UNIVERSITY OF SOUTHAMPTON

FACULTY OF MEDICINE

COMMUNITY MEDICINE

SAFE PRESCRIBING FOR CHILDREN IN WESSEX GENERAL PRACTICE

- a study of the relationships between personal, training, practice, neighbourhood, prescribing and educational factors of doctors, and the quality of their paediatric prescribing.

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Thesis submitted for the Degree of Doctor of Medicine

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ABSTRACT

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- a study of the relationships between personal, training, practice, neighbourhood, prescribing and educational factors of doctors, and the quality of their paediatric prescribing.

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Medical audit to assess the quality of prescribing for children in general practice is an urgent and important task. The literature reveals slow progress in this field with the result that little is known about the determinants of quality. This study of a random sample of 209 general medical practitioners, drawn from three Health Districts in Wessex, is based on 463,897 FP10 prescription forms issued by them in September 1979 and September 1980. Drugs widely recognised to be inappropriate on the grounds of age were sought amongst the prescriptions and were grouped into a hierarchy of quality. The findings were examined by a range of doctor variables including personal, training, practice and neighbourhood factors, general prescribing behaviour (including cost) and current educational status.

Contrary to what might have been expected the only important association appeared to be the educational and training history of the doctors. This observation was further supported by the results of a specific educational intervention which showed that personalised contact by a respected opinion leader could be very effective in improving prescribing. It is concluded that this method of quality assessment is practical, valid and useful. Although the results were generally reassuring about the frequency of inappropriate prescribing, there appears to be cause for concern about the management of vomiting, diarrhoea and enuresis in childhood. Ways in which the quality of general practitioner prescribing might be improved are recommended.

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PREFACE AND ACKNOWLEDGEMENTS

Information obtained from 463,897 FP10 prescription forms issued in September 1979 and September 1980 by a random sample of 209 general practitioners in Wessex forms the basis of this thesis. The aim was to assess the quality of prescribing for children and the factors related to it using aspects of safety as the measure of quality. The hypotheses tested were that safe prescribing for children (or the lack of it) by individual doctors was related to personal, training, practice and neighbourhood factors, general prescribing behaviour (including cost) and current educational status.

The work was based on earlier research by the author which commenced in 1978. This investigated the feasibility of obtaining and using FP10 prescribing information to assess the quality of medical care for children. The study reported here is original and is the work of the author except where otherwise stated. This thesis is divided into five main sections.

The introductory section describes the development of medical audit in the UK and USA, and then considers the rationale for assessing the quality of paediatric prescribing in general practice. A review of prescribing studies relevant to the field is presented. The feasibility study of assessing the quality of paediatric prescribing, undertaken in 1978-1979, is then described. Finally the aim and objectives of the main study are given.

The second section describes the methods used; how the FP10 forms were obtained from the Prescription Pricing Authority and how explicit quality criteria using indicator drugs were developed. The

study design is then presented together with the type and source of the doctor variables selected. Finally the data collection and analytical procedures are described.

The results are presented in the third section and are subdivided into seventeen parts. These first present descriptive information about the doctors and consider personal, training, practice and neighbourhood factors, general prescribing behaviour (including cost) and current educational status. Prescribing patterns of 'Hazardous', 'Hazardous or Illogical', or 'Inappropriate' drugs are then presented. Finally any possible assocations between the doctor variables and 'Hazardous' drug prescribing are examined.

The fourth section discusses the findings and considers the lessons for the future. Particular areas for concern are assessed and ways in which improvements in medical practice might be made are discussed. The utility and validity of the method for assessing the quality of prescribing is critically examined. Finally in the fifth section the main conclusions and recommendations of the study are presented.

For ease of reading the tables of results follow these sections together with extensive Appendices. Appendix I presents the rationale for choosing the specific indicator drugs. The remaining Appendices II-V amplify the methods and results sections.

Clearly such an extensive project as this would not have been possible without the help and support of a great many people and organisations.

I am particularly grateful to:

- The Prescription Pricing Authority (Newcastle) for approving the study; and making available the FP10 forms issued to children;
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- The Local Medical Committee for approving the study;
- The Local Pharmaceutical Committee for approving the study;
- The 209 general practitioners in Wessex whose prescribing habits were studied;
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- Wessex Regional Postgraduate Adviser in General Practice (Dr Robert Thomas) and his department for providing general practitioner information;
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Permissions were given to undertake this study on the basis that anonymity and confidentiality would be assured. One of the conditions was that no reference should be made to the names and addresses of doctors, pharmacists or patients and that the three Health Districts in Wessex studied should also remain unnamed. It is for this reason that the Districts are known as A, B and C.

SUMMARY

Critical appraisal of the quality of medical care is a necessary part of its delivery if health services are to achieve maximum effectiveness, efficiency and acceptability. Over the last thirty years in the UK and USA there has been increasing interest and activity in the field of medical audit in both hospital and general practice.

However an extensive review of the literature reveals that there has been slow progress in assessing the quality of paediatric care in the UK when compared to the USA. Other than preliminary work carried out by the author, little research has been carried out to examine the quality of prescribing for children. This is an important field of study because paediatric therapy is very common and consequently expensive. Prescribed drugs are the commonest cause of accidental poisoning. There is also mounting public and professional concern about indiscriminate, wasteful and hazardous prescribing.

Little is known, therefore, about the determinants of the quality of paediatric prescribing. Thus attempts to improve performance and maintain competence are a matter of conjecture. There have, however, been a number of studies of prescribing in the general population which are reviewed in the thesis. This study therefore sets out to assess the quality of prescribing for children and the factors associated with it amongst general medical practitioners in three Districts in Wessex. The work was based on a feasibility study I carried out in 1978-1979. This showed that it was possible to obtain, for individual doctors, age-related

prescribing rates of specific drugs which were widely recognised to be unsuitable for children. The findings were particularly helpful in designing this larger study.

Specific objectives of the main study were to establish a set of drugs which would be indicative of hazardous or inappropriate prescribing. Prescribing rates of these 'indicator' drugs would then be determined for a random sample of general practitioners. Thirty doctor variables would also be collected concerning personal, training, practice and neighbourhood factors, general prescribing behaviour (including cost) and current educational status. Any relationship between these doctor variables and the quality of prescribing would then be examined. Finally a specific educational initiative to improve prescribing would be mounted and evaluated.

Having obtained permission from a large number of people, bodies and organisations, 463,897 original FP10 prescription forms issued by a random sample of 209 general medical practitioners in three Health Districts in Wessex were made available to the author by the Prescription Pricing Authority. These represented the scripts which had been issued in September 1979 and September 1980 and were released on the basis that anonymity and confidentiality would be assured. Those forms exempt of charges because the patient was under 16 years were extracted.

32,835 forms issued to children were then examined for general prescribing information and the presence of 28 'indicator' drugs. These drugs had been selected from standard, widely available medical texts with the aid of an advisory group comprising ten clinicians from relevant specialties. In the context of normal general medical

practice these drugs would not be expected to be prescribed for children of given ages. Examples are tetracyclines to under 12 year olds, antihistamine creams, tricyclic antidepressants to under 5 year olds, Lomotil to under 2 year olds and metoclopramide to children under 1 year. The drugs were categorised into a hierarchy of three groups:

Group I: 'Hazardous'drugs;

Group II: Group I plus 'Illogical' drugs;

Group III: Group II plus 'Undesirable' drugs.

Doctor variables were collected from a variety of sources and the findings were cross tabulated against the presence or absence of 'Hazardous' drug prescribing. Between September 1979 and September 1980 a special educational intervention was performed. The Regional Postgraduate Adviser in General Practice wrote personally to all the doctors in District C. He pointed out the high rate of 'Hazardous' drugs prescribed in their District which had been revealed by the feasibility study previously. District B had minimum intervention and District A acted as a control. The data was analysed on the University of Southampton computer and chi-squared statistical tests were performed throughout.

The results, as expected, revealed that Wessex doctors were not a homogeneous group. There were considerable differences between them concerning personal, training, practice and neighbourhood factors, general prescribing behaviour and current educational status. For example, the distribution by age, list size and partners was large. Only 15% of doctors had been vocationally trained and only 14% had postgraduate paediatric training. Doctors worked in neighbourhoods of wide ranging social circumstances and

population densities. A striking feature was the idiosyncratic nature of general prescribing as judged by net ingredient cost, number of prescriptions per child form, and the frequency with which forms were written by ancillaries. Overall 45% of the forms in 1979 did not have the age of child recorded but this varied by doctor from 0 to 100%.

Individual drugs considered to be 'Hazardous' or 'Illogical' or 'Undesirable' for children were not prescribed by a large number of the doctors and for those that did the number of prescriptions was low. This is generally reassuring. However some notable exceptions occurred. During the two month period of study 21% of doctors prescribed antihistamine creams, 17% prescribed tricylcics to under five year olds, 12% prescribed tetracyclines to under twelve year olds, 11% prescribed two respiratory compound preparations on the same form, 17% prescribed Lomotil to under two year olds, 5% prescribed metoclopramide to under one year olds, and 6% prescribed phenothiazines to children aged one to four years. When the indicator drugs were grouped together 38% of doctors were found to have prescribed one or more 'Hazardous' drugs (Group I), and 5% had prescribed five or more of these drugs in the two month period. Although 87% of doctors had prescribed at least one 'Inappropriate' drug (Group III), this only represented 18 per 1000 child prescriptions.

Associations between 'Hazardous' drug prescribing and the doctor variables were then sought. Statistically and clinically significantly lower prescribing rates were found amongst those doctors qualifying from British universities, those undertaking postgraduate paediatric training and those working in a teaching

District ($p<0.05$). Surprisingly other doctor variables such as age, sex, practice organisations, neighbourhood, vocational training, GP Trainer, attached medical student did not appear important. Doctors prescribing greater volumes of drugs were more likely to prescribe 'Hazardous' preparations but there was no relationship with cost, nor with the percentage of forms written by ancillaries or without a record of age of the child.

The educational initiative proved particularly successful. In District C the percentage of doctors prescribing 'Hazardous' drugs decreased from 29% to 14% ($p<0.05$), whilst no changes were observed in the control District A. Doctors in District B who had received information in a non-personal way about the dangers and scale of 'Hazardous' drug prescribing did not alter their practice. These findings suggest that personal, informative but non-threatening approaches to doctors by a respected opinion leader can be very effective in improving prescribing behaviour.

It is concluded that age-specific and drug-specific prescribing data is a useful and practical way of assessing aspects of the quality of prescribing for children in general practice, and for studying the factors affecting it. The method could be improved if all child forms were required to have the age recorded on them.

Past and current education and training appear to be the important factors associated with quality of prescribing and not personal, practice and neighbourhood variables. This is encouraging as improvements could be made through continuing education initiatives within Districts perhaps complimented by medical audit such as the approach used in this study. In view of the results of

this study, particular attention should be payed to the management of diarrhoea, vomiting and enuresis.

Specific recommendations are made about the ways in which the quality of prescribing could be improved for children. Routine prescribing statistics for children should be prepared by the Prescription Pricing Authority. Health warnings should be issued with certain preparations. The Minister of Health should consider withdrawing the licences and recommended doses for children of some drugs currently available in Britain. Postgraduate paediatric training should be made more widely available to general practitioner trainees and pharmacists should assume a wider role in monitoring prescribing. Further research studies are also recommended to assess the value of this medical audit method in other areas of health care and to determine the most cost effective ways of promoting quality of prescribing.

GLOSSARY OF TERMS

Monitoring:	the collection of intelligence to provide warning of the need for intervention.
Quality:	the degree of excellence, comprising measures of effectiveness, efficiency and acceptability.
Quality Assessment:	the measurement of the level of quality provided at one time but without effort to alter it.
Quality Assurance:	the measurement of the level of quality provided at one time together with the action necessary to raise it to the required level.
Quality Assurance of Medical Care:	the primary goal of a quality assurance system should be to make health care more effective in bettering the health status and satisfaction of a population, within the resources which society and individuals have chosen to spend for that care.
Medical Efficacy:	the power of a particular medical action to alter the natural history of a disease for the better for those who comply with the treatment regimen (ie the inherent potential).
Medical Effectiveness:	the power of a medical action to alter the natural history of a disease for the better in a population when used under the normal conditions of practice.
Efficiency:	the ability to maximise the ratio of the outputs and inputs of health care.
Acceptability:	the subjective assessment by providers and receivers of health care of the value of

particular activities

Structure (Input): structural data describe the resource inputs used for health care eg the type, quantity and quality of manpower, facilities, equipment, organisation, finance.

Process: process data describe the activity of the health care system eg provider behaviour, provider/patient encounter.

Outcome: outcome data describe the health status of persons resulting from their interaction or lack of interaction with the health care system eg life expectancy, sickness absence, dependency, handicap.

Output: output data describe the products delivered by the health care system eg operations performed, immunisations given.

Medical Audit: the evaluation of the quality of medical care against explicit or implicit criteria of good practice as developed by practising clinicians.

Peer Review: medical audit by a group of clinicians all practising in a comparable situation, to help each other to remedy the defects revealed and to identify such factors as may apply to them all in achieving optimal care.

Explict Criteria: rigid criteria developed in advance of medical audit and based on the best available theory.

Implicit Criteria: criteria established in the course of medical audit in the light of what is regarded as reasonable practice.

1. INTRODUCTION

"First, do no harm"

Hippocrates 460-355BC

1.1 The development of medical audit in the UK and USA

The Royal College of General Practitioners in their evidence to the Royal Commission on the National Health Service (1977) stated "Our picture of the assets of general good practice must be balanced by the frank recognition that care by some doctors is mediocre and by a minority is of an unacceptablly low standard..... The College believes that medical education needs radical reshaping to place much greater emphasis on continuing education and medical audit."

The aim of medical audit is to improve the quality of medical care through: (i) supporting good practice (ii) indicating areas of need and (iii) providing ongoing education by setting standards. It normally involves a cycle of activities: (i) observing practice, (ii) setting a standard of practice; (iii) comparing the observed practice with the standard; (iv) implementing change; and (v) reobserving practice (Fowkes 1982).

Quality embraces the concepts of effectiveness, efficiency and acceptability which interact in a dynamic way with each other. There is an extensive literature on the concepts, principles, terminology and methods of medical audit or quality assessment/assurance as it is called in the United States of America (USA). It is not the purpose of this thesis to review the general state of the art and the interested reader is referred to some of the key reviews and discussions summarised in Table I.

TABLE I **MEDICAL AUDIT** - key reviews and discussions

Year	Author	Title
1968	Donabedian A	Structure, process and outcome.
1972	Donabedian A	Medical care chart book.
1972	Cochrane A	Effectiveness and efficiency
1976	McLachlan G (ed)	A question of quality? Roads to assurance in medical care.
1976	Greene R (ed)	Assuring quality in medical care.
1976	Avery A, Brook R	Quality of medical care assessment using outcome measures.
1976	McNerney WJ	The quandary of quality assessment.
1979	McAuliffe WE	Measuring the quality of medical care: Process versus outcome.
1980	Duncan A	Quality assurance: what now and where next?
1980	Shaw CD	(i) Aspects of audit. (ii) Audit in British Hospitals. (iii) Audit in British general practice. (iv) Acceptability of audit. (v) Looking forward to audit.
1980	Donabedian A	The definition of quality and approaches to its assessment.
1981	Watkins CJ	The measurement of the quality of general practitioner care.
1981	Scottish Council for Postgraduate Medical Education	Maintaining standards in general practice.
1982	McLachlan G (ed)	Reviewing practice in medical care: steps to quality assurance.

1982 Fowkes FGR Medical audit cycle. A review of methods and research in clinical practice.

At this early stage a distinction should be drawn between medical effectiveness and efficacy. Medical efficacy is the power of a particular medical action to alter the natural history of a disease for the better for those who comply with treatment regimens (ie the inherent potential). Medical effectiveness on the other hand is the power of a medical action to alter the natural history of a disease for the better in a population when used under the normal conditions of practice.

(i) Origins of medical audit

The need for critical appraisal of health care is not new. Medical audit responsibilities are embodied in Hippocratic teaching. Florence Nightingale initiatives in the Crimean War revolutionised nursing and medical practice. In 1860 she designed a format for collecting and presenting hospital statistics. In 1908 a British surgeon, EW Groves recorded in registers the results of his operations. However, it was probably not until later this century that the specific discipline of medical audit emerged with its own theory and methods.

In 1912 at the Massachusetts General Hospital, USA, Codman and Cabot developed an 'end-result' system for quality assessment and improvement (Codman 1914). This involved careful medical recording, analysis of the process of care, outcome evaluation, and determination of the reasons for substandard results. The system was grandly conceived, but its administrative mechanics were beyond

the existing capabilities of the health-care situation.

Subsequently in 1919, the American College of Surgeons instituted a programme of minimum standards for hospitals. This was based on a survey which found that only 89 of 692 hospitals with at least 100 beds could meet a reasonable minimum standard (McNerney 1976). Eventually, this programme evolved into the Joint Commission on Accreditation of Hospitals, which focussed on structure and process and largely on the hospital.

During the 1950's and 1960's in the USA further work centered on patient care in hospitals and methodological refinements were added. However researchers began to realise that effectiveness and hence quality should be determined ultimately by health outcomes. The work of the late 1960's and early 1970's addressed this issue. It demonstrated the intrinsic variability of peer-review methods and the questionable effect of many accepted processes on health outcome. These and other steps put the United States ahead of the rest of the world in subjecting patient care to routine evaluation. The subsequent Professional Standards Review Organisations (PSRO) and utilization-review legislation confirmed the importance of medical audit in the US health care system (Bellin 1974).

In the UK interest in medical audit began to mount in the early 1970's. This was a consequence partly of the North American experience but also because of public and professional concern about the standards of clinical practice in a changing political and economic environment (Klein 1973). The latter led to the setting up of a Committee of Enquiry into Competence to Practise under the auspices of the Royal Colleges, their Faculties in England and

Scotland, the Joint Consultants Committee and the British Medical Association. One of the Committees recommendations was "It is a necessary part of a doctor's professional responsibility to assess his work regularly in association with his colleagues" (Alment 1976).

At first opinion was guarded in Britain about the merits of the imposed American-style system of medical audit. "Audit is threatening to doctors ..... clinical freedom is in jeopardy", so ran the theme of a British Medical Journal leading article in 1974 entitled 'Controlling Quality' (Anonymous 1974a). Nevertheless there was a general feeling that critical self-examination should be encouraged. A whole series of initiatives were mounted. These included conferences by the Royal College of General Practitioners and Society for Social Medicine in 1975 (Mourin 1975), and the Royal College of Physicians of Edinburgh in 1978 (Anonymous 1978). Working parties were also set up for example the General Medical Services Committee Wales (Williams 1975). Reports appeared in the British medical press of the US experiences (eg Sanazaro 1974) and the need for new initiatives in the UK (eg Dudley 1974, Capstick 1974, Anonymous 1974b).

In the latter half of the 1970's medical audit became much more respectable and commonplace. Most of the Royal Colleges recognised their responsibility to encourage the practice, as demonstrated for example by the Royal College of Physicians regional lecture tours in 1978-1980. More than this they also accepted they had a role in commissioning and undertaking medical audit. Examples of projects can be found in the fields of radiology (Anonymous 1977) and anaesthetic deaths (Anonymous 1979a). The Royal College of Physicians of London with support from the King's Fund set up a

Medical Services Study Group under the direction of their past president, Sir Cyril Clarke. One of their first studies was to examine the causes of death among medical inpatients aged 1 to 50 to see if clinical care could be improved (Clarke, Whitfield 1978).

The part played by the Nuffield Provincial Hospital's Trust is particularly noteworthy. There is little doubt that the Trust's publications Effectiveness and Efficiency (Cochrane 1972) and A Question of Quality (McLachlan 1976) played a major part in moving professional opinion. By the late 1970's medical audit had been truly established in the UK. A leading article in the British Medical Journal (Anonymous 1978) stated "medical audit should be seen as a responsibility rather than a threat ..... If our American colleagues have pioneered the role we should make sure we benefit from their experience." At the 1979 Annual Representatives Meeting a motion was overwhelmingly passed which called for practical recommendations of systems of medical audit (Anonymous 1979 b).

(ii) Medical audit in general practice

Although the main thrust of medical audit schemes in the USA was concentrated on the treatment of patients in hospital, the need for progress within British general practice was realised early on by the UK. Parry (1975) argued that there were three aspects to the maintenance of professional competence in general practice: application of new knowledge, improved records, and free discussion between general practitioners which could lead to peer-review type medical audit. Stott and Davis (1975) showed that clinical and administrative audit could be an enjoyable and creative part of group-practice life, and could improve internal and external

communications for the primary care team. Acheson (1975) and Mourin (1976) described how audit techniques could be applied to general practice. Acheson (1978) stressed the importance of developing clinical standards from within the profession.

The Journal of the Royal College of General Practioners in 1979 not only published a wide number of papers on audit in practice but also extolled its virtues with a preceding editorial which stated: "External audit by other (medical) colleagues is hotly disputed but is becoming more accepted both in the United Kingdom and Canada. Self-audit by individual doctors or practices is now increasingly welcomed and needs to be encouraged" (Anonymous 1979c).

The interest within the professions was not lost to those outside. The Report of the Royal Commission on the National Health Service (Merrison 1979) devoted eight paragraphs to "Quality of care" in its section on primary care, and, thirteen paragraphs under the heading "measuring and controlling quality" in its section on the NHS and its workers. Out of these paragraphs three firm recommendations were made:

Recommendation 20 - "General practitioners should make local arrangements specifically to facilitate audit of the services they provide and the health departments should check progress with these developments."

Recommendation 62 - "The Joint Higher Training Committees for postgraduate medical education should approve only those Units and departments where an accepted method of evaluating care has been instituted."

Recommendation 63 - "A planned programme for the introduction of audit or peer review of standards of care and treatment should be set

up for the health professions by their professional bodies and progress monitored by the health departments."

In his enquiry for the Nuffield Trust following the Reports publication, Duncan (1980), found that these proposals were welcomed enthusiastically by some but cautiously by others. He recommended that the Royal Colleges and their Faculties, as the traditional guardians of professional standards, should follow up their own tentative moves by responding positively, strongly and quickly to the call made by the Royal Commission. They should ensure that quality of medical care is seen by society to be firmly and openly assured by the professions themselves for the benefit of the community. Duncan also proposed that universities and the General Medical Council should see to it that the practitioners of the future have instilled into them as students the attitudes of self and mutual criticism. This it was suggested, when followed through into practice, would encourage the development and use of ever-improving methods of quality assurance.

(iii) Progress during the 1980's

During the 1980's progress in the development of medical audit has been slow but steady. Conferences have attempted to avoid confusion and allay suspicion like for example the one organised by the General Medical Services Committee, the Royal College of General Practitioners, and the Royal College of Physicians (Fraser 1981). Health care workers appear to be intensely interested in defining and seeking quality (Maxwell et al 1983).

The Department of Health, as a step towards greater accountability within the National Health Service, has embarked on a

number of initiatives over the last few years. These have included Management Advisory Service trials in four NHS regions, Ministerial reviews of Regional Health Authorities (and in turn Regional reviews of Districts), and the development of Performance Indicators. These activities have formed part of a general efficiency drive within the NHS but have not concerned measures of effectiveness. The government's response to supporting medical audit has therefore been limited, but not so from other bodies. The Scottish Council for Postgraduate Medical Education published in 1981 a very valuable manual entitled "Maintaining standards in General Practice". Watkins (1982) also published a useful review of studies in the measurement of the quality of general practitioner care.

In 1982 as a sequel to 'A Question of Quality' the Nuffield Trust published Reviewing Practice in Medical Care (McLachlan 1982). Amongst the distinguished list of authors was the then president of the Royal College of General Practitioners, Dr John Horder. He reviewed the breadth of activities that had been undertaken in general practice over the last decade and reported that his College gave a very high priority to the development of medical audit particularly at local level. The interest in audit within the College has even led to evaluation of the membership exam and the training undertaken for it (Walker 1983).

In 1983 the Chairman of the Council of the same Royal College said that general practice would only achieve its full potential when general practitioners were willing and able to show their personal commitment to a range and standard of services that the community at large would find not merely acceptable but also highly desirable (Irvine 1983). He proposed a three-pronged approach to quality

assurance.

(1) the individual general practitioner should cultivate the habit of regular self-audit as part of his continuing professional development.

(2) the contract that general practitioners hold with family practitioner committees should be rigorously administered so that abuse is minimal; and

(3) in due course, the profession should ask the General Medical Services Committee to work out a contract that would encourage high standards of patient care by relating income more closely to performance.

Council adopted the first of these proposals in what has become known as the Quality Initiative (RCGP 1983). Members were encouraged to introduce the principles of performance review into their everday practice, and in this way to promote greater consistency in the range of quality of services that should be available from any general practice (Anonymous 1984). The Council has since developed a comprehensive strategy which is based on the principles of the Quality Initiative and which if implemented universally, it believes would lead to higher standards of care in all practices (RGGP 1985).

The Strategy is based on five elements; namely: professional development, practice management and team work, quality assessment and performance review, contracts and incentives, and the resources needed. Council recommended that standard setting and performance review were activities that should be incorporated into everyday clinical practice. Incentives should be developed to encourage doctors to participate. For example, performance review should be a

criteria for determining fellowship of the College, and unacceptable levels of performance should be reflected in a doctor's remuneration.

Medical audit thus continues to be a major task and responsibility for the medical profession. Review of the quality of medical care in the context of general practice continues to be pressing. The next section of this Introduction considers why the field of paediatric prescribing is particularly worthy of study.

1.2 The rationale for assessing the quality of paediatric prescribing in general practice

(i) Changing Prescribing patterns

Interest in prescribing in general practice originally arose because of the high and increasing cost of drugs prescribed within the health service. Although prescribing costs account for only 10% of total NHS expenditure, they now total well over one billion pounds per annum. Seventy per cent of the cost of drugs is derived from general practice. In 1949 the average expenditure per general practitioner on NHS prescriptions was £1,600. Thirty years later it had risen to £28,000 or £5,000 at 1949 prices (Fry 1981). This was a consequence of an increase in the price of each prescription as well as the volume. In 1949 5.0 prescriptions per head of population were issued compared to 6.8 in 1979 and the cost rose from 16p per prescription in 1949 to £2.50 in 1979.

Marked variations are known to exist in prescribing practices between countries (Kohn and White 1976, Abel-Smith and Grandjeat 1978, O'Brien 1984). In 1975 the annual number of prescriptions per person in England and Wales was 6.3 compared to 4.5 in Netherlands, 11 in France and West Germany and 21 in Italy. Monitoring

undertaken by the DHSS Prescription Pricing Authority continues to reveal several fold differences in the prescribing rates of general practices within the same Family Practitioner Committee area (Fry 1981). The commonest drug group now prescribed in England are psychotropics and analgesics (28% of all drugs) and these have been subject to enormous price increases (DHSS 1970-1980). However it should be noted that this is due to a combination of pharmaceutical industry pricing policy and inflation as well as the prescribing behaviour of doctors (Williams 1982).

The Department of Health as the major paymaster for drugs have been keenly interested in reducing costs (70% of patients receiving prescriptions are exempt of charges). The Department monitors total prescribing rates and costs for each general practitioner through the Prescription Pricing Authority (PPA) on an annual basis. Where the PD2 returns show 'excessive' rates or costs, doctors employed by the Department's Regional Medical Service visit the doctor concerned and discuss his prescribing behaviour with him. With computerisation the PPA's information service will be extended (Crawford 1981). In Scotland a computerised prescription data analysis scheme has been running since 1977 and this has improved the production and presentation of prescribing statistics at a relatively modest cost (Black et al 1981). Through the use of 'spotter' pharmacists in each NHS region the Department also obtains information on the number of prescriptions by therapeutic class and hence cost by Regional Health Authority.

Whilst concern for efficiency of prescribing is laudable, information on prescribing can also be used to examine other aspects of quality particularly effectiveness and acceptability. During the

1970's there was wide interest in prescribing on clinical as well as cost grounds. Professor Peter Parish's group was set up in the Medical Sociology Research Unit in Swansea and it demonstrated the potential for medical audit in the area of prescribing (see for example Parish 1971).

The Oxford Record Linkage Study showed that a drug prescription was a very common result of a doctor-patient contact, it was a discrete occurrence and could be linked to other information. Between 1.3.74 and 28.2.75, 53.8% of all males and 65.7% of all females (who had registered with 19 general practitioners in the Oxford area had received at least one drug (Skegg et al 1977). Amongst children under 15 years 59% of boys and 60% of girls were given at least one drug and 15% at least five drugs during the twelve month period. Since more than three out of every four children under the age of 15 will see their general practitioner every year and 90% of those under 5 years (Royal College of General Practitioners 1974, 1976), a prescription is likely to be the norm for doctor-child encounters. Studies of prescribing behaviour amongst children is likely therefore to concern an important part of paediatric care in general practice.

(ii) Medical audit in paediatric practice

Progress in assessing the quality of medical care for children has been limited in this country although there has been widespread concern about the quality of the child health services. The Committee on the Child Health Services (Court 1976) was highly critical of the structure and delivery of health care for children. The debate has continued for almost a decade with the British Medical

Association, British Paediatric Association, Health Visitors Association, Faculty of Community Medicine and Royal College of General Practitioners all eager to see improvements made, whilst at the same time protecting the interests of their members. Medical audit in child health has tended to concern children in the first year of life, usually based on a confidential inquiry approach (eg Wood, Catford, Cogswell 1983). Studies in older children have been much more limited and have concerned particular areas of concern such as management of asthma (Speight 1978), leukaemia (McCarthy 1975), and peripheral paediatric clinics (Weller 1975).

In the United States the literature is much more extensive and a wide range of studies have been performed. A few examples will be given of the breadth of activity. Meyers (1973) audited the medical records from paediatric specialty clinics for process information, as has Nathanson (1973) in paediatric outpatient clinics. Hein (1978) has assessed quality of perinatal care in small rural hospitals using mortality outcome measures. Lebow (1974, 1975) found the use of consumer questionnaires particularly effective in assessing the 'acceptability' of outpatient paediatric practice. Care in health centres for children has been studied (Lieberman 1974, Cunningham, Thacker 1976) and health surveillance has received particular attention (Gordis, Markowitz 1971, Mead 1976). Quality assessments in childhood mental health have been performed (Ricks 1976). On a management setting (Wallace et al 1974) have examined the ability of individual State Welfare Departments to provide children's services under Title 19 program of Medicaid, using structure and process measures. Finally, particular mention must be made to Kessner's tracer study of children and the studies of the US Joint Committee on

Quality Assurance into ambulatory child health.

Kessner and his co-workers studied the medical care given to a population of children mostly from black and low-income families in Washington DC, using the 'tracer method' designed by them (Kessner et al 1973, 1974, 1977). The method involved carrying out screening examinations on a random sample of children to determine the prevalence of four tracer conditions for specific age groups: anaemia, otitis media, hearing loss and visual defects. Health care providers were surveyed as to their 'usual' practices and then the medical records of the children were audited using 'explicit minimum adequate' criteria.

Kessner's design, then, permitted comprehensive study of the declared practice, the actual practice and the health status of the children with respect to the tracers. Like most outcome studies, as the researchers were first to point out, the responsibility for the poor outcomes that they found could not be attributed solely to the providers since lack of patient compliance might also have been a factor. However Kessner argued that 'good medical practice' would include efforts to secure compliance and he was therefore fairly condemning of the delivery of the medical care that he found. As a prospective venture, the tracer method was costly but it proved feasible and valid, providing generalisations were guarded.

The Joint Committee on Quality Assurance (JCQA) also attempted to assess quality of paediatric care using the tracer method. Rather than assessing care prospectively in a community, they developed criteria for retrospective audits of medical records for use at local level in peer review. The national Committee, which was

formed in 1970, was composed of representatives of the relevant health organisations, ie American Academy of Pediatrics, American Academy of Family Physicians, American Medical Association. Reports of its achievements have been published periodically in 'Medical Care'. The tracers chosen were health supervision/surveillance in four age groups, tonsillo-pharyngitis, bronchial asthma and urinary tract infection.

In phases one and two 452 paediatric 'experts' including members of the JCQA developed and validated process and outcome criteria for the tracers. There was remarkable agreement amongst them (Thompson, Osborne 1974). The third phase sought opinions regarding the criteria from 1,329 doctors delivering primary care. Although few disagreed with the criteria, many reported that they did not necessarily record the relevant information (Thompson, Osborne 1976). In the fourth phase the criteria were used in audits of 10,500 charts/case records by trained reviewers in the offices of 100 paediatricians and 66 family physicians. The results indicated a remarkable degree of homogeneity between the tracers in the quality of care of individual doctors (Osborne 1977).

