Research Policy

Medical researchers: training and straining

RICHARD SMITH

Research depends more than anything else on talented people with bright ideas. Money, equipment, and management pressure can do nothing without the talented people. This is why much of the anxiety over Britain's declining performance in science is focused on fears that bright people are becoming ever less attracted by a career in either science or research at the same time that experienced researchers are draining away abroad, particularly to the United States, and into other careers. A study conducted in 1986 by the Association of Researchers in Medicine and Science of 200 advertisements for postdoctoral posts in medical or biological research showed that 30% of the posts were unfilled.[1] Professor Peter Campbell, who helped conduct the survey, told me last month of a unit in a London medical school looking for a researcher to work on a Medical Research Council programme grant: no applicants were received in response to the first advertisement, and the only response to the second advertisement was from a Peking based researcher.

The problems with the supply of medically qualified researchers are somewhat different. There is no shortage of bright entrants to medical school, and stories of medically qualified researchers emigrating to North America are less common: many might be attracted by the research possibilities, but they are less enthusiastic about the style of clinical medicine practised in the United States. The "brain drain" among medically qualified researchers is an internal drain, into more lucrative and less demanding parts of medicine. Young medical graduates are put off a career in research by the poor career prospects, and those who do enter a career in research find it steadily more difficult to justify to their spouses if not to themselves the enormous demands of such a career, the uncertain future, and the small material reward. "Why not forget it?" their spouses ask. "Why not get a consultant post in a pleasant country town, build up a private practice, and develop your interest in sailing or building harpsichords? You could always do a little research on the side. A drug company would pay." Many cannot resist these pressures forever.

The potential supply of researchers

In maths, physics, and technology Britain has shortages of both schoolteachers and undergraduate students, and the Committee of Vice Chancellors and the Royal Society have drawn the government's attention to this problem. The biological sciences do not have these shortages, and applications continue to exceed by far places in medical schools. The block in the biological sciences comes later, and, as I talked to Professor Denis Noble, a fellow of the Royal Society and professor of physiology in Oxford, he developed the notion of the "brain filter." Between 1982-3 and 1985-6 the proportion of Oxford science graduates with first class degrees going into research fell while the proportion going into commerce increased. Professor Noble's perception is that bright science graduates are ever less interested in entering a career in research. He thought the main reason was the poor career structure and the way that so many researchers had to exist on "soft money"—research funds that are often guaranteed for no more than one year and rarely for more than five.

Non-medically qualified researchers

Most medical research is done by people who are not medically qualified.[2] Nobody knows exactly how many people are engaged in medical research, but a survey published in 1981 identified 10 805 medical researchers, of whom almost three quarters were not medically qualified.[2] (The authors sent 1146 questionnaires to universities, Medical Research Council institutes and units, institutes funded by medical charities, and various other government funded centres and ended up with 79% that were usable. Multiplying up suggested that there were thus about 10 000 non-medically qualified researchers and 2500 medically qualified ones. The figures did not include researchers working in industry.)

About two fifths of the researchers who were not medically qualified were funded entirely by grants; two thirds of those had been dependent on grants for three years or longer, 5% for more than 10 years. A third of the non-medically qualified researchers were women, and they were much more likely than men to have had to live long term with the uncertainty of being supported entirely by grants: 47% of the women over 35 had permanent jobs compared with 79% of the men.

These "contract researchers" do much of the medical research in Britain, and the Association of Researchers in Medicine and Science is particularly concerned with their conditions. The association conducted a survey of the conditions offered to the researchers by the universities, medical schools, and polytechnics; only 28% allowed them representation on senate, academic, or faculty boards and only 25% allowed representation on research committees; most (74%) did not have any bridging funds to support the researchers between grants; all but eight of the universities made the researchers sign contracts waiving statutory rights to redundancy payments; only 12 universities provided some payment for removal expenses; and, finally, contract researchers had very limited access to funds to attend scientific conferences.[3] These poor conditions matter increasingly because the proportion of contract researchers is increasing: the numbers in Britain rose from 6000 in 1976 to over 10 000 in 1984.[4]

The cynical, which may include the research councils and certainly includes the government, are not much bothered by the poor conditions of contract researchers. They see the researchers as the cannon fodder of research, bright young things who pass through quickly with their ideas and skills on their way to jobs in television or insurance companies. The authorities perhaps imagine that those who are really talented and determined will skilfully navigate the choppy waters of contract research into the calm of a salaried (if not tenured) post. But unfortunately it may well be the

