competition has been started"). Interestingly, when the laboratory at Hull opened the *x*-ray department had been in existence for some 20 years.

Costing was accomplished by essentially armchair calculations. The staff numbers and grades at different points were recalled and they were allotted contemporary pay, this being the largest item. The same was done for equipment. Such approximation may still serve where virtually only large changes matter.

Growth rate varies, of course, between departments (biochemistry high, histopathology low), and some activities lessen (diphtheria swabs) while new ones arise (transfusion). In our case, as specialised laboratories have opened in adjoining areas, so categories of work have been transferred to them—for example, syphilitic serology, cytology, and calcium studies. At the same time we have accepted work from the adjoining areas—for example, renal biopsies, fat biochemistry, and screening for phenylketonuria. The sum effect of these changes, in our case, is to render the curve less steep than if the laboratory had continued to be a self-sufficient island.

Pathology laboratories began to open in non-teaching hospitals in the 1920s, and the need for the rest of the country to be levelled up to the privileged became clear. By the end, in 1950, of the Emergency Medical Service expansion under Professor Panton and the start of the National Health Service the country was, I suppose, essentially levelled up. Yet pathology work continued to grow. The increase has been sustained and exponential, doubling every seven years. Throughout this period one has heard from clinicians "this increase cannot go on," but it has. It became apparent that laboratory staff not only carry out tests requested but also invent new ones. Moreover, the demand they generate by a day spent inventing a new test magnificently exceeds the demand assuaged by a day spent doing an old one.

Others have reported on the growth of laboratory investigation generally in one branch such as biochemistry or over a part of the laboratory history.[1-3] It has been broadly similar to that reported here. Since a world war made the curve no more than hiccup, neither, surely, will a national slump or other outside force. As I see it this relentless invasive growth will be halted either by the emigration of staff to pleasanter pastures or, more sensibly, by the clinician who clearly delineates work that is not needed.

Future growth

Let us, therefore, suppose that the curve of work will continue until 2000. Is the cost sustainable? (fig 3). At the point 2000 the work undertaken will be 12 times the present level. The proportion of the gross national product (GNP) and the man-in-the-street's pay going to it, however, will increase much more slowly. Now the cost of the growth of pathology is, in essence, recouped by a gain from better and quicker diagnosis. This pathology cost is small when compared with the clinical cost and the cost to the community of absence from work or inefficiency at work and the load put on others in the community. Thus higher pathology cost could, I imagine, be readily balanced by a saving to the community and a reduced level of bed occupancy. In this regard, the average length of stay of an inpatient at Hull Royal Infirmary has, during the life of its pathology department, dropped from 21 to 11 days (post hoc ergo propter hoc?). Thus there is no financial veto on the expansion continuing.

The figures say nothing about where the work will be done in 2000. Is it all to be done in Eurolab at Strasbourg, collected by rocket-pack to overflying Section 8 (Britain) swallowplane at 0900, with reports outprinted on ward and health centre case notes at noon, along with updated diagnoprobabilities? Or will much work be done in peripheral, 100-bed community hospitals offering a human pathology presence to the clinician and the patient. In my view the correct solution lies in encouraging evolution in both directions, central specialisation plus certain intelligent field workers.

As an immediate objective it might be wise to plan laboratory (and other) specialisation by area (1×10^6 people) rather than district and at the same time retain a laboratory presence at district and other principal hospitals. There must be face-to-face consultation, if need be by videophone. While big, in pathology, is certainly not beautiful, growth will continue and be the better for being anticipated.

I should also like to see, say, 0·0001% of the GNP spent on finding out if it is all worth it. The way to do this, it seems to me, is by furthering computer diagnosis. The well-informed computer will achieve significant diagnosis with a shorter request list, and so the up curve of work will flatten.[4-7] Computer diagnosis has already been shown to be practicable and advantageous to the patient and to save money. Moreover, the clinician's diagnosis experience gained in computer dialogue is to a useful extent carried on to other situations.

