

PRACTICE OBSERVED

Practice Research

On line prescribing by computer

JOHN B DONALD

Abstract

A computer is used to produce all prescriptions for patients seen in the consulting room in this practice. This method of prescribing improves safety, saves time, decreases prescribing costs, and provides an instant audit of all important prescribing parameters. In addition, treatment is rationalised and patients are given an improved service. An analysis of my own practice prescriptions showed that only 31% were repeat prescriptions, and this concurs with national figures. This means that the savings in costs are not likely to be substantial; however, when all prescribing is done by computer from a limited drug formulary then these savings may be appreciable.

Introduction

Computer systems in general practice have concentrated exclusively on repeat prescribing of drugs, and there have been no reports on the substantial benefits of producing all scripts by computer. The idea has been suggested many times, and a few systems can produce "one off" prescriptions but they do not approach the speed and ease of use that is required during a busy surgery. A system was therefore developed that required minimal keyboard skills, was unobtrusive during use, and allowed fast access to individual patient records and to the drug dictionary that was developed with the system.

I work single handed in a group of seven practitioners and have a limited list of 1400 patients because I do five sessions as a hospital practitioner. We have a practice policy of seeing our own patients as

much as possible and this consistently works out at 75% of the time, a figure derived from our workload statistics. It was therefore comparatively easy to put all of my patients on one file, the associated repeat drugs on a second file, and the "acute" drug dictionary on a third file and keep within the disc and memory capacity of a small, low cost computer system. This system is an adjunct to a larger computer system in our practice and in no way replaces it. In fact the data held in our main computer were of inestimable value in rapidly setting up the files for this small system.

Method

The hardware consists of a BBC B computer with remote keyboard, a Merlin double density disc interface, dual double sided disc drives, a Kaga R10 printer, and a standard green screen visual display unit. The double density interface is one of the few that allow a continuous file size of 700 kilobytes, which was necessary for the patient file, as it was essential that the floppy discs should not have to be changed while the program was running. The prescription writing program, plus many others that I use daily, are held on one disc drive and the patient and drug files on the other. The printer was chosen because it was fast (160 cps), reliable, fairly quiet, and, most essential, had a reverse line feed ability and a printer buffer. At present prices the whole system costs less than 11000.

It was most important that the system was as unobtrusive as possible to the keyboard, visual display unit, and printer are at the doctor's side at knee level on a low trolley out of sight of the patient. A cheap and simple hung hood lined with foam was constructed to cut out most of the printer noise as this is unusable during a consultation.

I wrote the software using as a starting point a program for repeat drugs which is available for the BBC computer. The program allows the production of both repeat drugs, which are linked permanently to selected patient files, and individual drugs, which are linked to the patient file for the production of the given prescription only. The main menu allows for the various options required in practice (such as a patient's drug, in patient's repeat drug, in patient only when a drug is not set on the dictionary, and in drug only when a patient is not on my list). There are additional menu options for the production of labels, etc. The patients are accessed either by a number which is displayed

Howden Health Centre, Livingston, West Lothian EH54 6TP  
JOHN B DONALD, MB, MRCP, general practitioner and part time lecturer,  
Department of General Practice, Edinburgh University

handed them the script and few then commented. The rest showed some curiosity and their remarks were complimentary. Service to the patient is improved because I am no longer faced with deciding whether to give patients their own or a relative's repeat prescriptions while in the surgery. This was sometimes not advisable because of not knowing which repeat drugs a patient was receiving and not having the notes. In all cases I can now give them this on the spot and at the same time increase the script count automatically. The patient of course also benefits directly from the safety measures mentioned earlier.

**Audit**—The table shows part of the print out of the drug list, which may be obtained quickly at any time. Some of the mnemonic search codes are shown and also the counts for the individual drugs over any given period of time, plus the cost of each prescription. These last two fields are automatically multiplied together at the print out to produce cumulative totals. It is therefore easy to monitor prescribing habits and costs at a glance. A further print out is available which displays each patient record together with a count of the number of scripts produced for that patient, again over any given period of time. These counts may of course be reset to zero at any time by a short program. I use separate drug dictionaries and counts are maintained, one for repeat drugs and the other for non-repeat drugs. This enables these two aspects of prescribing to be monitored separately, which has obvious benefits for the rationalisation of prescribing.<sup>1</sup> In studies done so far it has been difficult to show appreciable cost savings to the government when general practitioners use computers,<sup>2</sup> but the results of this study show one way in which substantial savings can be made in the drugs bill. In addition, there are so many other benefits to both patients and

doctors that I am sure that this method of producing prescriptions will be adopted increasingly in the future—the patients certainly see it as being entirely natural.