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most talented who are lost—because they see the dreadful conditions and find it most easy to turn away from research or disappear quickly to industry or abroad once they have experienced the poor conditions. Certainly some of the responses to the survey of the Association of Researchers in Medicine and Science of postdoctoral posts make frightening reading for those who care about medical research (see box).[1]

The association is campaigning to encourage the universities and polytechnics, the bodies that fund research, and the government to improve the conditions of contract workers, particularly by providing more permanent posts and five year rolling grants—even if it is at the expense of short term grants. It is also in favour of a better career structure, which, in the words of Professor Campbell, "would retain the best aspects of opportunity and flexibility but at the same time prove attractive enough for new recruits."

The Medical Research Council does not see any shortage in graduates in biological sciences wanting to go into research, but it frets that it cannot do better in its provision for them. The MRC's figures show an increase in applications for research studentships but a decline in the number awarded (figure).[5] These studentships go to recent science or medical graduates who want to undertake usually three years' research, leading to a PhD, and the MRC is concerned by the expanding gap between applications and the number of awards. It says in its corporate plan that it "is convinced that many gifted graduates are being lost to research" and it plans to increase the number of such studentships.[6] It also needs to consider the nature of the studentships; another factor that discourages some aspiring researchers is the poor quality of the training.

The studentships are awarded to departments rather than individuals and in line with the prevailing philosophy the MRC plans to concentrate them into the best departments. The usual problems will be encountered in deciding which are the "best departments," and I spoke to academics in basic science departments in medical schools who no longer had the opportunity to take medical undergraduates and encourage them to do PhDs. This was a source of despair, and the snag with concentrating studentships is that the brightest medical students are not necessarily in the medical schools with the best departments (although perhaps they will be in a decade's time once it is clear which are the "research medical schools.")

Comments made by respondents to a survey on applications received in response to advertisements for postdoctoral posts in medical or biological research[1]

"It seems that anyone in the molecular biology field who is any good has gone abroad, into industry or left academic circles. Almost impossible to fill short term University research posts now. Malaise at all levels in University science due mainly to career prospects, low recognition and (partly) funding." Biochemistry (Leeds University). There were two applicants for a post vacant because the previous holder had gone to West Germany for better career prospects. The post was not filled.

"We have had this position vacant for six months. Previous adverts brought only five applicants. We have advertised for postdoctoral fellows on numerous occasions in the last three years. The response has always been very poor. People are reluctant to enter academic research given the total lack of career structure." Biochemistry (Leicester University). There was one applicant for a two year project on gene expression in cancer.

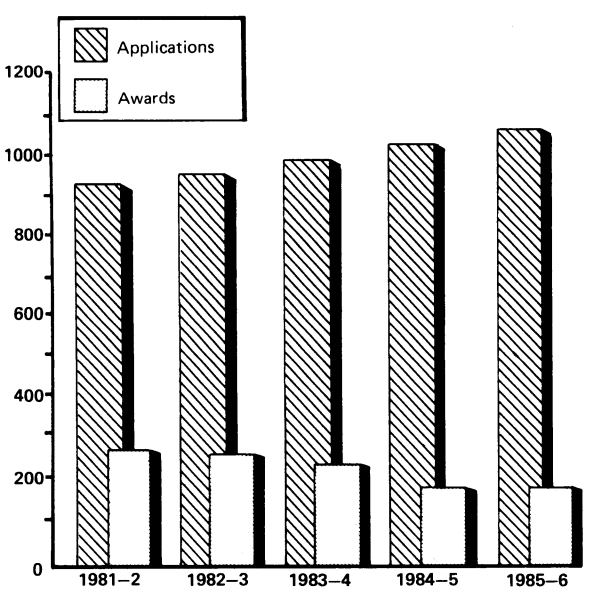
"I am amazed at the poor response to my adverts. Three years ago I had over 40 suitable applicants. Disenchantment with university posts and lack of career structure?" Biochemistry (London medical school). There were 13 applicants but none were suitable and the post will be readvertised.

"It is the outstanding, personnel that leave and are now replaced by a greatly inferior standard of scientist." Vaccine studies (Porton). This permanent post was vacant because the previous holder had left for Switzerland for double the salary. There were two applicants and the post was not filled.