An important finding was that many details regarding the tracers were insufficiently recorded. In the case of tonsillopharyngitis documentation was so poor that peer review by chart audit was impractical. Thus Margileth et al (1977) concluded that only with proper recording of the medical-care process using structured problem-orientated records, would audit of medical records, using predetermined valid criteria, be feasible and practical.

Most recently Kramer et al (1984) from McGill University, Quebec, reported on the use of preventable adverse outcomes to study the quality of child health care. Because cohort methods are insensitive in detecting rare outcomes, the authors used the more sensitive case-control techniques to investigate whether paediatricians or non paediatric generalists were better able to recognise severe acute illness or to avoid preventable complications. 103 patients with adverse outcomes for four tracer conditions (gastroenteritis, meningitis, pneumonia and otitis media) were compared with 103 controls with acceptable outcomes. The overall results indicated no evidence of different care between the groups. Although there were difficulties in interpreting the results due to confounding variables, this approach does seem worthy of further development. It is analogous in many ways to studies of inappropriate prescribing which will be considered in Section 1.3

Despite the wealth of medical audit activity in the USA, little attention has been payed there to studies of the quality of prescribing in child health care. This is primarily because of the nature of the health care system in the US, where prescription information is hard to obtain other than from the medical records themselves. Skegg (1982) has recently pointed out the uniqueness of the British prescribing information system and the scope for imaginative epidemiological research and medical audit.

(iii) Drug poisoning and public concern

Although prescribing for children in general practice is an everyday practice, this is not the only reason why it is worthy of medical audit. Other reasons concern safety and public pressure for

greater control over prescribing practices (Anonymous 1976a). In 1977 there were an estimated 24,000 children under 15 admitted to hospitals in England and Wales ostensibly because of the ingestion of poison (DHSS 1981). Most of them were under 5 years of age and the peak incidence was between 18-36 months. Many more, however, were likely to have been treated as outpatients and it has been suggested that as many as 40,000 attend each year with this problem (Department of Prices and Consumer Protection, 1976). There is also a wide social class gradient. For accidents, poisonings and violence amongst children aged 0-14 in 1970-1 the standardised patient's consulting ratio varied from 78 in Social Class I to 130 in Social Class V (Royal College of General Practitioners et al 1980). In comparison the standardised mortality ratio for this age group and cause ranged from 52 to 210 respectively (HMSO 1978).

Fraser (1980) reviewed the 598 deaths registered as due to accidental poisoning in British children under the age of 10 years from 1958-77. Drugs caused 484 deaths, non-medicinal products 111 and plants three. The annual number of deaths reached a peak in 1964 but fell steadily thereafter; 16 deaths occurred in 1977. After 1970 tricyclic antidepressants replaced salicylates as the most commonly fatal poison. The next ten drugs most often recorded in 1970-7 were, in order, opiates (including Lomotil), barbiturates, digoxin, osphenadrine (Disipal), quinine, potassium, iron, fenfluramine (Ponderax), antihistamines and phenothiazines. Since patterns of accidental poisoning are largely determined by the availability of prescribed drugs and by fashions in self-medication Fraser called for much more prudent prescribing in adult and paediatric practice.

In Newcastle changing patterns of poisoning in children have been observed amongst hospital admissions since the introduction of child resistant containers (Lawson et al 1983). Paracetomol and salicylate poisoning fell dramatically with the result that the most important medicines to cause poisoning in young children were tricyclics, benzodiazepines, Lomotil and iron preparations. The availability of these prescription-only drugs lies partly with the attitudes and behaviour of the prescribing doctors. Yet there is real concern that the quality of prescribing is far from satisfactory.

A recent 'Which?' report entitled 'The wrong kind of medicine? (1984) concluded that (i) too many drugs are prescribed (ii) drugs rated as 'less suitable for prescribing' by the medical profession itself are often prescribed and (iii) expensive brands of drugs are often prescribed when equally effective and much cheaper alternatives are available. The Consumers Association concluded that doctors do not prescribe just because of reasons of efficacy but also because of the influence of patients, drug companies, pressure of work, and lack of adequate training and information.

Criticism of current prescribing behaviour is also prevalent within the medical profession. This led the Secretary of State for Social Services, Norman Fowler, to establish an Informal Working Party on Effective Prescribing amongst NHS doctors in England. The group recommended improved undergraduate and postgraduate education as well as better information on prescribing behaviour for self-audit purposes (Greenfield 1982).

One of the most outspoken critics of current practice is Professor Michael Rawlins of the Wolfson Unit of Clinical Pharmacology, Newcastle. Writing in the Lancet in 1984 he said: "There is a grave danger that because of the nature of its dealings with the pharmaceutical industry, the medical profession is forfeiting public confidence. I know of no firm data from opinion polls that would allow me to substantiate my hypothesis, but I have been sufficiently impressed and alarmed by comments from members of the public, politicians of all the major parties, the media, and even doctors working within the drug industry, to have little doubt of its validity. The charge against us is that, in many of our dealings with the industry, we have become corrupt: that in return for needlessly (and sometimes recklessly) prescribing their expensive products, we accept (or even demand) rewards on a breathtaking scale."

Rawlins went on to state:

"I believe that there is cause for the public to be uneasy, and that the profession's relationships with the industry have become soured as regards not only conventional drug promotion, but also postgraduate and continuing medical education, and even research. And I believe that the faults lie at least as much with the profession as with the industry".

In summary then it has been argued that assessments of the quality of medical care is a necessary part of the delivery of health care and that medical audits of paediatric prescribing in general practice is an area worthy of particular study. The next section considers what studies have been performed in this field and what factors are known to influence the quality of prescribing.

1.3 A review of prescribing studies relevant to this research field

Many approaches can be discerned in studies of general practitioner prescribing (Taylor 1977). Descriptive studies, based usually on retrospective research of records, predominate. These document variations in prescribing frequency, cost range and selection of drugs. For example, Bain and Haines (1975) found that 76% of prescriptions in Livingstone were accounted for by 117 preparations although a total of 564 preparations had been used by the five doctors in their study. There are also studies linking prescribing behaviour with morbidity and therapeutic interest (eg Wilks 1975). Another approach is behavioural and uses questionnaire and interview methods to discover the influences of personal factors in prescribing. An example would be Julian and Herxheimer's study of doctor's anxieties in prescribing (1977) or Melville's study of the relationship between repeat prescribing of minor tranquilisers and doctors attitudes (1980). In addition monitoring of adverse reactions to drugs have taken a number of forms and these have been outlined by Crombie (1975).

It is not the purpose of this literature review to consider the extensive literature on research into prescribing in general, which has been well reviewed elsewhere (eg Taylor 1981). Rather it seeks to examine those studies relating to children, those studies specifically examining quality of prescribing and the factors associated with it. In this way the need for further research can be identified.

(i) Descriptive studies of paediatric prescribing

Although the Department of Health collects information about the number, costs and therapeutic class of drugs prescribed related to a given population, data is not available by age group. This has meant that it has been difficult to monitor changes in prescribing patterns for children at national, Regional or District level. Some general practices have reported aspects of their paediatric prescribing. For example, Bain and Haines (1975) found in Livingstone in 1971 that 336 prescriptions for psychotropic drugs were issued to 172 children (under 12 years old) which comprised six per cent of the population at risk. 43 per cent were sedatives, 41 per cent tranquilisers and 17 per cent hypnotics. Most were given for behavioural disorders and enuresis. 42 prescriptions for tricyclic compounds were for children under the age of five, which did not conform to accepted medical practice (see Appendix I). The analysis of drugs given by each doctor showed that one of the five had given about one third of the total. This demonstration of "over-prescribing" was found useful in discussing self-audit.

In Wilk's study (1975) in Bristol a smaller percentage (2.3) of children (0-14 years) had received psychotropic drugs during 1.3.71 to 29.2.72. However he made no particular reference to the quality of paediatric prescribing.

More recently Grace and Goulds (1980) have reported on the therapeutic experience of five year olds in their general practice. The number and therapeutic grouping of prescriptions given to 92 children before reaching their fifth birthday were examined. 1,241 prescriptions had been dispensed, comprising 33 per cent for

antibiotics and 31 per cent for an antihistamine or cough linctus. 96 per cent had received at least one course of antibiotics and the average child 4.5 courses; 89 per cent had received an antihistamine or cough linctus, and 50 per cent a skin preparation. The authors acknowledged that this was essentially a descriptive study and little could be inferred about quality of prescribing.

On a larger population basis descriptive accounts of prescribing for children are limited in this country to those of Jean Cleary. In her first study Cleary (1976a) examined prescriptions for patients under the age of 15 years issued by a sample of 116 doctors selected from a cohort of 859 doctors who entered general practice in England and Wales between 2nd July 1969 and 1st July 1970. Their prescribing habits had been examined periodically (eg Webb and Williams 1972). Cleary's detailed account of the nature of the pattern of prescribing however did not include age - specific prescribing and this omission limits quality assessments. Since drugs may be strongly contra-indicated below a certain age, prescription of a contra-indicated drug will therefore be indicative of sub-optimal quality of prescribing. Such is the case for tetracyclines owing to their ability to cause stained or deformed teeth in children under 12 (See Appendix I). However, over this age tetracyclines have an important role to play in the management of acne vulgaris, a common complaint of the teenager.

Cleary infers that since tetracyclines are contra-indicated for young children and that as she found that 85% of prescriptions were in syrup rather than tablet form, there may well be inappropriate prescribing. Such an assertion is open to criticism without age-specific date to support it since syrups may be prescribed to anyone

who finds the preparation easier to take (Brock and Roach 1979). On the other hand, Rowlatt (1978) has argued that it is irresponsible for manufacturers to market syrup tetracyclines and Herxheimer (1984) has called on the Minister of Health to withdraw the licence. One of the most important results in Cleary's study was that doctors were often idiosyncratic in their prescribing. For instance, one doctor was responsible for 30% of the non-barbiturate hypnotics. Hazards could thus occur from inferring too much from group findings.

In her second study (1976b) Cleary compared the pattern of prescribing for children between two groups of 15 doctors who had different interests and qualifications in paediatrics. No great differences were found in the frequency of the broad therapeutic groups that were given between those doctors with paediatric experience and those without. Since neither age-specific prescribing nor morbidity factors were examined, quality assessments of the appropriateness of the prescribing were not possible. Again there were great individual variations in prescribing habits and some apparent differences were due to the actions of two or three doctors rather than a general tendency. This further reinforces the requirement that any quality prescribing study must investigate doctor-specific prescribing.

The other British study of the quality of paediatric prescribing was performed by me in 1978 and reported in the British Medical Journal (Catford 1980). It formed the feasibility stage of the larger study which is described in this thesis and is considered in detail in Section 1.4. On an international setting, there appear to be no other major studies of paediatric prescribing despite extensive literature searches. This is in contrast to prescribing for the

elderly where there is a larger body of literature (eg Knox 1980, Tulloch 1981, Kiernan and Isacs 1981).

(ii) Studies of the quality of prescribing

The quality of prescribing may be judged by four main criteria (Parish 1973). Drug treatment should be appropriate, economic, effective and safe. Although there are no particular studies of the quality of prescribing for children, more general studies exist which indicate possible approaches to this field. They will be considered briefly here.

Measurements of quality of prescribing in terms of outcome of treatment are clearly a highly desirable goal but one which is difficult to obtain. Difficulties include deciding what is a 'good' outcome, and obtaining sufficient patient information from which to draw conclusions. In view of the complexity such studies are likely to attract highly motivated general practitioners unrepresentative of general practice as a whole. One alternative is to apply externally set criteria to dispensed prescriptions of a group of doctors, enthusiasts or otherwise. A particularly extreme but useful case is where there is general agreement that a particular drug should no longer, or hardly ever, be used (eg amphetamine). Continued use of such a drug in the face of evidence against it, must surely be a measurement of quality of prescribing, albeit crude. It is likely therefore that higher average prescribing of a drug which is generally thought to be undesirable might be a useful indicator of quality. This is the approach that I and other researchers have adopted.

The use of oral chloramphemicol was one of the earliest drugs used in this way. Meade (1967) tested the hypothesis that prescribing of chloramphemicol was related to 'definable characteristics of general practitioners, such as their skill and training'. This study examined 250,000 prescriptions issued by 258 doctors during a one month period in 1961 and found that three prescriptions per 1000 patients had, been issued for oral chloramphenicol. This was despite the fact that the dangers of the drug had been well publicised over the preceeding five years. Meade tried to relate the findings for each doctor to indexes of his training, current patterns of work and personal characteristics but found no relationship; probably because inappropriate estimates of these factors were used. In addition to demonstrating that there was a widespread underestimate of the use of chloramphenicol, Meade reported that a fifth of doctors were responsible for two-thirds of the prescriptions. High choramphenicol prescribers were in general high prescribers of other antibiotics. Meade concluded that general practitioner prescribing was very idiosyncratic and was not related to any great extent to specific doctor variables.

Other drugs have also been studied using this approach. Wade and Hood (1972a and b) used prescription data from the Pricing Bureau to describe the use of various drugs in Northern Ireland. They demonstrated, for example, that the prescribing of chloramphenicol was confined to a few doctors and that the prescribing of amphetamines was still 'remarkably high in 1970'. There were marked geographical variations in the prescribing of Mandrax. The prescribing of aerosols containing isoprenaline and adrenaline had decreased only slightly over the five year period 1966 to 1970,

despite information available to practitioners about the dangers of such aerosols. Cochrane and Moore (1971) used the same source to show that the observed to expected consumption of vitamin B12 varied, according to the method of calculation, from 3:1 to 20:1. This was clearly greatly in excess of requirement.

Stolley and his colleagues (1972) from John Hopkins University have also pursued a similar line of enquiry. They studied 37 doctors, representing 84% of all the primary care physicians in a county with a population of 112,000. Information was obtained by interview and concerned the physicians opinions and stated uses and contra-indicators for five drugs - 'Ritalin', 'Equagesic', 'Chlormycetin', Vitamin B12 and oral contraceptives. These drugs were selected because 'their use in certain circumstances is generally held to be undesirable'. The doctors' answers were compared to pre-set criteria developed by a panel of 33 nationally recognised 'experts'. A second assessment was based on the physicians stated treatment for five common complaints (eg nausea) and five common illnesses (eg arthritis) and also compared to the panel of judges prior opinion.

The physician's prescribing behaviour were summarised in a single numerical rating of 'appropriateness'. Correlations were then sought with a range of factors relating to the doctors. Physicians who were younger, more recently trained, had fewer years in practice or who had taken 'special courses on postgraduate training' were likely to have 'better' prescribing ratings. 'Better' prescribers were also likely to have larger practices, employ greater number of ancillary staff and spend relatively less time with each patient. They were also more likely to be in a group

than solo practice. They were also close links between the attitudes of the doctors and their quality of prescribing. Many of these findings were found to be consistent with earlier studies in North America (Peterson et al 1956, Chute 1963).

More recently Mapes (1977) reported a study of 54 British general practitioners in which an attempt was made to assess the effectiveness and safety of prescriptions prescribed. The data was derived from information obtained by the Medical Sociology Research Centre, Swansea in their study of prescribing by a cohort of 859 doctors who entered general practice in 1969-70. Cleary (1976a, b) also used this database as mentioned earlier. At the time of the study, prescriptions were only available for 116 doctors and because of lack of personal data on some, the eventual number in the study was reduced to 54 doctors who had been in practice for 18 months or less. This subsample cannot be considered representative of the original cohort nor of general practitioners in total.

Mapes, supported by a 'group of clinical pharmacologists' drew up a list of preparations which were considered to be 'conservative' (ie Meprobamate, Rexerpine, Potassium, Citrate) and 'Incautious' (ie chloramphenicol, monoamine oxidase inhibitors, erythromycin estolate, phenylbutazone, tetracycline for children, habituating non-barbiturates - not specified individually). If a doctor prescribed more than twice the average of the drug, he was considered a 'user' of that drug. The doctors were then grouped according to those displaying:

'Conservatism' and 'incaution'	- 7 doctors
'Conservatism' only	- 15 doctors
'Incaution' only	- 16 doctors

Neither - 16 doctors

Prescribing behaviour was then compared to eleven professional, educational and prescribing variables using a complex multivariable analysis. At the two extremes 'conservatism' tended to be associated with high prescription frequency, relatively low cost and membership of the Royal College of General Practitioners, whereas the tendency to 'Incaution' was associated with a declared dependence on pharmaceutical industry literature, a tendency to leave prescription writing to ancillary personnel and to poor specification of drugs to be dispensed.

The major deficiency of Mape's study lies in its over complex statistical treatment of data which were frequently derived from judgemental and therefore relatively non-numeric criteria. Moreover the details of the methods of derivation of data were insufficiently explicit to allow the reader to make simple commonsense assessments of their relative importance. For example, it was not possible to gauge the scale of paediatric prescribing of tetracyclines although this data was collected. These problems arose primarily because the data was collected for other purposes.

The other major study of the quality of prescribing amongst British general practitioners was conducted by Taylor (1981) and submitted successfully for a Doctor of Medicine degree at the University of Aberdeen. It was based on earlier work carried out in 1974 (Taylor 1978b). Unlike Mape's study, Taylor examined the prescriptions of a randomly selected 20% sample of general practitioners in the Grampian region of Scotland. Opinions of the 46 doctors themselves were used to derive a qualitative measure of prescribing, by rating the degree of general acceptability of 70

drugs taking both safety and efficacy into account but not cost. In this way an 'Index' of 33 undesirable drugs was drawn up which were split into five drug groups according to degree of acceptability. The drug group with the highest score of 'unacceptability' consisted of Delta-butazolidin, Tandalgesic, Chloromycetin, Durophet, Mandrax, Film and Durophet M. Weightings were given to the drug groups and measures of the quality of prescribing were then derived for the 46 doctors in the study who had issued prescriptions for the month of 1976. Index scores of quality were then correlated to factors relating to individual doctors.

Taylor found that there was no general correspondence between qualitative measurements and prescription costs. 'Better' prescribers appeared to have used a more restricted range of drugs; and doctors with 'poor' quality scores did not simply prescribe one or two 'undesirable' drugs more often, but made use of a wider range of 'undesirable' preparations. Doctors in urban practices, those in larger partnerships and those who were affiliated to the Royal College of General Practitioners tended to have 'better' quality scores. There was a similar relationship with teaching commitments, such doctors being twice as likely as others to be College members. However in view of the small number of doctors in the Study statistically significant differences between the sub-groups were not found. This must be considered a major drawback and any conclusions based on these results should be most guarded.

Another of Taylor's analyses examined the differences between doctors who had high total drug bills and high average unit cost of drugs prescribed with those that had low rates. The high cost doctors were on average the most recently qualified and generally

came from small partnerships with greater than average numbers of patients. The low cost prescribers had been qualified for longer, more of them worked in large urban partnerships with small average lists of patients and they were more likely to be teachers or members of the Royal College of General Practitioners. Taylor, however, did not report carrying out tests of statistical significance on these findings either. In view of the small numbers of doctors in each group, it is unlikely that the results reached statistical significance. Little therefore should be drawn from these findings since random chance could explain them.

Other drawbacks of Taylor's work is that the presentation of the results do not give the reader a clear grasp of the level of inappropriate prescribing. For example, prescribing rates for specific drug or drug groups are not given so that the reader can make his own assessment of the quality of prescribing. Mape's study discussed previously also suffered this defect. Finally, Taylor did not examine prescribing for children, the Index drugs were drugs used predominantly for adults.

Although some interesting hypotheses and methodologies stemmed from Taylor's work, factors affecting general practitioner prescribing are still very much open for debate. However, Taylor did show that the doctors own ratings of acceptability matched very closely with their own personal prescribing behaviour ($p<0.01$). This suggests that what a doctor believes he does. If this is so then an educational approach designed to change attitudes towards specific drugs by identifying and correcting misinformation might well have a corresponding effect on prescribing behaviour. This is a hypothesis which I test later in my study.

(iii) Studies of factors related to prescribing behaviour

Mention has already been made of educational, practice and prescribing factors which have been found to be related to quality of prescribing. Other studies have been performed which although not specifically examining quality do show how prescribing behaviour appears to vary according to personal attributes of doctors. These will be mentioned briefly. Those factors thought to be associated with paediatric prescribing have already been discussed.

Joyce et al (1967) sought reasons for the differences in the prescribing rates of 93 general practitioners in three English towns by examining features of the doctor's practices, personal characteristics and attitudes to medical problems. Information was obtained by 'semi-structured' interview. Their main finding was that in general 'higher' educational qualifications and an 'orientation towards the whole person' was associated with lower prescribing of drugs of all kinds. It is not clear, however, how the doctors were selected and it is likely that they were not typical. Although other criticisms both major and minor can be made about the study it was an important first step in examining influences on prescribing behaviour.

Other studies have followed on both sides of the Atlantic. Parish (1974) reported that younger physicians in Great Britain prescribed relatively more psychotropic drugs than older physicians. Hayman and Ditman (1966) reported on the other hand, that younger physicians in the US tended to prescribe psychoactive drugs less frequently, and to regard them less favourably as a treatment for psychiatric disorders. Lee (1965) using the same data base as Joyce

found no significant relationship between prescribing practices and medical school attended. Melville (1980b) found prescribing appropriateness was related to the job satisfaction of general practitioners.

Raynes (1980) found prescribing was associated with specific symptoms but also to social characteristics of physicians - ie the tendency to develop particular prescribing routines. This finding was subsequently examined in greater detail by Haayer (1982) in the Netherlands. 116 general practitioners were asked how they would treat eight hypothetical case histories. Replies were assessed by a panel of 'experts' and related to sources of information and age of the doctor. The hypothesis that prescribing rationality is related to physician rather than patient characteristics was confirmed. Younger physicians prescribed in a more rational way than their older colleagues and this was partly reflected in the patterns of obtaining information. None of the professional sources of information studied seemed to have a great impact on prescribing rationality.

For sometime it has been known that educational initiatives can influence the quality of care (eg McColl et al 1976). The same applies to prescribing behaviour. During 1975 to 1977 the CURB Campaign was mounted to reduce barbiturate poisoning. A stastically significant greater decrease in the total quantity of barbiturate hypnotics prescribed was observed (King et al 1980). Individual general practitioners have also reported improvements in prescribing following educational and self-audit activities eg Wilks (1980) following his earlier study in 1975, and Marsh (1981). However Wilson (1976) had no success. More elaborate methods of feedback of prescribing to practitioners have been evaluated with mixed result.

Swindell et al (1983) carried out an audit of antibiotic prescribing by a range of specialties in a Bristol hospital. Appropriateness of prescribing was judged by two independent medical microbiologists who had access to clinical details. In 1977 28% of prescriptions were judged as unnecessary and accordingly an educational programme was carried out. This appeared to have no beneficial effect as in 1980 35% of scripts were found to be unnecessary. The authors put the poor result down to the turnover of junior staff who were largely responsible for issuing the prescriptions.

Poor results have also been reported from the USA. Koepsell et al (1983) evaluated the Seattle computerised Drug Profile System which generated a profile of each patient's current and previously used drugs. A controlled trial between profile and no profile showed no differences in prescribing volume, and the low incidence of preventable drug-drug interactions and redundancies was unaffected.

More encouraging results have been reported elsewhere. Gehlbach et al (1984) in North Carolina, USA studied a model for improving physician prescribing that utilised computerised feedback in a family medicine residency practice. 43 resident and family physicians were stratified by level of experience and randomised into two groups. For 9 months the experimental group received monthly printouts identifying the drugs they had prescribed by brand name with estimates of cost savings that might have been realised by prescribing generic drugs. The control group received no feedback. Prescription monitoring of both groups continued for 12 months after all feedback had ceased. Increases in generic

prescribing by physicians in the experimental group were substantial and statistically significantly different ($p=0.01$) to that of the control physicians. The feedback model appeared to increase generic prescribing but the doctors were volunteers and perhaps therefore more susceptible to information. The findings may not therefore be reproducible for specific drug groups or prescribing practices in the total population of doctors.

Finally there is the study of Harris and his colleagues at St Mary's Hospital, London (1984), which has received widespread interest. The aim of this study was also to see whether or not general practitioners would alter their prescribing habits if they were given information about their own prescriptions, an opportunity to discuss it with other general practitioners and access to any further reasonable facilities they requested. 38 inner London doctors took part, one group was randomly selected and the other self-selected. There was also a control group of 22 doctors, which the authors acknowledge was biased making interpretation of the results difficult. By arrangement with the Prescription Pricing Authority, detailed listings (PD8s) of each practitioners dispensed prescriptions for one month on four occasions six months apart were analysed by computer. Tables relating to personal and practice prescribing were sent to each doctor each time and meetings were then held at which doctors discussed the findings amongst themselves.

Over the two year period many changes took place in terms of frequency and cost of prescribing. In particular, the randomly selected group had 5.7 per cent fewer prescriptions per 1000 patients dispensed in the final month than would have been expected, at a cost of 19p less (7.7 per cent) per item; the self-selected group had 12.8

per cent fewer prescriptions at 5p less (2.1 per cent) than expected. However the reduction in prescribing rate in the randomly selected group was not statistically significant.

There were differencies between younger and older doctors : the latter increased their level of generic prescribing significantly more than the former, and decreased their level and cost of prescribing to a substantially greater extent. The greatest potential for financial savings lay in the use of six drugs - Mogadon, Valium, Indocid, Aldomet, Lasix and Inderal. Prescriptions of all six proprietary drugs was reduced in favour of generic preparations, but these drugs are normally used for adults. No age specific prescribing rates were presented and thus no comment can be made of paediatric prescribing behaviour. In view of the statistical problems Harris' study like Taylor can only point to possible influences on prescribing. Even though generic prescribing and cost may be influenced by computer feedback of prescribing information, one cannot conclude that the quality of prescribing will be.

Since 1980 Patterson's unit at Heriot-Watt University, Edinburgh has been carrying out studies of the use of computerised prescribing information as a way of influencing practitioners prescribing behaviour (Crawford 1981). This work is based on earlier pilot studies (Patterson 1979) but at the time of writing no report has been published.

There also have been several useful reviews of factors affecting drug prescribing. Hemminski (1975) distinguished between factors easily modified by administrative activities such as advertising and

drug approval, and factors not easily modified such as characteristics of patients and doctors and the role of physicians. She also highlighted the drug industry as an important influence on prescribing which was also mentioned in Section 1.2(iii). Taylor (1977) has reviewed some of the earlier studies in this field. Christensen and Bush (1981) have looked at models of the prescribing process and have discussed strategies to change prescribing practices which address action at the level of the drug manufacturer, physician, pharmacist and patient. However few authors would dissent from the view that the greatest prospect for improvement lies with the doctor. As Stolley and Lasagna (1969) have noted "The eventual success of any efforts at continuing education in therapeutics will depend on a strategy and tactics designed to affect those factors that have the greatest impact on the physician in his choice of drug."

This review of the literature has shown that, although there has been much interest over the last twenty years in the quality of prescribing, advances in knowledge have been slow. Little information is known about the scale of good or poor quality of prescribing and the factors affecting it. Many studies have been limited because of small sample sizes from which to draw statistically valid conclusions, or because the original samples were not representative. There still remains a problem of defining quality in an explicit and comprehensive way which can be reproduced over time. Knowledge about the quality of paediatric prescribing and the factors affecting it is virtually non-existent. Accordingly we can only summise on ways of improving it. It was against this background that I became interested in the field of medical audit of

paediatric prescribing in general practice. The following section describes how I mounted a feasibility study to develop a new method of measuring the quality of paediatric prescribing.

1.4 Feasibility study of assessing the quality of paediatric prescribing 1978-79

In 1978-79 I undertook a research project in the medical audit field whilst at the London School of Hygiene and Tropical Medicine and subsequently at Hampshire Area Health Authority (Catford 1979). This examined and evaluated methods of assessing the quality of medical care for children using the tracer technique described and tested in the USA by Kessner and his colleagues (1973, 1977). One component of the research included a feasibility study which sought to determine the utility and validity of a method of assessing the quality of general practitioner prescribing for children. A brief description of the study will be given here, which was published subsequently in the British Medical Journal (Catford 1980). The findings were instrumental in formulating a much larger study which is the subject of this thesis.

(i) Quality criteria

Monitoring the quality of prescribing may focus either on the prescription of a specific drug - for instance, was tetracycline given appropriately for the illness and the patient? - or the occurrence of a specific illness in a given patient group - for instance, for otitis media in infants was an appropriate drug regimen given? The first method is the more attractive because prescription events are recorded on FP10 prescription forms. Furthermore, in childhood, because certain drugs and drug combinations are

contraindicated for certain age groups, inappropriate prescriptions may be identified in the absence of information concerning the illness. The British National Formulary (1976-8) states, for example, that "aspirin is not recommended for infants under 1 year because of the danger of metabolic disturbance. Fatal poisoning may occur with repeated doses." Such a prescription in general practice does not therefore conform with the standards of accepted medical practice and may be presumed to reflect inappropriate care.

A development of this approach to monitoring drug usage might therefore be useful in assessing the quality of paediatric prescribing. It would be similar to earlier studies using mandrax, vitamin B12, chloramphenicol as indicators of poor prescribing, which were described in Section 1.3 (ii). Safety has for many years been considered an essential component of good prescribing (Parish 1974).

Explicit criteria that would indicate poor quality of prescribing for children were therefore developed for 17 indicator drug groups or drug combinations. Controversial practices or the use of esoteric or rare drugs were not considered. Support for the criteria was found in current, widely available medical publications that presumably reflected accepted medical opinion. General practitioners who had received adequate undergraduate and postgraduate training in the treatment of childhood illnesses would have been well acquainted with these standards of recommended practice. Deviation would therefore not be justified in the context of normal British general practice.

Inappropriate drug prescriptions, which should be avoided within certain age groups of children, were categorised into those that were

'Hazardous' (potentially life-threatening) and 'Undesirable'. The latter group also comprised obsolete drugs and those of dubious medical efficacy. Supporting references for the following quality criteria are given in Appendix I.

'Hazardous' drugs according to age groups in years:

aspirin <1
barbiturates other than phenobarbitone <1
chloramphenicol <16
diphenoxylate (Lomotil) <2
loperamide (Imodium) <4
antiemetic phenothiazines (prochlorperazine, trifluoperazine, perphenazine) 1-4

'Undesirable' drugs according to age groups in years:

tetracyclines <11
tricyclic antidepressants <5
topical antihistamines <16
diphenoxylate (Lomotil) 2-4
metoclopramide <1
antiemetic phenothiazines (prochlorperazine, trifluoperazine, perphenazine) 1-4
antidiarrhoeals (as in MIMS section 1E) <1
appetite depressants (amphetamines, fenfluramine) <16
tonics and appetite stimulants (as in MIMS section 8A) <16
tricyclic antidepressants simultaneously with a urinary antimicrobial (for instance, co-trimoxazole) <16

(ii) Materials and methods

With the approval and help of the local medical committee, the local pharmaceutical committee, DHSS Branch PIE, and the Prescription Pricing Authority, 6331 original FP10 prescription forms for children who were exempt from prescription charges because they were under 16 years of age were obtained from the Prescription Pricing Authority at Newcastle. These forms represented the prescriptions for the month of September 1978 of a random sample of 72 general practitioners divided equally between two health districts in Wessex out of a total work force of 277. Forms issued by locum doctors were not

considered. Consent for the study was given on the understanding that anonymity and confidentiality would be assured. No permanent record of the names of the doctors or patients was made. I had sole access to the prescription forms.

Standard pharmacology texts, such as MIMS (Duncan 1979), were used to compile a list of proprietary and non-proprietary names of the above indicator drugs. For each doctor I collected the following data: number of all forms with and without age recorded by whether the writing was in the same hand or apparently written by more than one person; average (mode) number of prescriptions per form; and number of prescriptions of each hazardous and undesirable drug by age group and handwriting.

Where age was not recorded on forms containing prescriptions for tetracyclines and another drug commonly used for treating teenage acne vulgaris was not listed, dates of birth were obtained where possible from the family practitioner committee.

The validity of the data was assessed as follows: 10% of the prescription forms were reinspected so as to determine the levels of agreement with the initial measurements. No serious errors were found; the repeatability indexes ranged from 95% to 100%. In particular no doctor was falsely found to have prescribed a hazardous or undesirable drug. The validity of age recording was not determined, but there is no reason to suspect gross misrepresentation. The data were processed manually by extensive cross-tabulation.