I thank Mrs Anne King for the input of all the file information and many helpful suggestions, Mrs Dorothy Fisher, our local pharmacist, for help with drug procurement and WB Pharmaceuticals for supplying the original repeat prescribing program.

References

- 1. Rachele LD. Computer as prescriber. *Ch. 6. London: Mosby, 1984.*
- 2. Procter JF. *et al.* *Writing all prescriptions by computer.* *J R Coll Gen Pract* 1984; 34: 661-7.
- 3. Hayes G, Shotton M, *et al.* *Formal general practice computing.* *Ch. 1. London: Royal College of General Practitioners, 1983.*
- 4. Joint Formulary Committee. *British national formulary.* No. 10. Appendix 4. London: BMA and Pharmaceutical Society of Great Britain, 1983.
- 5. Redford ML, Zander LJ, Evans M, Murray R, Strang RA. Evaluation of a computer assisted repeat prescribing programme in a general practice. *Br Med J* 1983; 29: 426-8.
- 6. Green PS. The general practice formulary—a cost in medical progress. *J R Coll Gen Pract* 1983; 33: 570-4.
- 7. International Co-ordination of a computer in general practice. *J R Coll Gen Pract* 1983; 33: 668-9.
- 8. Hayes G. *Word power in a home.* *Practitioner* 1982; 12: 22-4.
- 9. Pringle M, Robson S, Brown G. Computers in the surgery. The patient's view. *Br Med J* 1984; 29: 289-91.
- 10. Wilson JF, Davies KR, Duffell B, Farnham JB, Reading JA. Developing practice formulary as a byproduct of computer controlled repeat prescribing. *Br Med J* 1984; 289: 178-2.
- 11. Duffell B. Computer controlled repeat prescribing and inpatient drug management. *J R Coll Gen Pract* 1983; 33: 571-3.
- 12. Duffell B. Reducing prescribing costs through computer controlled repeat prescribing. *J R Coll Gen Pract* 1984; 34: 664-6.

Accepted 24 January 1986

Role of an immunisation advisory clinic

S LINGAM, C L MILLER, JANE PATEMAN

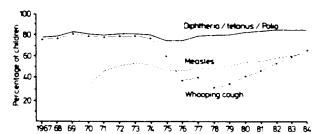
Abstract

An immunisation advisory clinic was set up in Redbridge in 1984 to try to allay the anxieties of parents and doctors about vaccination against whooping cough and measles. The parents agreed to vaccination for 54 out of 67 children against whooping cough and 54 out of 57 against measles. Most of the 117 children who were referred to the clinic were vaccinated and not have been vaccinated, although only two had valid contraindications.

Introduction

Adverse publicity surrounding whooping cough vaccine in the United Kingdom during the 1970s caused a dramatic fall in the number of children who were vaccinated. Two large outbreaks of whooping cough in 1977-9 and 1981-3, together with a gradual regaining of confidence in the vaccine, led to greater acceptance; thus by the end of 1984 65% of 589 364 children born in England in 1982 had been vaccinated (figure). The anxieties of parents and misconceptions held by the medical profession continue to prevent the vaccination of many infants against whooping cough, and there are similar doubts about measles.