"Only one applicant to date, aged 40, leaving senior position in industry. Reasons for not appointing—too expensive and no technical support available. I am now planning to leave the UK myself. This is too much." Bacteriology (London medical school).

Medical graduates entering research

In 1977 Professor Michael Oliver, who is now president of the Royal College of Physicians of Edinburgh, wrote: "Clinical science may be in danger of disappearing as a professional vocation."[7] The second box shows his analysis then of why clinical science was dying. When he gave evidence at the end of last year on behalf of the Edinburgh college to the House of Lords Select Committee on Science and Technology, Professor Oliver said: "There is only one urgent and fundamental priority needed in the training of medical researchers. This is a career structure."



Applications to the Medical Research Council for research studentships and number awarded from 1981-2 to 1985-6.

Data that prove that medical graduates are less and less interested in a career in research are hard to come by, but everybody I met assumes it to be so. The Americans suffered from a similar problem in the 1970s—the number of postdoctoral traineeships awarded by the National Institutes of Health to those medically qualified fell from over 3000 in 1973 to under 1500 in 1976.[8] It climbed back to 2239 in 1984,[9] but the fall caused much soul searching among American clinical scientists. Dr James B Wyngaarden, who was appointed director of the National Institutes of Health in 1982, gave his diagnosis for the causes of the fall in an article published in 1979.[8] The first cause was changes in society, which made medical students less concerned about basic science and more concerned about social injustice (see third box).

A second cause of the decline identified by Wyngaarden was the instability of federal support for training and research, and a third factor was that research was being squeezed out of medical school curriculums. A fourth problem was that specialty training boards were insisting on more clinical experience, and, finally, there was the fact that American students had to pay back money borrowed for both their medical training and for some sorts of research training. An ad hoc committee of the Association of American Medical Colleges reached a similar diagnosis in 1980.[10]

Decline in Britain

Some of the factors working against young doctors entering a career in research in Britain now are the same as those operating in the United States in the late 1970s. The first and perhaps most

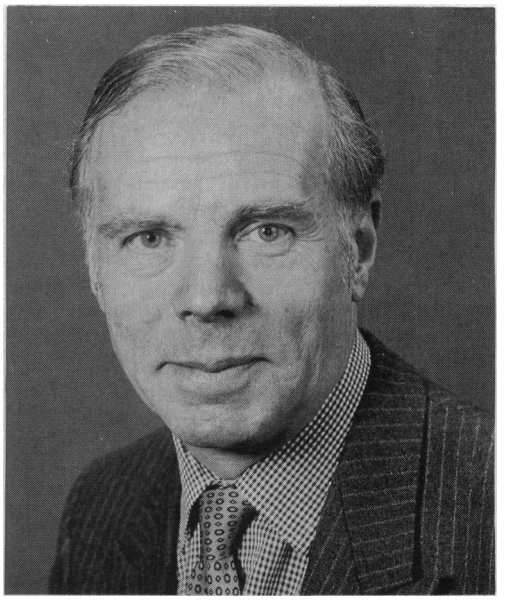
important of these factors is also the most difficult to pin down—but it is that the medical culture in Britain is antipathetic to research. Several of the researchers whom I spoke to raised this point. Everybody is for medical research in general, but a doctor's value is measured primarily on his or her clinical abilities. Thus doctors who spend much of their time doing research—and therefore less time honing their clinical skills—are suspect. Furthermore, some doctors are positively hostile to, say, molecular biology or immunology because they don't understand it (and are threatened by it), think that too many resources are devoted to such activities, and think that these activities are too reductionist at a time when the fashion is for holistic medicine.

This hostility is one of the factors that makes it very difficult for medically qualified people to do first rate research—because such research needs time. Another problem is that as both research and clinical work become steadily more demanding and specialised—and further apart from each other—it is increasingly difficult for researchers to keep a foot in both camps.

A much more tangible difficulty for potential medical researchers is the lack of a career structure and career posts. The Association of Clinical Professors of Medicine estimates that between 1979-80 and 1986-7 there was a loss of 513 clinical academic posts (almost 25% of all posts). Some of the shortfall has been made up with posts funded by "soft money," but most of this funding is short term. There is little room at the top and little security anywhere, particularly in comparison with the NHS.

Just as in the United States, another block is the fact that specialty training has become more demanding, while the reorganisations in manpower that have resulted from *Achieving a Balance* have made it impossible for junior doctors in most research posts to obtain honorary registrar contracts.[11] A final block, and one particularly poignant for potential surgical researchers, is the fact that clinical academics cannot enjoy the six figure sums that can be made in private practice.