As such streamlined investigation develops it may be wise to allow some redundancy in test and observation. As is the case with genes, where reduplication and redundancy is rife, this will allow plenty of room for random and intuitive new finds and so for knowledge to evolve. This in turn will draw men of imagination to where they are needed to add the diagnosis to the man; the man who, by so many variables, is unique and virtually unprogrammable; to where the mind of man must study man.

I am indebted to chief technicians Mr A Manby and Mr H Warley. I should also like to thank Mr F T de Dombal for advice on computer diagnosis, Dr T W G Kinnear and Dr P E McGill for helpful comment, and Mrs E Gray for her years of record keeping.

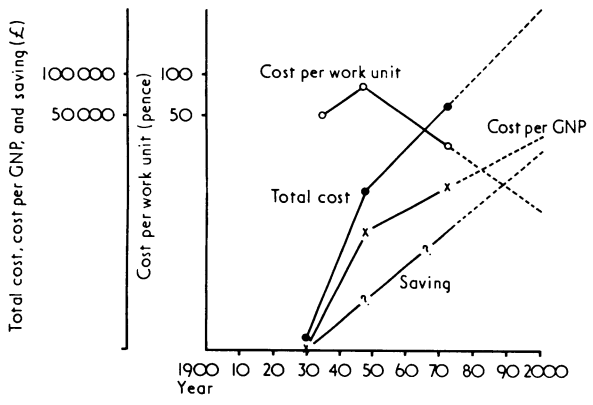

FIG 3—"Total cost" is a guesstimate made at three points at 1973 values. "Cost per GNP" (gross national product) is expressed as a ratio, and the GNP itself is taken (with doubt) as expanding each 10 years from 1·0 to 1·33. "Saving" is a guess of what, in the absence of laboratory investigation, it would cost in loss of productive life and labour and in maintenance of the sick, maimed, and dependent.

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A patient on propranolol 120 mg daily complains of excessive watering of the eyes on any slight stimulus. Does propranolol have any adverse effect on the eyes?

Dryness of the eyes with hyperaemia of the conjunctiva has been described in a patient treated with propranolol,[1] but I have not encountered any case of excessive watering, so that it would be wise to look for some other cause for the symptoms in this case.

1 Cubey, R B, and Taylor, S H, *British Medical Journal*, 1975, **4**, 327.

cardiovascular disease or hypertension. They are probably most effective in the depressed. They should be administered intermittently with intervals of not less than four weeks between monthly courses as this is as effective as, cheaper than, and less likely to cause addiction than continuous treatment. It should be explained to the patient that courses will only be repeated if significant weight regain does not occur during the four-week intervals, which should encourage the patient to establish good eating habit. Of the proprietary preparations of phentermine available, Duromine is clearly preferable to Ionamine (table I). The cost of Apisate and Tenuate Dospan are comparable and paradoxically both cheaper than Tenuate (table I).

Fenfluramine, although structurally related to amphetamine, has anorectic properties without causing CNS stimulation. Drug dependence may develop but addiction is not a problem. Side effects include lethargy, diarrhoea and other gastrointestinal upsets, vivid dreams, and reversible alopecia, but the major drawback is depression, which is especially likely to occur if the drug is withdrawn abruptly.[6] For this reason it should never be prescribed intermittently and should be discontinued stepwise under close medical supervision. Given continuously, its anorectic effect is similar to that of intermittent phentermine but appears to last longer than the other amphetamine analogues and may be related to dose. Individual response, however, is extremely variable. It is probably most effective in anxious tense patients and should be avoided in the depressed. The theoretical advantage of Penderax Pacaps (twice as distinct from thrice daily) does not justify the additional cost (table I).

Mazindol

Mazindol, although unrelated to the amphetamines, is a CNS stimulant. Some reports of its clinical efficacy are encouraging[7] but others are equally disappointing[8]; its major interest may be its chemical novelty.

