be used, making the method accessible to third-world countries. If enough genomic DNA is available, the diagnosis can be made by direct visualisation of the amplified sequences after staining of the gel with ethidium bromide.[4] In view of its high sensitivity, the technique has been applied to single hairs[5] and now, as Mr Lench and his colleagues indicate, to samples obtained by mouthwash. This latter variation has enormous potential in population screening for single gene disorders such as cystic fibrosis.

PCR is very specific, permitting the detection of viral pathogens even when there is a large excess of host nucleic acid. It has been applied to the detection of human immunodeficiency virus[6] and human papillomavirus.[7] PCR analyses can be successfully carried out on formalin-fixed, paraffin-embedded tissues because the reaction is not dependent on high-molecular-weight DNA.[8] Thus analysis at the DNA level can be correlated with histological and clinical information.

PCR amplification is already playing a major role in many laboratories. Automation of the reaction promises the development of rapid, low cost, non-radioactive detection methods for an enormous number and variety of clinical applications.

CRITICAL QUESTIONS; CRITICAL INCIDENTS; CRITICAL ANSWERS

> "It may be difficult for the junior student to realise that all he learns in the earlier courses is necessary to equip him for the work of a doctor in general practice; but he may rest assured that it is. . . . Nothing has been omitted that is necessary, and nothing has been included that is superfluous."—A. MILES; *A guide to the study of medicine;* 1925.[1]

WHAT should medical students be taught? Readers of our correspondence columns (April 16, p 889; May 7, p 1054) will have already noted some debate about the obstetric input. The Hippocratic aphorism, *ars longa, vita brevis*, becomes ever more difficult as the medical art lengthens exponentially while student life remains fixed at five years. The traditional (and still prevalent) solution teaches everything a student might ever conceivably need, and produces a curriculum overflowing with biochemical pathways, physiological niceties, psychological details, and a host of obscure diseases. An alternative solution teaches those things that are especially needed. But what are they? Answers given by medical school committees typically reflect medical school power politics rather than practitioners' actual needs.

The problem of defining course content has now been approached by Waterston,[2] who revives the critical incident technique,[3] a method developed by Flanagan, an occupational psychologist, and described as the most successful method for developing taxonomies of clinical competence.[4] The starting point is actual events in medical practice, reported by practitioners, nurses, patients, or other interested parties. A critical incident is defined as: "any episode of patient care in which . . . specific actions by a physician had . . . specific beneficial or detrimental effects on a patient. The term 'critical' simply means that, very likely, the physician's actions were directly responsible for the effects observed in the patient."[5] A particular, clearly defined piece of knowledge, or an action, skill, or attitude, has therefore indisputably resulted in good or bad practice. Several hundred or several thousand such incidents are classified by several assessors, until the final distillate isolates the skills actually needed for the job, rather than those that are merely desirable in an ideal world. The authors of the most influential of such studies, used to revise the American National Board of Examiners' part III examination, commented that: ". . . these [critical incident] records provide a most interesting—and also a rather disturbing—description of what actually goes on during internship".[6]

Incidents in child health in primary care[2] emphasise the difference between necessary knowledge and knowledge that is only potentially useful. From the massive diagnostic panoply of paediatric neurology, Waterston[2] isolates for special emphasis the differential diagnosis of recurrent convulsions and of a large head in infancy, and the recognition and early diagnosis of meningitis and meningococcal septicaemia, Reye's syndrome, herpes encephalitis, and muscular dystrophy. Here one has a rational, if controversial, basis for curriculum development and assessment, and a technique for defining the core curriculum.[7]

The critical incident technique is sometimes so modified as to lose its special features,[8] so that, like Molière's Monsieur Jordain, who was surprised to find that he had spoken prose all his life, one suspects oneself of always having used the method without awareness. There are no formal assessments of either validity[9,10] or reliability (although critical incidents are the basis of the very reliable situational interview[11]); nonetheless, the technique undoubtedly elicits the key components of a skill, and helps formulate precise teaching objectives in undergraduate and postgraduate medical education. In 1968, the American Board of Orthopedic Surgery classified 1700 critical incidents contributed by 1100 orthopaedic surgeons, into nine major categories and ninety-four sub-categories which formed standardised material for the oral certification examination.[12] Much more specifically, the method elucidated sixty-two separate important skills for administering epidural anaesthetics.[13] It has also been used in creating a medical school curriculum,[14] assessing doctor-

