Clinical Evaluation of Nutritional Status Under Field Conditions

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Of all the procedures that may be employed in the evaluation of human nutritional status, the simplest is clinical examination. The only indispensible need is for a trained observer. Therefore, for survey work in the field, clinical examination would appear to be the best approach. A single physician, with the assistance of one or two aids, can carry out meaningful examinations on as many as several hundred persons daily. The more detailed the examination, of course, the fewer that can be handled.

Clinical examination is also the most basic part of the evaluation of human nutritional status. It is the first of three approaches that have been used both in individual subjects and in population groups; the other two are biochemical evaluation and dietary assessment.[1] The two latter methods are to a large extent dependent on clinical examination for the establishment of standards. Before a biochemist with a new test can set up levels of normal and deficient, the clinician must tell him which of his test subjects are healthy and which are not. In making his decision, the clinician may rely in part on other laboratory tests, but ultimately behind all this lies a clinical decision as to health and disease. Similarly a standard of dietary intake is based, in the final analysis, on whether a particular level of intake of a nutrient will keep the consumer of it in good health.

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Severe nutritional disease is easily recognized; so is robust good health. It is the other 90 per cent that gives us trouble. Careful history taking and physical examination can reduce this fraction. However, the more one tries to reduce it, the more one comes to rely on historic and physical findings of decreasing specificity and doubtful validity. In this area better classification as to health or the lack of it comes from experiment. If controlled therapy with a nutrient ameliorates a physical finding, deficiency must have existed before.

CLINICAL SURVEY PROCEDURE

Clinical examination may be quite detailed or very brief. Obviously examination of individual subjects should be as inclusive as possible. Survey work of population groups must be limited in extent. Examinations in good surroundings, for example, in the clinic, can be most detailed. However, in the field, meaningful information can be obtained from the most rudimentary examination. Recording of age, measurement of height and weight, and a brief look at eyes, mouth and neck will provide most useful data. Even in the field, however, it is almost always possible to do more if time permits.

All clinical examinations should include some historic information and identifying data, such as age, sex and occupation. Information relating to economic status and environmental factors is most useful. Data should be also collected pertaining not only to possible past history or present existence of nutritional disease, but also to any other diseases which may possibly affect the nutritional status, e.g., infections. In large population surveys collection of all this information may be

impractical, and actually unnecessary. When such large groups are being studied much of the same type information on disease prevalence can be obtained by visiting the hospitals to see what types of patients are being treated there. For example, the finding of hospitalized patients with beriberi would indicate that special emphasis should be placed on thiamine nutriture in the examination of the population. In fact, such a finding might tell as much as all the rest of the survey.

Clinical nutritional examination should include an evaluation of three main areas of nutriture: (1) an estimation of the degree of fatness or leanness; (2) an assessment of growth and development; and (3) a search for certain specific physical signs associated with particular deficiencies. To these may be added elements of a general physical examination such as a check of the heart, lungs and abdomen. I believe we should pay more attention to general medical examinations than we have frequently done in the past. A high prevalence of many infectious diseases, such as tuberculosis, goes hand in hand with poor nutrition. Further, certain degenerative diseases, such as atherosclerosis and cirrhosis, may be in part nutritional disorders.

The degree of fatness is a measure of sufficiency of caloric intake in relation to requirement. A rough estimate of overweight, normal or underweight can be made by a brief look at an individual; this may be satisfactory for some purposes. However, it is relatively easy to obtain accurate body weights and the heights which are necessary to interpret the weights. The observed weight is then usually referred to some standard weight which is specific for height. For adults the standards generally used are the Medico-Actuarial Tables of 1912.[2] For children, the Iowa and Harvard tables may be used.[3] The degree of fatness can also be estimated from measurements of skinfold thickness.

