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PRINCIPLES BEHIND PRACTICE

1. Introduction to clinical epidemiology

Richard F Heller

The practice of clinical medicine is growing more and more complex with the availability of new diagnostic tests and types of treatment. It is becoming increasingly important to see if there are scientific principles we can use to guide us in choosing appropriately between the competing choices. This series of articles will attempt to describe an emerging science which was started by JR Paul when he entitled his Presidential Address to the American Society for Clinical Investigation in 1938 "Clinical epidemiology".¹ Epidemiology is the study of disease in groups, and when this is applied to clinical practice it becomes "clinical epidemiology". Because the individual clinician may be unable to collect enough cases over the years to provide enough experience of a wide spectrum of disease to guide future action, it is necessary to collect and pool the experience of many. The collection of groups of patients from which generalisations can be made is where epidemiology comes in.

A recent textbook says "... we believe clinical epidemiology is a basic science for clinicians. We rely on it when patient care begins, the evidence is reviewed, and decisions must be made".²

For example, angina is one of the commonest clinical problems encountered in adult medical practice. Yet with a prevalence of perhaps 1.5 cases per 100 adult men,³ how many new cases will the average general practitioner see in a year? Will he or she gain enough experience from these to know which patient to refer for investigation,

and whether the results of investigations have a different meaning, for example, among men and women, or in people of different ages? Will he or she know which patients could benefit from different types of treatment just from observing what happens to a relatively small number of patients?

As we will see in succeeding articles, there is a real science in the interpretation of results of diagnostic tests.⁴ For example, the chance of a positive test result actually indicating the presence of disease depends not only on the sensitivity and specificity of the test, but on the type of person and the setting in which the test is being used. How do we interpret a test result and what do we do with the patient in the light of this result? The science of choosing the best test and interpreting the results appropriately is discussed in detail early in the series. Similarly, the prognosis (or natural history) of a disease depends on many factors. There are "rules" or principles behind the interpretation of other people's experience of disease prognosis and its application to one's own particular patient. When it comes to deciding which therapy to choose — again, there are principles to apply which a later article discusses in detail.

As medical care becomes more expensive, there is pressure to use the diagnostic and therapeutic armamentarium in a cost-effective way. A later article in the series discusses the principles behind cost effectiveness and cost benefit analysis, and shows how these principles can be applied in real clinical practice. Other issues are considered also, such as how to decide if a screening test is worth introducing in your practice, and how to make sense of published papers — again, using various easily applied principles.

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It is this emphasis on the importance of epidemiology for clinical decision making that has inspired this series of articles, entitled "Principles behind practice". However, it is important to point out that the scope of clinical epidemiology is much broader. Many of the clinicians who study epidemiology in depth (as for a Master degree) do so to learn research skills which can be applied to major health problems. The application by the clinician of research methods to study health problems of importance to the population is a way of bridging the gap between clinical practice and public health.

This approach has been adopted by some North American training programmes for clinicians, the best example of this being the Robert Wood Johnson Foundation-sponsored Clinical Scholars Program.³ On the international scene, the Rockefeller Foundation has established an International Clinical Epidemiology Network (INCLIN).⁴ The Centre for Clinical Epidemiology and Biostatistics in the Newcastle Faculty of Medicine is the only training centre in the INCLIN network outside North America. INCLIN has fostered the development of 26 units in teaching hospitals across the developing world where clinicians from various specialities are performing

important research which is influencing health policy.

The series, "Principles behind practice", starts with an article on diagnostic tests in this issue (page 33) and continues with articles on clinical decision making, natural history and prognosis, how to determine causation, types of research study, health economics and prevention in the clinical setting. Each is intended to be of use as well as of interest. We hope that this series will not only help all clinicians with clinical decisions, but inspire some to develop further skills in research and apply these skills to the health problems of the country.

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2. Using the diagnostic test

Richard F Heller and Greg Whelan

In this paper we consider the interpretation of test results. For each of the examples given, some common principles apply and we need to obtain information about the way diagnostic tests work. For each case, we need to know sensitivity, specificity, and positive and negative predictive value of the test. In addition we must decide if the test and its result make a

difference to our management plan for the patient.

Case 1

A 60-year-old man comes to see you complaining of chest pain. You arrange for a stress test (exercise ECG) and the result comes back "positive".

How do you interpret this result?

Would a positive result have different implications if the patient with chest pain were a 30-year-old woman?

You happen to listen to the man's neck and hear a carotid bruit.

What test should you do for this? How can you interpret the results?

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