the Independent prescriber (IP) (a doctor or Dentist) and Supplementary Prescriber (SP) have joint access to the medical record and the second situation where they may use different records. You can see them both on the following pages.

## CMP for teams that have full co-terminus access to patient records

Name of Patient:		Patient medication sensitivities/allergies:		
Patient identification e.g. ID number, date of birth:				
Independent Prescriber(s):		Supplementary Prescriber(s)		
Condition(s) to be treated		Aim of treatment		
Medicines that may be prescribed by SP:				
Preparation	Indication	Dose schedule	Specific indications for referral back to the IP	
Guidelines or protocols supporting Clinical Management Plan:				
Frequency of review and monitoring by:				
Supplementary prescriber	Supplementary prescriber and independent prescriber			
Process for reporting ADRs:				
Shared record to be used by IP and SP:				
Agreed by independent prescriber(s)	Date	Agreed by supplementary prescriber(s)	Date	Date agreed with patient/carer

**CMP for teams where the SP does not have co-terminus access to the medical record**

Name of Patient:		Patient medication sensitivities/allergies:		
Patient identification e.g. ID number, date of birth:				
Current medication:		Medical history:		
Independent Prescriber(s):  Contact details: [tel/email/address]		Supplementary prescriber(s):  Contact details: [tel/email/address]		
Condition(s) to be treated:		Aim of treatment:		
Medicines that may be prescribed by SP:				
Preparation	Indication	Dose schedule	Specific indications for referral back to the IP	
Guidelines or protocols supporting Clinical Management Plan:				
Frequency of review and monitoring by:				
Supplementary prescriber		Supplementary prescriber and independent prescriber		
Process for reporting ADRs:				
Shared record to be used by IP and SP:				
Agreed by independent prescriber(s):	Date	Agreed by supplementary prescriber(s):	Date	Date agreed with patient/carer

The above two CMP templates are rather basic and I am sure IP working with SP's will develop detailed CMP's for specific chronic conditions, It would be nice to see the DoH site become a repository for such templates, unfortunately they will probably become too concerned with detailed issues such as academic rigor to make the possibility become reality, however having said this the next section investigating care pathways suggests that there is some grounds for hope.

The DoH sites' FAQ (**F**requently **A**sken **Q**uestions) section has two relevant questions about the legal importance of the CMP:

**Q: What is the legal position if a supplementary prescriber prescribes outside the Clinical Management Plan?**

A: If a supplementary prescriber prescribes a Prescription Only Medicine outside a Clinical Management Plan they will be acting illegally under the terms of the Prescription Only Medicines Order, and could be subject to sanctions under the Medicines Act.

If something other than a Prescription Only Medicine is involved, supplementary prescribers have a dual accountability:

- to their employer
- to their statutory regulatory body, the Nursing and Midwifery Council (NMC) or the Royal Pharmaceutical Society of Great Britain (RPSGB).

A supplementary prescriber who prescribes a non-POM without the agreement of a Clinical Management Plan could potentially be subject both to:

- disciplinary proceedings by their employer
- action by the regulatory body should a charge of professional misconduct follow.

**Q: Who will be responsible for the periodic reviews of the Clinical management Plan?**

A: The supplementary prescribing guidance clearly states that the patient needs to be reviewed by the independent prescriber after the interval stated in the Clinical Management Plan. This may be yearly, but in many cases will be less than this, and may occasionally, if the patient's condition is very stable, be longer than this.

The guidance states that 'ideally' the review should be carried out by both prescribers, but recognises that this may not be possible. What is essential is that the patient is reviewed by the independent prescriber, and that, at the time or afterwards, the CMP for the period before the next review is agreed by the independent prescriber, the supplementary prescriber and the patient, so that supplementary prescribing may continue. How this happens is a matter for local circumstances and local decision, as it will clearly differ depending on the working arrangements of the prescribing partners.

From: [http://www.dh.gov.uk/en/Healthcare/Medicinespharmacyandindustry/Prescriptions/TheNon-MedicalPrescribingProgramme/Supplementaryprescribing/DH\\_4123034](http://www.dh.gov.uk/en/Healthcare/Medicinespharmacyandindustry/Prescriptions/TheNon-MedicalPrescribingProgramme/Supplementaryprescribing/DH_4123034)

The development of individualised CMPs for patients was a large task and several organisations expressed concern about this aspect these are some comments from 2003 when they were first suggested, it is now nearly 10 years on - would you say attitudes have changed?