An assessment of growth and development is a most important part of a health survey. Retardation of growth is a sensitive index of many kinds of disease, although nutritional deprivation is certainly one of the most common causes. Presumably in man as well as in rats, deficiency of one of a large number of nutritional factors will slow growth; however, the most common nutritional lack causing growth retardation is protein deficiency. One reason rats are good nutritional test animals is that they do not stop growing. Human subjects do, so it is important to include children in a population survey. The simplest measure of development is, of course, height as related to age. If possible other parameters of development may be recorded, for example, anthropometric measurements such as head circumference or sitting height. The age of appearance of secondary sex characteristics may also be useful information.

The check list of physical signs of specific nutrient deficiency may be extensive or brief. After some experience with examinations by the ICNND detailed examination card of some 60 or more items, and with attempts to analyze the data therefrom, I prefer a short list. I believe the following list should be sufficient: circumcorneal injection with vascular invasion of the cornea, angular stomatitis, diffuse gingivitis, atrophy and inflammation of the tongue, goiter, follicular hyperkeratosis, edema and loss of ankle jerks. In examinations of children note should also be made of skeletal abnormalities, such as costochondral beading and bowing of the legs. Examiners should also be on the lookout for such severe nutritional diseases as keratomalacia, pelagra or the full blown polyneuritis of beriberi. Since these are so rare in population surveys, even when the diseases are endemic, they may not be listed on an examination card. They should be looked for rather in clinic or hospital patients.

To this brief check list of strictly nutritional lesions, I would like to add the following signs which are elements of a general medical examination: pallor of the lips or conjunctivas; a measure of dental decay, that is, a rough approach to a DMF rate; dental fluorosis; rales at the apices of the lungs; heart murmur; blood presssure in adults; and enlargement of liver and spleen.

With proper organization of the people to be examined, one physician with three assistants can carry out this full examination on 200

people a day, even under very primitive conditions. An assembly line procedure is set up in which one assistant fills in the examination card headings, name, identification data and any items of history. Another assistant measures and records height and weight, and the third takes the blood pressure before the physician completes the check list. All this is grinding labor, particularly for the first few days. Additional people on the team help to make life worth living.

Lack of time or of assistants may make it necessary to curtail this examination. Absence of privacy or taboos may prevent disrobing for such an examination. Body weights obtained with the subject clothed can be corrected by subtracting an estimated or determined average weight of clothing. The physical examination can still be meaningful even if limited to the head, neck and arms. Perhaps the ultimate in brevity of clinical examination was the procedure used by Dr. Harold Sandstead in assessing the subjects of the Korean Army in 1952. Groups of soldiers stripped to their underwear and walked slowly past the examiner at about ten to fifteen second intervals. The general appearance of each soldier was checked off as either good, fair or poor, and two or three gross signs, such as edema, were noted. The problem at that time was gross caloric undernutrition; the survey procedure was sufficient to evaluate the extent of it.

HEIGHT AND WEIGHT INFORMATION

The interpretation of the findings of a clinical nutrition survey requires great care and judgment. Even the objective measurements of height lack ideal standards for comparison. No one knows the full biologic potential for human growth. Population groups throughout the world, but particularly in the Western nations, have been gradually increasing in height over the years; this increase is apparently continuing. A philosophical question can be raised as to whether this growth is a good thing or not, although everyone seems to agree that it is. In describing the results of a survey of height, one can only compare them to other mean data. Our usual standard of reference is the attained height for age of children in the continental United States in the past thirty years. This is perhaps a little smug and certainly ignores genetic differences in growth potential. When differences are observed, the only means to determine the cause, whether from nutrition, sanitation or genetic make-up, is by experimental tests, either retrospective or prospective.

There are similar difficulties in the interpretation of survey results of body weight. It is obvious that in children ideal body weight increases with age and height. Since pediatric standards of weight are usually given in terms of age, deviations of survey data from the standard have also been expressed in terms of age. In underdeveloped areas there are always marked deviations of survey data from the standards, which are generally interpreted to indicate caloric deficiency. I do not believe this is the proper way to evaluate such data, for if one compares survey weights on the basis of standard weight for height, rather than age, the deviations are reduced or abolished. The interpretation would then be that, although growth may be retarded, body weight for attained height is satisfactory, and therefore caloric nutrition is sufficient. When used in this way, the pediatric standards for weight are most useful for the comparison of data.