King George Hospital, Ilford  
S LINGAM, MD, MRCP, consultant paediatrician  
PHLS Communicable Disease Surveillance Centre, Colindale, London  
NW9 5EQ  
C L MILLER, BA, MRCP, senior paediatric nurse  
Redbridge Health Authority  
JANE PATEMAN, MS, MRCP, nursing officer, community health  
Correspondence to Dr Miller



Percentage of children in England who had been immunised by the end of the second year after birth

prominently on the front cover of the notes or by a unique search code which can be worked out logically from the patient's address and first initial. This is not important for repeat prescriptions, which are sometimes requested when the patient's notes are not available. A repeat drug is shown from the list of drugs shown on the screen, and up to three drugs per prescription may be printed with essential information repeated on the blank side of the script to be torn off and passed to the main computer for updating. This solves one of the main problems of repeat prescribing by computer—that of updating the computer when scripts are produced during a consultation. The main computer is thus always fully up to date regarding repeat drugs and is in

possession of the given medicine. It is of course a legal requirement to put this information on a script for patients aged under 12 years. The age has been added to all scripts as this helps the chemist in deciding exemption categories, especially for the younger age groups.

**Time**—An average prescription takes roughly 30 seconds to write out. Complex prescriptions, such as that for a reducing dose of prednisolone or repeats for several items, can take up to one and a half minutes to write and much longer if, for instance, warning messages are included. No script that is produced by computer

Partial printout of drug formulary

No.	Drug name	Code	Quantity	Units	Cost £	Exemption £
62	Doxycycline capsules	1.5AAAP	125	mg	7.72	
63	Erythromycin	1.5AAB	100	mg	0.17	
64	Ethambutol BP (oral)	1.5P1A	30	mg	0.17	
65	Ethambutol BP (oral)	1.5P1P	30	mg	0.17	
66	Ergometrin (oral)	1.5A01	12	mg	0.77	0.22
67	Erythromycin (oral)	1.5A02	100	mg	0.17	
68	Erythromycin (oral) BP	1.5B11	20	mg	1.91	2.62
69	Erythromycin (oral)	1.5B02	20	mg	1.90	1.6
70	Erythromycin (oral)	1.5B03	40	mg	3.80	1.6
71	Erythromycin (oral) BP	1.5B51	60	mg	4.27	1.08
72	Erythromycin (oral)	1.5B12	30	mg	1.91	20.1
73	Erythromycin (oral)	1.5B05	40	mg	3.81	

while control of issuing warning messages for over-prescribing and non-compliance, for example. The repeat drug formulary was developed from an analysis of prescriptions issued over one year and contains 200 drugs. 36 of which are variations of the same drug in strength or quantities. The drugs are accessed by a simple five character code that usually consists of the first four letters of the drug name plus one other character representing the presentation or strength. All information is shown on the screen before printing and may be altered if necessary without going back to the main menu.

Results and discussion

**Safety**—(a) The patient "header record" has a field for drug allergy. Thus when a patient's record is accessed in setting up a script and that patient has one or more drug allergies the computer emits a warning tone and the allergies are shown flashing on the screen. The doctor then has to press a further key to continue. Data for this field were found from our main computer which has every patient fully coded for morbidity using the WONCA ICHPC-2. Defined code. In this case subsets of the code were used for individual allergies. (b) The "header record" also has a further field for "other drugs". Thus if a patient is regularly on repeat medication these drugs are emphasised on the screen whenever the patient's record is accessed. This alerts the doctor to possible drug interaction before prescribing a given drug. (c) Legibility has easily improved and to date there have been no queries from chemists about prescriptions. (d) Greatly expanded instructions for patients are issued where appropriate, specific for a given drug and printed on the blank side of the FPO (Comp form), to be retained by the patient. This is particularly valuable in reinforcing the doctor's verbal advice on such complex prescriptions as the first prescription for the contraceptive pill or the treatment of scabies, for instance. (e) Appropriate warning messages, as advised in the latest editions of the *British National Formulary*, are added where necessary to amplify both the doctor's and the chemist's advice. (f) Much care and attention are given to the initial entry of each drug into the drug dictionary for accurate spelling, exact quantities, and unambiguous instructions. These may be severely compromised when writing out prescriptions under pressure in a busy surgery. (g) The surgery telephone number is added to each script so that the chemist can phone the surgery if there is concern about alterations to a given script. Alterations are of course obvious because the script is machine printed. (h) The age of the patient is also added to each script and, where appropriate, matched to the correct paediatric

dose of the given medicine. It is of course a legal requirement to put this information on a script for patients aged under 12 years. The age has been added to all scripts as this helps the chemist in deciding exemption categories, especially for the younger age groups.

