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1 Surender R, Bradlow J, Coulter A, Doll H, Stuart Brown S. Prospective study of trends and referrals patterns in fundholding and non-fundholding practices in the Oxford region 1990-4. *BMJ* 1995;311:1205-8. (4 November.)

Fundholding has changed referral practice

EDITOR,—I disagree with Rebecca Surender and colleagues when they conclude that their study shows that fundholding has had little effect on general practitioners' referral rates.¹ In the context of the longstanding and inexorable increase in all phases of activity in the NHS, it is expecting a great deal that fundholders would have reversed this trend for outpatient referrals. It is more reasonable to ask whether fundholders, relative to non-fundholders, have slowed down the rate of increase in referral rates.

In the control practices chosen for the study the increase in NHS referral rates was 26.6% between phases 1 and 3 of the study. In the fundholding practices the increase was only 7.5%, a difference of 19.1%. On the basis of the fundholders' baseline referral rates of 107.3/1000 this represents a "saving" of 20.5 referrals per 1000 patients per year.

Applying this figure to the mean list size (13 044) of each of the fundholding practices means that 267 referrals per year, on average, have been avoided in each fundholding practice. In our district a typical outpatient appointment costs, at a conservative estimate, £50. The avoidance of 267 referrals per practice represents a cost saving of £13 370 per practice. In my district this would be enough to purchase at least 27 hip replacement operations.

I conclude that the study shows that fundholders have changed their referral decisions and that their rate of increase in NHS referral rates to specialist outpatient clinics was much lower than that in the control group of non-fundholders. This is an important achievement and has considerable cost saving implications.

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Fundholding reduces dependence on private sector

EDITOR,—As a general practitioner in one of the first wave fundholding practices involved in the prospective study of trends in referral patterns in fundholding and non-fundholding practices in the Oxford region,¹ I am not surprised that many of the suppositions which this study set out to investigate have been shown to be "unfounded." The researchers may have expected to see an increase in private referrals but we did not, as our aim in becoming fundholders was to improve access to NHS services. That our private referrals fell by 8.8%, whereas those from non-fundholding practices increased by 12.2%, probably reflects the fact that we were able to obtain improved access to NHS services and our patients (who previously had to respond to poor access by using the private

sector) were able to use the NHS. Not all patients using the private sector are insured, and our experience is that patients respond to poor access to NHS services by spending their own resources. Unfortunately, the non-fundholding practices in the Oxford region did not see such dramatic improvements in access times to specialist services—so their patients, unsurprisingly, responded by increasing their use of the private sector.

The authors conclude that fundholders' development of reinvesting savings in new practice based services did not encourage a shift away from dependence on specialist hospital services. There are several problems with this interpretation. Part of the rise is because we were reducing our dependence on the private sector; the authors have identified this. A further part is that some of the services we were referring to (vasectomies and female sterilisations, for example) were so inaccessible in the old NHS that many of these were done in the private sector and may not have been fully picked up by the practices, as patients were often referred through family planning clinics to private providers.

The fact that non-fundholders increased their referrals to specialist services at a faster rate than fundholders may also suggest that referrals from all general practitioners were rising and that fundholders managed to cap the rise and absorb the 8.8% reduction in use of the private sector and bring back into the NHS the services that were previously virtually inaccessible to patients.

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Authors' reply

EDITOR,—We agree that there are several possible explanations for the referral patterns observed in our comparison of fundholding and non-fundholding practices.¹ We are slightly surprised that James Dunbar and colleagues have assumed that a reduction in specialist referrals would be a beneficial outcome of fundholding. We certainly did not make that assumption, although it may have been the government's intention in introducing the scheme. Indeed, our paper pointed out that we were reassured to discover that fundholders' patients were not being deprived of specialist attention. If they have data on changes in referral patterns after the date on which our study ended, we hope that these will be published as we know of no evidence of such a change.

Kevin Perrett draws conclusions from our data which we believe are misleading. He is correct in pointing out that the rise in referral rates over the three phases of the study was steeper among the non-fundholding practices than among the fundholders, but he has ignored the point emphasised in our paper that four of the six non-fundholders were preparing to become fundholders in phase 3. This meant that their referral rates were probably not representative of the true underlying trend among practices outside the scheme. National figures show that new outpatient referrals to general and acute specialties rose by 10% between 1990 and 1993,² as compared with the 26% increase observed among non-fundholders in our study. We therefore attributed this steeper than expected increase to the fact that the method of budget allocation provides an incentive for fundholders to inflate their referrals in the preparatory year, although other explanations are of course possible.

