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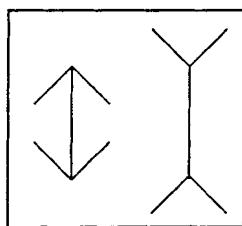
Trains of Clinical Thought - with special reference to Practical Reasoning

A. Felice

Department of Surgery, University of Malta Medical School, Guardamangia MSD 06, Malta.

Summary: *In the last two decades clinical reasoning has attracted the attention, not only of pure academics but also of practicing clinicians. This has followed a long period of neglect, when, discussion on such subjects was limited to few people, mostly speaking from their easy-chairs. The various philosophical processes utilized in methods of reaching a diagnosis and decision making in a clinical setting are portrayed. Special reference is made to Aristotelian Practical Reasoning, which though frequently used by most clinicians has not been given its due importance in the medical and to some extent even in the philosophical literature.*

Optimal decisions result from the application of a statistical decision – rule to data, as usually occurs in mathematics. Other methods, including clinical decision-making are considered sub-optimal because clinical practice is inherently uncertain and most processes probabilistic. Expertise in clinical reasoning thus depends both on mastery of logical rules and accumulation of experience. The importance of the latter factor is not surprising since one's very interpretation of external environment is moulded by previous experience. This is not only a philosophical consideration but has also been shown experimentally using illusions. Using the classical Muller Lyer illusion, the vertical line on the right appears to be longer than the one on the left though one can easily ascertain that their lengths are equal on measurement.



This is probably because the mind interprets the two-dimensional diagrams as three-dimensional, with the left diagram as the outside edge of a corner coming towards us and the right as the inside of a corner going away from us. It is illuminating that this illusion does not work on Zulus who traditionally live in round houses. Categories and concepts, even such high-level concepts as disease, depend on our previous experience and training. The observation that the trained mind is better equipped to solve problems may seem commonplace, but it has been formally proposed in psychology under the term "plasticity", i.e. the interaction between the environment and the brain. This effect as applied to the clinical process, has also been demonstrated experimentally by practical research. All this leads to the conclusion that understanding of thought processes involved in the clinical processes as well as the experience which is necessary to mould the expertise, are both vital to planning of medical curricula.

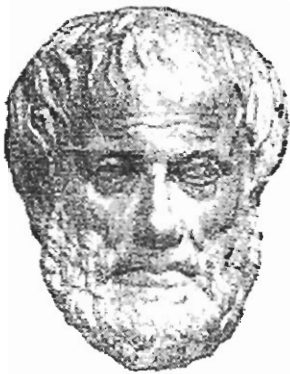
Diagnosis involves opinion revision with imperfect information. The mental processes, used may include, pattern recognition or categorization, prototypes, practical reasoning, generating competing hypothesis (hypothesis testing) and algorithms. These methods are not necessarily mutually exclusive. Since medicine is a highly visual as well as an intellectual discipline, pattern recognition combined with a personal template of the norm is often used especially in typical cases e.g. syndromes. This is however not applicable in the significant proportion of cases which are not typical.

The clinician has traditionally combined the science and the art (in different proportions) and in the same way combines discursive (logical) reasoning and intuitive reasoning into a synthesis. This is applicable to diagnosis, choices in clinical management and in predicting outcomes. Unfortunately intuitive reasoning suffers from several biases and there have been precious few studies investigating the effectiveness of clinical decision making based on intuitive thought.

The traditional ways of reaching a diagnosis are:

- Taxonomy – one decides whether the disease is congenital inflammatory, traumatic, degenerative or neoplastic. One then narrows down on the more specific pathological mechanism e.g. an acute abdominal emergency may be due to obstruction of a hollow viscus, peritoneal irritation or haemorrhage.
- Differential diagnosis – One produces a list of possible pathological conditions which correspond to symptoms and signs through a process of eliminations with the help of special investigations, narrow options to the correct diagnosis. This is an inductive process of reasoning on the basis that similar symptoms and signs should lead to the corresponding diagnosis.

- Goal-seeking (Heuristic) attitude - Heuristic reasoning is not synonymous with intuitive thought. The former, which literally means 'aiming at discovery', has as its primary goal the choice between alternative actions (in the way of algorithms) and is not so much concerned with arriving at absolute truths. Formal science, research and analysis improve the reliability of the premises, which are channelled into a utilitarian (goal-seeking) thought process. One develops short lists of important data, which allow decision as to the next step, forming a working hypothesis, which may be changed on the way, without assuming that this is necessarily the final pathological diagnosis. Because clinical decisions are often taken in close-call situations, the latter method is very useful. Though often described as a hypothetico-deductive process of logic this is really an application of Aristotelian "Practical Reasoning" (a situation which leads to a logical action) in contradistinction to Theoretical Reasoning (a collection of true facts which necessarily lead to a conclusion). Practical reasoning may be considered as a utilitarian approach, finding the options to maximize utility. The importance of practical reasoning to human sciences has been compared to that of deductive process in the natural sciences and merits further consideration.



