his colleagues found that a hospital diet supplemented with charcoal-grilled beef lowered plasma levels of phenacetin in man, probably by increasing first-pass elimination in the intestinal mucosa or the liver.

Once a drug has reached the general circulation a major determinant of the intensity and duration of its effect is its rate of elimination. Many drugs are oxidised in the endoplasmic reticulum of the liver cell, and normal individuals vary widely in the rates at which this occurs. The pioneering twin studies of Vesell and Page in the United States and the late Balzar Alexanderson and his colleagues in Sweden showed that polygenic factors influenced an individual's capacity to oxidise drugs. A family study in Britain by Whittaker and Price Evans suggested that the heritability of phenylbutazone oxidation was 0.65—but also reported a significant correlation of phenylbutazone half lives between unrelated spouses, confirming the importance of environmental factors.

The nature of some of these environmental influences are becoming clearer: apart from the known "inducing" effects of certain drugs, insecticides, and cigarette smoke, diet is also relevant. The half life of antipyrine (a widely used model substrate for drug oxidation) is slightly shorter in people who drink a lot of coffee. Of greater practical importance are the findings of Kappas and his colleagues, who found that changing normal volunteers' diets to a low carbohydrate—high protein mix caused substantial reduction in the half lives of antipyrine and tolbutamide (another oxidised drug); and that the half lives of these drugs could be restored by feeding a high carbohydrate—low protein diet. Fraser and his colleagues have shown that Asian vegetarians living in London have significantly longer antipyrine half lives than do Caucasian non-vegetarians and that protein intake correlates closely with the rate of antipyrine elimination. Nor are such dietary factors confined to the Western world: Fraser and his colleagues have also shown that cola nut consumption is one determinant of antipyrine half life in Gambian villagers; and frank malnutrition among adult Indians has also been reported to be associated with alterations in antipyrine elimination.

While the mechanisms underlying these changes are uncertain some of the practical implications are clear. Both patients on reducing, high protein, or low carbohydrate diets and those who are debilitated, malnourished, or receiving prolonged intravenous infusions may have an altered capacity to metabolise drugs. Drug dosages should be tailored individually to meet the needs of these patients if treatment is to be safe and effective.

Postoperative biliary stricture: falling frequency and improving results

Over 90% of benign biliary strictures result from surgery in the upper abdomen, usually cholecystectomy. In the largest reported series, collected between 1940 and 1967 at the Lahey Clinic, there was no detectable mishap at the initial cholecystectomy in two-thirds of the 987 patients. The exact incidence of postoperative biliary stricture is difficult to determine, as most centres accumulate experience as a result of referral from elsewhere. Maingot estimates that it occurs in one out of 400-500 cholecystectomies. The skill and experience of the surgeon affect the incidence of biliary stricture, but other precipitating factors include the presence of fibrosis, adhesions, or acute inflammation in the area of operation. If removal of the gall bladder appears to be too difficult cholecystostomy should be carried out as an interim procedure. Recent figures are encouraging and suggest a roughly eightfold fall in the incidence of the problem between the 1950s and the 1960s.

Discharge from the wound, postoperative sepsis, prolonged biliary drainage, or jaundice are all early indications of stricture formation. Cholestasis or cholangitis, however, may be delayed for several years after the initial biliary surgery and may be associated with abdominal pain if calculi have developed proximal to a stricture as a result of stasis and infection. Much later, and only very rarely, variceal bleeding may occur when portal hypertension results from the development of secondary biliary cirrhosis. Cholangiography by the percutaneous transhepatic or endoscopic retrograde technique, or both, will show the full extent of a stricture and of the remaining normal extrahepatic duct and thereby help the surgeon in planning the best type of operative repair.

High strictures, affecting the common hepatic duct or right and left hepatic ducts, cause the greatest technical difficulties in repair. The bile is usually infected and this may also cause problems during or after operation. Success depends on a large stoma, apposition of mucosa throughout an anastomosis, and an adequate blood supply to, and no tension on, the suture line. Plastic procedures to a slightly strictureted duct are rarely possible, as are end-to-end anastomoses which should be performed only if less than 5 mm of duct substance has been lost. Most repairs require anastomosis of hepatic ducts to a jejunal loop or a Roux-en-Y procedure.