Views of Professor Michael Oliver on why the supply of clinical scientists is drying up[7]



"Clinical science may be in danger of disappearing as a professional vocation . . . because of the cost of medical research, the enticement of investigators to other fields, changing social attitudes and the public's disenchantment with science.

While the shortage of money . . . is seriously restricting research programmes and closing some laboratories, an equal and, in some countries, more grave threat is the steady attrition of the cadre of clinical scientists. Committed clinical investigators are being seduced by promises of security and money into other areas of medicine. Fewer young men and women are excited by the intellectual challenge of applied science. . . . The satisfaction of academic accomplishments and the accolade of acceptance by one's peers are no longer enough. There appears to be a decreasing commitment to study, with greater domestic involvement and more time given to leisure for leisure's sake. Sociologists speak loudly, and perhaps rightly, about the need for doctors to improve the quality of community health and to get out into the field and combat the many psychological ills of our perplexed and over-indulged people. . . . These and other less easily definable pressures are steadily reducing the number of professional investigators to a level which may be no longer self generating; and self generation is a vital spark for clinical science."

Improving the career structure

In its evidence to the House of Lords committee the Association of Clinical Professors of Medicine has proposed that about half of the lost academic posts of clinical science—that is, about 250—should be recreated. These, it thinks, should be awarded competitively and directed towards subjects that are currently under-researched and poorly funded by charities—for example, infectious disease, mental handicap, and psychogeriatrics. These new clinical scientists should, the association argues, be senior lecturers—because NHS manpower committees will not allow more senior registrars and because the whole trend in the health service is towards more consultants and fewer juniors. These clinical scientists would need to be supported by 100 new posts for basic scientists. The association costs this scheme at about £18m.

Training medically qualified researchers

Clinical scientists must not only be recruited and slotted into a decent career structure: they must also be trained, and science policy analysts—particularly at the Ciba Foundation and in Cambridge—are turning their attention to the best ways of doing this.

INTERCALATED DEGREES

Only a tiny number of medical students embark on a PhD while still undergraduates, but many more get a taste of research by undertaking a BSc in basic medical sciences in the middle of their undergraduate course. (These intercalated degrees are optional in most medical schools but are built into the course in Oxford, Cambridge, and Nottingham, while students at Southampton spend their fourth year doing an in depth study.) The optional intercalated degrees are yet another part of the infrastructure of clinical research that is crumbling—the chance to do these degrees has been hit by bureaucracy.[12] In the 1960s the MRC was encouraged by the then Ministry of Education to support medical students who wanted to do these degrees, and in 1964 the council supported 12. By the end of the 1970s the council was supporting nearly 400 students a year at a cost of about £800 000 (about 1% of its budget). The MRC was paying for these students because most local education authorities were unwilling to do so.

In 1980 the MRC decided to reduce the number of students it supported, and in 1986 the number was cut to 304. Now the National Audit Office wants the number cut further because it says that the MRC has to use its funds to support research not education. The trouble is that no other organisation(s) is likely to foot the bill, although I understand that the Nuffield Foundation is considering supporting some students.

Few people doubt the value of these intercalated degrees, and—unusually—data are available that seem to support their worth. Research publications often result from the year,[13-15] students doing the degrees do better in the rest of the medical course than those who do not (even after controlling for academic ability),[16] and a high

percentage go into academic medicine.[13-15 17] And a study that started with 885 medically qualified professors and readers in medical faculties showed that 15·5% (four times the proportion of a random sample of all doctors) had an intercalated BSc (despite the fact that the degrees began only in 1964)[18]; and those in clinical specialties who had such degrees raised substantially more research grants from the MRC than the rest. The academics with intercalated BScs also published more than the rest, and the papers of a subset controlled for date of graduation and frequency of publication were cited more often. Most of these studies are open to the criticism that doing a BSc is simply a marker of an interest and ability in research and so naturally these people will enter academic medicine and do well, but the study that compared the performance of those with degrees with that of others in academic medicine is less open to the criticism.[18] Few other training courses have such a substantial body of data to support their worth, and every effort is being made by the research community to keep intercalated degrees.