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patient interaction,[15] evaluating clinical students,[16] assessing communication skills' courses,[17] defining the skills necessary for family medicine[18] and internal medicine,[19] assessing teaching skills,[20] and determining information-seeking skills.[21]

Is the critical incident technique especially favoured at eliciting objectives and criteria? Almost certainly not. Its apparent similarity to commonsense is reminiscent of Feyerabend's radical view of science as differing from other human knowledge not in kind but in degree: "Scientists do not solve problems because they possess a magic wand . . . but because they have studied a problem for a long time . . .".[22] Similarly, the critical incident technique replaces introspective ex cathedra pontifications by a sustained, careful, lengthy, and thoughtful analysis of actual incidents from medical practice. In automatically emphasising incidents that are both clinically important and highly prevalent, the method is particularly well suited for examinations that certify minimum professional competence and ensure the public is served by safe, competent doctors. American courts now require not only that licensing and certification examinations are based on a course whose content is prima facie related to professional needs, but also that they are valid, with examination content being theoretically and empirically related to specific competencies derived from a "properly conducted job analysis".[23] The critical incident technique and its derivatives are methods for assessing such competencies.[23]

BLOOD IN THE ALCOHOL STREAM—REVISITED

ALCOHOL abuse plays an important part in as many as a third of acute hospital admissions,[2] so hospital specialists have become familiar with the combination of mild enlargement of the red cells, raised serum gamma-glutamyl transpeptidase (γ-GTP) levels, and mild thrombocytopenia as markers of alcohol-induced tissue damage.[1] The reticulocytosis, rise in white cell count, and fall in serum iron values that follow alcohol withdrawal[3] on admission to hospital should not cause confusion if the alcohol abuse has been recognised. However, alcohol intake is often only cursorily assessed: the meaningless phrase "social drinker" still appears with distressing regularity in patients' hospital notes and the art of history taking in this sensitive area is often neglected in the undergraduate medical curriculum. Perhaps the ready availability of supposedly specific laboratory tests has contributed to the neglect. But how specific are they? The widely used serum γ-GTP level is abnormal in less than half of the alcoholics admitted to hospital and the commonest cause of mild thrombocytopenia is a recent viral infection. Red cells that are larger than normal are found in megaloblastic anaemias of B_{12} or folate deficiency, aplastic anaemia, myelodysplasia, and hypothyroidism. The combination of red cell size and serum γ-GTP level has better specificity for ruling out alcohol abuse but only moderate sensitivity (30–40%) for positive detection.[4]

How reliable are the history and physical examination by comparison with laboratory studies? In a study from Johns Hopkins University, senior residents failed to diagnose correctly 50% of patients who were likely to be alcohol abusers.[5] Their failure was one of application of well-proven methods of assessment with appropriately worded questions and a search for specific diagnostic physical signs. Use of the CAGE questions (C for attempts to *c*ontrol or *c*ut down, A for whether *a*nnoyed by criticisms of drinking, G for whether *g*uilty about drinking, and E for *e*arly morning "eye opener") has shown a high specificity and sensitivity for alcoholism,[6] and Skinner et al[4] have shown an overall accuracy in detecting alcoholism of 85–91% for selected clinical signs and 84–88% for appropriately directed medical history whereas the accuracy of laboratory tests was only 71–83%.[4] Their combination of history and physical examination gave a p value of less than 0·001 for distinguishing social drinkers from alcoholic patients and alcoholic patients from family practice control patients.

The effect of alcohol in removing sialic acid residues from serum transferrin molecules[7,8] may provide the basis for an additional laboratory test with specificity and sensitivity for alcohol abuse, and studies from the National Institute of Alcohol Abuse and Alcoholism in the USA hold out hope for primary prevention.[9] Tabakoff and colleagues[9] have shown that inhibition of platelet monoamine oxidase by ethanol is higher in alcoholics and that platelet adenylate cyclase activity after stimulation with guanine nucleotide, caesium fluoride, or prostaglandin E, is significantly lower. The changes in enzyme activity in platelets may reflect changes in the same enzymes in the brains of alcoholics. Moreover, the effects were longlasting: they were present in alcoholics who had abstained for one to four years. If it can be shown that these enzyme abnormalities antedate alcohol consumption and are genetically determined, then early identification and primary prevention of type 2 alcoholism[10] ("loss of control" type occurring in young men and having a strong hereditary component) becomes a possibility.

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