R A Smith's interesting suggestion that patients' awareness of the advantages of fundholding leads

to a reduced demand for private consultations may be correct, but there are of course a number of other possible explanations, none of which could be adequately tested in our observational study. Interestingly, gynaecology was the only specialty that saw a decrease in NHS referrals, which does not support Smith's contention that part of the increase in fundholders' referral rates was due to the relocation of female sterilisations to the NHS from the private sector.

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2 Department of Health. *Health and personal social services statistics for England, 1994 edition*. London: HMSO, 1994.

Computer based prescribing

Electronic BNF needs sophisticated hardware . . .

EDITOR,—Jeremy Wyatt and Robert Walton present an informative summary of the part that medical informatics can play in improving prescribing practices.¹ Their timely editorial coincides with the release of the CD ROM edition of the *British National Formulary*. Several problems with this electronic edition are cause for concern.

Firstly, the format requires a system based on Microsoft Windows, which many general practices do not have. Secondly, although the *BNF* is provided free to hospital doctors, £50 is required to subscribe to the electronic version—which is probably cheaper to produce. Finally, for the system to be acceptably quick for general use, I cannot see it running on anything less than a 486 based, IBM compatible machine with a large memory (>8 megabytes of random access memory) and a CD ROM drive. Many general practices—and many hospital networks—do not have such sophisticated machines. Unless there is yet another major outlay on the acquisition of computer hardware across the NHS, this wonderful initiative is not likely to be effective.

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1 Wyatt J, Walton R. Computer based prescribing. *BMJ* 1995; 311:1181-2. (4 November.)

. . . but Windows makes access easy

EDITOR,—The stand alone electronic *BNF*, available on CD ROM or disk, is the first of a range of eBNF products. The Windows platform was chosen for several reasons, most importantly because it allows presentation of *British National Formulary* text in a format that is similar to that of the familiar paper *BNF*. As it is a Windows application, the user can have the eBNF browser open at the same time as another application and shift between the applications. Finally, the Windows platform provides a relatively intuitive means of accessing and navigating the eBNF text. Further eBNF products are being developed and

will be made available to vendors of general practitioner and hospital software for incorporation in their systems, whether on DOS or other platforms.

Copies of the *BNF* are purchased by the Department of Health in bulk and then provided free to doctors and pharmacists working for the NHS. No such arrangement exists at present for the electronic version, which is available only through the publishers (BMA and the Royal Pharmaceutical Society of Great Britain).

The stand alone *eBNF* runs adequately on personal computers with a 386 processor, though a more powerful processor and more memory will increase its speed. The stand alone *eBNF* is run from the hard disk. Most new non-clinical software that clinicians may want to use runs under Windows; users are therefore likely to replace their systems with newer hardware that will run such software.

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Program calculates doses for neonates

EDITOR,—The value of computer based prescribing¹ should be immense, and the potential value is even greater for babies than adults. Drug injections for adults often use a half to a whole standard ampoule, but sick or premature neonates frequently require only a tiny proportion of the phial, which increases the scope for accidental and possibly lethal overdose² caused by medical or nursing error.³ A sequence of calculations may be required to obtain the correct dose: the weight of the drug in milligrams or micrograms must be chosen according to the baby's weight and then adjusted according to factors such as age, gestation, or renal function. The displacement volume of dissolved powder or crystals may be relevant when small proportions of a phial are required.⁴ Once the weight of the dose is known, the correct volume of the solution must be chosen and the dose diluted to obtain a manageable volume, bearing in mind that a 0.02 ml injection cannot be practically given and that in multiple drug treatment minimal volumes must be used to avoid fluid overdose. Each of these stages adds scope for error, however accurate or user friendly the compendium or formulary, in spite of the use of an electronic calculator.

At the 1995 annual scientific meeting of the British Association for Perinatal Medicine I presented a computer program (BABYDRUG) that carries out all these stages automatically. It now incorporates 31 drugs and runs off Microsoft Windows (version 3.1 or later). The program calls up relevant personal and medical factors and gives screen and printer output of the dosage as well as the preparation of the final injection to the above criteria. The formulation can be exactly and easily tailored for the individual baby in a way that would be cumbersome or oversimplified by traditional calculation. Manufacturers' instructions are used where possible, and extra drugs will be added and improvements to the schedules made by further consultation with potential users. A database for presenting qualitative information about drugs and saving prescriptions for audit is being developed. Transfer at present is by a single floppy disk, and this is not a commercial venture.

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2 Ferner RE, Whittington RM. Coroner's cases of death due to errors in prescribing or giving medicines or due to adverse drug reactions. *J R Soc Med* 1994;87:145-8.

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4 Mulholland P. Displacement volumes of powder injections. *Pharmaceutical Journal* 1993;251:14-5.