(iii) Results

The mean number of FP10 forms issued by each general practitioner to children in September 1978 was 88+57 (SD). The mode number of prescriptions per form was one, but one doctor issued 280 forms with a mode of three items per form. Only 56% of the 6331 forms had the age of the child recorded on them, though all were exempt from prescription charges because the child was under 16 years of age. Thirteen per cent of all forms were considered to have been written by more than one person (probably by an ancillary and then signed by a doctor). The proportion of forms without a recording of age was significantly greater ($p<0.001$) in those written by an ancillary (64%) than in those written solely by a doctor (41%).

Table II shows the frequency of general practitioners prescribing hazardous or undesirable drugs to children in one month. Inappropriate prescriptions of antisymptomatic drugs for diarrhoea, vomiting, and enuresis were the most widespread. Of the forms containing drugs where a specific record of age was essential for assessing quality of prescribing, 46% had no age recorded.

Nine doctors (13%) were found to have prescribed at least one hazardous drug during the month. Twenty-five (35%) had prescribed at least one undesirable drug, four of whom had also prescribed a hazardous drug. Altogether 30 doctors (42%) had prescribed at least one hazardous or one undesirable drug during the month. Ancillary staff had written 10% of the forms containing hazardous or undesirable drugs; thus they had not written proportionately more inappropriate prescriptions than the doctors.

Some example of inappropriate prescriptions were as follows. A 2 year old child was prescribed imipramine (Tofranil) syrup 10 ml at night (200 ml), and a 10 month old infant was given prochlorperazine (Stemetil) elixir 5 ml thrice daily (200 ml). A 3 month old baby was given diphenoxylate (Lomotil) syrup 2.5 ml daily (50 ml) with kaolin (paediatric) 5 ml daily (100 ml), with promethazine (Phenergan) elixir 5 ml daily (100 ml). Compared with 204 prescriptions for anti-diarrhoeals on the 6331 forms inspected, there was only one order for a dextrose-saline preparation.

FEASIBILITY STUDY RESULTS: Table II

Frequency of general practitioner prescribing of hazardous or undesirable drugs to children in one month

Drug group or combination	No of 72 doctors	No of prescriptions
Hazardous		
Aspirin, oral, <1	0	0
Barbiturates other than phenobarbitone, oral, <16	0	0
Chloramphenicol, oral, <16	0	0
Lomotil, oral, <2	6	6
Imodium, oral, <4	1	1
Antiemetic phenothiazines, oral, <1	2	2
Any hazardous drug above	9	9
Undesirable		
Tetracyclines, oral, <11	0	0
Tricyclic antidepressants, oral, <5	7	10
Antihistamines, topical, <16	3	6
Lomotil, oral, 2-4	8	8
Metoclopramide, oral, <1	3	3
Antiemetic phenothiazines oral, 1-4	1	1
Other antidiarrhoels, oral, <1	12	15
Combination of two antidiarrhoels, oral, <16	2	7
Antidiarrhoels with antibiotic other than neomycin, oral, <16	5	8
Isoprenaline, spinhaler, <16	4	8
Appetite depressants, oral, <16	0	0
Tonics, oral, <16	0	0
Tricyclic antidepressant with urinary antimicrobial, oral, <16	4	5
Any undesirable drug above	25	71
Any hazardous or undesirable drug above	30	80

(iv) Discussion

The feasibility study showed that assessing the quality of paediatric prescribing, as determined by the dispensing of prescription forms considered inappropriate by widely acknowledged medical reference books, was relatively convenient and easy. Subject to the necessary approvals and help, the approach could well be useful in studying factors thought to influence prescribing behaviour as well as collecting more information on the scale of inappropriate prescribing. A number of findings were also obtained which would be useful in planning further studies.

Firstly, it was apparent that percentage of doctors prescribing one drug inappropriately (as defined in this study) was low. Studies attempting to examine factors affecting a particular drug usage would therefore have to include a very large number of doctors. Pooling of 'hazardous' or 'inappropriate' drugs could reduce the number of doctors required. Calculations could be made on the basis of these observations to determine the number of doctors required in an intervention study to influence prescribing behaviour.

Secondly, a large number (44%) of forms issued to children under 16 years did not have the age stated on them. This meant that the use of age-specific criteria to determine quality of prescribing was severely limited, unless a method of obtaining the ages of the children receiving the indicator drugs could be found.

Thirdly, there was a group of drugs prescribed by an appreciable number of doctors which had similar pharmacological properties. This suggested that the treatment of particular paediatric conditions needed improvement. Consequently, any specific interventions to

improve prescribing could most profitably concentrate on the management of diarrhoea, vomiting and enuresis rather than for example appetite disorders.

Fourthly, existing and new innovative communication methods for improving quality of prescribing should be evaluated. Most of the hazardous and undesirable drugs prescribed by 42% of the sample doctors had only been considered as such within the previous decade. This raised the question whether standards of recommended practice were being passed to general practitioners in a speedy and effective manner. For example, the Drug and Therapeutics Bulletin (Herxheimer 1978) discussed in detail the management of childhood diarrhoea nine months before the prescriptions were issued and yet 10% of the sample doctors had prescribed drugs for children that were specifically cited as hazardous. This information, however, was distributed to only one-third of general practitioners in England - those that were newly qualified. The inappropriate use of some drugs, for instance, diphenoxylate, was confined to certain areas. Such prescribing did not appear to have stemmed from the region's teaching hospital (C F George, unpublished information) and may have reflected the intensity of promotion activities of pharmaceutical companies.

Finally, only one month's prescribing was studied. It is possible therefore that a general practitioner who would normally prescribe a drug inappropriately may not have been exposed to the clinical situation in which to do so. For the future it would seem advantageous therefore to examine at least two time periods during which a reasonable number of prescriptions had been issued.

I concluded therefore that I had developed the basis of a workable method of assessing one aspect of the quality of prescribing for children - ie that of safety. I proposed therefore to refine the method and use it in a much larger study of prescribing whose study design and aims and objectives are described in the following section.

1.5 Aims and objectives of the main study

The preceding sections have established that the need for medical audit to assess and improve the quality of medical care is widely acknowledged. Although quality assessments of child health care have been undertaken in the United States, information is lacking for Britain. Chemotherapy is a common form of management for childhood illness; 60% of children under 14 years of age receive at least one prescription a year from their general practitioners (Skegg et al 1977). There have been few attempts, however, to assess the quality of prescribing for children and the factors affecting it. Two descriptive studies in Britain (Cleary 1976 a,b) provided baseline data on the frequency of the broad groups of drugs prescribed for children and showed that performance of a few doctors may have a considerable effect on certain prescribing rates.

In 1979 a feasibility study carried out by me (Catford 1980) showed that it was possible to obtain for individual doctors age related prescribing rates of specific drugs widely recognised to be unsuitable for children. 6,331 FP10 prescription forms issued to children by a random sample of 72 general practitioners in September 1978 were examined. Prescriptions for drugs which have long been known to be contraindicated in children eg chloramphenicol,

barbiturates, were not encountered. Only about 1% of scripts could be legitimately called into question on the basis of current teaching although 42% of the doctors used drugs that have recently been considered to be hazardous or undesirable. The feasibility study showed how the method could be improved for assessing the frequency that doctors prescribe drugs inappropriately for children on the grounds of age. A larger study was consequently mounted with the following aim and specific objectives. The specific hypotheses that were to be tested are subsequently discussed.

(i) Aim

To assess the quality of prescribing for children and the factors related to it amongst general medical practitioners in Wessex, using aspects of safety as the measure of quality.

(ii) Specific Objectives

1. To establish a set of drugs and drug groups which if prescribed for children of given ages would be indicative of 'Hazardous', 'Illogical', 'Undesirable' or 'Inappropriate' prescribing.
2. To determine doctor-specific prescribing rates of these 'indicator' drugs in September 1979 and 1980 for a random sample of general medical practitioners in three health districts in Wessex.
3. To determine information on 30 variables concerning these doctors ie relating to personal, training practice, and neighbourhood factors, general prescribing behaviour (including cost) and current educational status.
4. To examine whether there was any relationship between these doctor variables and the quality of prescribing as judged by the

prescription of the 'indicator' drugs.

5. To determine whether informing general practitioners of the observed quality of prescribing within their District was more effective in improving the quality of their own prescribing than standard methods, such as via the medical press.

(iii) Hypotheses to be tested

At the outset of the study it was decided to test three core hypotheses. They were as follows:

1. **"The quality of prescribing is less associated with personal, practice, neighbourhood factors than the possession of relevant higher qualifications, postgraduate experience and current educational status."**

   Should this hypothesis be refuted then normal methods of establishing professional competence would be insufficient to maintain quality of medical care. This could have important implications for the organisation of general practice.

2. **"The quality of prescribing is inversely related to the cost of prescribing."**

   The routine audits conducted by the Prescription Pricing Authority and the Department of Health of the prescribing costs of general practitioners do not consider the quality of prescribing. Their primary objective is to reduce unnecessary costs. If it could be shown that high cost prescribing was directly associated with poor quality prescribing then the attempt to cut the escalating costs of prescribing might prove more successful.

3. "The quality of prescribing can be better improved by informing practitioners of their performance (without the use of sanctions) on a direct basis rather than through the medical press."

Should this hypothesis be supported, then the effectiveness of present attempts to achieve and maintain competence through the reliance on the medical press would be in doubt. There would then be evidence that medical audit (without the use of sanctions) had improved patient care. Despite the emphasis placed on medical audit (see Section 1.1) there is still apathy and cautiousness in some quarters regarding its widespread use. This is chiefly because of the lack of certainty that patient care will be improved (Anonymous 1976 b, Kessner 1978).

2. METHODS

"The line between failure and success is so fine that we scarcely know when we pass it, so fine that we are often on the line and do not know it". Elbert Hubbard 1927

2.1 Prescription Pricing Authority information

The feasibility study (Section 1.4) demonstrated that it was possible to assess aspects of the quality of paediatric prescribing by examining prescriptions of particular drugs considered inappropriate for children of given ages. This drug-orientated approach has been used in studies of prescribing in adult populations but not previously in children (see Section 1.3(ii)). The advantages of this method over a patient/illness orientated approach, is that prescription forms by doctor are available through the Prescription Pricing Authority in Newcastle. Unfortunately routine prescription information lacks clinical detail regarding the patient, therapeutic intent of the prescriber or the practice of repeat prescriptions. Table III summarises five possible types of studies of the quality of prescribing be they retrospective or prospective.

After a general practitioner has written a National Health Service (NHS) prescription the patient takes the form to a pharmacist for dispensing. Normally a charge is payable for each item on the form, whether a drug or an appliance, but the patient may be exempted if he comes within certain categories. These include persons suffering from certain specified medical conditions, elderly people and children, persons with low incomes, and war service pensioners. About 62% of prescriptions are dispensed without charge to patients (DHSS 1977).

Table III Possible types of studies of the quality of prescribing

	Appropriate quality of prescribing	Inappropriate quality of prescribing	
Drug-Orientated Approach	(1)	(2)	(3)
ie Prescription of a specific drug	"Drug regimen given appropriately for	for illness: "Drug regimen given inappropriately for the illness"	for patient: "Drug regimen given inappropriately for the patient"
(eg systemic tetracycline)	(eg teenage acne)	(eg tuberculosis)	(eg infant)
Patient/Illness Orientated Approach	(4)	(5)	
ie Occurrence of a specific illness in a specific patient group	"For the patient's illness appropriate drug regimen given"	"For the patient's illness an inappropriate drug regimen was given"	
(eg infantile otitis media)	(eg oral ampicillin 62.5mg qds for 5 days)	(eg oral chloramphenicol)	

Examples developed from Paediatric Vade-Mecum (Wood 1974)

A prescription form should carry the following information:

(a) the patient's name, address and sex;

(b) the patient's age, if under 12;

(c) the exemption category, eg a patient under 16 years of age, a woman aged 60 or over, a man aged 65 or over:

(d) the prescribing physician's name and address;

(e) the dispensing pharmacist's name and address;

(f) the drug prescribed and date of prescription;

(g) the quantity dispensed, including formulation, pack size, etc., if appropriate.

Each month in England the pharmacist sends bundles of the NHS prescriptions he has dispensed to the particular processing division of the Prescription Pricing Authority (PPA) that is responsible for pricing in his part of the country. There are several divisions in Newcastle-upon-Tyne where the headquarters of the PPA is located and where there is also the one Investigation Division; there are seven other small pricing divisions located elsewhere in the country. When the month's prescriptions arrive, they are priced and arrangements made for the pharmacist to be reimbursed the sum due. In England in 1976 PPA processed about 182 million forms bearing nearly 293 million prescriptions. The total cost was about £451 million (DHSS 1977).

After pricing has been completed, statistical information is extracted from the prescription forms. The prime purposes are to monitor the NHS drug bill and promote cost-effective prescribing by individual general practitioners. The first investigation routinely conducted by PPA concerns area prescribing. Its aim is to supply all family practitioner committees (the NHS authorities with which

general practitioners are under contract) with statistical data on the number and cost of prescriptions dispensed in their individual areas. Each Family Practitioner Committee (FPC) is given information for its own area each month on:

(a) the total number of prescription forms;

(b) the total number of prescriptions on those forms;

(c) the average number of prescriptions per form;

(d) the basic and total costs;

(e) the average total cost per prescription;

(f) the total number of persons on physicians' NHS presribing lists;

(g) the average number of prescriptions per person on lists;

(h) the average total cost per person on lists.

An annual tabulation is also prepared; that for 1976 for England showed an average total cost per prescription of £1.54 and an average total cost per person of £9.88. Many of the statistics issued by the Department of Health and Social Security (DHSS) are extracted from the information provided by the investigation and on it other statistical data are based. The information is also made available to organisations on request and much of it appears in the annual report published by PPA.

PPA's second set of statistics concerns individual general practitioners. In each month of 11 months of the year, the prescribing patterns of general practitioners in certain FPC areas are selected for special monitoring, so that in the course of the year the prescribing costs of all the general practitioners in England (20500 in 1976) are estimated. The FPCs are sent lists for the month in question, which bear the following information:

(a) the name of every physician in the area;

(b) the average number of persons on each physician's NHS prescribing list;

(c) the number of prescriptions issued by each physician;

(d) the total cost of prescriptions issued by each physician;

(e) the average number of prescriptions issued per person on each practice's NHS prescribing list;

(f) the average cost per prescription for each physician;

(g) the average cost per person on each practice's NHS prescribing list;

(h) the ratio of each practice's cost per person to the FPC area's cost per person for the month monitored in the previous year;

(i) the averages for the FPC area for (e), (f), and (g).

Physicians are given extracts from the lists by their FPCs. The statement relates only to the prescribing of their own practice but enables them to compare their costs with those of their colleagues in the same area. The information includes the following:

(1) the number of prescriptions issued by the practice;

(2) the ratio of the practice's figures to the average for the FPC area of:

(a) the number of prescriptions issued per person on NHS prescribing lists;

(b) the cost per prescription;

(c) the cost per person on NHS prescribing lists.

If the practice's average cost per patient is 1.25 or more of the area average, the Investigation Division at PPA is asked to prepare detailed statements. These may be used in a number of ways and further details are available (see Darby and Greenberg 1979).

As part of a general policy to encourage studies of prescribing PPA will consider releasing their prescribing statistics and FP10 forms to bona fide researchers. Approval was therefore sought to obtain these services so that a larger study could be carried out. An outline protocol was presented to the Local Medical Committee and Local Pharmaceutical Committee of the Family Practitioner Committee concerned. On behalf of the general medical practitioners and the pharmacists that the Committees represented permission was given for the release of PPA's information for the purposes of further research. This was on the basis of the following undertakings concerning confidentiality and anonymity:

1. No permanent records of the names of patients, pharmacists, or medical practitioners will be made. Patients and pharmacists will not be contacted.

2. The applicant and his assistant (who have no direct contact with doctors concerning clinical management of patients) will have sole access to the names.

3. The applicant and his assistant will have sole access to the FP10 prescription forms which will be kept under lock and key at Southampton University. The prescription forms will be disposed of in an appropriate manner at the end of the study.

4. Published work will not mention the names of the the study Districts but will describe social, demographic and other features of the areas.

Following the consent of the Family Practitioner Committee approval was then given by the Department of Health, Branch PIE which is responsible for general medical practitioner services and prescribing. The PPA agreed to make available their summary statistics on individual doctors and the FP10 forms issued by them for the months of September 1979 and 1980.

2.2. Quality Criteria

Explicit criteria that would indicate aspects of the quality of paediatric prescribing were developed in the same way as in the Feasibility Study. The main source of advice was the British National Formulary (BNF) compiled jointly by the British Medical Association and the Pharmaceutical Society. The BNF provides a "guide to rational prescribing" and the advice is comprehensive but plain spoken with no hint of doubts or uncertainties. Editions were originally produced annually, but since 1981 have appeared six monthly. Copies are distributed free of charge by the Department of Health and Social Security to all NHS doctors. For many years the BNF has had a traditionally didactic approach, and it would not be expected that high quality medical care would deviate from it, certainly in the context of modern general medical practice.

A list of 'indicator drugs' which were considered undesirable for children of given ages and route of administration, were prepared (Table IV). These were circulated for comment to the following doctors in Wessex (known as the Project Consultative Group).

Professor of Child Health

Senior Lecturer in Child Health (who was a world authority on paediatric prescribing)

Professor of Clinical Pharmacology

Profesor of Primary Medical Care

Senior Lecturer in Primary Medical Care (who had a special interest in child health)

Five General Medical Practitioners (one of whom was also a trained pharmacist)

All confirmed that the drugs numbered 1 - 24 were in their opinion inappropriate for children in the age ranges given in Table IV (overleaf). There was not agreement over the prescription of an isoprenaline/cromoglycate spinhaler (Drug no. 25) or a single respiratory compound preparation (Drug no. 26) This was despite the fact that the British National Formulary considered that the use of the latter drugs was "to be deprecated". Drug no. 27 (Electrolyte replacement) was considered as a proxy measure of "good" prescribing. Drug no. 28 (multivitamins) was included for descriptive purposes only.

The doctors were also requested to categorise the inappropriate drugs into three hierarchical prescribing quality groups ie:

Group I: 'Hazardous' Drugs

Group II: Group I plus 'Illogical' Drugs

Group III: Group II plus 'Undesirable' Drugs

(known collectively as 'Inappropriate' Drugs)

There was a high degree of uniformity between the doctors. This finding confers with the results of the US Joint Committee on Quality Assurance of Ambulatory Child Health Care (Thompson, Osborne 1974) which found that academics and practitioners agree well in judging criteria for peer review in paediatrics.

Only drugs which were agreed by all ten doctors to be 'Hazardous' were so classified. The same rule was applied to 'Hazardous' or 'Illogical' drugs (Group II). The drug groups that were developed in this way are also given in Table IV.

A rationale of why these indicator drugs are considered indicative of the quality of prescribing is presented in Appendix I. Appendix II gives the names of all the propriety and non-proprietary drugs which comprise the indicator drugs. This list was prepared by scrutinising the British National Formulary and MIMS.

Table IV

INDICATOR DRUGS: Details of 'Hazardous','Illogical' and 'Undesirable' drugs as used in the main study

No	Code	Name	Route of administration	Age range in years
'Hazardous' drugs				
1	D1	Antidiarrhoeal 'Lomotil'	oral	< 2
2	D3	Antidiarrhoeal 'Imodium'	oral	< 2
3	E1	Phenothiazines	oral	< 1
4	E3	Phenothiazines	suppositories	< 5
5	S	Metoclopramide	oral	< 1
6	X	Tricyclic antidepressants	oral	< 5
'Illogical' drugs				
7	A	Aspirin	oral	< 1
8	B	Barbiturates other than phenobarbitone	oral	<16
9	C	Chloramphenicol	oral	<16
10	D4	Antidiarrhoeals: combination of any two on same form	oral	<16
11	0	Appetite depressants	oral	<16
12	RR	Respiratory compound preparations - two or more per form	oral	<16
13	T	Tetracyclines	oral	<12
14	XA	Tricyclic antidepressant simultaneous with an antibiotic	oral	<16
'Undesirable' drugs				
15	D2	Antidiarrhoeal 'Lomotil'	oral	2-4
16	D5	Antidiarrhoeal simultaneous with an antibiotic other than neomycin	oral	<16
17	D6	Antidiarrhoeals: Kaolins	oral	< 1
18	D7	Antidiarrhoeals other than D1-3, D6	oral	< 1
19	E2	Phenothiazines	oral	1-4
20	H	Antihistamines	topical	<16
21	L	Unstandardised stimulant laxatives	oral	<16
22	MC	Eardrops containing nitrofurazone, chloramphenicol	topical	<16

23	MM	Eardrops containing framycetin, gentamycin, neomycin	topical	<16
24	P	Tonics, appetite stimulators	oral	<16

Other Indicator drugs

25	I	Isoprenaline and sodium cromoglycate	spinhaler	<16
26	R	Respiratory compound preparations one only per form	oral	<16
27	F	Electrolyte replacement	oral	<16
28	V	Multivitamins	oral	<16

2.3 Study design

The feasibility study indicated that further research, investigating factors related to the quality of prescribing, would have to examine a larger number of doctors over a longer time span. Evaluation of alternative forms of educational initiatives was also required. It was therefore decided to take a random sample of 80 doctors in each of three Health Districts within the same Family Practitioner Area in Wessex. Prescribing behaviour would be monitored for the months of September 1979 and 1980. The month of September was pre-determined as this was the period for which the PPA sorted out prescriptions for each doctor. As a consequence cost and other prescribing statistics were only available each year for September. It was also proposed to mount different educational interventions in each District and to measure the effectiveness of these by the number of doctors prescribing 'Hazardous' or 'Undesirable' drugs.

Since the component drugs of the 'Hazardous' or 'Undesirable' drug groups had remained largely unchanged since the 1978 study the percentage of doctors prescribing them could be assumed to be around

40 per cent. An improvement of the order of 50% was considered a sufficiently acceptable goal worthy of replication on a wider front. To be able to demonstrate such a reduction at the 5 per cent statistical significance level approximately 70 doctors per District would be required. Since not all doctors selected would be prescribing in sufficient quantities to children in both September 1979 and 1980 an initial sample of 80 per District was chosen. At least 20 prescriptions to children per month for both months was the entry criteria for the doctors to ensure detection of the indicator drugs.

Three Health Districts were chosen so that two types of interventions could be compared with a Control District (A) where no special activities were undertaken. To test whether communication through the medical press had any effect when doctors were made aware of particular articles all general practitioners in District B were sent in July 1980 a copy of the paper on the quality of paediatric prescribing in Wessex (Catford 1980). The Regional Postgraduate Adviser in General Practice enclosed with the reprint a compliments slip which said "For information. Doctors in this District were not included in the study". This measure ensured that all the study doctors had received a copy of the paper without indicating that any particular action was requested by the Regional Postgraduate Adviser.

However in District C all general practitioners were sent in July 1980 a personal letter by the Regional Postgraduate Adviser (see Appendix III). This referred to the study which had been carried out in their District and he called for particular action concerning the prescription of drugs which formed the 'Hazardous' group. Study doctors did not have any information provided about their own

prescribing, nor did they know whether they were included in the original study. All they knew was that concern had been expressed about the quality of paediatric prescribing in their District.

Although all three Districts were selected from the same Family Practitioner Area, there were differences in the ratios of general practitioners to child population. Table V shows that in District C general practitioners had proportionately more children on their lists than District A and B. However the average doctor to total population ratio was remarkably similar across the three Districts.

Table V

Ratio of general medical practitioners to population by District

District	Child Population (0-15 years) ratio per GP	Total Population ratio per GP
A	446	2,038
B	486	2,162
C	622	2,163

2.4 Doctor variables

In order to investigate whether there were any factors associated with the prescribing of 'Hazardous' drugs, a number of variables for each of the study doctors was collected. These were grouped into personal, training, practice, and neighbourhood factors, general prescribing behaviour and current educational status. The following sets of data were collected and their sources are given below.

Personal factors	Source:
1. Sex	Medical Register
2. Year of first medical degree	Medical Directory
3. Year of full registration	Medical Register
4. Number of persons on NHS prescribing list 1979	PD2 returns from PPA/DHSS
Training details	
5. Origin of first medical degree	Medical Register
6 Higher medical degree possessed	Medical Register/ Medical Directory
7. Known to have undertaken paediatric training for 6 months or more	Medical Directory and Regional Postgraduate Adviser in General Practice (Wessex)
8. Unrestricted principal	Family Practitioner Cttee
9. Vocational training allowance	" " "
Practice details	
10. Number of doctors in practice	" " "
11. Health Centre based	" " "
12. Dispensing practice in 1979 or 1980	PD2 returns from PPA/DHSS
13. Practice changed premises between 1978 and 1982	Family Practitioner Cttee
14. Partner(s) left practice between 1978 and 1982 (not due to retirement or death)	" " "
15. Woman doctor in practice (including study doctor)	" " "
16. GP trainee in practice 1978-82	" " "
17. 1st/2nd year medical student attached to practice 1978-82	Professor of Primary Medical Care, Southampton University
18. 3rd/4th year medical student attached to practice 1978-82	"
19. 5th/final year medical student attached to practice 1978-82	"
Neighbourhood details of practice	
20. Ratio of non-manual to manual workers 1971	County Council (Census data)
21. Unemployment rates 1981	"
22. Owner occupation of households 1981	"
23. Households with children without exclusive use of amenities 1981	"
24. Households with children living at high room densities 1981	"
25. Youth crime level 1978	Police Authority
26. Children in care 1977-8	County Council
27. Population density 1978	" "

General Prescribing Behaviour

28. Number of FP10 forms issued to anyone 1979, 1980	PD2 returns from PPA/ DHSS
29. Average net ingredient cost per FP10 form issued to anyone 1979, 1980	"
30. Number of FP10 forms issued to children (under 16 years) 1979, 1980	Derived from FP10 forms provided by PPA
31. Number of prescriptions issued to children (under 16 years) 1979, 1980	"
32. Average number of prescriptions per FP10 forms issued to children (under 16 years) 1979, 1980	"
33. Percentage of FP10 forms issued to children (under 16 years) written by ancillaries 1979, 1980	"
34. Percentage of FP10 forms issued to children (under 16 years) without age stated on them 1979, 1980	"

Current Educational Status

35. Working in teaching District	Family Practitioner Cttee
36. Claimed expenses for formal postgraduate education 1979, 1980	" " "
37. GP Trainer 1978-1982	" " "
38. 1st/2nd year medical student attached to doctor 1978-1982	Professor of Primary Medical Care, Southampton University
39. 3rd/4th year medical student attached to doctor 1978-1982	"
40. 5th/final year medical student attached to doctor 1978-1982	"

Because the Family Practitioner Committee was not computerised at the time of the study, it was not possible to determine patient turnover of individual doctors. I was not allowed access to the complaints file concerning individual doctors kept by the FPC. For practical reasons it also proved impossible to determine child consulting rates for the doctors in the study.

2.5 Data collection and analysis

A random sample of 80 general practitioners in Districts A, B, C were drawn from current lists in 1979 using random number tables. Following approval of the various bodies concerned, the Prescription Pricing Authority and the Department of Health made available to me the original FP10 forms and PD2 statistical returns for these doctors for September 1979 and 1980. Approximately 500,000 forms had been issued and the Prescription Pricing Authority kindly sorted out those forms issued to persons under the age of 16 years who had claimed exemption of prescription charges. Doctors who had issued more than 20 forms to children in September 1979 and 1980 were included in the study. There were 69 doctors in District A, 67 in District B and 73 in District C, as shown in Table VI. Information on the variables described in Section 2.4 was then collected for these 209 doctors with the help of a clerical assistant. In July 1980 the educational intervention was carried out as outlined in Section 2.3.

Table VI

STUDY POPULATION: general medical practitioners in the three Districts in Wessex Region

District	1 No. of doctors practicing in 1979 and 1980	2 No. randomly selected of Column 1	3 No. of column 2 who issued 20 or more prescriptions to children in both Sept. 1979 and Sept. 1980
A	195	80	69
B	237	80	67
C	91	80	73
Total	521	240	209

There were 32,835 FP10 forms issued by the 209 doctors and each form was inspected. The following information was recorded for each doctor for each year:

1. Number of FP10 forms
2. Number of prescriptions (ie items)
3. Number of prescription (ie items) per form
4. Number of forms where the signature was in a different handwriting to the drugs prescribed (ie indicates written by ancillary worker)
5. Number of forms with an age stated on form
6. Number of prescriptions for each of the 28 indicator drugs (which in total comprised 367 proprietary and non-proprietary preparations as given in Appendix II).

As expected from the feasibility study, there were many prescriptions for indicator drugs where the age of the child was not given. The names of all the children receiving indicator drugs, for which age was paramount in determining whether the prescription was inappropriate or not, were collected. Dates of birth were then requested from the Family Practitioner Committee. These requests also included those children where age was recorded; this was to check whether the age stated on the form was correct. There were 1029 forms issued without a statement of the age of the child. 74% of these children were traced. Table VII gives the results for each drug where age was a necessary qualifying criteria. Approximately one third of the forms traced without age were for children under 12 years in which situation a statement of age should have been recorded. All the children receiving indicator drugs where age was already recorded were found to be correctly aged for the purpose of the qualifying criteria.

Table VII

Forms without age stated, specifying drugs which might have been inappropriate according to age criteria: outcome of attempts to trace age of patient

	INDICATOR DRUG													
Forms not aged	S	E1	E2	E3	A	X	T	D1	D2	D3	D6	D7	Total	
Untraceable age	28	0	17	0	36	43	62	0	0	0	0	86	272	(26%)
Traceable: less than 12 years	30	0	26	0	15	70	20	7	4	4	2	98	276	(27%)
12 years or more	41	0	27	0	38	67	250	0	0	0	0	58	481	(47%)
Total	99	0	70	0	89	180	332	7	4	4	2	242	1039	(100%)

The manual search of the FP10 forms was carried out by me and a clerical assistant employed part-time. On average 50 forms were processed per hour. The data was intially recorded on cross-tabulation sheets and then subsequently transferred to five coding cards/sheets for computer analysis. Copies of the sheets used are contained in Appendix IV. The validity of the data collection was assessed as follows: 5% of the forms were reinspected so as to determine the levels of agreement with the initial observations. No serious errors were found and the repeatibility indexes ranged from 97% to 100%. In particular no doctor was falsely found to have prescribed a 'Hazardous' drug. Where it was not possible to determine with assurance those forms where the signature was in a different handwriting to the drugs prescribed, the benefit of the doubt was given. The forms were therefore not recorded as being written by ancillary workers.

A smaller study was carried out on the FP10 forms containing Respiratory Compound Preparations. A random sample of 21 general practitioners was selected and for each of these doctors data were collected on the cost of the prescriptions (based on the PPA's assessment), whether the compound was combined with an antibiotic or another drug, and the proprietary names given.

The data from the coding sheets were punched on to 1045 punch cards by a reputable agency and analysed on the University of Southampton mainframe computer using the SPSS software package. Chi-squared tests of statistical significance were performed to investigate any relationships between the Doctor Variables and the prescribing of 'Hazardous' drugs. The Yates correction was applied for two by two tables (one degree of freedom) to improve accuracy.

Probability levels less than 5% ($p>0.05$) were considered to be statistically significant. Data collection took from July 1980 to January 1983 and statistical analyses a further nine months under the supervision of the Department of Community Medicine and Medical Statistics at the University of Southampton.

3. RESULTS

"Curd yesterday of my disease
I died last night of my physician"
Mathew Prior (1664-1721)
from 'The remedy worse than the disease'

This section presents the major findings of the study. Further information is available in Tables 1 - 57 which are assembled for ease of reference at the back of this thesis as Appendix VI.

3.1 Personal details of the doctors

Eighty four per cent of the 209 doctors were male. 32% obtained their first medical degree before 1955 and one third after 1965. 35% became fully registered before 1957 and 32% after 1967. In 1979 and 1980 the mean number of persons on NHS prescribing lists per doctor was 2,263 and 2,379 respectively. However the number per doctor ranged considerably. The median number was 2465 in 1979 and 2467 in 1980. (Tables 1,2)

3.2 Training details of the doctors

Only 6% of doctors obtained their first medical degree outside the UK and 56% qualified from London Universities. Overall 33% had higher medical qualifications, 22% had MRCGP or FRCGP. 14% were known to have undertaken paediatric training for at least 6 months, or possessed the DCH qualification. 15% were in receipt of a vocational training allowance. 97% were unrestricted principals. (Table 3).