TABLE—*Cost of currently available anorectic drugs*

Aproved name	Dose in mg	Proprietary name	Cost per 30 days at recommended dose*
Diethylproprion	75	Apisate	43p
	75	Tenuate Dospan	44p
	25	Tenuate	67·5p
Phentermine	30	Duromine	£1·10
	30	Ionamin	£2·95
Fenfluramine	20 tablets	Ponderax	£5·07·5
	60 capsules	Ponderax Pacaps	£5·65
Mazindol	2	Teronac	£2·59
L- & D-amphetamine	20	Durophet	50p
Phenmetrazine	30	Filon	£2·02·5
Phenbutrazate	20		

*Derived from MIMS, June, 1975.

Bypass surgery

During the past few years an increasing number of patients with morbid obesity have undergone various bypass operations designed to produce weight loss by inducing a state of malabsorption. The most popular procedure is an end-to-side anastomosis of the first 33 cm of jejunum with the terminal 10 cm of ileum. The immediate operative mortality is about 4%. The operation results in steatorrhoea and explosive diarrhoea is common. This may be associated with excessive and distressing flatulence, anal excoriation, and prolapsing haemorrhoids, though these symptoms may settle with time. Other complications include an increase in the formation of renal and gall stones and impairment of liver function, occasionally resulting in hepatic failure. Polyarthritis is not uncommon; electrolyte imbalances are the rule; and without appropriate replacement treatment vitamin deficiencies must occur. Life-long medical follow-up is essential as the long-term consequences have yet to be evaluated. There is some evidence to suggest that the complications may be reduced by end-to-end anastomosis and by leaving a longer segment of ileum in continuity.

After the operation patients occasionally fail to lose weight. Others may reduce to less than their ideal weight and require re-anastomosis. Most, however, lose some 30-40 kg and then their weight stabilises within two years of surgery while still considerably above the ideal.[9] Most express themselves satisfied with the operation and many benefit psychologically.[10] The immediate mortality, postoperative complications, and uncertainty about the long-term effects, however, are such that bypass surgery should only be undertaken as a last resort in patients with gross morbid obesity and in centres where its ultimate efficacy can be objectively evaluated.

Conclusions

For weight loss to be effective it must be sustained. This can be achieved by bypass surgery, a mutilative operation with an appreciable mortality, inevitable side effects, and unknown long-term sequelae. The alternatives to surgery are to promote energy expenditure by considerably increasing daily physical activity or permanently to alter previous bad eating habit by making appropriate changes in diet. Some patients fail to achieve this change and there is very little evidence to suggest that permanent changes in eating habit can be brought about by the use of drugs, formula diets, or starvation. Weight loss, however, is only one aspect in the overall management of the obese, many of whom may benefit from sympathetic support and thereby learn to live with their obesity just as a dyspeptic may learn to live with his ulcer.

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What are currently considered to be the safe and acceptable limits for nitrate—expressed as NO_3 not nitrogen—in a public water supply? At what level should mothers of young babies be warned and advised to make up their feeds from an alternative low nitrate supply to avoid the risk of methaemoglobinaemia? In areas where high nitrates are present is there any evidence of nitrosamines being carcinogenic?

To avoid methaemoglobinaemia in infants, the level for nitrate (expressed as the ion NO_3) in a public water supply should not exceed 45-50 mg/l of water. Where this level in exceeded medical and health authorities should be warned to watch for cyanosis in young babies. Mothers should be supplied with low-nitrate water for milk feeds. There is some margin of safety in the above figures to cover other causes of methaemoglobinaemia, such as the lack of certain enzymes in infants, their gastric juices being less acidic, and some of their food, such as spinach, already having a high nitrate content. A more important factor is that prolonged boiling of high-nitrate water used to make milk feeds concentrates the dissolved solids, including the nitrate. Fresh tap water should be used to prepare each milk feed and the water heated but never allowed to simmer or boil for more than a few seconds. The nitrate content would have to be at a much higher level than that quoted above to form nitrosamines in humans. Processed meat and fish and canned goods are more likely sources or precursors of nitrosamines. There is no evidence that public water supplies in Britain contain nitrate in such amounts as to cause pollution from nitrosamines.[1]

1 *Aqua*, 1974, **1**, 3. London, International Water Supply Association.