FURTHER TRAINING

Nobody would pretend that doing an intercalated degree in a basic science provides a complete training in research, and a 1985 study of 262 medically qualified researchers showed that only 29% had done such degrees and only 40% had done any research at medical school.[19] Two fifths had planned a career in research, but another two fifths had developed an interest in research while doing a job that was not necessarily research orientated and another fifth had entered research fortuitously.

Those medical graduates who do want to develop a career in research will almost certainly need a "godfather" to guide them through the maze of possible routes forward and help them find sources of funding. Junior academic posts are not difficult to come by, but in many departments young potential researchers will find themselves with such a large teaching and service load that they will have little time for research. To spend enough time doing research to become proficient it will probably be essential to get outside funding. The MRC and the Wellcome Trust have various training schemes, but most of the medical charities are reluctant to sponsor training. Competition is intense for funds for training.

Many of those working towards a career in research do not actually receive much "training." They have to learn by doing, a time honoured method, but many of the researchers whom I spoke to were unhappy with their training. This unhappiness with the quality of training may partly explain why only about half of those who begin a PhD submit a thesis.[20] Many researchers think that more structured training could profitably be built into some training programmes for research. Many researchers in Britain look enviously at the MD-PhD programmes that operate in the United States: students do their clinical studies at the same time as research work. In Britain occasional students do a PhD in the middle of their undergraduate course, but the two courses do not proceed at the same time. The faculty board of clinical medicine in Cambridge has, however, proposed an MB-PhD programme, which would be analogous to the American MD-PhD programme. Many researchers are also keen on the idea of a larger taught component in training programmes for research. Instead of researchers grappling with statistics, computers, spectrometers, electron microscopes, or whatever by themselves or with the aid of their supervisors they would be taught about these techniques that are so common in research work. Such taught programmes are already common in North America and would probably feature in the Cambridge MB-PhD programme.

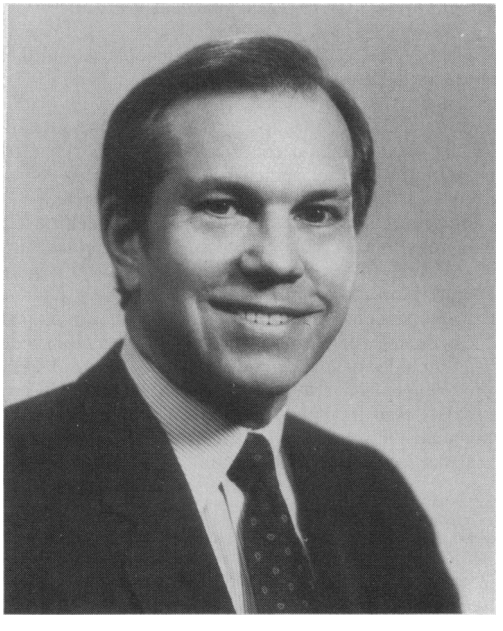
The MRC has recognised the problems of trying to find time and space to be a proficient scientist and competent clinician and has recently supplemented its range of training awards with seven year clinical fellowships. About five or 10 fellowships will be awarded each year, and they will allow the successful applicants to spend about three years in a basic science unit and four in a clinical unit. The arrangements will be flexible, but the idea is to produce researchers who are familiar with both the rapidly developing techniques of basic science and with clinical problems. The MRC will aim to spot "high flyers" when they are about two or three years out of medical school and prepare them to conduct the highest quality research.

Medically qualified doctors with the highest scientific training are rare in Britain but more common in the United States, where the National Institutes of Health have since 1984 been running a physician-scientist programme; physicians accepted on to this scheme are paid annual salaries of $66 000 for five years. Professor Keith Peters, regius professor of physic in Cambridge, hopes that the new British scheme will produce doctor scientists for Britain. Deans of medical schools are enthusiastic about the new scheme. Decisions on who will be supported will depend as much as the quality of the basic science and clinical units as on the quality of the candidate. At least to begin with, the units are expected to be in the same city, so Oxford, Cambridge, and London are likely to collect many of the fellowships. Central to the scheme will be measures to ensure that successful applicants are not overwhelmed with routine clinical work.

MD PROGRAMMES

Although medically trained researchers with a sound knowledge of basic science are rare, doctors doing a little research during their training, often to gain an MD, are extremely common. A survey (with a 56% response rate) of 596 doctors who had gained their membership of the Royal College of Physicians showed that 85% had done some research, a third had spent more than 500 days in research, and half had carried out work suitable for a higher degree.[21] Of those undertaking research, 89% had had financial support: 42% from drug companies, 40% from research bodies, 29% from health charities, and 27% from the NHS.