3.3 Practice details of the doctors

Five per cent of doctors were single handed and 52% were in a group-practice of 5 or more doctors. 26% were health centre-based and 13% were in dispensing practices. 11% of practices had changed premises between 1978 and 1982. In 20% of practices, partner(s) had left between 1978 and 1982 which were not a result of retirement or death. Half of the practices had a woman doctor, and half had a GP trainee between 1978 and 1982. 22% of practices had a 1st/2nd year medical student attached between 1978-1982, 28% a 3rd/4th year medical student, and 46% a 5th/final year medical student. (Table 4).

3.4 Neighbourhood details of the doctors' practices

Doctors worked in a wide variety of different neighbourhoods as indicated by a number of social parameters of the population served i.e. :

42% with a ratio of non-manual to manual workers of 0.4 or more;

40% with unemployment rates of 8.0% or more;

54% where owner occupation of households exceeded 56%;

32% where 1.6% or more of households did not have exclusive use of amenities;

42% with a ratio of non-manual to manual workers of 0.4 or more;

40% with unemployment rates of 8.0% or more;

54% where owner occupation of households exceeded 56%;

32% where 1.6% or more of households did not have exclusive use of amenities;

28% where 23% or more of households with children had high room densities;

29% where youth crime levels were not more than 6% (offenders per 10-16 year olds);
60% where children in care exceed 2.7 per 1000 children under 18;
53% where the population density was 25.0 or more persons per hectare.
(Table 5).

3.5 General prescribing behaviour of the doctors

The mean number of FP10 forms issued per doctor was 1079 in September 1979 and 1141 in September 1980. The ranges in the number issued per doctor were considerable (323 to 3035 in September 1980). Altogether 225,511 forms in September 1979 and 238,380 forms in September 1980 were issued by the 209 doctors. (Table 6).

The average net ingredient cost per FP10 form issued also varied greatly by doctor. In 1979 and 1980 the combined mean average net ingredient cost per FP10 form per doctor was £2.36 and the median was £2.33. 16% had an average cost of less than £2.00 while 5% had an average cost of £3.00 or more. Costs ranged from an average of £1.07 to £7.22 per doctor. (Table 7).

The mean number of FP10 forms issued to children (under 16 years) per doctor was 76 in September 1979 and 81 in September 1980. Numbers ranged from 21 to 210 in September 1980. (It should be remembered that doctors prescribing less than 20 forms in each month were excluded from the study). Altogether 15,976 forms in September 1979 and 16,859 forms in September 1980 were issued by these doctors to children. (Table 8).

The mean number of prescriptions issued to children (under 16 years) per doctor was 104 in September 1979 and 109 in September 1980. Numbers ranged from 33 to 468 in September 1980. Altogether 21,767 prescriptions in September 1979 and 27,852 in September 1980 were issued to children by the 209 doctors. The mean number of prescriptions per FP10 form was 1.36 in 1979 and the same in 1980. (Table 9).

The mean number of prescriptions per FP10 form issued to children (under 16 years) in September 1979 - 1980 was 1.36. The range was 1.08 to 2.41. (Table 10).

In September 1979 2.9% of the doctors had written FP10 forms for children (under 16 years) containing 4 or more prescriptions; and in 1980 3.3% of the doctors. However the percentage of these forms to all the forms was low; 1.3% in 1979 and 1.2% in 1980. The prescribing rate of these forms per issuing doctor was also very low; the mean number per issuing doctor was 2.9 in September 1979 and 3.3 in September 1980. (Tables 11,12).

In September 1979 14.8% of the FP10 forms were written by ancillaries. However the range was from 0 to 73% and the median was 12.8%. 10% of doctors originated forms of which 30% or more were written by ancillaries. (Table 13).

In September 1979 55.4% of FP10 forms had the age of children stated on them. However the range varied from 0 to 100% and the median was 60.4%. 4% of doctors issued forms to children of which less than 10% had the age stated on them. 5% of doctors issued forms to children of which 90% or more had the age stated

on them. It should be noted that the doctor is required to record the age of the child in the box provided on the form if the child is under 12 years. (Table 14).

The general prescribing information outlined above was compared between the three Districts. There were close similarities between Districts and no major differences were apparent. In District A the average number of FP10 forms and prescriptions per doctor was slightly lower. Slightly less forms were written by ancillaries in District B. Slightly less forms with the age stated were found in District C. District B had a slightly higher percentage of FP10 forms with one prescription only per form. (Table 15).

3.6 Current educational status of the doctors

By virtue of the study design 33% of doctors worked in a teaching district. 68% claimed expenses for formal postgraduate education in both 1979 and 1980, whilst 6% did not claim anything. 17% of the doctors were GP Trainers between 1978 and 1982. 1st/2nd year medical students were attached in 1978-1982 to 5% of the doctors, 3rd/4th year medical students to 9%, 5th/final year medical students to 12% and any year medical student to 16% of the doctors. (Table 16).

3.7 Indicator drug prescribing rates

Table VIII presents the prescribing rates for the indicator drugs described in Section 2.2 for September 1979 and September 1980 combined. Information provided includes the number and

Table VIII

Frequency of prescribing of indicator drugs to children in September 1979 and/or 1980 by 209 Wessex general practitioners issuing 32,835 FP10 forms/44,619 prescriptions.

Code	Drug group or combination, route of administration, age range (years)	Doctors		No of prescriptions issued	No of prescriptions per prescribing doctor	
		No.	%		Mean	Range
Hazardous						
D1	Antidiarrhoeal 'Lomotil', oral, <2	36	17.2	59	1.6	1-4
D3	Antidiarrhoeal 'Imodium', oral, <2	9	4.3	12	1.3	1-2
E1	Phenothiazines, oral, <1	0	0	0	-	-
E3	Phenothiazines, suppositories, <5	6	2.9	8	1.3	1-3
S	Metoclopramide, oral, <1	10	4.8	16	1.6	1-3
X	Tricyclic antidepressants, oral, <5	36	17.2	49	1.4	1-4

Illogical						
A	Aspirin, oral, <1	6	2.9	7	1.2	1-2
B	Barbiturates other than phenobarbitone, oral, <16	2	1.0	3	1.5	1-2
C	Chloramphenicol, oral, <16	1	0.5	1	1.0	1
D4	Antidiarrhoeals, combination of any two on same form, oral, <16	7	3.3	12	1.7	1-3
O	Appetite depressants, oral, <16	7	3.3	10	1.4	1-3
RR	Respiratory compound preparations, two or more per form, oral, <16	23	11	29	1.3	1-3
T	Tetracyclines, oral, <12	25	12.0	32	1.3	1-6
XA	Tricyclic antedepressant simultaneous with an antibiotic, oral, <16	8	3.8	8	1.0	1
Undesiderable						
D2	Antidiarrhoeal 'Lomotil', oral, 2-4	31	14.8	54	1.7	1-4
D5	Antidiarrhoeal simultaneous with an antibiotic other than neomycin, oral, <16	16	7.7	30	1.9	1-5
D6	Antidiarrhoeals : Kaolins, oral,<1	62	29.7	96	1.6	1-7

D7	Antidiarrhoeals other than D1-3, D6, oral, <1	16	7.7	23	1.4	1-4
E2	Phenothiazines, oral, 1-4	12	5.7	16	1.3	1-2
H	Antihistamines, topical, <16	44	21.1	96	2.2	1-9
L	Unstandardised stimulant laxatives, oral, <16	1	0.5	2	2.0	1
MC	Eardrops containing nitrofurazone, chloramphenicol, topical, <16	12	5.7	2.0	1.7	1-3
MM	Eardrops containing frannycetin, gentamycin, neomycin, topical, <16	97	46.4	194	2.0	1-12
P	Tonics, appetite stimulators, oral, <16	24	11.5	34	1.4	1-5
Other						
I	Isoprenaline and sodium cromoglycate, spinhaler, <16	64	30.6	129	2.0	1-11
R	Respiratory compound preparations are only per form, oral, <16	205	98	4105	20.0	1-157
F	Electrolyte replacement, oral, <16	16	7.7	24	1.5	1-4
V	Multivitamins, oral, <16	76	36.4	180	2.4	1-39

percentage of doctors issuing one or more prescriptions of a given indicator drug and the total number of prescriptions issued. For the doctors who prescribed a given indicator drug, the mean number of prescriptions, and range are also given. A complete listing of the proprietary and non-proprietary names of each indicator drug are given in Appendix II. Examples of FP10 forms containing indicator drugs are presented in Appendix V. These are exact typewritten copies but the names of the patient, doctor and pharmacist have been omitted.

Respiratory compound preparations (RCPs) were very widely prescribed. 98% of doctors issued at least one form (R) containing one RCP only per form in September 1979-80. 11% of doctors issued forms containing at least two RCPs per form (RR) in September 1979-80. 12.5% of all FP10 forms for children contained RCPs and 9.2% of all prescriptions for children were for RCPs. For each month doctors issued on average 10.4 forms to children containing RCPs. However the range varied greatly from 1 to 84 in September 1979 (Tables 17,18). The average cost of RCP prescription in September 1980 per prescribing doctor was 9.98. (Table 19).

Details were also collected on how RCPs were combined with other drugs by a random sample of 21 doctors. Of the 422 RCP prescriptions issued in September 1979 and 1980, 172 (41%) were on their own, 178 (42%) were combined with an antibiotic and 72 (17%) were combined with something else. 25% of prescriptions were for 'Actifed', 19% for 'Dimotapp Syrup', 11% for 'Triominic', 10% for 'Phensedyl' and 9% for 'Dimotopp LA tabs (Tables 20,21).

Analysis of individual doctors prescribing indicator drugs in September 1979 showed that these were not necessarily the same doctors that prescribed them in September 1980. This was particularly the case for drugs which were rarely prescribed. On average the number of doctors prescribing indicator drugs in September 1979 or September 1980 was at least as half as great as September 1979 or September 1980 separately.

3.8 'Hazardous' drugs prescribing rates

Those six indicator drugs considered to form a category described as 'Hazardous' (Group I) have already been detailed in Section 2.2. Table IX presents the prescribing rates of these drugs by the 209 doctors for September 1979 and September 1980 combined. 38% of doctors prescribed one or more 'Hazardous' drugs in 1979 and/or 1980 and 19% of doctors prescribed two or more 'Hazardous' drugs.

3.9 'Hazardous' or 'Illogical' drugs prescribing rates

Those fourteen indicator drugs considered to form a category described as 'Hazardous' or 'Illogical' (Group II) have already been detailed in Section 2.2. Table X presents the prescribing rates of these drugs by the 209 doctors for September 1979 and September 1980 combined. 52% of doctors prescribed one or more 'Hazardous' or 'Illogical' drugs in 1979 and/or 1980 and 26% of doctors prescribed two or more drugs.

Table IX

HAZARDOUS DRUGS :

Prescribing rates for children in September 1979 and 1980 combined. (percentages in parentheses)

Number of doctors prescribing	1979/ 1980
1 drug	40 (19)
2 drugs	18 (9)
3 drugs	15 (7)
4 drugs	3 (1)
5 drugs	1 (.5)
6 drugs	1 (.5)
7,8 drugs	1 (.5)
one or more	79 (38)
two or more	39 (19)
Mean number of prescriptions per all doctors	0.37
Mean number of prescriptions per prescribing doctors	1.92
Total number of prescriptions	152
Rate per 1000 prescriptions	3.41
Number of prescriptions written by ancillaries	8 (5)

Table X

HAZARDOUS OR ILLOGICAL DRUGS :

Prescribing rates for children in September 1979 and 1980 combined. (percentages in parentheses).

Number of doctors prescribing	1979/80
1 drug	54 (26)
2 drugs	20 (10)
3 drugs	16 (8)
4 drugs	8 (4)
5 drugs	1 (.5)
6 drugs	4 (2)
7 drugs	3 (1)
8-11 drugs	2 (1)
one or more	108 (52)
two or more	54 (26)
Mean number of prescriptions per all doctors	1.18
Mean number of prescriptions per prescribing doctors	2.28
Total number of prescriptions	246
Rate per 1000 prescriptions	5.51
Number of prescriptions written be ancillaries	15 (6)

Table XI

UNDESIRABLE DRUGS :

Prescribing rates for children in September 1979 and 1980 combined. (percentages in parentheses).

Numbers of doctors prescribing	1979/80	
1 drug	46	(22)
2 drugs	43	(21)
3 drugs	18	(9)
4 drugs	15	(7)
5 drugs	9	(4)
6 drugs	8	(4)
7 drugs	3	(1)
8 drugs	4	(2)
9 drugs	3	(1)
10 - 24 drugs	10	(5)
one or more	159	(76)
two or more	113	(54)
Mean number of prescriptions per all doctors	2.70	
Mean number of prescriptions per prescribing doctors	3.55	
Total number of prescriptions	565	
Rate per 1000 prescriptions	12.66	
Number of prescriptions written by ancillaries	64	(11)

Table XII

INAPPROPRIATE DRUGS :

Prescribing rates for children in September 1979 and 1980 combined. (percentages in parentheses)

Number of doctors prescribing	1979/80
1 drug	35 (17)
2 drugs	42 (20)
3 drugs	28 (13)
4 drugs	23 (11)
5 drugs	8 (4)
6 drugs	15 (7)
7 drugs	8 (4)
8 drugs	3 (1)
9 drugs	3 (1)
10 - 24 drugs	17 (8)
one or more	182 (87)
two or more	147 (70)
Mean number of prescriptions per all doctors	3.88
Mean number of prescriptions per prescribing doctors	4.46
Total number of prescriptions	811
Rate per 1000 prescriptions	18.18
Number of prescriptions written by ancillaries	79 (10)

3.10 'Undesirable' drugs prescribing rates

Those ten indicator drugs considered to form a category described as 'Undesirable' have already been detailed in Section 2.2. Table XI presents the prescribing rates of these drugs by the 209 doctors for September 1979 and September 1980 combined. 76% of doctors prescribed one or more 'Undesirable' drugs in 1979 and/or 1980 and 54% of doctors prescribed two or more drugs.

3.11 'Inappropriate' drugs prescribing rates

The twenty-four indicator drugs considered to form a category described as 'Inappropriate' (Group III) refer to the combination of 'Hazardous', 'Illogical' and 'Undesirable' drugs (see Section 2.2). Table XII presents the prescribing rates of these drugs by the 209 doctors for September 1979 and September 1980 combined. 87% of doctors prescribed one or more 'Inappropriate' drugs in 1979 and/or 1980 and 70% of doctors prescribed two or more 'Inappropriate' drugs.

3.12 Association between personal details and 'Hazardous' drug prescribing

Comparisons were made between those doctors prescribing and not prescribing 'Hazardous' drugs and a range of personal characteristics. No statistically significant differences ($p > 0.05$) were found for sex, the number of persons on NHS prescribing list in 1979, or the year of first medical degree and full registration. No trend was found with increasing length of service and the likelihood of prescribing 'Hazardous' drugs.

(Tables 22-25).

3.13 Association between training details and 'Hazardous' drug prescribing

Comparisons were made between those doctors prescribing and not prescribing 'Hazardous' drugs and a range of training details about themselves. No statistically significant difference was found according to whether the doctors had been vocationally trained i.e. were in receipt of a vocational training allowance ($p = 0.93$). However eight out of twelve (67%) doctors whose first medical degree was overseas prescribed 'Hazardous' drugs compared to 71 of 197 (36%) ($p = 0.069$). The possession of higher medical degrees was associated with a lower probability of prescribing 'Hazardous' drugs. 42% of 139 with no degree did prescribe compared to 29% of 70 with a degree ($p = 0.072$).

Only 5 of 30 (17%) 'paediatric' doctors (i.e. known to have undertaken paediatric training for 6 months or more, or possessed DCH) prescribed 'Hazardous' drugs compared to 74 of 179 (41%) non paediatric doctors. This difference was highly statistically significant ($p = 0.018$).

3.14 Association between practice details and 'Hazardous' drug prescribing

Comparisons were also made between the doctors and a range of details about the practice of which they were a member. No statistically significant differences ($p > 0.05$) were found for the following :

Number of doctors in the practice;

Whether the practice dispensed in 1979 or 1980;

Whether partner(s) left between 1978 and 1982, which was not due to retirement or death;

Whether there was a woman partner;

Whether there was a GP trainee;

Whether a 1st/2nd or 3rd/4th or 5th/final year medical student was attached to the practice.

However there was a statistically significant difference according to whether the practice was health centre-based ($p = 0.01$). Doctors were twice as likely to prescribe 'Hazardous' drugs if they worked at a health centre (65% of 54) than if they did not (35% of 155). Those practices that had changed their premises between 1978 and 1982 had a lower rate of prescribing 'Hazardous' drugs; 9% of 22 that had changed compared to 41% of 187 that had not changed ($p = 0.007$). (Tables 30-39).

3.15 Association between neighbourhood details and 'Hazardous' drug prescribing

No statistically significant differences were found between doctors prescribing and not prescribing 'Hazardous' drugs according to a range of social factors concerning the neighbourhood in which the doctors practised ($p > 0.05$) i.e. :

Ratio of non-manual to manual workers;

Unemployment rates;

Owner occupation of households;

Households with children without exclusive use of amenities;

Households with children living at high room densities;

Rate of children in care;

Population density.

However a statistically significant difference was found for the level of youth crime (offenders per 10-16 year olds) analysed in three groups ($p = 0.032$). However no trend emerged, the middle group had a higher probability of 'Hazardous' drug prescribing. (Tables 40-47).

3.16 Association between general prescribing behaviour and 'Hazardous' drug prescribing

General prescribing behaviour of the doctors was also examined according to whether they prescribed 'Hazardous' drugs. As might be expected those issuing 1400 or more FP10 forms in September 1979 had an increased probability of prescribing 'Hazardous' drugs ($p = 0.045$). Similarly those doctors issuing more FP10 forms to children had a higher probability of prescribing 'Hazardous' drugs ($p = 0.003$). Greater number of patient contacts is likely to lead to higher number of prescriptions being issued and thus greater potential for prescribing 'Hazardous' drugs. However, there was no statistically significant difference by average net ingredient cost per FP10 form ($p = 0.616$). Higher cost doctors were therefore not found to be more likely to prescribe 'Hazardous' drugs.

Doctors who prescribed more prescriptions per FP10 form for children were more likely to prescribe 'Hazardous' drugs but this

was not statistically signficant ($p = 0.11$). No statistical differences were found according to the percentage of all FP10 forms for children written by ancillaries (i.e. probable repeat prescriptions) or with age stated on them ($p > 0.6$). (Tables 48-53).

3.17 Association between current educational status and 'Hazardous' drug prescribing

Finally comparisons were made between the current educational status of doctors and whether they prescribed 'Hazardous' drugs. No statistically significant differences emerged ($p > 0.05$) by whether :

expenses were claimed for formal postgraduate education;

the doctors where a GP trainer;

a 5th year/final year student was attached to the doctor;

a medical student of any year was attached to the doctor.

(Tables 54-57).

However important differences were found in the remaining analyses. Table XIII shows that 17% of doctors in District A prescribed 'Hazardous' drugs in September 1979 compared to 31% in District B and 29% in District C. However these differences did not reach statistical significance ($p = 0.138$). District A was in fact the teaching District and the differences in prescribing rates between teaching and non-teaching Districts are more clearly shown in Table XIV ($p = 0.073$).

Table XV presents the findings a year later. 20% of doctors in District A prescribed 'Hazardous' drugs in September 1980,

compared to 31% in District B and 14% in District C. This was a statistically significant difference ($p = 0.038$).

During September 1979 and September 1980 District C underwent a special educational intervention (see Section 2.3). Table XVI shows that the number of doctors prescribing 'Hazardous' drugs fell from 29% to 14% in District C. This was a statistically significant difference ($p = 0.043$). In the other two Districts, which did not experience a special educational initiative, the frequency of doctors prescribing 'Hazardous' drugs did not alter substantially; District A increased from 17 to 20% and District B remained at 31%.

Table XIII

HAZARDOUS DRUGS :

Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 by District

	Prescribed			
	No	Yes	(%)	
District A	57	12	(17)	69
District B	46	21	(31)	67
District C	52	21	(29)	73
	155	54		209

chi-square = 3.96 p = 0.138 d.f. = 2

Table XIV

HAZARDOUS DRUGS :

Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 by teaching or non-teaching Districts.

	Prescribed			
	No	Yes	(%)	
Teaching	57	12	(17)	69
Non-Teaching	98	42	(30)	140
	155	54		209

chi-square = 3.20 p = 0.073 d.f. = 1

Table XV

HAZARDOUS DRUGS :

Number of doctors prescribing one or more 'Hazardous' drugs in September 1980 by District.

	Prescribed			
	No	Yes	(%)	
District A	55	14	(20)	69
District B	46	21	(31)	67
District C	63	10	(14)	73
	164	45		209

chi-square = 6.53 p = 0.038 d.f. = 2

Table XVI

HAZARDOUS DRUGS :

Number of doctors prescribing one or more 'Hazardous' drugs in District C in September 1979 (prior to educational initiative) and September 1980 (after educational initiative).

	Prescribed			
	No	Yes	(%)	
1979	52	21	(29)	73
1980	63	10	(14)	73
	115	31		146

chi-square = 4.10 p = 0.043 d.f. = 1

4. DISCUSSION

"Without contraries is no progression"

William Blake (1757-1827)

4.1 Representativeness of Wessex doctors

At the outset it should be emphasised that the Wessex general practitioners studied may not be typical of other British doctors. Comparisons of General Medical Practitioner Statistics 1980 (DHSS 1981b) show that although list sizes and distribution are remarkably similar between Wessex and England, Wessex doctors tend to be younger, work more in larger group practices, and are more likely to be born in Great Britain. The percentage of female doctors in Wessex and England is similar. Additional data from Cartwright and Anderson's study of 360 British general practitioners in 1977 (1981) indicate that the percentage of MRCGP or FRCGP and those vocationally trained are similar. However there are proportionately more GP Trainees in Wessex. Table XVII gives the salient features of the two groups. It should also be remembered that by design one third of the doctors studied worked in a teaching District.

The demography, geography, social and economic characteristics of Wessex are also different to many areas of the UK. Nevertheless the three Districts studied embraced a wide range of social groups, ranging from relatively deprived high

Table XVII

Comparisons between general practitioners in Wessex and England for a range of variables

Characteristics	Year	England	Wessex	Source
% female	1980	18	16	DHSS 1981
average list size	1980	2247	2170	"
% aged less than 40	1980	22	37	"
% aged more than 60	1980	13	9	"
% born in Great Britain	1980	73	89	"
% born in the Indian subcontinent	1980	15	4	"
% in single handed practices	1980	14	8	"
% in practices of 6 or more partners	1980	12	23	"
% with MRCGP or FRCGP	1977	20	22	Cartwright, Anderson
% who are GP Trainers	1977	10	17	"
% who are vocationally trained	1977	17	15	"

density areas to more afluent low density areas. Although the proportion of specific occupational groups differ between Wessex and the UK (there are proportionately more agricultural workers and less heavy industrial workers), the distribution of the Registrar General's social class groups are remarkably similar. The differences between Wessex and the UK should thus be born in mind.

4.2 Doctor variables

Wessex doctors are not a homogenous group. There were wide differences between them concerning personal, training, practice and neighbourhood details, general prescribing behaviour and current educational status. It would be hoped therefore that any particular feature closely associated with 'Hazardous' prescribing would emerge.

There are several doctor variables worthy of comment. 16% of doctors had list sizes greater than 3,000, which is well above that normally recommended. Only a small proportion of doctors had been vocationally trained (15%) or had special paediatric experience (14%). Two-thirds did not have a higher medical degree. There were very few in single-handed practices (5%) which is encouraging in view of the professional isolation it brings. A quarter of doctors were health centre based. There appeared to be a surprisingly high turnover of partners in the practices (20%) which was not explained by retirement or death.

Half of the practices did not have a woman doctor and many of the practices (22%-46%) had some exposure to medical students depending on the year of the student. Doctors worked in neighbourhoods of wide ranging social circumstances and population densities. 94% received their first medical degree from a British university, mostly London (56%). 94% of the doctors had claimed expenses for formal postgraduate education in 1979 or 1980 indicating some interest in continuing education. However only 16% of the doctors had a medical student of any year attached to them between 1978 and 1982. 17% were GP Trainers between 1978 and 1982.

A striking feature of general prescribing behaviour of the doctors was the idiosyncratic pattern that emerged. Doctors varied greatly in the number of FP10 forms and prescriptions that they issued to all patients and children. This must be largely due to differing list sizes, proportion of children in the practice, and the particular work schedules during September 1979 and 1980.

Nevertheless for the forms that were issued there was great variability in the average net ingredient cost (which ranged from 1.07 to 7.22), in the average number of prescriptions per child form (which ranged from 1.08 to 2.41), in the proportion of child forms written by ancillaries and signed by the doctor (which ranged from 0 to 73%), and in the proportion of child forms with age stated (which ranged from 0 to 100%). There were also

differences between Districts in general prescribing behaviour which may suggest that there are 'special District' factors affecting prescribing or differences in the type of doctor working in them.

4.3 Indicator drug prescribing rates

(i) Older products

In general it was encouraging to observe from Table VIII that few doctors prescribed individual drugs considered to be 'Hazardous', 'Illogical' or 'Undesirable'. There was also a very low prescribing rate of these drugs. However there was some notable exceptions and these will be discussed in more detail below.

Those drugs very infrequently prescribed such as chloramphenicol, barbiturates, aspirin to infants, appetite depressants, unstandardised stimulant laxatives, and chloramphenicol eardrops have been known for many years to be inadvisable in paediatric therapy. This may suggest that with time prescribing behaviour reflects recommended practice. Alternatively it may have been that few clinical situations emerged during the period of study to warrant their consideration by doctors. However the latter is an unlikely reason in view of the high incidence of infection and pyrexia for which some of these drugs could have been prescribed.

For over 25 years it has been known that treatment with oral tetracyclines can permanently stain children's teeth (Schwachman, Schnster 1956). Up to one third of children receiving tetracyclines have been affected (Stewart 1968, Conchie et al 1970, Stewart 1973, Moffit et al 1974, Yaffe et al 1975). In this study 12% of doctors had issued 32 prescriptions for tetracyclines to children under 12 years during the two month period. The feasibility study (Section 1.4) found no example of inappropriate prescriptions, but 44% of all child forms did not have the age of the child recorded which is necessary to determine whether a tetracyline was prescribed inadvisably to children under 12 years. Section 2.5 described that there were 332 prescriptions of tetracycline without the age of the child recorded on the form. Following enquiries to the Family Practitioner Committee, 20 of these were for children less than 12 years old (Table VII).

The usefulness of tetracycline has decreased as bacterial resistance has emerged and effective alternatives have been introduced. The tetracycline spectrum can largely be covered by erythromycin, as for example in mycoplasma pneumoniae infections. The continued availability of liquid formulations and the manufacturers' dosage recommended for children encourage prescription of these preparations. In 1982 over 75,000 prescriptions for a liquid tetracycline preparation were dispensed in Britain. Furthermore most of the liquid preparations are formulated with sucrose which greatly increases the risk of dental caries (Drug and Therapeutics Bulletin 1981). Stronger action to

stop the use of tetracyclines for children under 12 years has recently been recommended (Drug and Therapeuticsd Bulletin 1984) including issuing of warning notices and withdrawing the licence on the remaining paediatric tetracycline preparations. Better information is also needed for prescribers which is accurate, objective and concise for both tetracycline and other commonly used drugs (Herxheimer, Lionel 1978).

The widespread use of antihistamine creams is another example of a drug known for several decades to be inadvisable. The British National Formulary is uncompromising. "Locally-applied antihistamines are very likely to produce sensitisation and are not recommended". Yet 21% of doctors issued 96 prescriptions during September 1979 and 1980. It is suggested that more effective action is required to prevent this situation.

A surprising finding was that 12% of doctors prescribed tonics and appetite stimulators to children. A placebo effect might be the chief reason in view of the inefficacy of these products. However there are cheaper alternatives. 30% of doctors also used sodium cromoglycate spinhalers containing isoprenaline (Intal Co.) although this practice is not widely supported by paediatricians (see Appendix I). Multivitamins were also widely prescribed by a third of doctors. In the absence of clinical information it is not possible to comment on the appropriateness of these although their value is fairly limited. Specific vitamin deficiencies require specific vitamin supplementation and not a

dispensed, although this form of treatment is considered to be correctly indicated in the management of acute diarrhoea.

'Inappropriate' prescriptions of antiemetics in comparison were less common. Phenothiazines were not found to have been prescribed for children under one year unlike metoclopramide (5% of doctors). However phenothiazines were prescribed to children aged one to four years (6% of doctors) and also in the form of suppositories (3% of doctors). It is suggested that particular attention should be given to improving the management of diarrhoea and vomiting in general practice. This is very relevant as disturbance of bowel function is a common presenting symptom under the age of 5 years (Morell 1971). On average a general practitioner will see about one new case every week, most of whom suffer from diarrhoea rather than constipation.

The management of enuresis also appears to be problematic for doctors as was apparent in the feasibility study (Section 1.4). 17% of doctors issued prescriptions of tricyclic antidepressants to children under 5 years although the practice has been widely condemned for many years (see Appendix 1).

(iii) Respiratory Compound Preparations

This study did not seek to determine why the 'Inappropriate' drugs were prescribed. There may have been intense parental pressure on the doctor to prescribe a drug in the 'Inappropriate'

category. Alternatively the doctor may not have known that the drug was considered 'Inappropriate'. Even if he did, he may not have believed or accepted the advice (Julian, Herxheimer 1977).

It must also be acknowledged that this particular approach to assessing the quality of prescribing is limited to the information available from the FP10 form. By design no contact was made with either patient or doctor. Thus it was not possible to assess what the natural history of the presenting complaint was, nor whether there had been previous contact with the doctor when other therapeutic approaches may have been attempted. Nevertheless given the clear instruction in the British National Formulary and other such authoratative sources that these drugs should not be given to children of certain ages, the majority of cases could not be considered optimal care but rather the opposite.

These issues, can be explored further by examining the prescribing of respiratory compound preparations (RCPs). Although virtually all doctors (98%) prescribed RCPs the British National Formulary has for many years been opposed to their use (see Appendix I). It is inconceivable that 98% of the doctors were unaware of this advice but rather they tended to ignore it. Two possibilities exist; either they denied that these drugs were inappropriate or they rationalised their use in the belief that the advantages outweighed the disadvantages. Both explanations are likely to be relevant.

The doctor patient relationship is a complex one (Stott, Davis 1975) and one common way an encounter is terminated is by the issue of a prescription (Herxheimer, Beeley 1982). A number of factors influence the decision making process for prescribing in general practice and include not only the therapeutic indications but also expectations of the patient and family as well as the doctor himself (Julian, Herxheimer 1977). There may be a good case for a placebo and the need to maintain a delicate doctor patient relationship which could be seriously jeopardised if a prescription was not issued. No information was collected on what the families thought of the encounter and the resulting RCP prescription. It is likely that in many cases the perceived quality of the management of the presenting complaint was improved by the RCP prescription. Whilst avoidance of the prescription might be preferable in "textbook" terms the effect of doing so, however, might be to lessen the overall benefit to the patient.

Respiratory compound preparations are likely to fall into the category of drugs which appear to have a wider benefit over and above any therapeutic effect. Clearly many are potent but it is the polypharmacy nature that the British National Formulary takes exception to. For these reasons one prescription of an RCP per form was not included in the 'Hazardous', 'Illogical' or 'Inappropriate' drug categories. This action was supported by the recommendations of the Project Consultative Group which comprised both hospial doctors and general practitioners. Whilst the

paediatricians and pharmacologists agreed that RCPs were inappropriate the general practitioners did not.

Nevertheless agreement was reached on the prescription of two RCPs on the same form as indicative of 'Inappropriate' prescribing. 11% of doctors were found to have done this over the two month study period. Interestingly more than half of all RCPs issued were with another drug usually an antibiotic. This may suggest that RCPs are not used merely as a placebo and that their therapeutic properties are also relevant.

During the study period about 4,200 RCPs were dispensed representing 13% of all child FP10 forms and 10% of all child prescriptions. In 1982 prescriptions for cough medicines cost the NHS 17 million while in 1984 over-the-counter sales reached 38 million of which cough and cold remedies comprise by far the largest category. In an attempt to curb NHS expenditure the DHSS chose cough medicines, particularly RPCs, as one of the targets of the limited list which was introduced in 1985. Now only 10 simple preparations for cough suppression and 3 for easing cough are availabble on NHS prescription.