The standards of weight for height and age in adults also lead to difficulties in the interpretation of survey data. The commonly used standards simply describe the means of healthy Americans of fifty years ago; they show a regular increase in weight with increasing age. The main thing that body weight can show is the sufficiency or deficiency of caloric intake, which is represented in the body by the amount of fatty tissue. This is the most variable of the several components described in body composition studies, and without doubt an increase in body fat is the cause of the progressive increase in body weight with age, described by the standard weight tables. Therefore, if we wish to quantify body fat, we should not use a standard that changes with age, at least not after growth has ceased and body musculature has fully developed. One useful compromise

has been to apply the tabular standard weight at age twenty-five as the only standard for all ages greater than this. Difficulties still remain, however. The standard has shown an embarrassing tendency to say that many healthy, well developed people of short height are underweight. This problem also appears when one attempts to link up the pediatric standards, which go up to eighteen years of age, with the adult standards. In the few age groups, which are present in both, at short heights the pediatric standard gives lower body weights than the adult table, while in tall persons the difference is in the other direction.

A better approach to the whole problem may be to try to estimate body fatty tissue and lean tissue more directly through anthropometry. A few skinfold thickness measurements were made in most of the ICNND surveys. My impression is that these did not give more information than the height and weight data alone; however, a thoroughgoing analysis of these data has yet to be made.

Other types of anthropometry beside skinfold thickness may very possibly be of great use in clinical nutrition survey work. Arm circumference, corrected in some way for the contribution of the overlying fat panniculus, may be of value in estimating muscular development, and the relative size of body musculature.[4] If the size of this body compartment could be predicted, it would be of great interest to look for variations in its size produced by different levels of intake of nutrients, particularly protein. At present, I believe that such anthropometric procedures need further evaulation by the detailed methods for estimation of body composition before they can be usefully applied in clinical nutrition survey work.

SUBJECTIVE CLINICAL FINDINGS

Problems also exist in the interpretation of the various physical findings on the doctor's check list. The diagnosis of them all is a highly subjective thing, particularly in borderline cases. Unfortunately, most survey work is carried out in population groups considered more or less healthy, and most of the lesions that can be found are borderline. Two physicians may find widely different prevalence rates of a lesion. Further, one doctor's criteria for diagnosis may change unconsciously with the passage of time.

Difficulties of this kind may help to explain another problem, that is the lack of correlation of prevalence rates of some indicator lesions with the levels of the nutrients they measure in blood or urine samples, or with the dietary intakes.[5] Goiter is well correlated with dietary iodine intake, dental fluorosis with fluorine intake, and diffuse gingivitis with vitamin C intake. On the other hand, in an analysis of the results of several surveys together, I found no correlation between the clinical and biochemical, and clinical and dietary findings with regard to thiamine, riboflavin, niacin or vitamin A. The lack of correlation may well be due to the fact that clinical, biochemical and dietary surveys measure different things in time. Dietary analysis gives the intake at the time of the survey, whereas biochemical tests give an idea of intake in the recent past. To produce a clinical sign may require a long period of deficiency; to obtain a cure may require an equally long period of sufficiency. These findings do not necessarily invalidate the use of the indicator lesions, since they can be produced by appropriate deficient diets, and cured by proper therapy, but they certainly bring the specificity of these lesions into question. Even so, clinical appraisal will certainly pick up gross deficiencies of the B vitamins and vitamin A. For example, a 10 or even 20 per cent prevalence rate of angular stomatitis may not mean that the population is deficient in riboflavin, but a 50 or 70 per cent prevalence rate does. Clinical surveys, however, cannot approach the precision of specific biochemical testing in the evaluation of nutritional status. With the continuing simplification of biochemical methods and equipment, it is becoming possible to carry out more and more of such testing in field situations. Just as clinical chemistry is daily becoming a more integral part of the practice of medicine, so, I believe, biochemical tests of nutritional status should be added to clinical surveys whenever possible.

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