**Cost**—When the formulary was created the choice of drugs was influenced by many factors, not the least being cost. Of the current total of 200 drugs, 165 are generic formulations, which save on costs, and individual quantities of drugs are optimised. Unlike general non-computer formularies' compliance is good with the formulary because it is a personal one and is on computer so there are no problems of remembering which drugs are on the formulary.

I think that it is impractical in a busy surgery to have a vast drug dictionary that attempts to cover all drugs with warnings for all the possible drug interactions that might occur. Prescribing is a highly personal activity, and it is far more satisfactory for each doctor to have a small formulary to which additions or deletions may be made as necessary. A single month was chosen at random and the costs compared with a previous similar month before computerisation. The latter figures were obtained from the tables produced by the Prescription Pricing Authority. For the study prescriptions that were written during home visits were in duplicate and were put through the computer one a week to keep the counts correct. This took a short time as the numbers were small. In addition, all repeat prescriptions produced by the main practice computer were recorded, coded, and added to the running totals. Thus every script produced during the month was counted. Comparing the total cost of prescriptions over the month of the study with a similar month one year ago showed a reduction of 13%. Over the same time the cost of prescriptions went up by 15%, as measured by the average cost per prescription of both my own and our health board scripts. This is perhaps not as great as might be expected but though repeat drugs account for only 30% of prescribed items numerically, they account for 65% of total prescribing costs. I expect greater savings in the future because I can now look easily and critically at prescribing costs, in particular between repeat and non-repeat drugs, and have already made a few changes that are cost saving.

**Acceptability to patients**—My experience over the past two years of the use of computers in the consulting room concurs with that of doctors who have actually used computers in this way—that is, most patients are not concerned or interested in the use of this technology during a consultation. Most of my patients seemed unaware that a prescription was being prepared by computer until I

In Redbridge there was cause for concern since in 1983 acceptance of whooping cough and measles immunisation was estimated to be only 52% and 51% respectively. Therefore an immunisation advisory clinic was set up on the lines of that pioneered at St Ann's Hospital, Tottenham, by Dr W C Marshall. The objective of the clinic was to allay the anxieties of parents and the profession, to educate, and to offer immunisation on the spot.

Methods

The clinic was set up in June 1984 in the Children's Centre at Barkingside. For the first year the clinic was held monthly by a team consisting of a consultant paediatrician, a senior epidemiologist, a senior clinical medical officer, and a nursing officer in community health. Senior house officers in paediatrics also attended to enquiries. All general practitioners and community health staff in Redbridge were informed about the clinic, and it was agreed that children would be referred to the clinic by parents who had doubts about immunisation or if there were possible medical or social reasons for advising against it. Referrals were accepted from all health workers and from parents. A full explanation of the risks and benefits was given, and parents were encouraged to voice their fears, extra time was allowed when necessary. A letter was sent to the referring doctor or nurse as well as to the child's general practitioner informing them of the action taken and the reason for it. Immunisation was given as appropriate with the parent's consent.

Results

During the first year 117 children were seen on 145 attendances. 43 were referred by health visitors, 38 by clinical medical officers, 20 by paediatricians, seven by general practitioners, five by parents, three by the nursing officer at the Children's Centre, and one by a community physiotherapist. Parental anxiety was the reason for the referral of 13 children, food allergy for 15, and other medical reasons for 49. These included history of eczema 12 and asthma eight in both the child and the family, febrile convulsions in the child 19, epilepsy in the family 24, possible reaction to previous immunisation 12, cardiac problems three, and developmental delay in the child 10. Several children had more than one medical reason for referral.

Sixty seven children were referred for advice about whooping cough vaccine, of whom 41 were vaccinated after discussion with the parents, seven with phenobarbitone cover because of a doubtful neurological history. The parents of two children refused. In two other children there were neurological contraindications as specified in the DHSS handbook, and in another two antibodies to pertussis were found. Nine children who were unwell at the clinic visit were subsequently vaccinated, together with another four whose parents were undecided at the time, making a total of 54. 83% of those at risk. Another parent who had been unwell subsequently decided to ask her general practitioner to vaccinate the child. This was refused despite a letter from the advisory clinic confirming the absence of any contraindication. One family moved away and the other five remained unwell. One child who had already been immunised against pertussis and tetanus were given monovalent pertussis vaccine. No other follow up enquiries were made.