Drug and Therapeutics Bulletin (1985) commenting on this initiative stated :

"The drastic pruning of the vast array of cough medicine is welcome. Those that remain appear adequate; recourse to others

by purchasing them over the counter is likely to be wasteful and may sometimes be dangerous".

Whilst the DHSS action has been widely criticised from within the medical profession it waits to be seen what effect the removal of RPCs has on total prescribing cost and quality of the doctor patient relationship. There may well be merely a shift from a 'blacklisted' combination preparation (i.e. RCP) to an approved single preparation.

4.4 'Hazardous', 'Illogical' and 'Inappropriate' drug prescribing Rates

The three hierarchial groups of indicator drugs reflecting 'Hazardous', 'Hazardous or Illogical' and 'Inappropriate' prescribing were described in Section 2.2. Although relatively few doctors prescribed individual indicator drugs, when a combination of drugs was considered the frequency increased dramatically.

Tables IX, X and XII revealed that 38% of doctors prescribed one or more 'Hazardous' drugs, 52% prescribed one or more 'Hazardous or Illogical' drugs, and 87% prescribed one or more 'Inappropriate' drugs during the two months study period. Those prescribing two or more drugs were far fewer but nevertheless there was a 'hard' core of doctors who prescribed one of these drug groups relatively frequently. For example 5% of doctors

prescribed 5 or more 'Hazardous' or 'Illogical' drugs and 8% prescribed 10 or more 'Inappropriate' drugs. Although the frequency of 'Inappropriate' prescribing was high amongst the doctors, the rate per 1000 prescriptions was low at only 18 per 1000 child prescriptions. The results therefore do not give great cause for concern.

Repeat prescribing is a common feature of general practice. An indicator of this is the frequency of FP10 forms where details of the drugs prescribed are written by another person other than the signing doctor. The feasibility study had found that it was a relatively straight forward procedure to distinguish those scripts with two or more handwriting styles from those with a single handwriting style i.e. that of the issuing doctor.

It is conceivable that 'Hazardous' drugs might be more commonly issued in situations where the doctor countersigned FP10 forms prepared by ancillaries for example the receptionist. This could apply for repeat prescriptions for his own patients or that of another doctor. For this reason the proportion of prescriptions written by ancillaries for 'Hazardous' drugs were compared to all prescriptions. Table IX and Table 13 (Appendix VI) showed that the percentage for 'Hazardous' drugs was lower (5%) than all drugs (15%) and this was also the situation for the other categories of indicator drugs. This finding implies that repeat prescribing habits do not appear to result in an increased

probability of the particular 'Hazardous' or other undesirable drugs defined in this study being issued.

These results might be thought surprising as a higher rate of errors has been found amongst ancillary written prescriptions. For example, Austin and Dajda (1980) found that ancillary staff made more than twice the number of mistakes than general practitioners. However, the definitions of inadequate prescription writing were (i) no directions whatsoever (ii) directions which were trivial, vague or unhelpful (iii) dose stated but frequency omitted. These mistakes are ones chiefly of omission whereas in this study the criteria for inappropriate prescribing were clear errors of commission. This may therefore explain the discordance.

On closer consideration the observation in this study is perhaps not so unexpected as the majority of the indicator drugs are used normally for short term acute illness e.g. diarrhoea and vomiting. This is particularly true of the 'Hazardous' drug category. There is less call therefore for a repeat prescription which would normally be required for chronic longer term conditions and thus ancillary written FP10 forms for 'Hazardous' drugs are rare. It appears therefore that the doctors themselves are responsible for writing out these prescription and signing accordingly.

With regard to this particular method of assesing the quality of prescribing, these findings suggest that the observed behaviour of the doctor by this approach is more likely to portray his/her actual actions than other methods, where the behaviour of partners and the practice as a whole may be reflected.

4.5 Association between doctor variables and 'Hazardous' drug prescribing

One or more 'Hazardous' drugs were prescribed by 79 of the 209 doctors. The size of this category is reasonable to assess whether any particular doctor variables were associated with 'Hazardous' drug prescribing. Some notable findings emerged which are important since Section 1.3 demonstrated that no information exists to date on the quality of paediatric prescribing and the factors affecting it. It is not possible therefore to compare the results in Sections 3.12 - 3.17 with other studies except by extrapolation of adult data.

Age of doctors might be thought to influence the quality of paediatric prescribing as has been found elsewhere (see Section 1.3 iii). However this was not found to be the case with 'Hazardous' drug prescribing as judged by year of first medical degree or full registration. Younger doctors did not do any better; nor did female doctors who often have an interest in

paediatric care. Large list sizes also did not appear to be important.

Those doctors originally qualifying overseas (mainly in the Indian subcontinent) did worse than UK trained doctors which suggests that undergraduate training may be relevant. Possession of higher medical degrees appeared to be associated less with 'Hazardous' drug prescribing. In particular those doctors undertaking paediatric training did well. These results are not surprising as it would be expected that those doctors receiving more appropriate training would do better. However it is perhaps disappointing that those doctors vocationally trained did not perform more favourably than those not vocationally trained. Attendance at postgraduate education courses in 1979 and 1980, being a GP Trainer, or having a medical student of any year attached to the doctor or practice does not appear to affect the probability of prescribing 'Hazardous' drugs.

Single-handed practice or size of group practices seemed to be unrelated to 'Hazardous' drug prescribing. Dispensing practices made no difference. However those practices that had changed their premises between 1978 and 1982 had a very low level of 'Hazardous' drug prescribing. It is only possible to suggest what factors could be operating here. Perhaps the change of surroundings was an emotional stimulus to improve quality of care. More likely though is that "better" doctors are more "go-ahead" and that they change their premises if unsatisfactory. This may

also be the explanation of why doctors working in health centres were more likely to prescribe 'Hazardous' drugs. However it should be rememberd that when performing a number of tests of statistical significance using a threshold of $p<0.05$ one out of every 20 tests can be expected to be misleading. These findings may therefore be attributable to random error in sampling.

Turnover of partners or the presence of a GP trainee or a woman doctor in the practice did not affect 'Hazardous' drug prescribing contrary to what might have been expected. It was also surprising that varying neighourhood factors were not associated with differences in prescribing. A range of social, economic and demographic features were compared but no trends emerged, even for those specifically considering children, e.g. children in care, children living in households with lack of amenities. Atypical results were found for youth crime levels and children living at high room densities but as discussed in Section 3.15 these were not considered relevant.

The findings strongly suggest that the social neighbourhood in which a doctor practices is not associated with 'Hazardous' prescribing behaviour. However the Health District in which he works is very important. Teaching District doctors did much better than non-teaching District doctors. There may be several reasons why this could be so. For instance there may be a selection process operating when doctors are appointed which

results, for example, in a higher proportion of doctors with paediatric training being recruited to the teaching District. As shown already such doctors are less likely to prescribe 'Hazardous' drugs.

Another explanation may also relate to the nature of the teaching District itself and its educational influence on general practice. Standards of good practice are likely to dessiminate from both hospital staff (NHS and University) as well as the University Department of General Practice (Herxheimer, Twycross 1976). General practitioners in non-teaching Districts are likely not only to have less contact with the University Department of General Practice but it is also possible that the hospital consultants they relate to are, in comparative terms, less interested in postgraduate education and maintaining high standards of care. This aspect will be considered further in Section 4.7.

4.6 Association between general prescribing behaviour and 'Hazardous' drug prescribing

'Hazardous' drug prescribing was also compared with general prescribing behaviour. It was perhaps not surprising that those doctors issuing larger numbers of prescriptions and FP10 forms to anyone or children did worse than those issuing smaller numbers since there was a greater opportunity of being detected. However it may also be the case that those with a lower threshold for

prescribing may be more prone to issuing 'Hazardous' prescriptions. Without information on the number and type of patient contacts it is not possible to draw any further conclusions. It was not thought appropriate to relate child prescriptions to total list size as the proportion of children in the list could not be assessed. (Computerisation of Family Practitioner Committee files which could provide age and sex profiles of individual practices, had not been undertaken at the time of the study).

One of the hypotheses generated at the outset of the study was that the quality of prescribing was inversely related to the cost of prescribing. The findings indicate, however, that there is no association between cost and quality. High cost doctors were not statistically significantly worse or better prescribers. This suggests that consideration of quality of paediatric prescribing should not be used as a factor in encouraging more cost conscious prescribing. Taylor (1978b) also found that there was no relationship between cost and the quality of prescribing as judged by the prescription of undesirable drugs in the whole population. However there was some evidence that those doctors issuing a greater proportion of FP10 forms containing several prescriptions prescribed more inappropriately. Limiting FP10 forms to one drug only may therefore improve the quality of prescribing.

Doctors with low frequencies of FP10 forms for children with age stated on them were not more likely to prescribe 'Hazardous' drugs. If doctors were conscious that certain drugs were contraindicated on the grounds of age, writing the child's age might be thought to be a stimulus for better prescribing. However indicator drugs, for which age was an important criteria in judging quality, were the more commonly prescribed, even amongst those doctors that recorded age. It is therefore suggested that the main problem lies with doctors not knowing, denying or rationalising away current prescribing recommendations rather than forgetting to consider the age of the child.

4.7 Effectiveness of the educational initiative on 'Hazardous' drug prescribing

The final set of results to consider concerns the effect of the particular educational initiative in influencing the prescribing of 'Hazardous' drugs between September 1979 and 1980. District A acted as the control group and the prescribing rate did not alter over time. District B doctors all received the results of the feasibility study but in a non discript, non alarmist and non personal way as would be the case with scientific papers and medical articles published in journals etc. (see Section 2.3). No changes were observed in their prescribing rates.

However as shown in Table XVI the frequency of doctors prescribing 'Hazardous' drugs in District C dropped by a half from

29% in September 1979 to 14% in September 1980 ($p = 0.043$). This appeared to be as a result of the personal intervention of the Regional Postgraduate Adviser in General Practice, who was a senior and highly respected member of their specialty. The approaches made were direct and informative but not personally critical (see Section 2.3). This implies that the use of medical publications in improving the quality of care, may have at the least limited value and and at the worst no value.

A similar suggestion was put forward in the feasibility study (Section 1.4) about a Drug and Therapeutics Bulletin on the management of childhood diarrhoea. This was circulated to the doctors studied nine months before their prescriptions were issued but inappropriate antidiarrhoeal prescriptions were still found. The findings suggest that direct, personal, constructive and informative contact with an important opinion leader or role model is an effective way of influencing prescribing behaviour.

Such a conclusion is consistent with current social-psychological perspectives relevant to individual and group learning. These theories show how new knowledge, attitude and behaviours are acquired such as the early work of Cartwright (1949) on the role of interpersonal influence as a needed trigger for action. Other work includes the "Hierarchy of learning" model of Ray et al (1973), the communication-persuasion model of McGuire (1969), the counter arguing concepts of Roberts and Maccoby (1973), the attitude change model of Ajzen and Fishbein (1980),

the peer influence concepts of Festinger (1954), and the adoption-diffusion model of Rogers (1983).

Of particular note is the social learning model of Professor Albert Bandura (1977) at Stanford University. Based on empirical data his research shows that behaviour, environmental influences and personal factors (such as knowledge) affect each other bi-directionally. Emphasis is placed on the role of social modelling. The capacity to learn by observation enables people to acquire rules and inetegrated patterns of behaviour without having to form them gradually by tedious trial and error. The constraints of time, resources and mobility impose severe limits on the types of situations and activities that can be explored directly. Through social modelling people can draw on vast sources of information, exhibited and authored by others, for expanding their knowledge and skills.

In many ways professional life is not dissimilar to other aspects of life. Social learning theory distinguishes between the acquisition of knowledge and the application of knowledge. People do not perform everythin they learn. Motivation requires short term goals with positive incentives and minimised discentives. Seeing others who they respect and have empathy with exhibiting or exhorting particular types of behaviour increases the tendency to behave in similar ways. This is what is likely to have happened with the change in prescribing behaviour in District C.

It is likely that the Postgraduate Adviser in General Practice in Wessex was seen more of a friend than an expert in paediatric prescribing. His intervention may well have accomplished two important things. Firstly it short circuited the learning curve and provided information that was not already available to the doctors. However more importantly his intervention presented a form of prescribing behaviour that other doctors found attractive enough to model. The Postgraduate Adviser was well known to the doctors and was someone that they respected if not admired. His involvement may well therefore have been more effective than for example a professor of paediatrics or therapeutics.

The intervention component of this study was not developed to investigate the relative effectiveness of different approaches of personal contact but rather to establish whether the prescribing of 'Hazardous' drugs could be reduced more in the short term by personal education than by non-personal education such as via scientific publications. The results clearly indicate that personal contact is more effective and the value of the medical press is called into doubt. The magnitude of the improvement also seems to suggest that the role of the 'professional social model' is worthy of further investigation not only in terms of ways to improve the quality of prescribing but also the quality of medical care generally. Strategies to promote quality should perhaps be more focused on using appropriate professional social models than

on large scale information dissemination programmes of a non personal nature.

4.8 Role of pharmacists in encouraging safe prescribing for children

This study has primarily investigated general practitioner's use of inappropriate drugs in paediatric medical practice. Inevitably the focus has been on prescribing rather than dispensing. However before a child is issued with an inappropriate medicine the drug has to be dispensed. The role of the pharmacist is relevant because he has the opportunity to intervene if he is concerned about a particular prescription (Herxheimer, Davies 1982).

Pharmacists commonly consult the initiating doctor about a script should the dose or pack size recommended be highly unusual. Normally in these cases the doctor has made a straightforward mistake. On other occasions the pharmacist may not have the propriety drug prescribed in stock and so he will contact the doctor about an alternative. Should a pharmacist change a prescription with the doctors consent he writes "PC" on the form ("Prescriber Contacted") to indicate to the Pricing Authority what has happened. One might expect that in the case of inappropriate and particularly 'Hazardous' prescriptions to children many pharmacists would have checked with the prescribing doctor.

However this was not the case - no such markings were found on any of the prescriptions.

A number of workers have suggested that pharmacists should be more actively involved in patient education concerning medication (Kelly and West 1980, Shulman et al 1981, Herxheimer and Davies 1982) but for this to be effective better education of pharmacists is required (Turner 1984). Nonetheless if retail pharmacists were advised about particular preparations not recommended for children of certain ages the possibility exists of an additional safety net. Pharmacists could be asked by DHSS to clarify and confirm the prescription of these drugs with the prescriber. Such a guidline might circumvent any personal rebuttal from the prescriber concerned, which has been considered likely (Burden 1980).

Another approach would be to issue warning leaflets with specific medicines which state "Not recommended for children under X years". The onus would then be on the child's parents to consult the doctor but this could threaten an effective doctor-patient relationship. Nevertheless this practice already exists for example in the case of pregnancy or drug interactions, for which special warnings are issued.

4.9 Usefulness of the method of assessing the quality of paediatric prescribing

This final section of the Discussion considers the utility and validity of the methodology used in the study to assess the quality of paediatric prescribing.

Rational prescribing should be based on the following premises (Taylor 1978a):

(1) Is the drug necessary ? Is it likely that the patient's problems will be best solved by the medicine ?

(2) Is the drug effective ? Does the drug really work in the real life situation ?

(3) Is the drug safe ? Could it do more harm than good ?

(4) Is the drug economic ? Is there a cheaper way of solving the patients problem(s) as effectively ?

This study used a method which focused largely on the safety element. The advantage of this was that, other than the age of the patient and details of the drug dispensed, no other clinical information was required. Analysis of the prescribing behaviour of a large random sample of general practitioners could then be performed through access to FP10 forms issued by them. Through such an approach it was not possible to assess other aspects of paediatric prescribing.

The practical problem of prescribing and drug administration in childhood have been described elsewhere (e.g. Rylance 1981, Rylance and Stevens 1982). The areas of concern are very wide and

it may be that factors affecting safety are not the same as those affecting other aspects of quality of paediatric prescribing. However as indicated in Section 1.2 those doctors exhibiting high or low quality of medical care tend to do so in a number of fields (see for example Lyons and Payne 1977). It is reasonable therefore to suggest that this particular method of assessing safe prescribing is likely to indicate general quality of prescribing.

The method used explicit criteria developed before the prescribing data was analysed. This is the preferred method of assessing practice in view of the objectivity of the measures. It thus enables reproducible comparisons over time and between study populations using different observers who may be non-medical (Fowkes 1982). Ultimately the validity of the approach depends on the original decision-making process when formulating the criteria. The 'bench marks' were initially obtained from standard, widely available, authorative medical texts such as the British National Formulary (BNF). The criteria were then vetted by a small panel of clinicians from a variety of backgrounds known as the Project Consultative Group (see Section 2.2). There was a high degree of concordance as has been found in a US study of quality of paediatric care (Thompson, Osborne 1974). The only exception appeared to be regarding the use of respiratory compound preparations. There was a marked contrast on the one hand between the advice given in the BNF, and on the other hand the views of the general practitioners on the Project Consultative Group and the observed practice amongst Wessex general practitioners; see

Section 4.3 (iii). As a result a single prescription of these drugs on an FP10 form was not considered to be indicative of poor prescribing.

An important finding of the study was that assessing one months prescribing was not sufficient to identify all those doctors who prescribedg drugs inappropriately. The inclusion of a second month increased the 'yield' substantially (e.g. for 'Hazardous' drugs by 52%). It is not known what additional information would be gained by studying a third month. However, it is likely that longer periods of prescribing of at least two months duration are required for studies of this kind. The decision though will ultimately depend on the objectives of the study.

The number of doctors to be studied will also depend on the purpose of the investigation. Given the particular indicator drugs chosen, experience from this study indicates that approximately eighty doctors per unit of investigation will provide sufficient knowledge to describe prescribing behaviour and show significant changes over time. The same may not be true for smaller numbers.

A major constraint on this approach was the unavailability of age on a large number of the child prescription forms (45% of forms in 1979). This led to long and painstaking enquiries to obtain the date of birth of the child concerned from the Family

Practitioner Committee's records. Future audits could be greatly facilitated if it became compulsory for every prescription form issued to children under 16 years to have the age entered on it, if not by the prescriber then at least by the dispenser. Such a practice would also be likely to benefit the patient, since there would be greater opportunity for the doctor and pharmacist to revue the appropriateness of the prescription on the grounds of age.

The Prescription Pricing Authority in Newcastle is currently undergoing a technological revolution in terms of computerised data analysis along the lines of the Scottish initiative (Black et al 1981). If the age of children was entered into the computer in addition to the description of the drug prescribed, it would be comparatively simple to produce age-specific prescribing rates of individual drugs or drug groups. This could form the first step in a new approach to encouraging better prescribing for children.

The aim of medical audit is to improve the effectiveness and efficiency of medical care. A cycle of activities is involved (Fowkes 1982): (i) setting a standard of practice (ii) observing practice (iii) comparing the observed practice with the standard (iv) implementing change and (v) reobserving practice. This study has involved all five stages and it is particularly encouraging that the reobserved practice appears to have changed in response to the original assessment and the consequential educational initiative. Similar results have been reported

recently with adult prescribing (Rosser et al 1981). This supports the premise that medical audit is worthwhile and that the particular approaches used in this project are worthy of replication and further stuy.

The development of this novel method of investigating the quality of paediatric prescribing is very timely in view of the increasing importance attached by the Royal College of General Practitioners to ways of assessing, promoting and maintaining high standards of quality of medical practice (Section 1.1 iii). A number of major conclusions and recommendations can be put forward which are presented in the final section.

5. CONCLUSIONS AND RECOMMENDATIONS

"It is not enough to take steps which may some day lead to a goal; each step must itself be a goal and a step likewise".

Johann Von Goethe (1794 - 1832)

5.1 Conclusions

The following major conclusions from the study are proposed :

1. Age specific and drug specific prescribing data can be valuable in assessing aspects of the quality of prescribing for children in general practice, and also for studying the factors affecting quality. The information generated can be used to change prescribing behaviour.

2. The method used is straightforward, practical, low cost and can be performed on a random sample of general practitioners over a number of years.

3. Analysis would be greatly improved if age was routinely recorded on all FP10 forms issued to children, who were exempt of prescription charges on the basis that they were aged less than 16 years.

4. Although the proportion of doctors prescribing 'Hazardous', or 'Illogical', or 'Undesirable' drugs in September 1979 or

September 1980 was appreciable, the frequency of the prescriptions was low. This should be considered as reassuring. However the management of diarrhoea, vomiting and enuresis in childhood gives cause for concern. Tetracyclines and topical antihistamines continue to be prescribed inappropriately.

5. The quality of paediatric prescribing does not appear to be associated with personal attributes of doctors such as age and sex, the neighbourhood in which they work or the characteristics of their practice.

6. This study revealed no relationship between the cost of prescribing and the quality or prescribing. High cost doctors are not necessarily poor prescribers.

7. However the quality of paediatric prescribing is associated with the place of initial training, possession of higher medical qualifications and postgraduate paediatric training, and whether the doctor works in a teaching District. The latter finding may be a consequence of more extensive postgraduate education of a formal or informal kind.

8. Sub-standard medical care in a Health District is often attributed to an unfavourable social or physical environment. This study of prescribing for children does not support that hypothesis.

9. Educational initiatives carried out in personal, informative but non-threatening ways by a respected opinion leader can be very effective in improving prescribing behaviour. The value of non personal education in promoting better prescribing through medical publications is called into doubt.

10. The role of "professional social models" may well be a better way of promoting quality of medical care than through the provision of information alone. Together these findings suggest that the quality of medical care is more influenced by the continuing education activities of the Health District in which the doctor works than by any other means.

5.2 Recommendations

The following major recommendations are proposed :

1. The main thrust to improve the quality of paediatric prescribing in general practice should be through an educational approach. However the methods used need to be more personal and should involve the use of "professional social models". Medical audit approaches such as have been used in this project appear to be particularly useful.

2. The recording of age on an FP10 form should be mandatory for prescriptions to children. Exemption of charges should not be permitted unless this has been performed. Not only will this aid future medical audit studies but the practice may well

encourage prescribers to think more seriously about the quality of their prescribing for children.

3. The Prescription Pricing Authority should investigate the possibility of obtaining age-specific, drug specific prescribing rates for children using its improved computer analysis facilities. Results could be fed back to practitioners routinely with PD2 costing information. Copies could also be sent to Regional Postgraduate Advisers in General Practice who would then be in the position to mount educational initiatives (perhaps along the lines in this project) and to monitor results.

4. General Practitioners should be encouraged to prescribe only one item per illness episode as has been recommended previously by Rawlins (1981). This will reduce the likelihood of illogical combinations which are not uncommon in paediatric therapy.

5. Pharmacists should take a special interest in paediatric prescriptions and should consult prescribers if they are concerned. The Minister of Health should ask pharmacists to confirm and clarify with the prescribing doctor concerned those FP10 forms containing the drugs listed in Table IV as 'Hazardous'.

6. The Minister of Health should (i) consider withdrawing the licence of the remaining paediatric tetracycline preparations; and (ii) withdraw the recommended dosage for all tetracycline

products for children under 12 years, Lomotil under 5 years, tricyclic antidepressants under 5 years, metoclopramide and phenothiazines under 1 year.

7. When prescriptions for tetracyclines, Lomotil, tricyclic antidepressants, metoclopramide and phenothiazins are dispensed a warning leaflet should be issued and the bottle should be labelled 'Not suitable for children under ... years' (details as for recommendation no. 7).

8. The Minister of Health should consider withdrawing the licence of topical antihistamines. At the very least warning leaflets should be issued with the prescription indicating the strong possibility of hypersensitivity.

9. Since the value of postgraduate paediatric training for general practice has been demonstrated, general practitioner trainees should be given every opportunity of having such training.

10. Further research should be carried out to investigate :

(i) how consistent the findings of the quality of prescribing in this study are with those assessed by other methods;

(ii) to what extent the inclusion of additional prescribing data over longer periods improves the sensitivity and specificity of the method to determine inappropriate prescribers.

(iii) whether the method could usefully be adapted to determine quality of prescribing in other care groups, for example the elderly;

(iv) the role, place and value of "professional social models" in continuing medical education;

(v) the effectiveness of confidential and personal prescribing profiles of inappropriate drug use are in changing the behaviour of individual doctors;

(vi) over what period improvements in prescribing are sustained following educational initiatives; and hence how often educational programmes should be repeated or modified.

REFERENCES

Abel-Smith B, Grandjeat P 1978 Pharmaceutical consumption trends in expenditure - main measures taken and underlying objectives of public intervention in this field. Social Policy Series No. 38 Commission of the European Communities, Brussels

Acheson H W K 1975 Medical audit and general practice. Lancet 1: 511-513

Acheson H W K 1978 Why standards? Journal of the Royal College of General Practitioners 28: 692-695

Ajzen I, Fishbein M 1980 Understanding attitudes and predicting social behaviour. Englewood Cliffs, New Jersey: Prentice-Hall.

Alment E A J (Chairman) 1976 Competence to Practise. The report of a committee of enquiry set up for the medical profession in the United Kingdom. Royal College of Obstetricians and Gynaecologists, London

Anonymous 1974a Controlling Quality. British Medical Journal 3: 704-705

Anonymous 1974b New alternatives for the NHS. British Medical Journal 2: 247-248 and subsequent papers 272-279, 327-333, 389-369

Anonymous 1976a Safe paediatric prescribing. British Medical Journal 2: 1276

Anonymous 1976b Audit of Audit. Lancet 2: 453

Anonymous 1977 Clinical audit in diagnostic radiology. British Medical Journal 2: 479-480

Anonymous 1978 Medical audit and continuing education. British Medical Journal 2: 156

Anonymous 1979a Anaesthetic deaths. British Medical Journal 1: 703

Anonymous 1979b Annual Representatives meeting. British Medical Journal 2: 143

Anonymous 1979c Medical audit in general practice. Journal of the Royal College of General Practitioners 29: 699-700

Anonymous 1984 Quality in general practice - again. Journal of the Royal College of General Practitioners 34: 187

Austin R, Dajda R 1980 Ancillary-written prescription errors. Journal of the Royal College of General Practitioners 30: 417-419

Avery A, Brook R 1976 Quality of medical care assessment using outcome measures: 8 disease specific applications. Vol I and II R-2021/2 - HEW Rand, Santa Monica, USA

Bain D J G, Haines A J 1975 A year's study of drug prescribing in general practice using computer-assisted records. Journal of the Royal College of General Practitioners 25: 41-48

Bandura A 1977 Social Learning Theory. Englewood Cliffs, New Jersey: Prentice Hall

Bellin L E 1974 PSRO - Quality Control? or Gimmicking? Medical Care 12:12:1012 - 1018

Black J E, Mitchell G, Potter M L 1981 Pharmaceutical Journal 244-246

Bloch A 1978 Metoclopramide poisoning. British Medical Journal 2: 1092

Brearley L 1968 Tetracyclines and children's teeth. Medical Journal of Australia 2: 653-655

British National Formulary 1976-8 British Medical Association and the Pharmaceutical Society of Great Britian Aylesbury : Hazell Watson and Viney Ltd 8: 75

Brock P G, Roach M 1979 Tetracycline preparations for children. British Medical Journal 1: 126-128

Burden M J S 1980 Quality of prescribing for children (letter). British Medical Journal 281: 388

Capstick I 1974 Medical audit - need for pilot studies in general practice. British Medical Journal 1: 278-279

Cartwright A, Anderson R 1981 General Practice Revisited - a second study of patients and their doctors. Tavistock Publications, London

Cartwright D 1949 Some principles of mass persuasion. Human Relations 2: 253-267

Casteels-Van Daele 1970 Metoclopramide poisoning. Archives of Disease in Childhood 45: 130

Catford J C The quality of medical care for children: the feasibility of tracers in paediatric audit. London University, 1979 (MSc Social Medicine thesis)

Catford JC Quality of paediatric prescribing in general practice. British Medical Journal 280: 1435-1437

Christensen D B, Bush P J 1981 Drug prescribing: patterns, problems and proposals. Social Science and Medicine 95: 343-355

Clarke C, Whitfield G 1978 Deaths under 50. Medical Services Study Group of the Royal College of Physicians of London. British Medical Journal 2: 1061-1062

Cleary J 1976a Paediatric Prescriptions. Journal of the Royal College of General Practitioners. Supplement 1:26:34-39

Cleary J 1976b Specialty interests and prescribing patterns: an examination of paediatric prescriptions. Journal of the Royal College of General Practitioners. Supplement 1:26:52-58

Clute K F 1963 The General Practitioner: A study of medical education and practice in Ontario and Nova Scotia. University of Toronto Press, Toronto, Canada

Cochrane A L, Moore F 1971 Expected and observed values for the prescription of Vitamin B12 in England and Wales. British Journal of Preventive and Social Medicine 25:147-151

Cochrane A 1972 Effectiveness and efficiency. Nuffield Provincial Hospitals Trust, London

Codman E A 1914 The product of a hospital. Surgery Gynecology Obstetrics 18:491-496

Conchie J M, Munroe J D, Anderson D O Tetracyclines Canadian Medical Association Journal 103:351-356

Court D (Chairman) 1976 Fit for the Future. Report of the Committee on Child Health Services. Vol I & II HMSO London

Craft A W, Sibert J R 1977 Accidental poisoning in children. British Journal of Hospital Medicine 469-478

Crawford G E 1981 Prescription Pricing Authority's information services. British Medical Journal 282:840

Crombie D L 1975 Monitoring adverse drug reactions. Journal of the Royal College of General Practitioners 25: 337-341

Cunningham N, Thacker S B 1976 Health accounting at the Wagner Child Health Station. Clinical Pediatrics 15:9:811-814

Darby F J, Greenberg G 1979 Data collection in England. In: Studies in Drug Utilization Methods and Applications Ed. Bergman V et al World Health Organisation, Copenhagen

Department of Health and Social Security Selected years 1970-1980 Health and Personal Social Services Statistics for England. HMSO, London

Department of Health and Social Security 1977 Annual Report 1976 HMSO, London

Department of Health and Social Security 1980 Present Day Practice in Infant Feeding: 1980. Report of a Working Party of the Panel on Child Nutrition Committee on Medical Aspects of Food Policy. Report on Health and Social subjects 20 HMSO, London

Department of Health and Social Security 1981a Hospital Inpatient Enquiry for 1977. HMSO, London

Department of Health and Social Security 1981b General Medical Practitioner Statistics 1980. DHSS, Russell Square, London

Department of Prices and Consumer Protection 1976 Child poisoning from household products. Report of the Consumer Safety Unit. HMSO, London

Donabedian A 1968 Structure, process and outcome. Medical Care 6:181-394

Donabedian A, Axelrod S J, Swearingen C, Jameson J 1972 Medical Care Chart Book. Fifth edition. Bureau of Public Health Economics, University of Michigan School of Public Health, Ann Arbor USA

Donabedian A 1980 The definition of quality and approaches to its assessment. Health Administration Press Ann Arbor, Michigan USA

Drug and Therapeutics Bulletin 1981 Liquid medicines can rot sick children's teeth. 19:75-76

Drug and Therapeutics Bulletin 1984 Tetracycline syrups and children's teeth. 22:55-56

Drug and Therapeutics Bulletin 1985 Cough Medicines 23: 85-87

Dudley H 1974 Necessity for surgical audit. British Medical Journal 1:275-277

Duncan A 1980 Quality assurance: what now and where next? British Medical Journal 280:300-302

Duncan C, ed 1979 MIMS London, Haymarket Publishing Ltd

Festinger L 1954 Theory of social comparison processes. Human Relations 7: 117-140

Fowkes F G R 1982 Medical audit cycle. A review of methods and research in clinical practice. Medical Education 16:228-238

Fraser R C 1981 Audit at work. The future. British Medical Journal 282: 1199-1200

Fry J 1981 Prescribing. Update 1823-1826

Gehlbach S H, Wilkinson W E, Hammond W E, Clapp N E, Finn A L, Taylor W J, Rodell M 1984 Improving drug prescribing in a Primary Care Practice. Medical Care 22:193-201

Godfrey S 1977 Treatment of asthma in childhood. British Journal of Hospital Medicine 430-433

Gordis L, Markowitz M 1971 Evaluation of comprehensive and continuous pediatric care. Pediatrics 48:5:766-776

Grace J F, Goulds R K 1980 An examination of the prescribed therapeutic experience of five year olds in general practice. Journal of the Royal College of General Practitioners 30:529-532

