The training mannikins and models are not human beings and cannot replace clinical experience. We believe, however, that they form a very useful bridge, particularly for the uninitiated. A medical student or nurse is much more likely to pass an endotracheal tube satisfactorily in the anaesthetic room if he has practised with an intubating model.

The production of the cassette for each lesson is not easy—as the teachers, who are familiar with the apparatus, tend to take short cuts that are obvious to them but not to the novice. This was noticed in our prototype cassettes which were tested with trainees and then revised in the light of experience.

The market for such a teaching arrangement is wide and the equipment and cassettes may be varied to suit all grades, from lay staff to senior doctors. Possibly the idea will appeal to many district general hospitals who have a responsibility to teach resuscitation.²⁰ Once established, the facilities of the room may be offered to local general practitioners; district nurses and health visitors; and members of the emergency services. Large industrial concerns may also wish to apply the concept for training basic resuscitation to selected employees. In the district general hospital it may well be decided to locate the room in the post-graduate centre, and it may even be possible to teach other practical skills outside resuscitation using the combination of self-assessment models with audiovisual aids.

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Problems of Childhood

Diarrhoea

GEOFFREY HATCHER

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The practice of treating diarrhoea in babies and children with a blunderbuss combination of kaolin and an antibiotic is not acceptable to doctors who are familiar with children's diseases. The urge to prescribe medicine should be resisted. The only urgent requirement is to maintain hydration, and the younger the patient the more important this is. Other treatment should usually be delayed until the cause of the diarrhoea is identified. Except for the relatively rare colonic causes of diarrhoea, loose frequent stools are due to a shortened transit time of intestinal contents through the bowel, most commonly due to infection from faeco-oral contamination of food or to malabsorption.

Non-infective diarrhoea

Often mothers say that their infants and children have diarrhoea when the stools are normal. Inspection of a specimen is essential. Even if the stools are loose, simple questioning about the amount of sugar added to the feed, giving

orange juice or oral iron supplements, or, in older children, about indulgence in nuts or fruit-cake may provide the explanation. Frequent small, green, but formed motions in a young baby who is not gaining weight but who is otherwise well (hunger stools) are characteristic of underfeeding. The total daily milk intake should be checked whether the child is being fed on the breast or by bottle. One clinically distinct condition occurs in the newborn baby who is breast-fed. Fluid, orange-coloured motions are relatively common in the first few weeks of life. The gastrocolic reflex produces an explosive stool after each feed. The baby thrives and gains weight satisfactorily. Without treatment the stools become less fluid, presumably as the child's intake of milk is adjusted to his needs.

Soiling of the pants with small, fluid, dark-brown stools suggests strongly that the diarrhoea is spurious, being caused by the leakage of bowel contents, often loose as a result of laxatives, which escape past a firm faecal reservoir partially obstructing the sigmoid colon and rectum. This diagnosis is confirmed by abdominal and rectal examination. Although the possibility of Hirschsprung's disease should always be considered, constipation with or without a behaviour problem is nearly always the cause.

Infective diarrhoea

Although it has long been assumed that gastroenteritis is caused by bacteria, those who culture the stools in this disease

Royal Alexandra Hospital for Sick Children, Brighton BN1 3JN
GEOFFREY HATCHER, MB, FRCPED, consultant paediatrician

know that, apart from the occasional presence of certain serotypes of *Escherichia coli*, to which young babies who have not been breast-fed are particularly susceptible, pathogenic bacteria are uncommon. The development of techniques for isolating viruses was proving equally disappointing in explaining the epidemiology of a clearly transmissible disease until the role of viruses of the reoviridae family (rotavirus) in the acute enteritis of the early years of life was recently recognised. The disease has an incubation period of 48 hours and the excretion of the virus is greatest on the third or fourth day of the illness, with identification rare after the eighth day. The virus is not commonly isolated from children over the age of 6.

Acute epidemic diarrhoea in summer in children at nursery and primary schools, particularly when accompanied by abdominal colic and the passage of blood and mucus, points to a diagnosis of dysentery rather than of gastroenteritis. The commonest variety is due to *Shigella sonnei*.

Parenteral diarrhoea was the name formerly given to the passage of loose stools as an unexplained complication of infection not affecting the gastrointestinal tract. The infection was usually in the respiratory tract or ears. We know now that viruses responsible for such infections may also be enteropathic and therefore may cause concomitant diarrhoea. So, of course, may antibiotics given by mouth as treatment for infections of the respiratory tract or elsewhere.

