the indignity of being time expired. The problem improved somewhat in the next two decades owing to an expansion in consultant posts, but a disproportionate increase in junior staff has contributed to the present serious imbalance. In the last parliament Geoffrey Finsberg told the house that only 27 senior registrars had not yet found consultant posts; the true figure is probably 10 times as great.

A state of affairs which has persisted for at least 30 years is unlikely to be changed for the better overnight. Planners will need to consider sensitive issues such as reducing the intake of medical students, balancing the numbers of general practitioners (and their list size) and hospital specialists, and establishing a suitable retirement age for general practitioners, as well as the option of early retirement in the more stressful specialties such as emergency surgery and medicine in district hospitals. Better ways of predicting the requirements of different specialties must be devised to prevent the development of the sort of problems that have led to the impasse in rheumatology, where a call some years ago for more specialists cannot now be implemented.

Those concerned with medical education must devise incentives to divert students and young graduates from popular and glamorous specialties into those, such as preventive and community medicine, whose current image is so unappealing. The alternative might have to be an embargo on entering particular specialties. At present there are 50 to 100 applications for each senior house officer post in medicine and surgery. It may take several months to obtain a place (thus no doubt contributing to medical unemployment), and yet the overall number of senior house officer posts in Britain is said to be more than sufficient. This chaotic state underlines the urgent need for the sort of computer technology envisaged by J C C Smith in his widely circulated paper; with such a scheme it would surely be possible to base a national matching plan for senior house officers similar to that used for residency programmes in the United States. Our own training has also become increasingly narrow and inflexible, and the suggestion by the Joint Consultants Committee that the first two or three years after registration should be spent in truly general training for everyone is to be welcomed.

Given that consultant expansion is likely to remain sluggish and that many things have to be done to correct the career imbalance, the priority should surely be to accommodate senior registrars who have completed their training. At present the advice from the Department of Health and Social Security is that contracts should not be terminated—thus contributing to the bottleneck lower down—provided the holders apply for all suitable consultant posts. Since most do eventually obtain appointments it would surely be reasonable at least for them to be automatically shortlisted. Time expired posts and those in oversubscribed specialties which become vacant should be scrutinised by regional senior registrar committees rather than being automatically readvertised. Now that regions hold most senior registrar contracts a realistic ratio—roughly one to six instead of the present one to two in some of the popular specialties—could be planned between senior registrars and consultants.

If such a balance is to be achieved one problem that will have to be attacked is the profusion of posts which carry honorary senior registrar status. These are broadly of two kinds: established lecturer posts in medical schools which have received educational approval from the royal colleges and faculties and an unknown number of research fellowships, funded mainly by bodies outside the NHS, which are given senior registrar status so that the holder can work with patients. The latter are not always subject to formal review for educational purposes. True, some occupants of these posts—for example, those from abroad—will not be competing for consultant posts and others will go on to approved senior registrar appointments, but some research fellows do apply for consultant posts. Any substantial reduction in numbers for the sake of the NHS could have a disastrous effect on basic and clinical research, and ways must be found of counting and designating such posts so that they are included in manpower figures.

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Umbilical vein for bypass operations

Despite the vast numbers of operations on blood vessels performed each year surgeons have yet to find an ideal vascular prosthesis. Virtually any replacement vessel will remain patent when it replaces a large artery with a high flow rate,[1] but many patients with vascular disease who face the prospect of amputation require a bypass from the common femoral artery to the distal popliteal artery or to one of the vessels distal to it. Even autogenous vein does not perform very well in these circumstances. The mean patency rate of saphenous vein implanted from the common femoral artery to the arteries below the popliteal artery is only 56% after 12 months.[2] These are depressing figures, but they show that the surgeon is able to save the limb in half his patients with this unfavourable pattern of disease. These patients have such a limited life expectancy that many will not lose their limb within their lifetime.

Many patients needing vascular surgery do not have a suitable saphenous vein, or it may have been used previously for a variety of purposes. In 1975 Dardik and his colleagues in New Jersey developed, in association with Meadox Medicals Inc, a graft consisting of human umbilical vein obtained from obstetric units. The vein is treated by a complex series of processing steps, including tanning with glutaraldehyde to reduce its antigenicity. The grafts are then covered with a polyester-Dacron mesh to reduce the possibility of late aneurysm formation and are stored in alcohol. Long prostheses are made by the manufacturers by suturing two umbilical veins end to end.