Greene R (ed.) 1976 Assuring quality in medical care. Ballinger, Cambridge, Mass USA

Greenfield P R (Chairman) 1982 Report to the Secretary of State for Social Services of the Informal Working Group on Effective Prescribing. Department of Health and Social Security, London

Harris C M, Jarman B, Woodman E, White P, Fry J S 1984 Prescribing - a suitable case for treatment. Occasional paper 24 Journal of the Royal College of General Practitioners

Hayman M, Ditman R 1966 Influence of age and orientation of psychiatrists on their use of drugs. Comprehensive Psychiatrist 7:152-155

Hein H 1978 Perinatal care in rural hospitals. Journal of the American Medical Association 240:2070-2074

Hemminski E 1975 Review of literature factors affecting drug prescribing. Social Science and Medicine 9: 111-116

Herxheimer A, Twycross R 1976 Continuing education in therapeutics: aids to discussions on prescribing. British Medical Journal 1: 1198-1200

Herxheimer A, Lionel NDW 1978 Minimum information needed by prescribers. British Medical Journal 2: 1129-1132

Herxheimer A ed 1978 Diarrhoea in children. Drug and Therapeutics Bulletin 16:1-2

Herxheimer A, Davies C 1982 Drug information for patients: bringing together the messages from prescriber, pharmacist and manufacturer. Journal of the Royal College of General Practitioners 32:93-97

Herxheimer A, Beeley L (Ed) 1982 Topics in drug therapy. Open University Press, Milton Keynes

Herxheimer A 1984 Tetracycline syrups and children's teeth. Drug and Therapeutics Bulletin 22:14:55-56

HMSO 1978 Occupational mortality 1970-72 London

Howie J G R 1972 Journal of the Royal College of General Practitioners 22:310-315

Irvine D 1983 Quality of care in general practice: our outstanding problem. Journal of the Royal College of General Practitioners 33:521-523

Joyce C R B, Last J M, Weatherall M 1967 Personal factors as a cause of differences in prescribing by general practitioners. British Journal of Preventive and Social Medicine 21:170-177

Julian P, Herxheimer A 1977 Doctor's anxieties in prescribing. Journal of the Royal College of General Practitioners 27:662-666

Kelly B G, West A L 1980 A study of the provision of additional printed information by pharmacists. Pharmaceutical Journal April 399-400

Kessner D M, Kalk C E, Singer J 1973 Assessing health quality - the case for tracers. New England Journal of Medicine 288:189-194

Kessner D, Snow C, Singer J 1974 Assessment of Medical care for children. In: Contrasts in Health Status. Vol.3 National Academy of Sciences, Washington, USA

Kessner D 1977 Applicability of the Tracer Method to Child Care. In: Conference on Evaluation of Child Health. Bethesda, Maryland, USA

Kessner D M 1978 The quality of medical care. New England Journal of Medicine 298:381-384

Kiernan P J, Isaas J B 1981 Use of drugs by the elderly. Journal of the Royal Society of Medicine 74:196-200

King D J, Griffiths K, Hall C E, Cooper N C, Morrison D J 1980 Effect of the CURB Campaign on barbiturate prescribing in Northern Ireland. Journal of the Royal College of General Practitioners 30:614-618

Klein R 1973 Complaints against Doctors. Charles Knight, London

Knox J D E 1980 Prescribing for the elderly in general practice. Journal of the Royal College of General Practitioners Supplement No. 1:30

Kohn R, White K L 1976 Health Care. Oxford University Press

Kramer M S, Arsenault L, Pless B 1984 The use of preventable adverse outcomes to study the quality of child health care. Medical Care 22:223-230

Lawson G R, Craft A W, Jackson R H 1983 Changing patterns of poisoning in children in Newcastle, 1974-1981. British Medical Journal 287:15-17

Lebow J 1974/1975 Consumer questionnaires in paediatric audit. Medical Care 12:328-332, 13:250-254

Lee J A H 1965 Prescribing in three English towns. Milbank Memorial Fund Quarterly 43:285-288

Lieberman H M 1974 Evaluating the quality of ambulatory pediatric care at a neighbourhood health center. Clinical paediatrics 13:1:52-55

Lyons T F, Paynes B C 1977 Interdiagnosis Relationships of Physician Performance Measures in hospitals. Medical Care 15:475-479

Mapes R 1977 Aspects of British general practitioners prescribing. Medical Care 15:5:371-381

Margileth A M, Thompson H C, Osborne C E 1977 Management Criteria, recording of performance and peer review of tonsillo-pharyngitis. American Journal of Diseases of Childhood 131:270-274

Marsh G N 1981 Stringent prescribing in general practice. British Medical Journal 283:1159-1160

Maxwell R, Day M, Hardie R, Lawrence H, Rendall M, Walton N 1983 Seeking Quality. Lancet 1:45-48

McAuliffe W E 1979 Measuring the quality of medical care: process versus outcome. Milbank Memorial Fund Quarterly/Health and Society 57:1:118-152

McCarthy M 1975 Medical care of childhood leukaemia. Lancet 1:1128-1130

McGuire WJ 1964 Inducing resistance to persuasion: Some contemporary approaches. In L Berkowitz (Ed). Advances in Experimental Social Psychology (Vol.1) New York, Academic Press

McColl I, Fernow L C, Mackie C, Rendall M 1976 Communication as a method of medical audit. Lancet 1: 1341-1344

McLachlan G, ed 1976 A question of quality? Roads to assurance in medical care. Oxford: Oxford University Press for Nuffield Provincial Hospitals Trust

McLachlan G, ed 1982 Reviewing practice in medical care: steps to quality assurance. Nuffield Provincial Hospitals Trust, London

McNerney W J 1976 The quandary of quality assessment. New England Journal of Medicine 295:1505-1511

Meade T M 1967 Chloramphenicol prescriptions. British Medical Journal 1:671-674

Mead W F 1976 Quality assurance for health supervision of the ambulatory child. Journal of Family Practice 3:6:587-591

Melville A 1980a Reducing whose anxiety? A study of the relationships between repeat prescribing of minor tranquillisers and doctors attitudes. In: Prescribing Practice and Drug Usage Ed. Mapes R, Croomhelm, London 100-120

Melville A 1980b Job satisfaction in General Practice: implications for prescribing. Social Science and Medicine 14A:495-505

Merrison A (Chairman) 1979 Report of the Royal Commission on the National Health Service. HMSO, London

Meyers A 1973 Audit of medical records from paediatric specialty clinics. Paediatrics 51:1:22-25

Moffit J M, Cooley R O, Olsen N H, Hefferen J J 1974 Tetracyclines and teeth. Journal of American Dental Association 1:422-423

Morrell D et al 1971 Journal of the Royal College of General Practitioners 21:32-36

Mourin K 1975 Audit in general practice. Journal of the Royal College of General Practitioners 25:682-683

Mourin K 1976 Auditing and evaluation in general practice. Journal of the Royal College of General Practitioners 26:726-733

Nathanson C A, Becker M H 1973 Work satisfaction and performance of physicians in Pediatric Outpatient Clinics. Health Services Research Spring 17-26

O'Brien B 1984 Patterns of European Diagnoses and Prescribing. Office of Health Economics, London

Osborne C E 1977 Medical Care 15:465-473

Parish P A 1971 The prescribing of psychotropic drugs in general practice. Journal of the Royal College of General Practitioners 21:Supplement 4:1-77

Parish P A 1974 Sociology of prescribing. British Medical Bulletin 30:214-218

Parry K M 1975 Quality of care in general practice.
Journal of the Royal College of General Practitioners 25:551-556

Patterson A W 1979 Development of Prescribing data acquisition, analysis, and feedback as an operational research tool for general medical practice. In: Studies in Drug Utilisation. Methods and Applications. Ed Bergman U et al. World Health Organisation, Copenhagen. 137-145

Peterson O L, Andrews L, Spain R S, Greenberg B G 1956 Analytical study of North Carolina general practice. Journal of Medical Education 31 No.1 Part II 1-20

Rawlins D 1981 Rules and advice on how to prescribe. General Practitioner September 18, 29-44

Rawlins M D 1984 Doctors and the drug makers
Lancet 2:276-278

Ray ML, Sawyer AG, Rothschild ML, Heeler RM, Strong EC, Reed JB. 1973 Marketing communication and the hierarchy of effects. In P Clarke (Ed) New Models for mass communication research, California: Sage.

Raynes N V 1980 "What can I do for you" In: Prescribing Practice and Drug Usage. Ed Mapes R Croomhelm, London 83-99

Reynolds G 1978 Metoclopramide poisoning. British Medical Journal 2:1713

Ricks J 1976 Assessing standards in Children's mental health. Canada's Mental Health 24:4:7-9

Roberts DF, Macoby N 1973 Information processing and persuasion: counter arguing behaviour. In P Clarke (Ed) New models for mass communication research. Beverley Hills, Claifornia: Sage.

Rogers EM 1983 Diffusion of innovations (3rd edition) New York: Free Press.

Rosser W W, Simms J G, Forster J, Patten D W 1981 Improving benzodiazepine prescribing in family practice through review and education. Canadian Medical Association Journal 124:147-152

Rowlatt R J 1978 Letters to the editor: Tetracycline preparations for children. British Medical Journal 2:1436

Royal College of General Practitioners, Office of Population Censuses and Surveys, Department of Health and Social Security 1974 Morbidity Statistics from General Practice Second National Study Day 1970-71 HMSO, London

Royal College of General Practitioners 1976 Trends in National Morbidity. Journal of the Royal College of General Practitioners

Royal College of General Practitioners 1977 Evidence to the Royal Commission on the National Health Service. London : Royal College of General Practitioners

Royal College of General Practitioners, Office of Population Censuses and Surveys, Department of Health and Social Security 1980 Morbidity Statistics from General Practice 1970-71 Socio economic analysis. Studies in medical and population studies. No.46 HMSO, London

Royal College of General Practitioners 1983 The Quality Initiative - Summary of Council Meeting. Journal of the Royal College of General Practitioners 33: 523-524.

Royal College of General Practitioners 1985 Towards Quality in General Practice. A Council Consultation Document. Royal College of General Practitioners

Rylance G 1981 Practical problems of prescribing and drug administration in childhood. Journal of Maternal and Child Health February 58-61

Rylance G, Stevens R 1982 Therapeutics in Children. Hospital Update March 343-361

Sanazaro P J 1974 Medical audit - experience in the USA. British Medical Journal 1:271-274

Schwachman H, Schnster A Tetracycline and Children's teeth. Paediatric Clinics North America 3:295-303

Scottish Council for Postgraduate Medical Education 1981 Maintaining standards in general practice. Edinburgh

Shaw C D 1980 (i) Aspects of audit. British Medical Journal 1:1256-8 (ii) Audit in British hospitals. Ibid 1314-6 (iii) Audit in British general practice. Ibid 1361-3 (iv) Acceptability of aduit. Ibid 1443-6 (v) Looking forward to audit. Ibid 1509-11

Shulman J I, Shulman S, Haines A P 1981 The prevention of adverse drug reactions - a potential role for pharmacists in the primary care team? Journal of the Royal College of General Practitioners 31: 429-434

Sills J, Glass E 1978 Metoclopramide poisoning British Medical Journal 2:431

Skegg D C G, Doll R, Perry J 1977 Use of medicines in general practice. British Medical Journal 1:1561-1563

Skegg D C G 1982 Drug monitoring in general practice. British Medical Journal 285:1245-1246

Speight A N P 1978 Is childhood asthma being underdiagnosed and undertreated? British Medical Journal 2:331-332

Stewart D J 1968 Tetracycline and Children's Teeth. British Dental Journal 124:318-320

Stewart D J 1973 Tetracyclines. British Medical Journal 3:320-322

Stolley P D, Lasagna L 1969 Prescribing patterns of physicians. Journal of Chronic Diseases 22:345-352

Stolley P 1972 Isoprenaline aerosols. American Review of Respiratory Disease 105:883-885

Stolley P D, Becker M H, Lasagna L, McEvilla J D, Sloane L M 1972 The relationship between physician characteristics and prescribing appropriateness. Medical Care 10:17-28

Stott N C H, Davis R H 1975 Clinical and administrative review in general practice. Journal of the Royal College of General Practitioners 25:888-896

Swindell P J, Reeves D S, Bullock D W, Davies A J, Spence C E 1983 Audits of antibiotic prescribing in a Bristol hospital. British Medical Journal 286:118-122

Taylor R J 1977 General-practitioner prescribing. Journal of the Royal College of General Practitioners 27: 79-82

Taylor R J 1978a Towards better prescribing. Journal of the Royal College of General Practitioners 28:263-270

Taylor R J 1978b Prescribing costs and patterns of prescribing in general practice. Journal of the Royal College of General Practitioners 28:531-535

Taylor R J 1981 General Practice prescribing in North-East Scotland. Thesis submitted for the degree of Doctor of Medicine. University of Aberdeen

Thompson H C, Osborne C E 1974 Development of Criteria for Quality Assurance of Ambulatory Child Health Care. Medical Care 12:807-827

Thompson H C, Osborne C E 1976 Quality assurance of ambulatory child health care : Opinions of primary care physicians regarding proposed criteria. Medical Care 14:22-38

Tulloch A J 1981 Repeat prescribing for elderly patients. British Medical Journal 282:1672-75

Turner P 1984 Pharmacy: an inquiry into its contribution to patient care. British Medical Journal 288:810-811

Wade O L, Hood E 1972a An analysis of prescribing of an hypnotic in the community. British Journal of Preventive and Social Medicine 26:121-128

Wade O L, Hood H E 1972 Prescribing of drugs reported to cause adverse reactions. British Journal of Preventive and Social Medicine 26:205-211

Walker J H 1983 Quantity, quality and controversy. Journal of the Royal College of General Practitioners 33:545-556

Wallace H M, Goldstein H, Oblesby A C 1974 The Health and Medical Care of Children under Title 19 (Medicaid). American Journal of Public Health 64:501-505

Watkins C J 1982 The measurement of the quality of general practitioner care. Royal College of General Practitioners. Occasional Paper 15

Webb B, Williams W 1972 Prescribing Sociological Review 50:591-594

Weller S D V 1975 Peripheral paediatric clinics : survey and medical audit. British Medical Journal 2:390-393

Which? 1984 The wrong kind of medicine? Which? June 1984 262-264

Williams D L (Chairman) 1975 Report of a working party on medical audit by peer review. General Medical Services Committee (Wales) 39

Williams P 1982 The cost of tranquilizers. Social Science and Medicine 16:1955-1958

Wilks J M 1975 The use of psychotropic drugs in general practice. Journal of the Royal College of General Practitioners 25:731-744

Wilks J M 1980 Psychotropic drug prescribing: a self-audit. Journal of the Royal College of General Practitioners 30:390-395

Wilson J B 1976 One month's prescribing in a rural practice. Health Bulletin 34:263-265

Wood B 1974 Paediatric Vade-Mecum Llyod-Luke, London

Wood B, Catford J C, Cogswell J J 1983 Confidential Paediatric Inquiry into Neonatal Deaths. British Medical Journal 288:1206-1208

Yaffe S J, Bierman C W, Cann H M et al 1975 Tetracyclines and children's teeth. Paediatrics 55:142-3

APPENDIX 1

RATIONALE FOR CHOOSING THE SPECIFIC INDICATOR DRUGS

Section 2.2 describes the development of quality criteria for the study and the use and value of specific indicator drugs and combinations (see Table IV). This appendix outlines the rationale for selecting particular drugs.

The drugs chosen to indicate quality of prescribing were obtained from study of current, widely accessible medical texts, whose own validity are accepted by the medical profession. Publications, such as the British National Formulary (BNF), are routine sources of reference and instruction. Deviance from such guidance would therefore not be expected in normal general medical practice.

For each indicator drug the source of guidance is given below, together with any particular comments from the Project Consultative Group. In all cases the guidelines were published and available to the general practitioners prior to their prescriptions in September 1979 and 1980. The names of proprietary and non-proprietary preparations forming each indicator drug group are listed in Appendix II.

The order of the indicator drugs discussed is as follows by code letter:

1. R	2. RR	3. I	4. O	5. P	6. MM
7. MC	8. V	9. H	10. F	11. S	12. El
13. E2	14. E3	15. A	16. X	17. XA	18. T
19. B	20. C	21. L	22. Dl	23. D2	24. D3
25. D4	26. D5	27. D6	28. D7		

1.Respiratory compound preparation - one only per form(R)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 3.9 and Appendix II

"There is no advantage in prescribing a preparation containing several ingredients that have similar therapeutic properties, or in which each ingredient has a different action. Combinations such as expectorant and cough suppressant, sympathomimetic and sedative, and any or all of these with other types of drug such as antihistamines are to be deprecated. If particular components are needed they should be prescribed separately and dosage adjusted independently."
- British National Formulary (1981 no. 1)
Section 3.9, 95

"Compound preparations have no place in the treatment of respiratory disorders. Many of them contain an unnecessarily large number of ingredients, often in subtherapeutic doses, and often with similar therapeutic properties. Other preparations contain ingredients which have opposing effects, in particular the inclusion of expectorants together with antihistamines, sedatives, cough suppressants, brochodilators, and sympathomimetics. Such preparations are to be deprecated not only as irrational but also for administering a large number of drugs to patients in inappropriate

dosage and in excess of their needs. It is therefore best to prescribe one of the simple cough mixtures recommended above and if any other component is needed it may then be prescribed separately, tailored to the needs of the patient, and dosage adjusted accordingly."

- British National Formulary (1984 No.7)
  Section 3.9.2. 123

2. Respiratory compound preparations - two or more per form (RR)

Route of administration; oral
Age range : less than 16 years
Definition : BNF(1981) Section 3.9, and Appendix II

"Given than respiratory compound preparations are not favoured, two prescriptions at the same time to the same child is even more illogical."
- Project Consultative Group

3. Isoprenaline and sodium cromoglycate spinhaler (I)

Route of administration : spinhaler
Age range : less than 16 years
Definition : Appendix II

"In the mid 1960s there was an epidemic of sudden deaths in asthmatic children. It was associated with the introduction of high dose B-stimulant metered aerosols (mainly isoprenaline) and did not occur in countries where these were not marketed. The epidemic declined in Britain when the profession were warned and the aerosols were made available on prescription only (Stolley 1972). In a review of the treatment of asthma in childhood, a well known authority Godfrey (1977) considers that the newer selective sympathomimetic drugs such as salbutamol and terbutaline are ideal, and infers that isoprenaline no longer has a place. This view is also supported by the Project Consultative Group.

"It is unfortunate that the action of sodium cromoglycate has been confused by the addition of isoprenaline as in 'Intal Compound', where the isoprenaline may have its own specific effect. Practitioners are advised to use the pure preparation 'Intal' when evaluating the response to treatment."
- British National Formulary (1974-76) 62
  British National Formulary (1976-78) 67

"Intal Co probably has no advantage over Intal and has not been marketed outside Britain ..... It may lead patients to use it symptomatically instead of prophylactically."
-Drug and Therapeutics Bulletin (1971) 9: 81

"Sodium cromoglycate has few side-effects. However, occasionally the dry powder inhalation may cause bronchospasm. In such patients, the best procedure is to use a selective beta 2- adrenoceptor stimulant inhalation such as salbutomol or terbutaline a few minutes

before the sodium cromoglycate inhalation is given. There is no advantage in using the compound inhalation of sodium cromoglycate which contains isoprenaline (Intal compound) as this has a less selective action and may lead to the patient misusing the preparation for relieving bronchospasm rather than for its prophylactic effect."
- British National Formulary (1984 no. 7) Section 3.3 112

4. Appetite depressants (0)

Route of administration : spinhaler
Age range : less than 16 years
Definition : BNF(1981) Section 4.5.2 and Appendix II

"Illicit teenage aphetamine use is a cause for continuing concern in Britain ... The risk of toxic psychoses and dependance on these drugs are well documented ... Amphetamines should not be prescribed for obesity and weight control."
- Drug and Therapeutics Bulletin (1968) 6:33
"Appetite suppressant drugs have little place in the management of the obese patient."
- British National Formulary (1974 - 76) 132
British National Formulary (1976 - 78) 151

"There are suggestions that fenfluramine may reduce linear growth velocity in children. Until further evidence is available, careful monitoring of obese children treated long term with the drug is advisable."
- Drugs (1975) 4 : 10 : 312

"In view of the doubtful value and possible dangers of anoretic drugs in childhood, careful monitoring of the growth of obese children treated with these agents is indicated."
- Rayner P and Court J (1975) Postgraduate Medical Journal (Supplement 1) 51 : 125

"Centrally-acting appetite suppressants carry the risk of dependence and other adverse effects .... The use of amphetamine-like drugs, including phenmetrazine, in the treatment of obesity is not justified as any possible benefits are outweighed by the risks involved .... The centrally-acting appetite suppressants should be avoided in children because of the possibility of growth suppression."
- British National Formulary (1984 no. 7) Section 4.5
152 - 153

See also Munro JF. Drug treatment of obesity.
Prescribers Journal (1979 No. 4) 106-112

5. Tonics, appetite stimulators (P)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 9.8, MIMS April 1981
Section 8A and Appendix II

Tonics and appetite stimulators are considered to be of very dubious efficacy, and Taylor (1978a) consider them indicative of inappropriate care. This view was shared by the Project Consultative Group in the case of prescriptions for children.

6. Eardrops containing framycetin, gentamicin or neomycin (MM)

Route of administration : topical
Age range : less than 16 years
Definition : BNF (1981) Section 12.1.1 and Appendix II

"Ear-drops containing framycetin, gentamicin or neomycin should be avoided when the tympanic membrane is perforated for this may lead to permanent deafness."
- British National Formulary (1981 no. 1)
Section 12.1.1 268

7. Eardrops containing nitrofurazone, chloramphenicol (MC)

Route of administration : topical
Age range : less than 16 years
Definition : BNF (1981) Section 12.1.1 and Appendix II

"Chloramphenicol ear-drops should be avoided as they cause a high incidence of hypersensitivity skin reactions (10% of patients) as do nitrofurazone ear-drops."
- British National Formulary (1981 no. 1)
Section 12.1.1 268

8. Multivitamins (V)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 9.7.7 and Appendix II

These drugs were not used to indicate quality of prescribing but rather as a general indicator of prescribing.

9. Topical antihistamines (H)

Route of administration : topical
Age range : less than 16 years
Definition : Appendix II

"Since the first reports in 1947 thousands of instances of antihistamine contact dermatitis have occurred and yet many topical antihistamines remain on the market. In 1973 the US Committee on Drugs, therefore, urged practitioners:
"(i) to discontinue the use of topical antihistamine preparations because their toxicity exceeds their limited benefit

(ii) to discourage patients from purchasing over the counter topical antihistamines"
- Paediatrics (1973) 2: 51: 299

"Topical use of these drugs (antihistamines) can cause photosensitivity and other skin eruptions, and should be avoided."
- Turner (1973) 108

"Topical use (of antihistamines), whether on the skin or in the eyes or nose is likely to cause sensitisation."
- British National Formulary (1974-76) 66
British National Formulary (1976-78) 72
"Both local anaesthetics and locally-applied antihistamines are very likely to produce sensitisation and are not recommended."
- British National Formulary (1981 no. 1)
Section 13.3 281

"Though widely prescribed, topical antihistamines and local anaesthetics should be avoided as they may cause sensitisation : moreover topical antihistamines are only marginally effective."
- British National Formulary (1984 no. 7)
Section 13.3 340

10. Electrolyte replacements (F)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 9.3.3, Appendix 2

"For severe diarrhoea the most important measures are to prevent or treat depletion of fluid salts. This is particularly so for infants and frail or elderly patients who may become dangerously ill through dehydration alone in the course of a day."
- British National Formulary (1981 no. 1) Section 9.3.3. 230

"Prescriptions for electrolyte replacements are likely to reflect appropriate care rather than the reverse."
- Project Consultative Group

See also oral therapy for acute diarrhoea Lancet (1981) 2 : 615 - 616

11. Metoclopramide (S)

Route of administration : oral
Age range : less than one year
Definition : Appendix II

For the last ten years many cases of children showing alarming dystonic reactions to metoclopramide have been reported (eg Castels - Van Daele 1970). In 1978 letters and case reports in the British Medical Journal again drew attention to these dangers (Sills, Glass 1978, Bloch 1978, Reynolds 1978). Although metoclopramide produces symptomatic relief in many instances, Bloch pointed out that the resultant effect actually masked the diagnosis of meningitis in three

infants. Reynolds considers that "the use of metoclopramide for infants and children should be discouraged and more attention paid to the primary diagnosis rather than to the symptoms it produces."

"The use of metoclopramide in general practice for the treatment of infants should be avoided."
- Project Consultative Group

"Avoid use in Children"
- British National Formulary (1981 No. 1) Section 1.2 36

12. Phenothiazines (E1)

Route of administration : oral
Age range : less than one year
Definition : Appendix II

"Perphenazine, prochlorperazine and trifluoperazine are liable to cause Parkinsonism and after even a few doses may produce oculogyric crises."
- British National Formulary (1974-76) 76
"Prochlorperazine (perphenazine, trifluoperazine) should not be prescribed in the paediatric age group because of the relative frequency of extra pyramidal tract involvement with this drug."
- Paediatric Therapy (1975) 960

"Prochlorperazine, perphenazine, trifluoperazine and thiethylperazine are less sedating than chlorpromazine but severe dystonic reactions sometimes occur, especially in children."
- British National Formulary (1981 No.1) Section 4.6 124
- British National Formulary (1984 No.7) Section 4.6 154

13. Phenothiazines (E2)

Route of administration : oral
Age range : 1 - 4 years
Definition : Appendix II

Rationale as above (no. 12 E1).

14. Phenothiazines (E3)

Route of administration : suppositories
Age range : Less than 4 years
Definition : Appendix II

Rationale as above (no. 12 E1).

15. Aspirin (A)

Route of administration : oral
Age range : less than one year
Definition : BNF(1981) Section 4.7.1.1 and Appendix II

"Aspirin is not recommended for infants under one year because of the danger of metabolic disturbance. Fatal poisoning may occur with repeated doses."
- British National Formulary (1974-76) 68
  British National Formulary (1976-78) 75

"Aspirin is not recommended for use in infants under one year because of the danger of metabolic acidosis and fatal poisoning which may occur after repeated dosage."
- British National Formulary (1981 no.1) Section 4.7.1.1 128
- British National Formulary (1948 no.7) Section 4.7.1.1 158

See also Prescolt LF Poisoning with salicylates, paracetomol and other analgesics. Prescribers' Journal (1979 No.6) 169-175

16. Tricyclic antidepressants (X)

Route of administration : oral
Age range : less than 5 years
Definition : BNF(1981) Section 4.3 and Appendix II

The sole use of tricyclic antidepressants in the young child is in the management of enuresis. Since bed-wetting is widely prevalent in normal children under the age of 5, childhood nocturnal enuresis should be defined as involuntary nocturnal micturition in children over the age of 5.

"These drugs are unsuitable for children under the age of 5."
- Drug and Therapeutics Bulletin 1977 15 : 25

"Treatment (with tricyclics) is indicated only in older children (5 years or over).... Antidepressants are now the commonest cause of fatal poisoning in children under the age of 5 years. Every year a score of doctors probably regret writing a lethal paediatric prescription for a benign conditions which usually resolves spontaneously."
-British Medical Journal leading article (1979) 1 : 705

"Certain tricyclic antidepressants are used to treat nocturnal enuresis in children. Their use should be reserved for when alternative methods have failed. ....Also, behavioural disturbances may occur and cases of poisoning have been reported. It is recommended that they should be avoided in children under 6 years of age, and that treatment should not exceed 3 months unless a full physical examination (including electrocardiogram) is given:
- British National Formulary (1981 no.1) Section 4.3 115
- British National Formulary (1984 no.7) Section 4.3 145

See also George CF Adverse effects of psychotropic drugs Prescribers' Journal (1978 No.4) 75-83

See also Volan GN Poisoning by sedatives, hypnotics and antidepressants. Prescribers' Journal (1979 No.6) 178-182

17. Tricyclic antidepressants simultaneous with an antibiotic (XA)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 4.3 and Appendix II

Enuresis is the most plausible reason for continuing an antidepressant with an antibiotic commonly used to treat urinary tract infection (eg Septrin). Physical disease should always be considered as a cause of bed-wetting. The urine should be examined for sugar, albumin and infection (BMJ leading article 1979 1 : 705). "Blind treatment of enuresis with antidepressant and antibiotic combinations is not recommended."
- Project Consultative Group

18. Tetracyclines (T)

Route of administration : oral
Age range : less than 12 years
Definitions : BNF(1981) Section 5.1.3 and Appendix II

Tetracyclines form a coloured complex with calcium which is deposited in bones, and in the enamel and dentine of teeth. This complex can permanently stain developing teeth a disfiguring greyish-brown or yellow. In a sample of 1168 Australian children one in five were found to have teeth discoloured by tetracycline (Brearley 1968).

"Tetracyclines should not be used in children up to 12 years of age."
- MIMS (1979) no. 1 21:144
- Laurence (1973) 7.47
- Lancet editorial (1968) 1:1360

"The tetracyclines are deposited in growing bone and teeth (being bound to calcium) causing staining and occasionally dental hypoplasia, and should not be given to children under 12 years or to pregnant women."
- British National Formulary (1981 No.1) Section 5.1.3 159
- British National Formulary (1984 No.7) Section 5.1.3 194

See also Tetracycline syrups and children's teeth
Drug and Therapeutics Bulletin 1984 22.14. 55-56

19. Barbiturates other than phenobarbitone (B)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 4.1.3, Appendix 2

"Barbiturates should be avoided (in children) as they cause paradoxical excitation, shown as irritability, bad behaviour and even sleeplessness, particularly in children who are mentally subnormal or who have cerebral palsy ..... Phenobarbitone remains the drug of

choice in grand mal epilepsy".
- British National Formulary (1974-76) 74, 82

"The benzodiazepines have supplanted the barbiturates for most purposes as hypnotics, sedatives and anxiolytics because the barbiturates are more hazardous in use".
- British National Formulary (1981 no.1) Section 4.1.3 104

"Avoid in children"
-British National Formulary (1984 no.7) Section 4.1.3 134

See also Volans GN. Poisoning by sedatives, hypnotics asnd antidepressants. Prescribers' Journal (1979 no.6) 176-182.

20. Chloramphenicol (C)

Route of administration : oral
Age range : less than 16 years
Definition : Appendix II

"(Systemic) chloramphenicol may cause aplastic anaemia... and is particularly likely to accumulate and cause toxic effects in the newborn when these organs are not fully functioning. Other antibiotics should be preferred for most infections."
- British National Formulary (1974-76) 100
British National Formulary (1976-78) 110

"Chloramphenicol should only be used when the infection is insensitive to other drugs and this situation is only likely to arise in severe Haemophilus influenza infections (meningitis, pneumonia) and in typhoid fever ... Urinary tract infections should not nowadays require chloramphenicol."
- Laurence (1973) 7.44

"Chloramphenical is a potent, potentially toxic, broad-spectrum antibiotic which should be reserved for treatment of life-threatening infections particularly those caused by Haemophilus influenzae or Klebsiella pneumoniae and also for typhoid fever."
- British National Formulary (1981 no.1) Section 5.1.7
165

"Children with the forementioned infections should be under the care of consultant paediatricians in hospital. General practitioners, therefore, would not have the opportunity of prescribing chloramphenicol for the rare occasions when it is justifiable."
- Project Consultative Group

"Chloramphenicol is widely overprescribed. Its toxicity renders it unsuitable for systemic use except in the circumstances indicated above."
- British National Formulary (1984 no.7) Section 5.1.7 200

21. Unstandardised stimulant laxatives (L)

Route of administration : oral
Age range : less than 16 years
Definition : BNF(1981) Section 1.6.6 and Appendix II

"Unstandardised preparations of cascara, rhubarb and senna should be avoided as their laxative action is unpredictable. Aloes, colocynth and jalap should be avoided as they have a drastic purgative action."
- British National Formulary (1981 no.1) Section 1.6.6 47

"Phenolphthalein should be avoided as it may cause rashes, albuminuria and haemoglobinuria. Its laxative effects may continue for several days because of enterohepatic recycling."
- British National Formulary (1984 no.7) Section 1.6.6 59

22. Antidiarrhoeal Lomotil (D1)

Route of administration : oral
Age range : under 2 years
Definition : Appendix II

"Recently there have been several reports of Lomotil poisoning in children from either accidental ingestion of large doses or wrongly prescribed medication. Of 18 children thus poisoned two have died. The dangers of poisoning are not sufficiently well recognised. Its use should be avoided completely for children under the age of 2 years."
- BMJ leading article (1973) 678

"Lomotil is best avoided completely in those under 2 years."
- Drug and Therapeutics Bulletin (1978) 16:2

"Lomotil has no place in the management of children."
ABC of 1 to 7 : Vomiting and Acute diarrhoea
Valman HB British Medical Journal (1981) 282 : 2031-2034

"Antimotility drugs and antisecretory drugs have no proven place in the management of acute diarrhoea in children. Many are opium derivatives like codeine or diphenoxylate with atropine (Lomotil) and are particularly contraindicated in infants and young children."
- Cutting WAM Acute diarrhoea in children in the UK Prescribers' Journal (1982 no.2) 32-38

"Drugs such as opiates, diphenoxylate and loperanide, which reduces bowel mobility, should not be given to very young children. There is little evidence of any benefit in children, and opiates and diphenoxylate can depress respiration. Lomotil (diphenoxylate with atropine) is an important cause of accidental poisoning in children under the age of 5 in this country. Symptoms of overdosage in children can occur after as little as one tablet."
- Drug and Thereapeutics Bulletin (1983) 21: 103

"Antidiarrhoeal drugs which reduce motility (eg Lomotil, loperamide): Their use should preferably be avoided in children and they are potentially harmful if used to treat infective diarrhoeas as

they may delay the passage of liquid faeces, encourage proliferation of pathogens and cause the severity of the diarrhoea to be underestimated."
- British National Formulary (1984 no.7) Section 1.4.2 5

See also Freese B, Medawar C, Herxheimer A.
No more Lomotil for infants. Lancet (1981)2 : 816-817

See also Little M. Treatment of gastroenteritis in children. General Practitioner (1984) July 20 : 21

23. Antidiarrhoeal Lomotil (D2)

Route of administration : oral
Age range : 2 - 4 years
Definition : Appendix II

Rationale as above (no. 22, D1).