Aristotle: 384 - 322 BC

less clear than inductive, deductive, or even hypothetico-deductive forms of theoretical reasoning. There is a difference of form between reasoning leading to action (practical reasoning) and reasoning leading to a truthful conclusion (theoretical reasoning). Basically, in practical reasoning, the first premises mentions an end to an action and the second premises some means to this end.

eg I want to attain E
Unless I perform action A, I shall not attain E
Therefore I shall do A

The hallmark of practical reasoning is that the end is at a distance from the immediate action, the latter being a means to attain an end. The following is a clinical example:

1. I want to prevent this patient with right iliac fossa pain from developing peritonitis.
2. To achieve this I must explore or laparoscope the patient's abdomen, to investigate whether he has appendicitis and treat it.
3. Therefore prepare this patient for operation.

Clearly, though it may be in the patient's best interest, the argument itself is not logically conclusive. For example, the causative pathology of the right iliac fossa pain may not lead to peritonitis. In addition, the clinician concerned may not have the necessary expertise to operate the patient. In the latter event the patient may be better off if he is not prepared for the operation.

Practical reasoning may either look to the past for motivations for previous actions (retrospective use), or to the future for actions (prospective use). In the retrospective application one starts from the conclusion and reconstructs the premises. This happens when we justify our actions eg:

1. The patient had to have endotracheal intubation
2. The patient had glottic spasm
3. Patients with glottic spasm may need endotracheal intubation.

In the prospective use, one sets out from the premises and the conclusion follows eg:

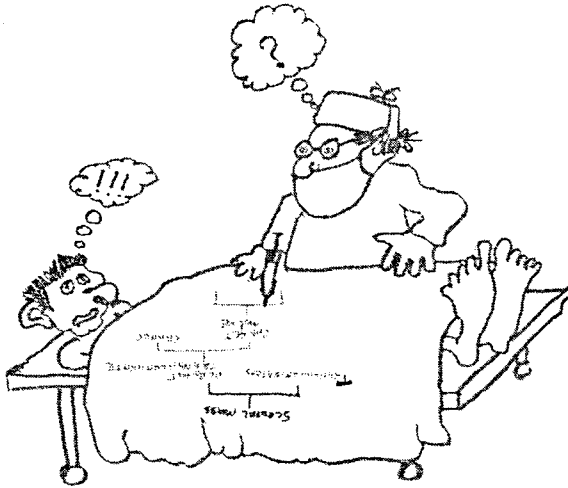
1. This patient has suffered blunt abdominal trauma and has developed hypovolaemic shock from haemoperitoneum.
2. To save his life I need to explore his abdomen surgically (laparotomy) to stop the bleeding whatever the source.
3. Therefore prepare the patient for laparotomy.

Clinical decision-making is based on different degrees of evidence, values (or preference) and circumstances. It is also influenced by bias, which is consequent on the different ways we see things. Several 'aids' have been proposed to render the decision-making process more accurate e.g. multivariate equations, decision analysis, information technology, patient data banks, artificial intelligence, clinical problem analysis, mechanistic case diagramming and algorithms.

To discuss these in any detail would be outside the scope of this essay, but it is important to note that all these methods involve the use of the thought processes previously described.

Conclusion

Practical reasoning is used very frequently in the clinical process, though almost invariably this is not done consciously. Furthermore, the diagnostic process may involve several logical processes and perspectives¹³ (e.g. inductive, deductive, hypothetico-deductive and



practical reasoning, as well as pattern recognition, heuristic application and priority setting, in different degrees, and with varying frequency and emphasis. In a clinical scenario characterized by estimates of probabilities, close-calls and balancing trade-offs, clinicians use both formal and informal (intuitive) strategies. As the proportion of 'certainties' becomes progressively more consistent, the need for intuitive thought decreases, and science would be expected to encroach upon (but not eliminate) the art.

To recognize, dissect and analyse these processes may be more than a pedantic academic exercise. It is a first step towards appreciation, formal teaching and conscious application of such methods. It also highlights one aspect of the clear influence of many disciplines on clinical practice and the need for a multi-disciplinary approach to medical education.

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