Guidelines for GPs are being tested

EDITOR,—December saw the launch of the electronic version of the *British National Formulary* with its full text indications, side effects, etc.¹ January saw the start of a unique national research and development programme of computerised prescribing guidelines which will be synergistic to the electronic *BNF*. PRODIGY (prescribing rationally with decision support in general practice study) is the first programme of its kind in the United Kingdom to test the concept of computerised prescribing guidelines in a live environment. PRODIGY will provide computerised advice to general practitioners during the consultation on the different drug choices and advice leaflets that can be offered to patients.

PRODIGY has been developed from a Dutch program of computerised guidelines (PRESCRIPTOR),² collated and referenced by staff at the Medical Advisor Support Centre in Liverpool. The English guidelines have been reviewed by an expert panel with representatives of several professional bodies (General Medical Services Committee, Royal College of General Practitioners, Royal College of Physicians, and Royal Pharmaceutical Society of Great Britain), who have made over 400 amendments. The guidelines will be further developed within PRODIGY from suggestions from focus groups of general practitioners selected from the 150 volunteer practices participating and from other observational data from the study. Towards the end of phase 1 of PRODIGY, specifications for future continual development and change control methods will be drawn up from the experiences and views of users, thereby ensuring that the system developed is professionally driven.

The software implementation of these guidelines has been developed in the Sowerby Unit from an initial user requirement developed and published by the NHS Executive and will undergo an iterative development during several phases of PRODIGY. The development of this specification is exciting in that for the first time at a national level the user requirements for the computer system are being developed using qualitative and quantitative methods. The software requirement is being fine tuned by a collaboration of the five major suppliers of general practice software in England and the Sowerby Unit. If the project proves successful consideration will be given to including the software requirement specification in the requirement for accreditation³ for general practice computer systems.

The overall aim of phase 1 of PRODIGY is to test the concept and the acceptability of prescribing decision support for general practitioners.

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Database is linked to Read codes

EDITOR,—Jeremy Wyatt and Robert Walton say that the compilers of the *British National Formulary* have begun the task of restructuring

their data for use as a drugs database for computers.¹ I sympathise because it is an enormous and quite daunting task to turn a book into a database.

The team that tackled the task of putting together knowledge about drugs for our World Standard Drug Database had the great advantage of being able to structure it for use on computers right from the start. Besides me (a general practitioner who spent six years working with James Read on the Read codes) the team consisted of Dr Ivan Stockley (a pharmacologist with special interest in drug interactions), Dr David Beckles (a mathematician and systems analyst), and Mr Colin Duncton (formerly a hospital chief pharmacist).

Our database is purpose built and written for integration with or to "bolt on" to existing Read coded clinical systems in hospital or general practice so that, when prescribing, users have full drug information at their fingertips. This information includes drug ingredient based indications; contraindications; side effects; and drug use in pregnancy, lactation, liver disease, and renal disease. Each product is linked to dosage, legal information, and other product specific information.

The database is pitched at a level of information comparable with the *British National Formulary* and the *Datasheet Compendium* so that it is crisp, to the point, and very user friendly. Read code terms are used throughout the 30 000 products, which have been coded for ingredients and strength. Our thesaurus, which contains all words, terms, and messages in the prescribing knowledge domain, is fully coded and classified. It includes dosage regimens; defined daily dosages; drug form terms (tablet, suppository, etc); Read codes (for indications, contraindications, and side effects); all drug ingredients (world list); pharmacological actions; interaction messages; and messages relating to use of drug ingredients in pregnancy, lactation, renal failure, and liver disease. It also has tables to show the cheapest product for any ingredient(s) and alternative products with similar pharmacological actions.

The drug interaction alerting module targets specific individually named drug ingredient pairs, thereby avoiding all the "noise" and false interactions generated when drugs are categorised into groups. Each interaction message that is "flagged" says what is likely to happen and offers a recommendation on how to handle it.

We have produced software called SafeScript-Interactive (available from Doctors Independent Network Coding Ltd at the address below) to demonstrate the World Standard Drug Database. We believe that the database will help to reduce errors in prescribing by flagging timely information and advice to clinicians during prescribing. As the initiator and editor I have been able to ensure that the database is tailor made for prescribers like myself. I use it every day in my surgery when prescribing, and I can't imagine how I used to manage without it.

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1 Wyatt J, Walton R. Computer based prescribing. *BMJ* 1995;311:1181-2. (4 November.)

Patient's consent to abortion is usually necessary even in emergencies

EDITOR,—In Clare Dyer's report on a gynaecologist who was acquitted of performing an illegal abortion after he carried out a hysterectomy while suspecting that the patient was pregnant she states that "the emergency provisions of the 1967 Abortion Act . . . allow a doctor to terminate a pregnancy without the patient's consent if her physical or mental health is thought to be endangered by the