This modified human umbilical vein graft (biograft) is the most expensive form of vascular prosthesis, costing almost £600, but good early results have fired the enthusiasm of vascular surgeons in a relatively short time. Dardik and his colleagues recently published the results of 552 biografts implanted between 1975 and 1980.[3] Of these, 241 have been

followed up for more than one year after implantation and 129 have been followed up for more than two years. Femoropopliteal grafts followed up between one and two years had a patency rate of 73%, and 52% of femorotibial bypasses were patent after the same period. Femoroperoneal bypasses had a patency rate of 47%. These commendable results compare with those of a vein bypass—but they have been achieved by a highly experienced surgeon. Cranley and Hafner found comparable results in 63 biografts in the femoropopliteal region,[4] with a patency of 73% and a 63% patency for their eight grafts followed up for that period in more distal sites. Klimach and Charlesworth,[5] however, performing femorotibial bypasses in a series of 112 patients, found that only 29% of the biografts were patent after 12 months, results worse than those of vein bypasses. They did, however, include in their series patients with severe distal vessel disease, who may well have been excluded from other series. Patients with good vessels fared better. Those with only one vessel patent below the knee had 15% of grafts patent after 12 months. Those with two vessels had 28% patent and the few patients with three vessels had a patency of 49%. Clearly, like all others, this conduit fails in the presence of severe arterial disease, and careful selection of patients is necessary if acceptable results are to be obtained, even in the short term.

Comparable results have been claimed in uncontrolled studies with other vascular prostheses such as velour Dacron or polytetrafluoroethylene, but there has only been one controlled trial of these prostheses versus umbilical vein. In a joint Scandinavian study Eickhoff and Buchardt-Hansen and their colleagues[6] examined the fate of 104 patients having femoropopliteal bypasses for severe ischaemia in whom no saphenous vein was available. They were randomised into those who received polytetrafluoroethylene and biografts. The trial was discontinued when a significant difference was found between the two materials, umbilical vein giving better results than grafts of polytetrafluoroethylene. The patency rate was 40% in the polytetrafluoroethylene group as against 75% in the umbilical vein group. The authors acknowledge that these were very short term results and that late failures in the umbilical vein group might possibly make the grafts comparable. The results of this trial must therefore be interpreted with caution, but the report is welcome, as far too few such trials have been published.

Published data cover only the short term patency of these grafts, which is mainly dictated by the degree of distal arterial disease. Long term patency is affected by many other factors, including progression of atheroma, subintimal fibrosis at the anastomoses, and degeneration of the material. False aneurysms at anastomotic sites occur with any graft material, but true aneurysms of biological material are to be feared, as they were the downfall of the human homograft, which was widely used in the early days of vascular surgery, and of heterografts. Recently the development of true aneurysms has been reported in three biografts, each followed up for three years.[7] One other graft was found to be aneurysmal on arteriography at 50 months in Cranley's series, and I recently had to replace a common femoral to anterior tibial biograft, which had been patent for two years, because of diffuse aneurysmal degeneration. These aneurysms do not appear to be associated with sepsis and, though rare, seem to be due to degeneration of the biological material and rupture of the Dacron mesh which encloses it. These early reports need not cause too much alarm, for many of these patients will die within three years of implantation, and most of the aneurysms have been replaced successfully without amputation. Clearly a longer follow up is necessary before this prosthesis is accepted unequivocally, but that caution should not be allowed to overshadow its early promise.

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Prostheses in the management of bone cancer

Amputation is no longer the sole contribution of the surgeon to the management of bone tumours. Improvements in the design of and in methods of fixing prostheses have been combined with advances in chemotherapeutic regimens to give surgical procedures for preserving limbs affected by both primary and secondary bone tumours and by locally destructive conditions. Careful selection of patients is, however, essential: we must avoid the premature death of a patient with a satisfactory prosthesis who might have lived had he or she been treated by immediate amputation.

Total hip replacement and metallic implants fixed with methylmethacrylate cement are now well established in the management of pathological fractures secondary to metastatic carcinoma.[1 2] In such patients treatment aims at improving the quality of life that remains, and both the demands placed on the prosthetic implant and the length of time it is expected to function satisfactorily are limited. By contrast, patients requiring resection of primary bone tumours are often young and should live with the prosthesis for many years; those with benign destructive tumours have a normal life expectancy. A substantial amount of healthy bone may need to be resected to ensure a safe margin, leaving little for the secure fixation of an endoprosthesis. At present large rapidly growing tumours and those not confined to the metaphysis of bone are quite unsuitable for prosthetic replacement, and this includes most osteosarcomas.

The first reported case of a prosthetic implant for tumour was for a recurrent giant cell tumour of the proximal femur. This was replaced with a 25 cm long Vitallium mould of the upper end of the femur; after operation the active motion at the hip joint was roughly three quarters of normal, though unfortunately this patient died 20 months later in cardiac failure.[3] Custom built prostheses have been used to replace the femur, the hip joint, part of the pelvis, the knee joint, the humerus and shoulder joint, and parts of the ulna and radius. These are the most common sites at which primary bone tumours occur.