The **Dispensing Doctors Association** had numerous concerns [NB: not detailed] and objected to the proposals in primary care settings. The Association felt the requirement to produce individual clinical management plans is an awesome task and can't see how this will save time for the IP-er.

Requirement for good communication channels only practicable for health professionals working from the same premises. Sharing and updating the patient record will be problematical. There are also accountability issues and profound budgetary implications. Put forward their views on delegation of repeat dispensing which they feel should be a more attractive solution to the workload issue.

**The Royal College of Physicians – Edinburgh-** considers that proposed timescale for introduction of SP seems remarkably hasty. To maintain patient safety, substantial training would be required to implement this initiative and this resource is not currently in place. Need to recognise costs of locum cover and the time spent on development of the agreed clinical management plan. Other issues about which there is uncertainty is the level of experience required for SP-ers and professional indemnity cover for extra responsibilities. SP characteristics should be enshrined in the clinical management plan. Considers the range of medicines should be broad. Although supporting the exclusion of unlicensed medicines (outside paediatric care) and controlled drugs, they comment that this may cause difficulties where powerful analgesia may be required and eg dermatology where SP would be suitable. Clear that relationship between the independent/SP-er will be extremely important to the success of the arrangement. The clinical management plan will be key to success but impractical to tailor to individuals and think a better model would be an arrangement similar to a PGD but with more freedom for the actions that can be taken under it. For arrangements for teams, the College argue that it might be safer if more than one IP-er had helped frame the plan. In hospital, application of this development should be relatively easier than in general practice. Changes of IP-er should not be a problem if there is a clear robust clinical treatment plan - the new IP-er would be free to decide whether or not to sign up to it. Any system introduced should, with suitable safeguards, be applicable to all health care establishments whether in the private or public sectors. From: [http://medicines.mhra.gov.uk/inforesources/publications/mlx284-published\\_summary.pdf](http://medicines.mhra.gov.uk/inforesources/publications/mlx284-published_summary.pdf)

The development of skills in the development of individual CMP's, is of upmost importance but fortunately there is much expertise already available in the very similar area of developing Integrated Care Pathways which we will now look at briefly.

## 10.3 Integrated Care Pathways (ICP)

Integrated Care Pathways have been in use for over a decade now, and I have always been a keen supporter of them as they can drastically reduce the amount of unnecessary paperwork involved in patient care as well as improving the quality of care given. I have concentrated on integrated care pathways in the UK NHS health care system in this section.

The former NHS connecting for health program included a e-care pathway project and you can find two excellent talks from this program given in 2007 at; [www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/carepathways2\\_nhs.pdf](http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/carepathways2_nhs.pdf) and [http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/carepathways\\_e\\_nhs.pdf](http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/carepathways_e_nhs.pdf) one of those involved in the project, Claire Whittle, was undertaking a PhD at the time looking at care pathways and her web page had some interesting references to care pathways, unfortunately she has since moved back into the NHS and the resource has been lost it was at <http://www.healthscinet.bham.ac.uk/Staff/StaffProfile.asp?staffID=16889>.

Haringey NHS trust provide a list of local carepathways at:  
[http://www.haringey.nhs.uk/services/specialist/care\\_pathways\\_and\\_guidelines/index.shtm](http://www.haringey.nhs.uk/services/specialist/care_pathways_and_guidelines/index.shtm)

A good description/example of a ICP is the care for the dying patient from the Marie Curie Palliative Care Institute Liverpool (MCPCIL) <http://www.mcpcil.org.uk/liverpool-care-pathway/>

### 10.3.1 What does a ICP look like?

Excellent examples can be found at Great Ormond st. hospital London (GOSH) at <http://www.gosh.nhs.uk/health-professionals/integrated-care-pathways/>

Another example is a presentation by Aung Soe Consultant Neonatologist, Medway, Kent concerning Bronchiectisis at: <http://www.nhsalliance2011.org.uk/Th5AungSoe.pdf>