Toddler diarrhoea

One condition which is familiar to paediatricians but not well recognised in family practice is toddler diarrhoea. This term is certainly preferable to that of "irritable colon" to describe the passage of loose and sometimes frequent stools containing identifiable vegetables, especially carrots, peas, beans, and tomato skins in children from the age of weaning to 4. The children are physically well and do not show any failure to gain weight. Removal from the diet of those foods which are recognisable in the stool often brings about some improvement but does not necessarily cause the stools to return to normal. Symptomatic treatment with kaolin and dicyclomine is not always effective. The symptoms are a social rather than a medical nuisance. The demonstration to parents of satisfactory weight gain and the absence of any systemic illness will reassure them.

Some children who show no sign of systemic disease continue to produce loose stools of unexplained origin, either intermittently in bouts or continuously, when the diagnosis of infection, coeliac disease, and cystic fibrosis has been excluded. Elimination of lactose from the diet followed by a lactose challenge may reveal lactose intolerance, although such cases are rare in general paediatric practice. The slippery arena of allergy to the proteins of cows' milk is one which British paediatricians have been reluctant to enter. Recently the practice of treating "allergic" diarrhoea with the empirical use of oral disodium cromoglycate (Intal) has been spreading. It is to be hoped that before long the promise of specific tests to confirm gastrointestinal milk allergy will be fulfilled. Meanwhile it would be unfortunate if this agent became the fashionable replacement for kaolin, dicyclomine, or other non-specific preparations at present used in the symptomatic treatment of diarrhoea.

Investigation

Is there any point in the doctor involved in primary care asking for laboratory investigations in the child with diarrhoea? Firstly, undoubtedly a strong case can be made out for culture of the stools on epidemiological grounds. The child who is excreting *Shigella*, *Salmonella*, specific types of *E coli* or *Giardia lamblia* should not be attending a day nursery and, if he is

to be admitted to hospital, should be isolated from other patients. Secondly, in any child with diarrhoea lasting more than a few days the exclusion of a bacterial or viral origin is important negative evidence in establishing a diagnosis. In young children if the physical signs suggest that the plasma urea and electrolytes should be measured then the child should be admitted to hospital, but if there is no evidence of dehydration and the child is not ill such investigation is unnecessary.

The continued presence of blood and mucus in the stools in the absence of bacterial pathogens will need further investigation by sigmoidoscopy, because of the possibility of a proctocolitis in an infant or of an ulcerative colitis in an older child.

In children who fail to thrive and have loose stools the possibility of malabsorption due to coeliac disease or pancreatic involvement in cystic fibrosis must be considered. These children require careful investigation and should be referred to a paediatrician, but initially samples of stool should be sent to the laboratory to see whether bacterial pathogens are present. Mild and sometimes intermittent diarrhoea may persist for months after acute salmonella enteritis. A specific search should also be made in several stools for *G lamblia*. Infestation with this parasite has been common in children attending day nurseries but recently it has occurred also in families who have spent holidays abroad, especially after fashionable trips to Leningrad and Moscow. Although the organisms are frequently merely carried in the bowel, they may produce abdominal pain and steatorrhoea and occasionally give rise to systemic symptoms and loss of weight.

Management

An acute episode does not usually present the doctor with a problem when the child is over 3, but with younger children the condition is potentially more serious. The strong desire of some mothers to "get nourishment into the baby" by continuing milk feeds must be adamantly resisted because of the risk of the baby developing hyperosmolar dehydration. If he shows no evidence of dehydration or only minimal clinical signs of it then withholding all solid food and giving clear fluid for 24 hours by mouth should be tried. Water is more important than anything else, though sugar may be added (5% sugar solution (50 g/l) may be provided by adding five teaspoonfuls of sugar to 500 ml of water). Proprietary glucose drinks containing high concentrations of sugar should be avoided because of their osmotic effects. The addition of salt is potentially more dangerous than useful unless it is accurately measured. The fluid should be given in frequent small amounts of not more than 100 ml at a time to provide the child's requirement for the day (150 ml/kg in the first few months of life, reducing to 75 ml/kg at the age of 3). If the fluid is persistently vomited or the child refuses to take it or there are unequivocal signs of dehydration, then admission to hospital is essential and in young babies is a matter of urgency, since parenteral fluid replacement will probably be needed. In the milder cases vomiting and diarrhoea usually stop within hours of restricting the oral intake to clear fluid. After 24 hours diluted milk may be given with graded return to a normal diet during the next few days. Medicines such as kaolin have no appreciable effect on fluid loss from the bowel, although by absorbing some of the water they make the stools appear improved. Opiates and codeine have no place in treating gastroenteritis but they may be of symptomatic value in dysentery.