Views of Dr James B Wyngaarden on the social causes of the decline in American doctors entering research in the seventies[8]



"A major reason [for doctors not entering research] involves a re-evaluation of societal goals in the wake of the Vietnam conflict. This has led to greater emphasis on medical care for underserved segments of our society as a more pressing and urgent need than basic biomedical research in the improvement of health.... There is a feeling among some students that the technology of medicine has outrun its sociology. The advocates of primary care . . . have been successful Pied Pipers."

These researchers were thus consuming time and resources, and, depressingly, many seemed to be doing it simply because they thought that it would help them get consultant jobs: 80% thought that research experience was highly regarded by the committees appointing consultants, and only two thirds thought that research experience made them better doctors. Another depressing finding was that 40% had not published a paper and a quarter had neither published nor presented their research work. Of the 38 doctors who had registered for an MD, 43% had obtained it but about one in five had abandoned it, and 40% of those abandoning their MDs blamed lack of resources and 36% lack of help.

Many of the "real" researchers whom I spoke to—people doing internationally competitive research—thought that resources may be wasted on this short term research undertaken by doctors to advance their careers. It seems silly that doctors with little interest in research should have to do it simply to become a consultant. (Particularly when, as one regular member of appointment committees told me, the committees are concerned that applicants should have done some research but rarely ask what it was or whether it had any impact.) If I have to have my gall bladder removed I want the operation to be done by somebody who has taken out a lot of gall bladders rather than by somebody who has spent two years reluctantly doing some immunological research.

The need for research into research training

Does doing some research make for "better" surgeons or physicians? What is the impact of research done by doctors working for MDs? Anderson and Evered have argued that we need to consider such questions,[22] and clearly many other aspects of research training need to be researched. What happens to those who pass through the various training schemes of the MRC and others? Would a taught component in training programmes improve the effectiveness of research workers? Will concentrating resources into high flyers on the clinical fellowships produce richer returns than spreading resources more widely?

Some of these questions are easily answered, some are difficult to answer. The MRC and other bodies may be reluctant to devote limited resources to evaluating their research programmes, but they surely have a duty to ensure that resources are spent in the most effective way.

Conclusion

The edifice of medical research in Britain is more likely to crumble away because of lack of researchers than because of lack of money. The training and conditions of researchers—both those who are medically qualified and those who are not—need to be much improved. Research training must be made useful, interesting, and attractive, and a much better career structure needs to be established. These are jobs for universities, research councils, and the medical charities—and possibly for industry. In the competitive environment being encouraged by the government those universities that can improve training and conditions are likely to prosper. The charities (and industry) must recognise, however reluctantly, that the government is expecting them to pay for some of the training of research workers; if they do not accept this responsibility then they may eventually have difficulty finding able researchers to take up their grants and fill their laboratories.

Meanwhile, some concentration of training resources might not go amiss, and the royal colleges need to consider what they might do to discourage resources being wasted by fledgeling specialists who dabble in research simply to decorate their curriculum vitae.

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A woman in her 50s had an oophorectomy and hysterectomy and is now receiving oestrogen replacement treatment to control severe menopausal symptoms. What treatment is advised to combat weight gain from fluid retention?

Many symptoms have been attributed to the menopause, but there is little evidence that the menopause causes weight gain,[1 2] and cessation of ovarian activity does not usually cause oedema. Nevertheless, idiopathic oedema may sometimes start after the menopause.[3] Although weight gain may be a side effect of the combined oral contraceptive, it is rarely attributed to postmenopausal hormone replacement treatment, which requires lower doses of steroid. Oestrogens may cause sodium retention and oedema, but weight gain during combined oral contraceptive treatment is usually due to fat, and fluid retention is not a recognised side effect of hormone replacement treatment. Patients may blame oestrogens for weight gain that is really caused by overeating. If this patient's oedema is due to cardiac or renal disease hormone replacement treatment may be contraindicated. If she had idiopathic oedema, which can be confirmed by a simple water loading test, treatment includes salt restriction, weight loss, and exercise, and diuretics should be avoided if at all possible.[3] If she attributes her weight gain to hormone replacement treatment it may be worth considering oestradiol implants, which have fewer metabolic effects than oral treatment.[1]—JAMES OWEN DRIFE, senior lecturer in obstetrics and gynaecology, Leicester.

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