### 10.3.2 The history of the NHS and ICP's

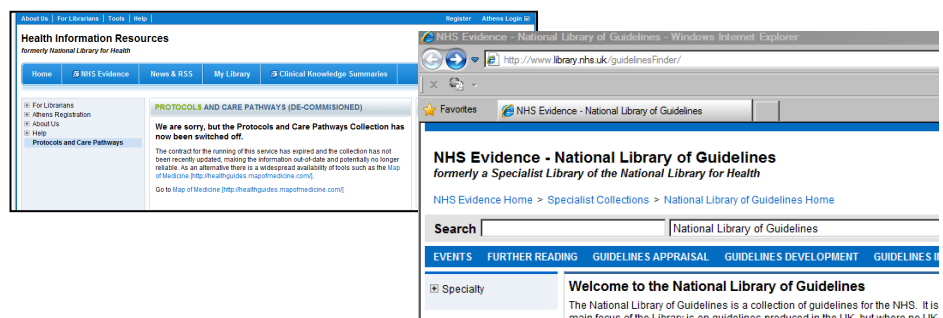
The history of Care pathways and the NHS would require a chapter in itself, currently there appears no detailed clinical carepathways on the NHS website despite the fact that it states that all the pathways have been incorporated into the [www.evidence.nhs.uk](http://www.evidence.nhs.uk) website. This is clearly not the case as when you type the term 'care pathway' or ICP into the search box, while it produces what appears to be a feast of information when you look in more detail, it is all high level evidence based general management guidelines. I have been unable to find a single example of a detailed ICP on the new improved site!



The now defunct national electronic Library for Health HeLH did provide a pathways section with many examples [<http://www.nelh.shef.ac.uk/nelh/kit/cps/paths.nsf/welcome?open>] in fact in October 2003 the National Electronic Library for Health (NeLH) website showed 232 pathways in use, ranging from ACE inhibitors to wound care management. In addition 1,054 were being implemented and more than 1,600 were in development (Davis 2004). Since then the NeLh was decommissioned and then integrated into the NHS Health Information Resources web site <http://www.library.nhs.uk> who then switched off the resource. The alternative map of medicine web site <http://healthguides.mapofmedicine.com/choices/map/index>.

html is only a set of clinical algorithms, as is the case with the Nice pathways, these are in no way the same as IPC's..

However it is still possible to find the occasional ICP on the web such as the ones described above. I feel this is a terrible lost resource, having gone from extremely useful detailed practical information to high level guidelines - this is not a step forward!



## Exercise 14.

Go to: [www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/default.htm](http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s8/default.htm)

Have a look at the detoxification care pathway developed at Northallerton hospital.

Have a read of the beginning of the following chapter which describes what a care pathway is, after you have read the beginning make sure you understand what variance recording is. Go to:

<http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s6/pathways1.pdf>

Take a look at a set of lecture notes about care pathways, which compare them to care plans and similar methods of documenting care at: <http://www.robin-beaumont.co.uk/virtualclassroom/chap11/s7/notes1.pdf>

### **Outside the UK:**

A excellent presentation (2007) which includes detailed outcomes measures demonstrating the effectiveness of care pathways can be found at: <http://www.bmia.be/Events/2007/Conference-2007-5/WSermeus.pdf>

Other care pathway resources:

- Integrated Care Pathways in Scotland <http://www.icpus.org.uk/>
- European Pathway Association <http://www.e-p-a.org/index2.html>
- The Journal of Integrated Care Pathways is available from, unfortunately most universities do not subscribe to it. <http://www.rsmprss.co.uk/jicp.htm>

## 11. Coding

One important aspect of record keeping is the use of a good coding system. To learn about coding systems in healthcare carry out the exercise below.

### Exercise 15.

Visit <http://www.p-jones.demon.co.uk/infselct.htm>

Go to the following site and read about SOAP (Symptoms, Observations, Assessment, and Plan) and SNOCCAMP (+ nature of illness [severity], Counselling and Medical decision making complexity):

<http://www.ritecode.com/snocamp.html>

It is important to realise that coding systems have been developed for very different purposes, for example some are more suited to retrospective, largely non clinical coding such as the OPCS codes, where the coding is often carried out after the patient has left the hospital by 'coders' in the UK. Alternatively in the GP sector coding is often carried out in the actual consultation Using OPCS, Read or Snomed codes (see; <http://www.medicine.leeds.ac.uk/museum/SNOMED.aspx>).