Although, when stools have been cultured, there is a great temptation to prescribe one of the antibiotics to which the organism is reported to be sensitive, such treatment is not justifiable in terms of shortening the length of the illness or of reducing the time during which organisms are excreted from the bowel. Most community physicians and paediatricians therefore recommend that only symptomatic treatment be used and that antibiotics should not be given routinely. The combination tablet of diphenoxylate hydrochloride and atropine sulphate (Lomotil) is proving dangerous to young

children when taken accidentally in excess or in a wrongly prescribed dose.

Young children, especially infants in the first few months of life, who have diarrhoea may temporarily lose the brush border of the villi of the small bowel. Since the enzymes which split disaccharides are produced there, intolerance of some sugars, such as lactose, develops. This is most common after a severe attack of gastroenteritis but is relatively frequent in young infants in whom coeliac disease has been precipitated

by the early introduction of cereals. Even after the primary disease has been treated, loose frothy acid stools may persist. The avoidance of lactose, and hence of milk, for two to three weeks usually allows the lining of the small bowel to recover.

G lamblia may be treated with metronidazole (the organism is related to *Trichomonas vaginalis*) or mepacrine. These are effective but difficult to administer to young children since the bitter taste of the medicines cannot be successfully disguised. Fortunately the disease is self-limiting.

Today's Treatment

Endocrine and metabolic diseases

Modern approach to diabetes mellitus—II

J M STOWERS

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Insulin

The aim in treating diabetes is to achieve biochemical normality, and the most relevant single test is still measurement of the blood sugar level. In the non-diabetic the level of plasma insulin varies in relation to the intake of carbohydrate and protein, so that the diurnal fluctuation in blood sugar may stay within a range of about 1.7 mmol/l (30 mg/100 ml). If diabetics are studied on regular identical feeds every two hours during the day before they start insulin treatment, the blood sugar will usually tend to be considerably higher in the late morning than in the evening, presumably representing the net effect of hormones which tend to antagonise the small amount of residual insulin they produce. Such a diabetic needs treatment with an insulin that acts most strongly in the morning, but it will certainly be impracticable to achieve the narrow limits of normal

blood sugar control seen in the non-diabetic without risking potentially dangerous hypoglycaemia. We have not yet achieved the necessary fine adjustment of insulin administration except by complicated computerised artificial pancreas machines which can continuously monitor the blood sugar and infuse insulin as needed to achieve a predetermined level of glycaemia.

Although new insulins are still being introduced, old ones are seldom withdrawn, so that we now have available 12 different kinds, each one in at least two different strengths. These are classified in the table.

It is most important for doctors to know well a useful range of insulins rather than spread their experience too thinly. There are theoretical and some practical advantages in avoiding the addition of proteins to insulin for they increase the incidence of local skin reactions and antibody formation. Similarly, neutral rather than acid insulins produce less subcutaneous fat atrophy. Finally, porcine insulin is less antigenic in man than bovine, but there is not enough porcine insulin to satisfy the world demand.

Aberdeen Royal Infirmary, Aberdeen AB9 1GS
J M STOWERS, MD, FRCP, consultant physician

MONOCOMPONENT INSULIN

The most recent addition is monocomponent porcine insulin, which may be virtually non-antigenic and is available also in

Insulins—Comparative table

Name	Duration of action	Peak(s) of action (h)	pH	Appearance	Source	Added protein	Special features
Soluble:							
Unmodified	Short	2-5	Acid	Clear	Mainly beef	0	Virtually non-antigenic
Nuso	Short	2-5	Neutral	Clear	Mainly beef	0	
Actrapid MC	Short	2-5	Neutral	Clear	Pig	0	
Insulin zinc suspensions or lente group							
Amorphous or semilente (SL)	Intermediate	3-6	Neutral	Cloudy	Pig	0	Virtually non-antigenic
Crystalline or ultralente (UL)	Long	6-12	Neutral	Cloudy	Beef	0	
Lente (30% SL)	Intermediate-long	3-8	Neutral	Cloudy	{ 30% pig 70% beef	0	
(70% UL)							
Monocomponent:							
Actrapid MC (see under soluble insulins)							
Semitard	Intermediate	3-8	Neutral	Cloudy	Pig	0	Virtually non-antigenic
Monotard	Intermediate-long	6-10	Neutral	Cloudy	Pig	0	
Biphasic	Intermediate	2-5	Neutral	Cloudy	{ Pig 25% Beef 75%	0	
Globin zinc	Intermediate	3-5	Neutral	Clear	Beef	x	Contains no excess of protamine or zinc uncombined with insulin
Isophane	Intermediate	3-6	Neutral	Cloudy	Beef	x	
Protamine zinc	Long	5-14	Neutral	Cloudy	Beef	x	Contains excess of protamine and zinc