Indwelling tubes of varying design are generally used after operation, and some surgeons have advocated that splinting tubes should be left in situ for six to 12 months, during which fibrous tissue may mature without causing narrowing. Others, however, believe that prolonged intubation predisposes to both scarring and debris formation. Satisfactory results have been achieved for high anastomoses using a "mucosal graft" of a Roux loop splinted to each hepatic duct by a Y tube. The use of indwelling splints that pass through a hepaticojenunostomy, along the hepatic ducts, and thence through liver substance and out through the skin may also be helpful in selected cases. Techniques now exist for changing these splinting tubes percutaneously, by guidewire or pull-through techniques, if they become obstructed with biliary concretions. In some patients, preliminary percutaneous tube drainage of dilated intrahepatic ducts may allow time for recovery of liver function and reduction in liver size before a planned repair procedure.
The first attempt at repair should be carried out by a surgeon with the greatest available skill and experience. The likelihood of a recurrence is reduced by recognising that strictures are lined by granulation tissue and that anastomosis must therefore always be from mucosa to mucosa. If symptoms do not recur within two years of initial repair there is a 90% chance that the satisfactory results will be permanent. The results of operative repair have improved over the years, operative mortality being about 13% in the 1950s and as low as 2% more recently. In the larger series a good or excellent result has been obtained in about 80% of patients over a minimum of four years. When the more difficult hepaticojejunostomy alone is considered, a satisfactory result has been reported in 60% of cases at three years; and this proportion fell to only 53% over 17 years in another series.


Making better use of our nurses

In 1971 the schools of medicine and nursing at McMaster University in Canada began an educational programme for nurse practitioners. The results, just published, should provide NHS planners with food for serious thought. The nurses chosen for training were already working in family practices in Ontario. They were mostly in their late 20s or 30s, married, with an average of 7½ years' nursing experience. The course organisers insisted that no nurse applicant would be accepted unless the doctor with whom she would be working agreed to take part in the scheme himself. The McMaster programme was not intended to train nurse assistants: it set out to give nurses the skills and the confidence to make independent clinical decisions and to carry them through. Five years and 99 nurses later, these aims have been fulfilled. The nurses are doing twice as much clinical work as before and only half as much administration. In general they have taken over the management of patients with obesity and established hypertension; they give advice on contraception and marital problems; and they provide antenatal care, school examinations, health checks, and routine surveillance of elderly patients. The doctors find they have more time for patients with complicated problems. This change in working patterns does not seem to have led to clashes of temperament, for over 80% of the nurses are still in the same practices as before.

How applicable are these findings to Britain? While two-thirds of our general practices have one or more nurses attached, the use they make of them is very different. On average, the Canadian nurses work 37 hours a week, with 70% of their time spent on the clinical care of patients. British nurses work only 23 hours a week, and spend only half that time on nursing duties and half as receptionist/administrators—a pattern similar to that of the Canadian nurses' lives before their specialist training.

There is no practical or legal obstacle to nurses taking on more clinical commitments within the NHS. Already some practices here have shown that nurse practitioners are acceptable to patients, and the BMA and the Royal College of Nursing have agreed on guidelines on the range of duties that a nurse can undertake—when properly trained. Part of the impetus for the McMaster programme came from the existence of too many nurses in Ontario; there, as in Britain, nurses who marry and leave their hospital careers have difficulty in finding work that makes full use of their training.

Attitudes will have to change, however, if British nurses are to become primary care practitioners on the Canadian pattern: for many doctors (in both countries) still see the practice nurse's role as that of a procedural assistant rather than a decision-maker and her relationship to the doctor as "servant rather than colleague." Yet a new professional group of nurse practitioners could help to maintain the revitalisation of general practice as much as has the new generation of vocationally trained practitioners.

Such a change would be welcome—but it has longer-term implications for our manpower planners. Already there are growing fears that we may be admitting too many students into medical education. If we are to look ahead to a time when general practice has many more nurses and, perhaps, fewer doctors, then we need to start cutting the intake to our medical schools now.