"Since Lomotil is not an innocuous drug, since poisoning has occurred in children over 2 years old and since the use of antidiarrhoeals of Lomotil's efficacy is questionable in early childhood, Lomotil should be avoided in children under 5 years."
- Project Consultative Group

24. Antidiarrhoeal Imodium (D3)

Route of administration : oral
Age range : under 2 years
Definition : Appendix II

Rationale as above (no. 22, D1).

"Data on the use of loperamide (Imodium) in children are very sparse and the drug is not yet licensed for use in children under the age of four years."
- Drug and Therapeutics Bulletin (1978) 16 : 2

25. Antidiarrhoeal: combination of any two on same form (D4)

Route of administration : oral
Age range : Under 16 years
Definition : Appendix II

"In symptomatic treatment a combination of two drugs, which are intended to perform the same function, such as two antidiarrhoeals, is inappropriate."
- Project Consultative Group

26. Antidiarrhoeal simultaneous with an antibiotic other than neomycin (D5)

Route of administration : oral
Age range : under 16 years
Definition : Appendix II

"Combination of an antidiarrhoeal with an antibiotic (other than neomycin) may be intended to achieve three purposes. All the intentions are inappropriate."
- Project Consultative Group

(i) The antidiarrhoeal may be intended to control the symptoms of antibiotic-induced diarrhoea (antibiotic-associated colitis).
"It is essential for the physician to realise that diarrhoea complicating antibiotic therapy is not just a 'nuisance' problem to be ignored or treated symptomatically and then ignored."
- Adverse Drug Reaction Bulletin (1979 no.75) 268

(ii) The antidiarrhoeal may be intended to control the symptoms of a gastro-intestinal bacterial infection for which the antibiotic is also given.
"Antibiotics do not usually help acute infective diarrhoea. Bacterial pathogens cause only about 10% of clinical gastroenteritis, but even when a bacterial cause is established, antibiotics do not shorten the attack, and may prolong the period of bacterial excretia (particularly with Salmonellae); they can also predispose to gut colonisation by secondary invaders such as Candida."
- Drug and Therapeutics Bulletin (1978) 16:2

(iii) The antidiarrhoeal may be intended to control the symptoms of a non-gastro-intestinal bacterial infection for which the antibiotic is also given (eg otitis media).
"Such diarrhoea is seldom bothersome or of long duration.
Treatment of the underlying condition will resolve the diarrhoea. Symptomatic treatment may mask or accentuate more sinister problems (eg acute appendicitis)".
- Project Consultative Group

"No antibiotics should be given to children with gastroenteritis treated at home."
-Valman HB. ABC of 1 to 7: Vomiting and acute diarrhoea.
-British Medical Journal (1981)282 : 2031 - 2034.

"Antibiotic and sulphonamide preparations should be avoided for the treatment of diarrhoea even when a bacterial cause is suspected because they may prolong rather than shorten the time taken to control diarrhoea and carrier states."
- British National Formulary (1981 no.1) Section 1.4.3 40

27. Antidiarrhoeal Kaolins (D6)

Route of administration : oral
Age range : under 1 year
Definition : Appendix II

"Non specific antidiarrhoeal drugs should not be administered to infants. Absorbents such as Kaolin-pectin do not decrease the amount of fluid loss; they merely increase stool consistency and decrease the frequency of evacuation, thus masking the true magnitude of fluid loss."
- Paediatric Therapy (1975) 507

"Kaolin should not be prescribed as it deflects the mother's attention from the main treatment."
- Valman HB. ABC 1 to 7: Vomiting and acute diarrhoea. British Medical Journal (1981) 282 : 2031-2034

"Adsorbents, like Kaolin and pectin also have no proven place in therapy. The disadvantage of such medicines is that they will distract attention away from the more essential management of dehydration."
- Cutting AM. Acute diarrhoea in children in the UK.
Prescribers' Journal (1982 no.2) 32-38.

28. Antidiarrhoeals other than D1, D2, D3, D6 (D7)

Route of administration : oral
Age range : under 1 year
Definition : BNF(1981) Section 1.4.3 and Appendix II

Rationale as above (no. 27 D6).

APPENDIX II

LIST OF INDICATOR DRUGS BY NAME OF PROPRIETARY AND NON-PROPRIETARY PREPARATION. (Total number = 367)

Name	Code Letter
Abidec	V
Achromycin (Capts, Inj, Syrup, tabs, V)	T
Adexolin	V
Adrenaline and Atropine Spray, Compound	R
Albamycin T	T
Aleudrin	I
Allegron	X
Alophen	L
Amisyn	V
Amitriptyline Hydrochloride	X
Ammonia and Ipecacuanha Mixture	R
Ammonium Chloride and Morphine Mixture	R
Actifed	R
Alupent Expectorant	R
Amesec	R
Amylobarbitone	B
Amylobarbitone Sodium	B
Amylomet	B
Amylozine Spansule	B
Amytal	B
Anafranil	X
Anthical	H
Anthisan Cream	H
Antidiar (with neomycin)	D
Antoin	A
Apisate	0
Asmapax	R
Asma-Vydrin	R
Arobon	D
Aspergum	A
Aspirin	A
Atasorb-N	D
Aventyl	X
Avomine	E
Audicort (Ear drops)	M
Aureomycin	T
Benafed	R
Berkmycen	T
Berkomine	X
Betnesol-N Ear Drops	M
Benylin Decongestant	R
Benylin Expectorant	R
Benylin Paediatric	R
Benylin with Codeine	R
Bisolvomycin	T
Bolvidon	X
Breoprin	A
Bricanyl Compound	R
Bronchilator	R
Bronchotone	R

Brontisol	I
Brovon Inhalant	I
Brovon, Pressurised	R
Budale	B
Butobarbitone	B
Butriptyline	X
Caprin	A
C.A.M.	R
Cafadol	A
Caladryl	H
Calavite	V
Calcimax	V
Carbrital	B
Cascara	L
Cellevac	D
Ceratonia	D
Chalk	D
Chloramphenicol	M, C
Chloromycetin Ear Drops	M
Chloromycetin (Caps, Inj, Susp, Succinate)	C
Chymocyclar	T
Chlortetracyline	T
Claradin	A
Clinimycin	T
Clomipramine Hydrochloride	X
Clomocycline Sodium	T
Codeine Phosphate	D
Codis	A
Concavit	V
Concordin	X
Copholco	R
Copholcoids	R
Cremomycin	D
Cremostrep	D
Cremosuxidine	D
Cyclobarbitone Calcium	B
Dalivit	V
Davenol	R
Demeclocycline Hydrochloride	T
Desipramine Hydrochloride	X
Deteclo	T
Dibenzepin Hydrochloride	X
Diethylpropion Hydrochloride	0
Diphenoxylate Hydrochloride	D
Dimotane Expectorant	R
Dimotane Expectorant DC	R
Dimotapp LA	R
Diorylate	F
Dolasan	A
Doloxene Compound	A
Domical	X
Donnagel with Neomycin	D
Dothiepin Hydrochloride	X
Doxepin	X
Doxycycline	T

Dramamine	E
Duo-Autohaler	I
Duromine	0
Durophet	0
Economycin	T
Effico	P
Elavil	X
Electrosol	F
Emprazil	A,R
Enpac	D
Enterfram	D
Enteromide	D
Equagesic	A
Eskornade	R
Evadyne	X
Evidorm	B
Expansyl	R
Expulin	R
Extil Compound	R
Exyphen	R
Falcodyl	R
Fenfluoramine Hydrochloride	0
Filon	0
Flar	D
Flavelix	R
Fosfor (inj, syrup)	P
Framycetin sulphate	M
Framycort	M
Framygen	M
Franol	R
Furoxone	D
Furacin (ear drops)	M
Galenomycin	T
Gentamycin	M
Genticin Ear Drops	M
Gentisone HC (Ear Drops)	M
Gerisom	B
Glykola	P
Gravol	E
Guanor Expectorant	R
Guanimycin susp. forte	D
Heptabarbitone	B
Histofax	H
Haymine	R
Histalix	R
Hypon	A
Hydromycin D Ear Drops	M
Impramine Hydrochloride	X
Impramine	X
Intal Compound	I
Imodium	D
Imperacin	T

Insidon	X
Iprindole	X
Iodo-Ephedrine	R
Ionamin	0
Iso-Autohaler	I
Iso-Bronchisan	I
Ivax	D
Ipecacuanha and Morphine Mixture	R
Juvel	V
Kaolin	D
Kaolin & Morphine	D
Kaodene	D
Kaylene-Ol	L
Kaomycin	D
Kaopectate	D
Kemicetine Succinate	C
Ketovite	V
KLN	D
Labiton	P
Labophylline	R
Laboprin	A
Ledermycin	T
Lentizol	X
Levius	A
Limbitrol 5 and 10	X
Linctified Expectorant	R
Lomotil (with Neomycin)	D
Loperamide Hydrochloride	D
Lotussin	R
Ludiomil	X
Lymecycline	I
Maprotiline Hydrochloride	X
Maxolon	S
Mazindol	0
Medihaler-Duo, Epi, Iso	I
Medomin	B
Megaclor	T
Merital	X
Metaclopramide Hydrochloride	S
Metatone	P
Methcycline Hydrochloride	T
Mianserin Hydrochloride	X
Minocin/Minocycline	T
Morphine Hydrochloride	D
Monotheamin and Amytal	R
Muflin	R
Multivitamins	V
Multivite	V
Mysteclin	T
Napsalgesic	A
Nembutal	B
Neocortex	M

Neomycin Sulphate	M
Neomycin Undecenode	M
Neo-Sulfazon	D
Neovax	D
Nethaprin Dospan	R
Neuro-Phosphates	P
Nitrofurazone	M
Noradran	R
Nomifensine Hydrogen Maleate	X
Norpramine	X
Nortriptyline	X
Norval	X
Nu-Seals Aspirin	A
Noveril	X
Onadox-118	A
Opobyl	L
Opium	D
Orovite 7	V
Orthoxicol	R
Otopred (Ear Drops)	M
Otoseptil	M
Otosporin	M
Opipramol Hydrochloride	X
Oxymycin	T
Oxytetracycline	T
Palabrin Forte	A
Paragesic	R
Pavacol-D	R
Paynocil	A
Pectomed	R
Pentobarbitone Sodium	B
Periactin	P
Perphenazine	E
Pertofran	X
Phenadorm	B
Phentermine	0
Phenergan Compound Expectorant	R
Phensedyl	R
Pholcolix	R
Pholcomed	R
Pholtex	R
Phyldrox	R
Ponderax	0
Predsol N Ear Drops	M
Polyvite	V
Primperan	S
Pib (Plus)	I
Pressurized Brovon	I
Prochlorperazine	E
Prolryptyline Hydrochloride	X
Promethazine Theoclate	E
Prondol	X
Prothiaden	X
Pulmodrine Expectorant	R

Purgoids	L
Quinalbarbitone sodium	B
Quixalin	D
Randomycin	T
Rapidal	B
Reasec	D
Riddovydrin	I
Rinurel	R
Rhubarb Co.	L
Ruhbard and Soda	L
Robaxisal forte	A
Robitussin AC	R
Rubilex	R
Rybarvin	I
Rybarex	I
Safapryn (Co.)	A
Saroten	X
Sancos Co.	R
Seconal Sodium	B
Sedatussin	R
Sinequan	X
Silbe Inhalant	I
Sodium Amytal	B
Sodium Chloride & Dental Oral Powder	F
Solprin	A
Sol-Tercin	A
Sonalgin	B
Sonergan	B
Soneryl	B
Sparine	E
Squill Opiate, Linctus, pastilles	R
Stelazine	E
Stemetil	E
Streptotriad	D
Stugeron (forte)	E
Sudafed Expectorant	R
Sulphamagna	D
Surmontil	X
Sustamycin	T
Syrtussar	R
Tancolin	R
Taumasthman	R
Tedral	R
Teevex	H
Tenuate Dospan	0
Tercin	A
Tercoda	R
Teronac	0
Terpalin	R
Terpocodein	R
Terpoin	R
Terramycin Caps,tabs,syrup,inj,SF, with PolymyxinB	T

Tetrabid	T
Tetrachel	T
Tetracycline	T
Tetracyn (SF)	T
Tetralysal	T
Tetrex	T
Thalazole	D
Thiethylperazine	E
Theominal	R
Theonar	R
Thyropit	0
Tixylix	R
Tofranil (with Promazine)	X
Tonivitan (caps, A & D, B)	P,V
Torecan	E
Totomycin	T
Totolin	R
Triocos	R
Triogesic	R
Triominic	R
Triotussic	R
Trifluoperazine	E
Trimipramine	X
Trancogesic	A
Tryptizol	X
Tuinal	R
Tussifans	R
Unidiarea	D
Uniflu Plus Gregovite C	R
Uniflor	D
Unihepa	V
Unimycin	T
Valledrine	R
Vallex	R
Valoid	E
Veganin	A
Verdiviton	V
Veracolate	L
Vertigon Spansule	E
Vibramycin	T
Vi-Daylin	V
Villescon	P
Viloxazine Hydrochloride	X
Virvina	P
Vitamin Capsules	V
Vitavel	V
Vortel	I

APPENDIX III

LETTER SENT PERSONALLY BY THE REGIONAL POSTGRADUATE ADVISER IN GENERAL PRACTICE TO ALL GENERAL PRACTITIONERS IN DISTRICT C

UNIVERSITY OF SOUTHAMPTON

OFFICE OF THE
CULTY OF MEDICINE

POSTGRADUATE DEPARTMENT
SOUTH BLOCK
SOUTHAMPTON GENERAL
TREMONA ROAD
SOUTHAMPTON SO9 4XY

Telephone: 777222 Ext: 3547

gional Postgraduate Adviser in General Practice
SWIFT, OBE, FRCGP

ase quote:

r Ref. GS/VDH/GEN-10

ur Ref.

July 1980

Dear

You may be interested in the results of a Wessex prescribing study (enclosed) which I understand did concern some general practitioners in Health District. The Local Medical Committee approved the study that is reported and has asked me to watch their interests in any further studies that may be carried out.

The impression was that in general the quality of prescribing for children, as studied, was satisfactory. It is fully appreciated that general practitioners have full responsibility for their choice of drugs and that the circumstances and clinical details of the patients for whom the prescriptions in the study were written was unknown.

However, certain questions were raised about the symptomatic treatment of diarrhoea, vomiting and "enuresis" in the young child. For example, 8% of the doctors studied had in one month prescribed 'Lomotil' to children aged less than two years. This practice has been strongly criticised for some time (1,2). 10% of doctors had also issued in one month prescriptions for tricyclic antedressants (e.g. 'Imipramine') to children aged less than 5 years. This again is considered most undesirable (3,4) particularly as tricyclics are now the commonest cause of drug poisoning deaths in children (5).

With best wishes,

Yours sincerely,

G. Swift

Encl/

References:

1. "Lomotil Intoxication in Children". Editorial. British Medical Journal 1973, 23 June, 678.
2. "Diarrhoea in Children". Drug and Therapeutics Bulletin. 1978, 6 January, 16,1,1.
3. "Poisoning and Enuresis". Editorial. British Medical Journal. 1979. 17 March, 705.
4. "The Management of Childhood Enuresis". Drug and Therapeutics Bulletin. 1977, 1 April, 15,7,26.
5. "Accidental Poisoning deaths in British Children 1958-77". Fraser NC. British Medical Journal. 1980, 26 June, 1595.

APPENDIX IV

DATA PROCESSING FORMS

FIRST CARD

1) Form no.

2) GP No.

3) Health District

Southampton 1
Portsmouth 2
Basingstoke 3

4) Sex

Male 1 Female 2

5) DCH obtained

Yes 1 No 2

6) MRCGP or FRCGP obtained

Yes 1 No 2

7) MRCP or FRCP obtained

Yes 1 No 2

8) Other Higher Degrees of other Royal Colleges (i.e. FFARCS, MRC Psych, FRCS MD) obtained

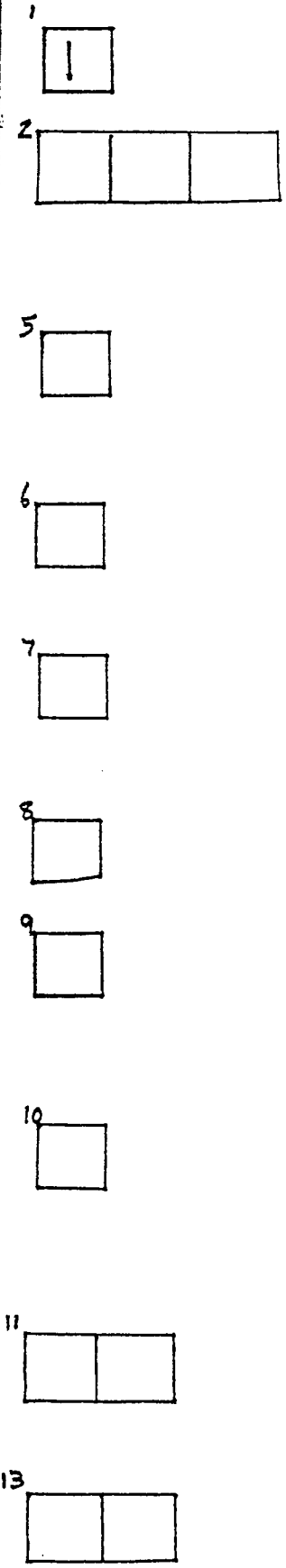
Yes 1 No 2

9) Year of 1st Medical Degree

19--

10) Year of Full Registration with GMC

19--



11) Place of 1st Medical Degree

London	1	Indian Sub-Continent	5
Oxbridge	2	EEC, N. America, Australia, N. Zealand	6
Scotland	3	Elsewhere	7
Other UK (England, Wales N. Ireland)	4		

15 ☐

12) Practice Size

Single	1	Group of 5	5
Group of 2	2	Group of 6	6
Group of 3	3	Group of 7 or more	7
Group of 4	4		

16 ☐

13) Health Centre used

Yes 1 No 2

17 ☐

14) Local Authority District of Practice

Hart	01	Eastleigh	08
Rushmoor	02	East Hants	09
Gosport	03	Test Valley	10
Fareham	04	Winchester	11
Havant	05	Portsmouth	12
Basingstoke	06	Southampton	13
New Forest	07		

18 ☐☐

15) Children admitted to care in area of practice

Less that 1.5 per 1000 children under 18	1
1.5 - 2.4 " " " " "	2
2.5 - 2.7 " " " " "	3
3.0 and more " " " " "	4

20 ☐

16) Youth Crime in area of practice

Less than 4%	1
4 - 6%	2
Greater than 6%	3

21 ☐

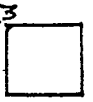
17) Population Density/persons per hectacre in area of practice

0 - ½	1
½ - 1	2
1 - 5	3
5 - 25	4
25 - 150	5

22 

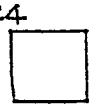
18) Dispensing Doctor in 1979 or 1980

Yes 1 No 2

23 

19) Woman doctor in practice including GP

Yes 1 No 2

24 

20) GP Trainer between 1978 and 1982

Yes 1 No 2

25 

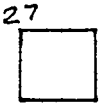
21) Trainee in Practice between 1978 and 1982

Yes 1 No 2

26 

22) Vocational Training allowance received

Yes 1 No 2

27 

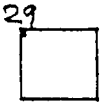
23) Paediatric Training undertaken

Yes 1 No 2

28 

24) Change of practice premises between 1978 and 1982

Yes 1 No 2

29 

25) Partners left (not due to retirement or death) between 1978 and 1982

Yes 1 No 2

30 

26) Type of Doctor

Unrestricted principal	1
Restricted principal	2

31 

27) 1st/2nd yr. student attached to GP between 1978 and 1982 32 ☐

Yes 1 No 2

28) 3rd/4th yr. student attached to GP between 1978 and 1982 33 ☐

Yes 1 No 2

29) 5th/final yr. student attached to GP between 1978 and 1982 34 ☐

Yes 1 No 2

30) 1st/2nd yr. student attached to practice between 1978 and 1982 35 ☐

Yes 1 No 2

31) 3rd/4th yr. student attached to practice between 1978 and 1982 36 ☐

Yes 1 No 2

32) 5th/final yr. student attached to practice between 1978 and 1982 37 ☐

Yes 1 No 2

33) Claimed expenses for formal postgraduate education in: 38 ☐

1979 and 1980 1

1979 or 1980 2

Neither 1979 nor 1980 3

Not known 4

SECOND CARD

1) Form no. 1 [2]

2) GP No. 2 [| |]

1979 Data

3) List Size (column 2) 5 [| | | |]

4) No. of Prescriptions issued (column 3) 9 [| | | |]

5) Total net ingredient cost of preparations (column 5) 13 [| | | |]

6) Total No. of Child Forms 17 [| | |]

7) Total No. of Child Prescriptions 20 [| | |]

8) Total Child Forms written by Receptionist 23 [| | |]

9) Total No. of Child Forms with age on 26 [| | |]

10) No. of prescriptions per form

1 prescription 29 [| | |]

2 prescriptions 32 [| |]

3 prescriptions 34 [| | |]

4 prescriptions 37 [| |]

5 prescriptions or more 39 [| |]

THIRD CARD

1) Form no. 1 [3]

2) GP No. 2 [| |]

1980 Data

3) List Size (column 2) 5 [| | | |]

4) No. of Prescriptions issued (column 3) 9 [| | | |]

5) Total net ingredient cost of preparations (column 5) 13 [| | | |]

6) Total No. of Child Forms 17 [| | |]

7) Total No. of Child Prescriptions 20 [| | |]

8) Total Child Forms written by Receptionist 23 [| | |]

9) Total No. of Child Forms with age on 26 [| | |]

10) No. of prescriptions per form

1 prescription 29 [| | |]

2 prescriptions 32 [| |]

3 prescriptions 34 [| | |]

4 prescriptions 37 [| |]

5 prescriptions or more 39 [| |]

FOURTH CARD

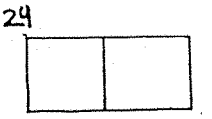
1) Form No. — 1 [4]

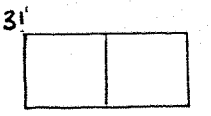
2) GP No. — 2 [ ][ ][ ]

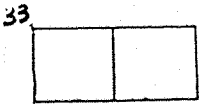
1979 Data

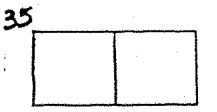
3) No. of prescriptions for:

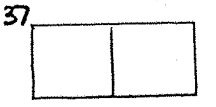
R	5 [ ][ ]
RR	7 [ ][ ]
I	9 [ ][ ]
Ø	11 [ ][ ]
P	13 [ ][ ]
Mm	15 [ ][ ]
Mc	17 [ ][ ]
V	19 [ ][ ]
H	21 [ ][ ]
P	23 [ ][ ]
S	25 [ ][ ]
E 2	27 [ ][ ]

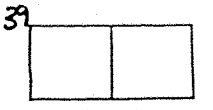
E1 

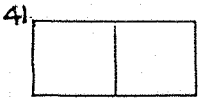
E3 

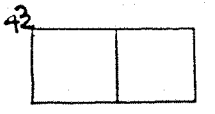
A 

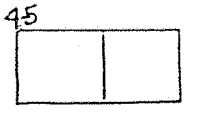
X 

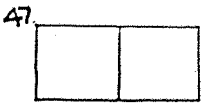
Xa 

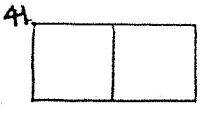
T 

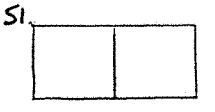
B 

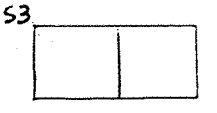
C 

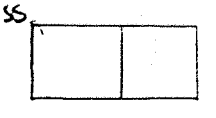
L 

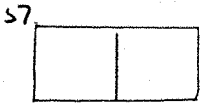
D7 

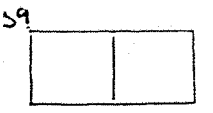
D6 

D1 

D2 

D3 

D4 

D5 

FIFTH CARD

1 [5]

Form No.

GP No. 2 [ ][ ][ ]

1980 Data

No. of prescriptions for:

R 5 [ ][ ]

RR 7 [ ][ ]

I 9 [ ][ ]

Ø 11 [ ][ ]

P 13 [ ][ ]

Mm 15 [ ][ ]

Mc 17 [ ][ ]

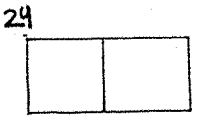
V 19 [ ][ ]

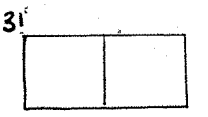
H 21 [ ][ ]

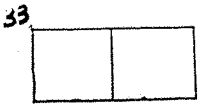
F 23 [ ][ ]

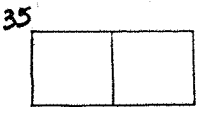
S 25 [ ][ ]

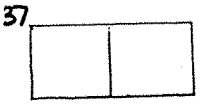
E 2 27 [ ][ ]

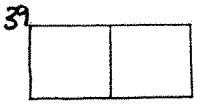
E1 

E3 

A 

X 

Xa 

T 

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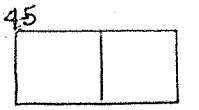
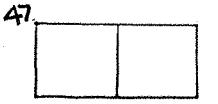
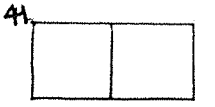
L 

D 7 

D 6 

D1 

D2 

D3 

D4 

D5 

APPENDIX V

EXAMPLES OF FP10 FORMS CONTAINING INDICATOR DRUGS WHICH WERE ISSUED TO CHILDREN IN SEPTEMBER 1979 or 1980

Note

The name and address of the doctor and pharmacist, the surname and address of the patient, and the date have been removed from these copies. The remaining contents of the script have then been reproduced in typewritten form.

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: yrs. ... mths.
Timothy
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement	No. of days treatment NB Ensure dose is stated	NP	Pricing Office use only
	INTAL CO. Spincaps t.d.s. (100)		8.75
	ALUPENT Elixir 300ml		1.50
	ACTIFED Linctus 300ml		1.86
	INTAL Spinhaler x 1		.96

Signature of Doctor | Date

For pharmacist No. of Prescns. on form: 4

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains
2 Respiratory Compound
Preparations and 1
Isoprenaline Compound
Spinhaler

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 8 yrs. ... mths.
Michael
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement	No. of days treatment NB Ensure dose is stated	NP	Pricing Office use only
	ALUPENT Syrup 5ml mdn x 200ml		1.00
	DIMOTAPP Syrup 5ml x 200ml		1.06
	V.CIL.K 250mg g.d.s. x 5 days		67
	LINCTIFIED 5ml mdn x 200ml		1.50

Signature of Doctor | Date

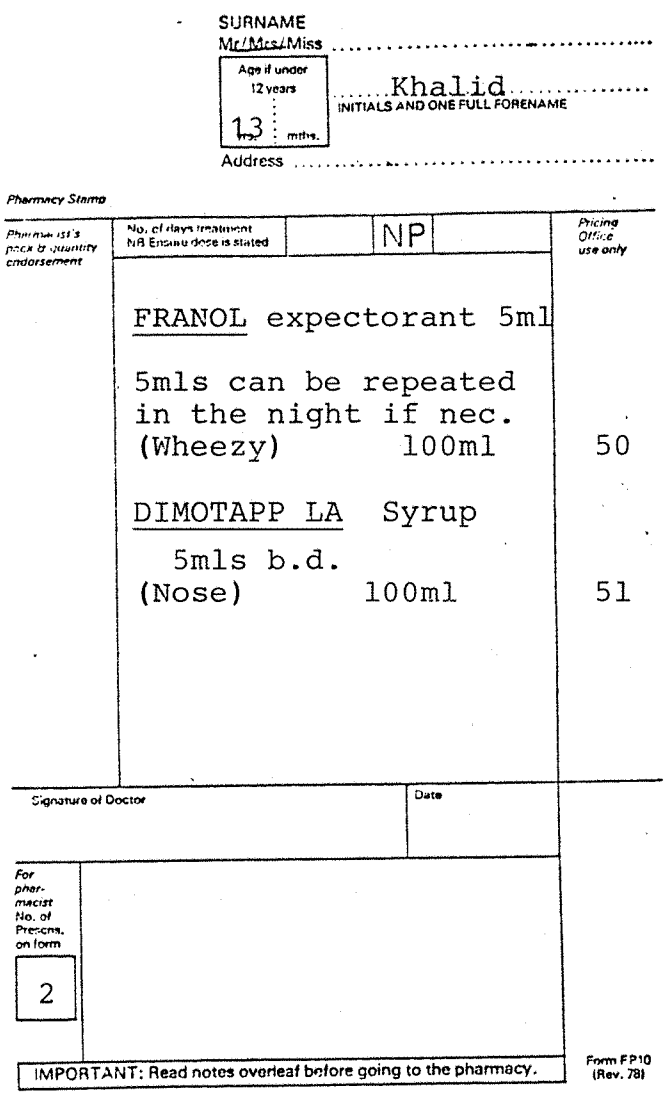
For pharmacist No. of Prescns. on form: 4

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains
3 Respiratory Compound Preparations



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 13 yrs. mths.
.....Khalid.....
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment N.B Ensure dose is stated | NP | Pricing Office use only

FRANOL expectorant 5ml

5mls can be repeated in the night if nec.
(Wheezy) 100ml 50

DIMOTAPP LA Syrup

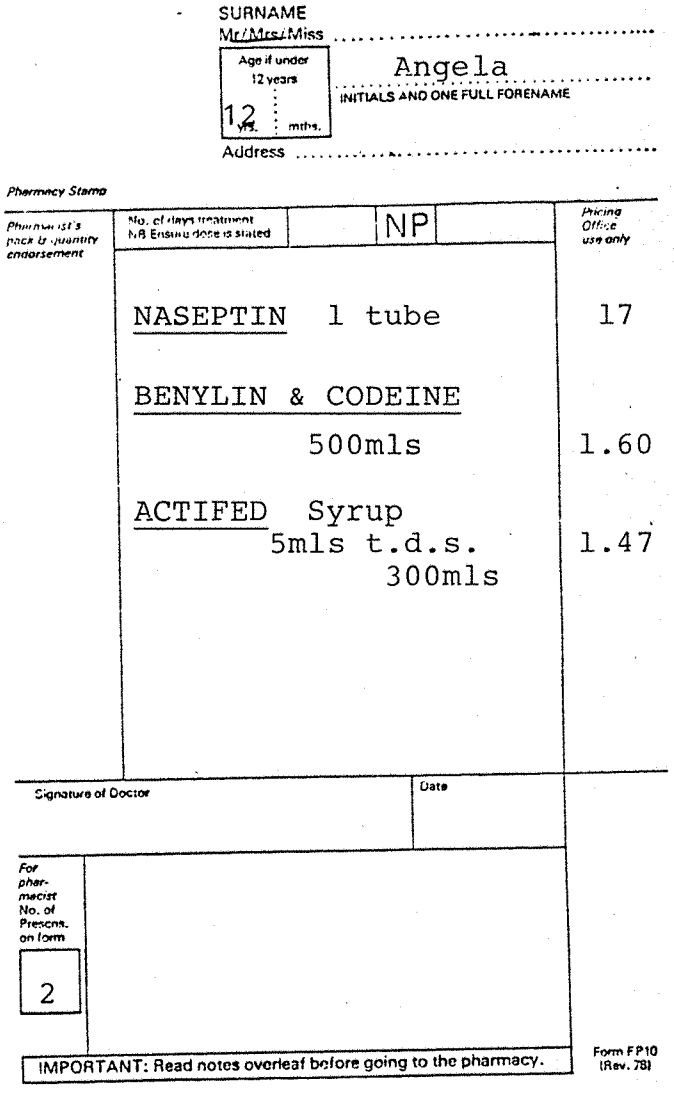
5mls b.d.
(Nose) 100ml 51

Signature of Doctor | Date

For pharmacist No. of Prescns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 12 yrs. mths.
Angela
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment N.B Ensure dose is stated | NP | Pricing Office use only

NASEPTIN 1 tube 17

BENYLIN & CODEINE
500mls 1.60

ACTIFED Syrup
5mls t.d.s.
300mls 1.47

Signature of Doctor | Date

For pharmacist No. of Prescns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

These scripts each contain 2 Respiratory Compound Preparations

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years
yrs. | mths.