Obviously if the coding takes place in the consultation the consultation model must adapt to allow this. To frameworks which take coding into account as part of the consultation are SOAP and SNOCCAMP. The following information is taken from the US Ritecode website, a company that specialise in clinical coding <http://www.ritecode.com/>.

[Information below taken from <http://www.ritecode.com/> - edited slightly]

#### What is SNOCCAMP?

SNOCCAMP is a medical records format that includes the same four elements of SOAP with the addition of

- Nature of Illness (hi/ med/ low severity)
- Counselling
- Medical Decision Making (hi/ med/ low complexity)

SOAP	SNOCCAMP
Subjective	Subjective
	Nature of Illness (hi/med/low severity)
Objective	Objective
	Counselling
Assessment	Assessment
	Medical Decision Making (hi/med/low complexity)
Plan	Plan

SNOCCAMP, in conjunction with proper physician training, a coding compliance plan and a trained coding and medical transcription staff, will ensure better documentation, better medicine and a better chance of passing a documentation audit.

SNOCCAMP was developed in 1992, by Walter I. Larimore, MD. This format assists in assigning the correct Evaluation and Management (E & M) code. The categories are defined as follows:

**Subjective:** Chief complaint, HPI, System Review and Past, Social and Family History.

**Nature of Presenting Problem:** describes the complexity or severity of the patient's chief complaint, a disease, condition illness, injury symptom, sign, finding or other reason for the encounter.

**Objective:** Review of Systems (denies loss of weight, headaches, chest pain, etc...)

**Counseling:** Think of **PAR**, Procedures, Alternatives and Risks; list start and end times, detail the nature of the counseling or coordination of activities.

**Assessment:** What is the diagnosis or differential diagnosis? What are the potential complications?

**Medical Decision Making**

- Number of Diagnoses or Management Options
- Amount and/or complexity of Data to be reviewed
- Risk of Complications and/or morbidity or mortality
- Complexity of Decision-Making

This must be based on the information documented in the counselling, assessment and plan components of the medical record.

**Plan:** Treatment options should include rationale for any changes in treatment or tests ordered.

SNOCAMP an example:

<b>S</b>	Patient complains of sneezing, itchy/watery eyes
<b>N</b>	Low Severity
<b>O</b>	HEENT: Bilateral conjunctival cobblestoning with minimal erythema and no discharge. PERL: EOMs intact. Nasal turbinates boggy. Pharynx and ears n.
<b>C</b>	Discussed diagnostic impression, risks/benefits of mgmt options with patient
<b>A</b>	1. Allergic rhinitis. 2. Allergic conjunctivitis
<b>M</b>	Take over the counter antihistamine, drink plenty of fluids (Straightforward)
<b>P</b>	1. Pleph-10 Ophthalmic Solution, 2 dp ou quid x 5 d. 2. Claritin-D, 1 po bid prn (#30 ~ NR, but may call for refill of #30 x prn). 3. Follow-up prn.

[End of quote from <http://www.ritecode.com/> - edited slightly]

**12. Summary**

This chapter has looked in detail at the process of diagnosis and prescribing in the consultation in depth including, specifically at how consultations are managed and documented. It contained a large amount of material and many of the web sites that you visited contained very detailed material.

I hope that you have found some of the material useful to you and hopefully will take away some of the techniques and learn to use them in your professional lives.

Robin Beaumont 21/01/2012 19:51

**Exercise 16.**

Please draw a Mindmap of the main topic areas in this chapter and highlight or underline those areas you feel would be of most use to you in your professional role.

If you don't know what a mindmap take a look at [http://en.wikipedia.org/wiki/Mind\\_map](http://en.wikipedia.org/wiki/Mind_map).

