Chapter 14

The Use of Laboratory Test Results in Health Care Management

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ABSTRACT

Laboratory test results used in health care management can be qualitative or quantitative. These cover several disciplines, the four major disciplines being histopathology, haematology, medical microbiology and chemical pathology. Histopathology and medical microbiology are mainly qualitative assessments, while chemical pathology is predominantly based on quantitative analysis of chemical constituents in blood or other body fluids. Haematology encompasses both quantitative and qualitative assessments, the blood cell parameters being quantitative while blood film reports and bone marrow reports are qualitative. The application of such results to healthcare management includes screening for disease as well as in making a diagnosis and for monitoring response to treatment of a known disease. This necessitates the availability of normal ranges to compare with and decide whether the results are normal or not. Normal means the individual is in a state of good health and a deviation from normal is interpreted as implying ill-health. Data used in these tests are taken from previous studies of Sri Lankan Adults carried out from May 2005 to July 2006.

INTRODUCTION

Laboratory test results used in health care management can be qualitative or quantitative. These cover several disciplines: the four major disciplines being histopathology; haematology; medical microbiology; and chemical pathology. Histo-pathology and medical microbiology are mainly qualitative assessments, while chemical pathology is predominantly based on quantitative analysis of chemical constituents in blood or other body fluids. Haematology encompasses both quantitative and qualitative assessments, the blood cell parameters being quantitative, namely, Haemoglobin (Hb). Red Blood Cell count (RBC), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH),

Mean Corpuscular Haemoglobin Concentration (MCHC), Packed cell volume (PCV), White blood cell count (WBC), Differential Count (DC) and Platelet Count (Pl. Count)., while blood film reports and bone marrow reports are qualitative.

In the developing countries good quality automated laboratory equipment to measure the various biochemical and haematological parameters are now often available, and laboratory results are accurate and show precision. Their application to healthcare management includes screening for disease as well as in making a diagnosis and for monitoring response to treatment of a known disease. This necessitates the availability of normal ranges to compare with and decide whether the results are normal or not. Normal means the individual is in a state of good health. A deviation of the test results from the normal is interpreted as implying ill-health.

THE REFERENCE RANGE

Laboratory results are conventionally compared with established physiologically normal values, such values being often derived from text books. For any individual, the ideal reference value for a test result would be that obtained when that individual is healthy. Test results for the normal and abnormal can overlap, and a value within the accepted normal range may be pathological for a particular subject. For this reason, more recently, the concept of normal ranges has been replaced by the concept of reference ranges and test results of patients have been compared with the reference ranges. Ideally, each laboratory should establish its own data bank of reference values and reference ranges.

A reference individual is one selected using defined criteria and picked from a population that includes all individuals who meet those criteria. A reference sample is a number of such reference individuals. Reference values are test results obtained by testing the reference sample

or population. They can be subject to statistical analysis, and they will show a certain distribution. Leaving out the lowest 2.5 percent and the highest 2.5 percent at either end of the observed range, the central 95% of the observed values is known as the reference interval (Bain, 1995). Reference ranges for a particular test for a select population are determined from groups of comparable subjects assumed to be representative of the population being dealt with, namely a reference population, of defined criteria such as age, sex, non-smokers, non-alcoholics, non- pregnant (if female), not on regular drugs and free from chronic disease. The technique and timing of sample collection and posture of the subject at the time the sample is taken must be standardized. Whether the subject is ambulant or resting in bed also may affect the test results. Samples should be collected at the same time of the day, in fasting state, with the subject in standardized position i.e. either seated or recumbent with the arm semi-flexed and with minimum stasis (Lewis et al, 2001).

Statistical Procedures

In order to determine the reference range, the set of results for each variable is recorded graphically. The application of the Gaussian curve to describe biological variables was popularized by the English naturalist Sir Francis Galton, cousin of Sir Charles Darwin (Amador, 1975. Usually the data will fit a certain type of graph. Normal results usually produce a symmetric (Gaussian) type of graph. If the values fit a Gaussian distribution their arithmetic mean and standard deviation are calculated. From these the 95% confidence interval i.e. mean +/- 2 Standard Deviations (SD) is calculated. The result thus obtained gives the reference range of the particular test for the population being studied. If the graph is asymmetrical with a skewed distribution (non-Gaussian), the data should be converted to log values and these used to draw the graph. Then the geometric mean and SD are calculated, and the 95% confidence

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