100 YEARS AGO

In the cyclical discussion which takes place on the question of the propriety of marriage with a deceased wife's sister, many of the speakers give evidence of a want of familiarity with the physical aspect of the question, which is probably after all the most important factor in the case. In any case, it is the only aspect of the question which can appeal to members of the medical profession, and therefore merits that a little light should be thrown upon the subject. It is a generally accepted maxim that interbreeding affects the offspring injuriously, but, without entering into the subject, it may be mentioned that this opinion does not rest on an absolutely unimpeachable basis, and is moreover absolutely contradicted in many particulars by the breeding of cattle. The probability is, that marriage between the members of a family is only attended with undesirable effects on their offspring when a hereditary taint exists, which is thereby remedied. But even if we admit the assumption that marriage within certain limits of consanguinity is undesirable and hurtful, the argument is still without value in the present instance. It is impossible to allege any consanguinity between individuals,

was made, but because parents knew that they were welcome to contact the clinic, reactions undoubtedly have been reported.

For 57 children the parents sought advice about measles vaccine. 51 were vaccinated, 22 of them with gammaglobulin. Of the remaining six, one child had adequate antibody level and three were later vaccinated. Thus 96% of those who attended and were at risk were vaccinated. There were no genuine contraindications for any other children referred.

Discussion

Immunisation is potentially one of the most effective activities undertaken by health professionals, but many factors influence its uptake. The immunisation advisory clinic in Redbridge has become a focus for health professionals and parents, and it is hoped that the interest generated and the regular correspondence with referring doctors will lead to greater acceptance of immunisation, although it is too soon for this to be discernible. It is apparent that most of the children who attended the clinic would not have received immunisation elsewhere, although only two of the 117 children had valid contraindications. The clinic has highlighted the confusion that remains about contraindications and has shown the importance of ensuring that all who are concerned are kept up to date with the latest knowledge and guidelines from the Department of Health so that conflicting advice is not given.

The need for such a clinic has been shown by the increase in attendance during 1985 when the numbers necessitated holding a second clinic each month; in addition, telephone and written requests for information and advice from general practitioners and parents have been answered. Research projects have also been carried out, including a study of clinical reactions and antibody response to measles vaccine given with immunoglobulin in press, and a study of antibody response to whooping cough vaccine. The results of an inquiry of paediatricians about their recommendations for timing immunisations in preterm infants will be published. A second inquiry will start shortly on interpreting perinatal distress as a contraindication to vaccination for whooping cough.

References

- 1. Anonymous. Vaccination and immunisation manual. *1985*. September 1985. Available from: DHSS, Statistics and Research Division, 28, Broom 601, Haining House, Brighton and Little, London.
- 2. Nuffield. *Contraindications to whooping cough immunisation: myth or reality?* *Lancet* 1985; 2: 971-3.
- 3. Anonymous. *Falsety vaccine* [Editorial]. *Lancet* 1983; 1: 1414.
- 4. Anonymous. Measles immunisation: some local data on the efficacy of a live virus vaccine. *Public Health* 1985; 95: 101-8.
- 5. Anonymous. Measles immunisation: some local data on the efficacy of a live virus vaccine. *Public Health* 1985; 95: 108-20.
- 6. Anonymous. *Immunisation against infectious disease*. DHSS guide, 1984.

Accepted 12 March 1986

such as a man and his sister-in-law, who spring from different family stocks, and have, physiologically speaking, nothing in common. Whatever evil results may attend marriages between near relations are certainly not to be feared here. The question is really one of social order, and should be decided, not on political or family considerations, but on accordance with the dictates of physiological science and common sense. It is absurd to lay down, or attempt to lay down, any absolute rule on the subject of the influence of civilisation, and climate, and custom. It is, nevertheless, extremely desirable that the question should be disposed of in such a way as to avoid the necessity for a constantly recurring discussion, which can do no good, and may, in fact, be attended by disagreeable results with regard to the relations in the domestic circle throughout the country. (*British Medical Journal* 1886; 1:180.)