For more examples and a free mindmap drawing package, that is if you don't like drawing with a pen and paper check out: <http://freemind.sourceforge.net/wiki/index.php/Screenshots>



## 13. Main References

- Audit commission 1995 Setting the Records Straight: A study of Hospital Medical Records See also <http://www.audit-commission.gov.uk/nationalstudies/health/other/Pages/settingtherecordstraight.aspx> for an update.
- Beale R Jackson T 1990 Neural computing: An introduction. Institute of physics publishing, Bristol and Philadelphia. Bristol UK
- Bryne P S Long B E 1974 Doctors talking to patients H.M.S.O
- Chadwick J Mann W N (trans. & editor) 1950 The medical works of Hippocrates: A new translation from the original Greek made especially for English readers. Blackwell scientific publications.
- Davis M (2004) Way To Go. Health Service Journal 13th May 2004 p24-25 [www.hsj.co.uk](http://www.hsj.co.uk)
- Dobson R 2003 Doctors issue warning over misuse of slang. BMJ 2003; 327: 360 <http://bmj.com/cgi/content/full/327/7411/360-f>
- Dy SM D, Garg P, Nyberg D et al. 2005 Critical pathway effectiveness: assessing the impact of patient, hospital care, and pathway characteristics using qualitative comparative analysis. Health Serv Res 40(2):499-516.
- Feltovich P J Barrows H S 1984 Issues of generality in medical problem solving. In: tutorials in problem-based learning: A new direction in teaching the health professions, H G Schmidt & M L De Volder, eds. Pp. 128 - 142. Assen, The Netherlands: Van Gorcum.
- Fitter M J Cruickshank P J 1982 The computer in the consulting room: A psychological framework. Behaviour and information technology 1 81 – 92
- Gandhi TK, Weingart SN, Seger AC, Borus J, Burdick JE, Poon EG, Leape LL, Bates DW 2005 Outpatient prescribing errors and the impact of computerized prescribing. Journal of General Internal Medicine 20, (9) 837-841, DOI: 10.1111/j.1525-1497.2005.0194.x
- Gigerenger 2007 Gut Feeling: Short cuts to better decision making. penguin
- Grant J Marsden P 1988 Primary knowledge, Medical education and consultant expertise. Med education 22 746 - 753
- IMG 1996 Personal Health Record: a computer-based training guide to record keeping for health care professionals. Ref. IMG:A1057 to obtain copies contact tel. 0193784 5381 (DoH) or 01252 626453 (Stephan Coaker Associates)
- Komaroff A L 1979 The variability and inaccuracy of medical data. Proceedings of the IEEE 67 9 [September] 1196 - 1207
- Marshall J 1977 Assessment of problem solving ability. Med education 11 329 - 334
- Moskowitz A J Kuipers B J Kassirer J P. 1988 Dealing with uncertainty, risks and tradeoffs in clinical decisions. Annals of internal medicine 108 435 - 449
- Myers-Worsley M Johnston W A Simons M A 1988 The influence of expertise on X-ray image processing. J Exp. Psychol. Learn. Mem. Cogn. 14 553 - 557
- Scheff T J (1961?) Decision rules, types of error, and their consequences in medical diagnosis ??
- Schmidt H G Boshuizen H P A Hobus P P M 1988 Transitory stages in the development of medical expertise: The "intermediate effect" in clinical case representation studies. In proc. 10th conf. Cognitive science soc. Pp. 139 - 145. Hillsdale, New Jersey: Erlbaum.
- Schmidt H G.. Norman G R Boshuizen H P A 1990 A cognitive perspective on medical expertise: theory and Implications. Academic medicine 65 10 611 – 621. Available from: <http://journals.lww.com/academicmedicine/toc/1990/10000>
- Scott D 1995 Computer anxiety: A longitudinal study and discourse analysis investigation. The Irish jour of psychology 16 1 83 - 87
- Sox H C Blatt M A Higgins M Marton K I 1988 (reprint 2006) Medical decision making. Butterworth Heinemann. Available at google books at: <http://books.google.co.uk/books?id=-Gu-Wz9tiSUC>
- Style Alec 1979 Intuition and problem solving. Jour royal coll. of Gen. Practitioners 29 71 - 74
- Sullivan F Mitchell E 1995 Has general practitioner computing made a difference to patient care? A systematic review of published papers. BMJ [Sept. 30th] 311 848 - 52
- Vanhaecht K Bollmann M, Bower K et al. 2006 Prevalence and use of clinical pathways in 23 countries: an international survey by the European Pathway Association. Journal of Integrated Care Pathways. 10, 28-34.

End of chapter