Susan
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

Tabs ACTIFED
mitte 30 - b.d. 111

Linctus PHOLCOLIX
mitte 300ml 2.52
3 t.d.s.

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years
2
yrs. | mths.

David
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

DIMOTAPP 5ml t.d.s.
x 100 ml

L.DAVENOL 5ml p.r.n.
x 50ml

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

These scripts each contain 2 Respiratory Compound Preparations

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years: 8 yrs. 9 mths.

Andrew
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
N.B. Ensure dose is stated

NP

Pricing Office use only

Syrup ACTIFED 5ml t.d.s. mitte 150ml	86
Syrup ALUPENT 5ml t.d.s. mitte 150ml	75
caps INTAL CO. - 1bd mitte 100	8.75
BEXTASAL inhaler mitte (1)	4.77

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

4

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains
2 Respiratory Compound
Preparations and 1
Isoprenaline compound
spinhaler

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years: 6 yrs. 9 mths.

Lucy
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
N.B. Ensure dose is stated

NP

Pricing Office use only

TRIOMINIC Syrup 200ml 5ml	74
Caps INTAL 100	8.75
AMOXIL Syrup 125mg to 5ml g.d.s. 100ml	1.06
BENILYN PAEDIATRIC 200ml - 5ml g.d.s.	74

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

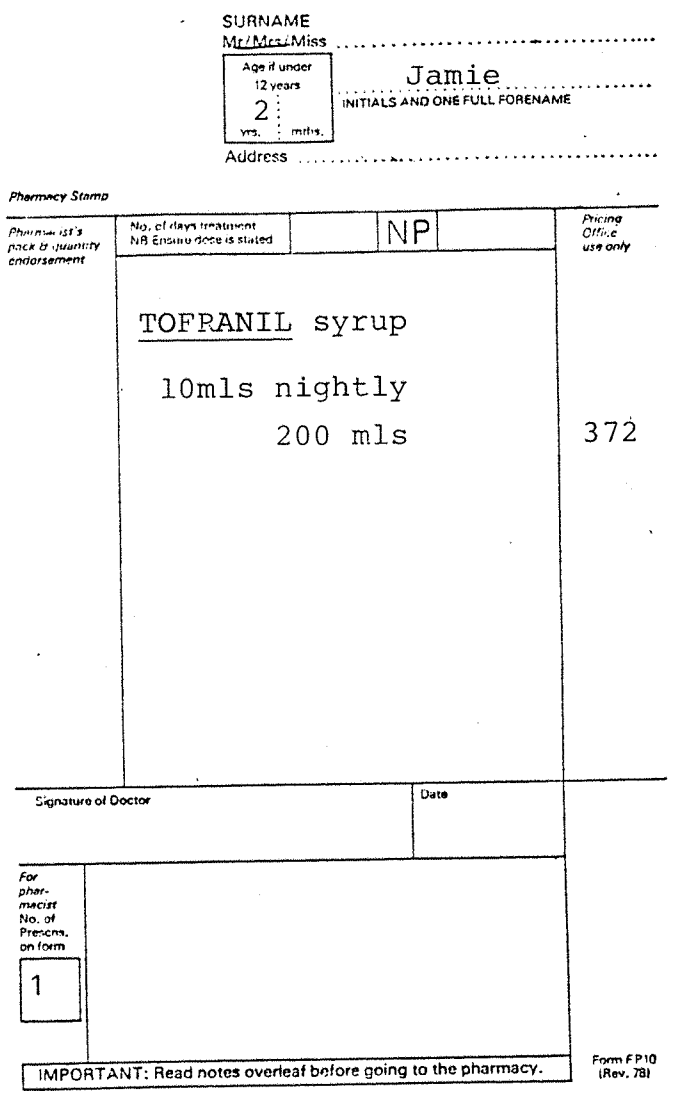
4

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains
2 Respiratory Compound
Preparations



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 2 yrs. / mths.
Jamie
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

TOFRANIL syrup

10mls nightly

200 mls

372

Signature of Doctor

Date

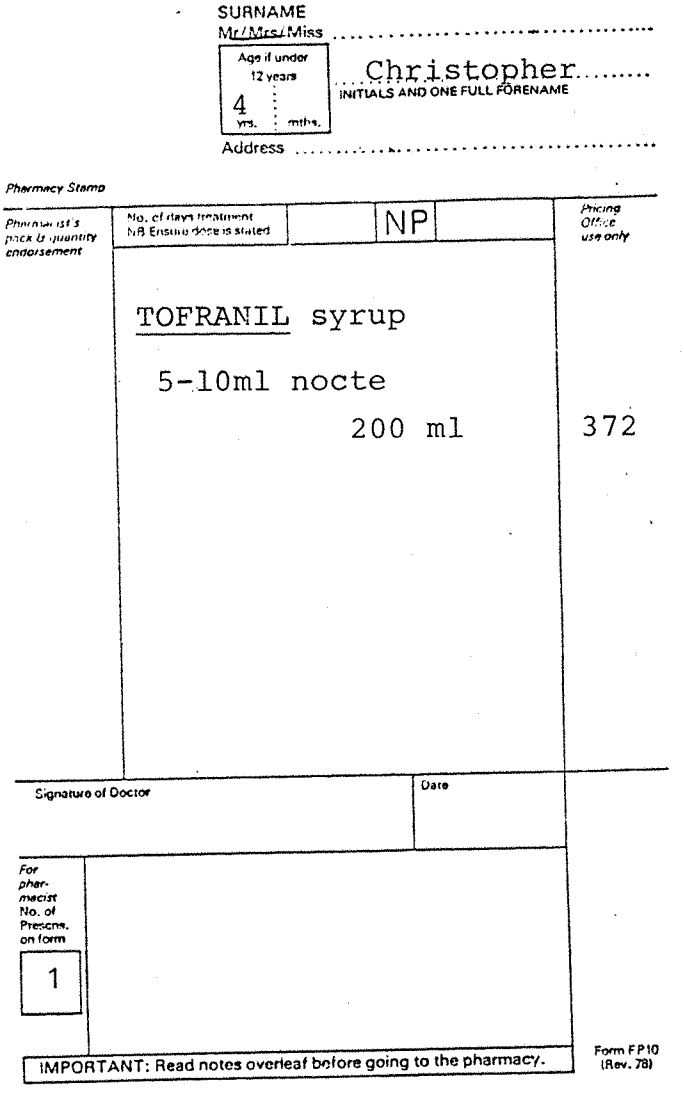
For pharmacist No. of Prescns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a tricyclic antidepressant for a 2 year old boy.



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 4 yrs. / mths.
Christopher
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

TOFRANIL syrup

5-10ml nocte

200 ml

372

Signature of Doctor

Date

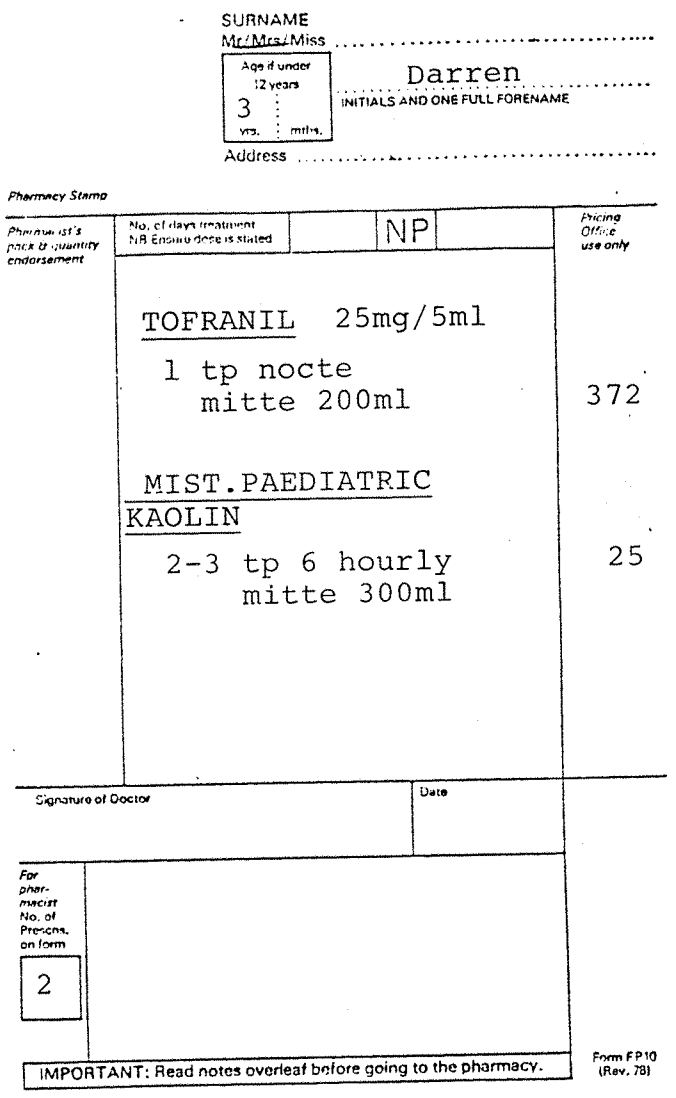
For pharmacist No. of Prescns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a tricyclic antidepressant for a 4 year old boy.



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 3 yrs. / mths.
Darren
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
N.B. Ensure dose is stated

NP

Pricing Office use only

TOFRANIL 25mg/5ml
1 tp nocte
mitte 200ml
372

MIST.PAEDIATRIC
KAOLIN
2-3 tp 6 hourly
mitte 300ml
25

Signature of Doctor

Date

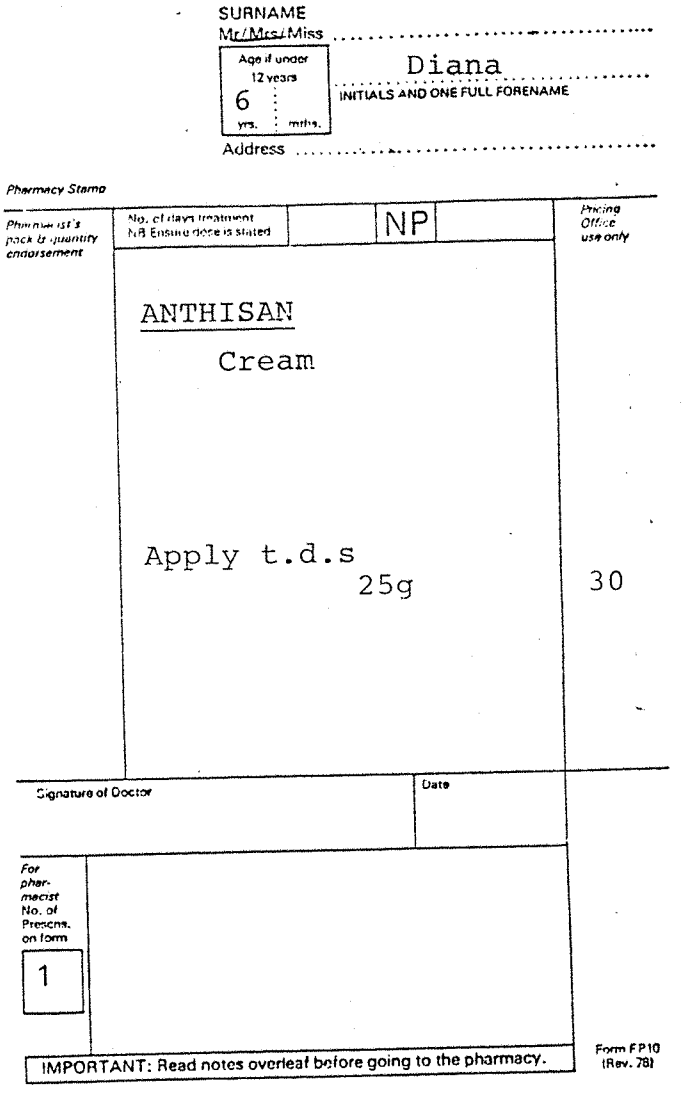
For pharmacist No. of Prescns. on form
2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a tricyclic antidepressant for a 3 year old boy.



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 6 yrs. / mths.
Diana
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
N.B. Ensure dose is stated

NP

Pricing Office use only

ANTHISAN
Cream
Apply t.d.s
25g
30

Signature of Doctor

Date

For pharmacist No. of Prescns. on form
1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a topical antihistamine.

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years	
yrs.	mths.
	6

Balkar
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

MAXOLON syrup

5 ml t.d.s.
mitte 100ml 99

VALLERGAN syrup 31

5 ml O.D.
mitte 100ml

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains metoclopramide for a 6 month old baby

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years	
yrs.	mths.
1	9

Julie
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

STEMETIL syrup

½ strength
5ml b.d. 11

mitte 50ml 3

Signature of Doctor

Date

For pharmacist No. of Prescns. on form

1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains prochlorperazine for a 21 month old baby.

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 4 yrs. / mths.
Rakish
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

GAVISCON Infant granules
1g with every feed 372
30g 29

BELOSYM syrup
½ tsp daily 100ml 11

MAXOLON paediatric syrup 1 tsp 6 hourly 86
20ml

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 3

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script containing metoclopramide for a 4 month old baby.

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 2 yrs. / mths.
Gareth
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

MAXOLON liquid
1mg/ml
1ml b.d. 86
15ml

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains metoclopramide for a 2 month old baby.

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years: yrs. | 3 | mths.

Tara
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

PHENERGAN elixir
5ml O.D. 100ml 23

KAOLIN paediatric
5ml + d.s. 100ml 8

LOMOTIL syrup
2.5ml O.D. 50ml 74

12

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 3

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains Lomotil and an antidiarrhoel for a 3 month old baby

SURNAME
Mr/Mrs/Miss .....

Age if under 12 years: yrs. 1 | 2 | mths.

Gareth
INITIALS AND ONE FULL FORENAME

Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

IMODIUM syrup
5ml qid 100ml 141

TIMODINE
One tube 149

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains Imodium for a 14 month old baby

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 10 yrs. mths.
Richard
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

LOMOTIL Liq.
5ml b.d.
mitte 60ml

95

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains Lomotil for a 10 month old baby

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 9 yrs. mths.
Bajura
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

LOMOTIL Liquid
2.5ml t.d.s.
mitte 60ml

95

CALPOL
5ml t.d.s.
mitte 70ml

14

34

Signature of Doctor

Date

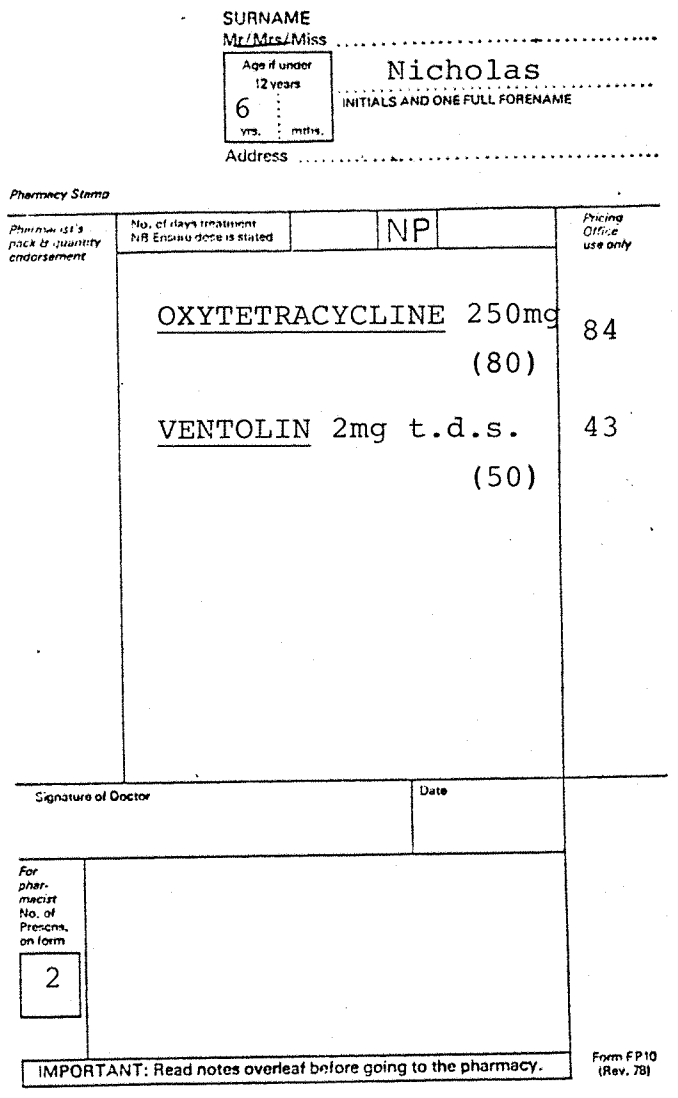
For pharmacist No. of Prescns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains Lomotil for a 9 month old baby



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 6 yrs. : mths.
Nicholas
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

OXYTETRACYCLINE 250mg 84
(80)

VENTOLIN 2mg t.d.s. 43
(50)

Signature of Doctor

Date

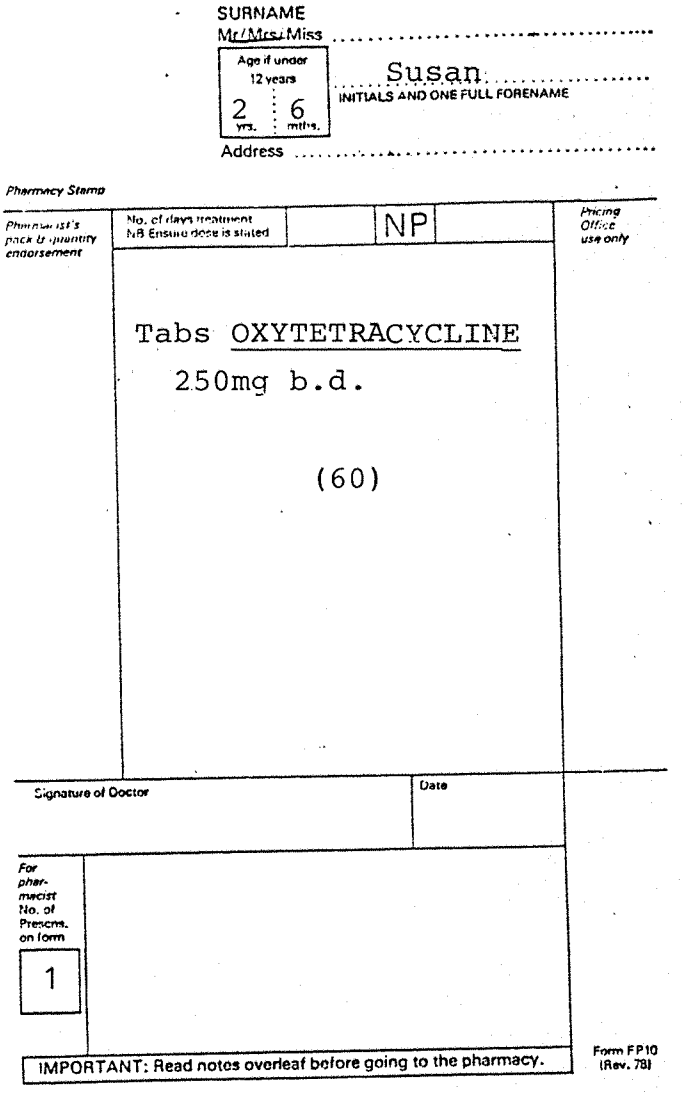
For pharmacist No. of Prescrns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a
a tetracycline for a
6 year old boy



SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 2 yrs. : 6 mths.
Susan
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

Tabs OXYTETRACYCLINE
250mg b.d.

(60)

Signature of Doctor

Date

For pharmacist No. of Prescrns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains
a tetracycline for a
2½ year old girl

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: 11 yrs. 4 mths.
Joanna
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

TENUATE DOSPAN

Mitte (30) 69

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 1

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains an appetite depressant for a 11 year old girl

SURNAME
Mr/Mrs/Miss .....
Age if under 12 years: yrs. mths.
Alan
INITIALS AND ONE FULL FORENAME
Address .....

Pharmacy Stamp

Pharmacist's pack & quantity endorsement

No. of days treatment
NB Ensure dose is stated

NP

Pricing Office use only

DIAZEPAM 2mg

tds (30) 12

EFFICO 10mls

tds 34

(200 ml)

Signature of Doctor

Date

For pharmacist No. of Prescns. on form: 2

IMPORTANT: Read notes overleaf before going to the pharmacy.

Form FP10 (Rev. 78)

Comment

This script contains a tonic/appetite stimulant

APPENDIX VI
ADDITIONAL TABLES OF RESULTS

This section contains the additional Tables 1 - 57 which have been referenced in Section 3: Results.

PERSONAL DETAILS: Table 1

Frequency of the 209 doctors according to sex, year of first medical degree and full registration.

		No	Percentage
1.	Male	175	84
2.	Female	34	16
3.	Year of first medical degree		
	1934 - 45	11	5
	1946 - 54	56	27
	1955 - 65	72	34
	1966 - 75	70	33
	Other years	0	0
4.	Year of full registration		
	1934 - 46	15	7
	1947 - 56	58	28
	1957 - 67	69	33
	1968 - 76	67	32
	Other years	0	0

PERSONAL DETAILS: Table 2

Frequency of the 209 doctors by number of persons on NHS prescribing list in 1979 and 1980

List Size	1979 No	1979 Percentage	1980 No	1980 Percentage
less than 1000	29	14	20	10
1000 - 1499	12	6	10	5
1500 - 1999	21	10	20	10
2000 - 2499	51	24	58	28
2500 - 2999	56	27	62	30
3000 - 3499	34	16	30	14
3500 - 3999	4	2	5	2
4000 and more	2	1	4	2
Total	209	100	209	101
Mean number per doctor	2,262.7		2,379.2	
Standard deviation	890.2		853.3	
Median	2,465		2,467	
Range	29 - 4149		69 - 5846	

TRAINING DETAILS: Table 3

Frequency of the 209 doctors according to a range of variables.

		No	Percentage
1.	Origin of first medical degree		
	London	118	56
	Oxbridge	24	11
	Scotland	19	9
	Other UK	36	17
	Indian subcontinent	8	4
	Elsewhere	4	2
2.	Higher medical degrees possessed		
	MRCGP and FRCGP	46	22
	MRCP and FRCP	14	7
	DCH	22	11
	Other types	4	2
	All types	70	33
3.	Known to have undertaken paediatric training for 6 months or more	12	6
4.	Known to have undertaken paediatric training for 6 months or more, or possesses DCH	30	14
5.	Unrestricted principal	203	97
6.	Received vocational training allowance in 1982	31	15

PRACTICE DETAILS: Table 4

Frequency of the 209 doctors according to a range of details about the practice of which they were a member.

		No	Percentage
1.	Number of doctors in practice		
	Single-handed	10	5
	Group of 2	22	11
	Group of 3	43	21
	Group of 4	23	11
	Group of 5	45	22
	Group of 6	26	12
	Group of 7 or more	37	18
2.	Health centre based	54	26
3.	Dispensing practice in 1979 or 1980	27	13
4.	Practice changed premises between 1978 and 1982	22	11
5.	Partner(s) left practice between 1978 and 1982 (not due to retirement or death)	42	20
6.	Woman doctor in practice (including study doctor)	111	53
7.	GP trainee in practice 1978-1982	114	55
8.	1st/2nd year medical student attached to practice 1978-1982	46	22
9.	3rd/4th year medical student attached to practice 1978-1982	58	28
10.	5th/final year medical student attached to practice 1978-1982	97	46

NEIGHBOURHOOD DETAILS: Table 5

Frequency of the 209 doctors according to the a range of details about the neighbourhood in which they worked.

		No	Percentage
1. Ratio of non-manual to manual workers 1971			
	less than 0.3	81	39
	0.3 -	41	20
	0.4 or more	87	42
2. Unemployment rates 1981			
	less than 5.5%	69	33
	5.5% -	56	27
	8.0% or more	84	40
3. Owner occupation of households 1981			
	less than 55%	39	19
	55% -	57	27
	57% or more	113	54
4. Households with children without exclusive use of amenities (ie lack/share bath and/or inside WC) 1981			
	less than 0.8%	94	45
	0.8% -	49	23
	1.6% or more	66	32
5. Households with children living at high room densities (ie one plus persons per room) 1981			
	less than 18%	85	41
	18 - 23%	66	32
	23% or more	58	28
6. Youth crime level (offenders per 10-16 year olds) 1978			
	less than 4%	52	25
	4 - 6%	97	46
	more than 6%	60	29
7. Children in care (per thousand children under 18 years) 1977-8			
	less than 1.5	20	10
	1.5 - 2.4	10	5
	2.5 - 2.7	52	25
	more than 2.7	126	60
	not known	1	0
8. Population density (persons per hectare) 1978			
	less than 1.0	9	4
	1.0 -	28	13
	5.0 -	61	29
	25.0 or more	111	53

Table 6

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by number of FP10 forms issued to anyone in September 1979, 1980.

Number of Prescriptions	1979 No	1979 Percentage	1980 No	1980 Percentage
less than 500	8	4	8	4
500 -	85	41	76	36
1000 -	89	43	87	42
1500 -	25	12	35	17
2000 or more	2	1	3	1
Total	209	101	209	100
Mean number per doctor		1,079.0		1140.6
Standard deviation		379.0		410.8
Median		1064		1104
Range		280-2741		323-3035
Total number of FP10 forms issued		225,511		238,380

Table 7

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by average net ingredient cost per FP10 form issued to anyone in September 1979 - 1980.

Average net ingredient cost per FP10 form (£)	Number	Percentage
1.00 -	34	16
2.00 -	40	19
2.20 -	47	22
2.40 -	43	21
2.60 -	20	10
2.80 -	15	7
3.00 or more	10	5
	209	100

1979 mean average net ingredient cost per FP10 form per doctor = £2.13

1980 mean average net ingredient cost per FP10 form per doctor = £2.57

1979+1980 mean average net ingredient cost per FP10 form per doctor = £2.36

Standard deviation £0.48

Median £2.33

Range £1.07 - £7.22

Table 8

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by number of FP10 forms issued to children (under 16 years) in September 1979 and 1980.

Number of forms	1979 No	1979 Percentage	1980 No	1980 Percentage
20 -	49	23	51	24
50 -	71	34	52	25
75 -	44	21	50	24
100 -	24	11	28	13
125 -	11	5	11	5
150 or more	10	5	17	8
Total	209	99	209	99
Mean number per doctor		76.44		80.67
Standard deviation		37.91		39.96
Median		68.13		75.25
Range		21 - 235		21 - 210
Total number of forms issued		15,976		16,859

Table 9

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by number of prescriptions* issued to children (under 16 years) in September 1979 and 1980.

Number of prescriptions	1979 No	1979 Percentage	1980 No	1980 Percentage
less than 50	26	12	24	11
50 - 74	41	20	44	21
75 - 99	33	16	39	19
100 - 124	54	26	38	18
125 - 149	26	12	25	12
150 - 199	16	8	22	11
200 or more	13	6	17	8
Total	209	100	209	100
Mean number per doctor		104.1		109.3
Standard deviation		60.4		61.3
Median		91.4		96.3
Range		21 - 527		33 - 468
Total number of prescriptions issued		21,767		22,852
Mean number of prescriptions per form		1.36		1.36

* There may be more than one prescription per FP10 form

Table 10

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by average number of prescriptions per FP10 form issued to children (under 16 years) in September 1979 - 1980.

Average no. of prescriptions per form	Number	Percentage
1.0 -	1	0
1.1 -	29	14
1.2 -	62	30
1.3 -	41	20
1.4 -	51	24
1.5 -	12	6
1.6 -	10	5
2.0 or more	3	1
	209	100

Mean no. of prescriptions per form	1.36
Standard deviation	0.18
Median	1.32
Range	1.08 - 2.41

Table 11

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by number of prescriptions per FP10 form issued by them for children (under 16 years) in September 1979.

Prescriptions per form	Doctors No	Doctors %	Total forms No	Total forms %	Mean per doctor issuing
1	209	100	11474	72	54.9
2	208	99	3457	22	16.6
3	179	86	847	5	4.7
4	96	46	155	1	1.6
5 or more	33	16	43	.3	1.3
Total			15976	100	

Table 12

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by number of prescriptions per FP10 form issued by them for children (under 16 years) in September 1980.

Prescriptions per form	Doctors No	Doctors %	Total forms No	Total forms %	Mean per doctor issuing
1	209	100	12040	71	57.6
2	209	100	3884	23	18.6
3	179	86	736	4	4.1
4	82	39	162	1	2.0
5 or more	28	13	37	.2	1.3
	Total		16859	99	

Table 13

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by percentage of FP10 forms written by ancillaries for children (under 16 years) in September 1979.

Percentage	Number	Percentage
0	25	12
1 -	21	10
5 -	37	18
10 -	66	32
20 -	39	19
30 -	14	7
40 or more	7	3
	209	101

1979 mean percentage of all child forms written by ancillaries	14.8%
Standard deviation	12.5%
Median	12.8%
Range	0 - 73%

1980 mean percentage of all child forms written by ancillaries	15.0%

Table 14

GENERAL PRESCRIBING BEHAVIOUR:

Frequency of the 209 doctors by percentage of FP10 forms issued to children (under 16 years) with age stated in September 1979.

Percentage	Number	Percentage
less than 10	9	4
10 -	25	12
30 -	33	16
50 -	84	40
70 -	48	23
90 or more	10	5
	209	100

1979 mean percentage of all child forms with age stated	55.4%
Standard deviation	22.7%
Median	60.4%
Range	0 - 100%
1980 mean percentage of all child forms with age stated	58.0%

Table 15

GENERAL PRESCRIBING BEHAVIOUR:

Prescribing practices of the 209 doctors by District for FP10 forms issued to children (under 16 years) in September 1979, 1980.

		District A	B	C	Total
Average no. of FP10 forms per doctor	1979	71.1	75.5	82.1	76.4
	1980	72.8	83.5	85.4	80.7
Average no. of prescriptions per doctor	1979	98.3	100.4	116.8	104.1
	1980	100.6	110.7	115.6	109.3
% FP10 forms written by ancillaries	1979	15.9	12.3	14.3	14.2
	1980	14.9	12.8	16.9	15.0
% FP10 forms with age stated	1979	55.7	59.7	57.7	57.5
	1980	59.5	59.4	55.4	58.0
% FP10 forms with 1 prescription	1979	70.6	73.6	71.2	71.8
	1980	70.0	74.2	69.9	71.4
% FP10 forms with 2 prescriptions	1979	22.0	21.4	21.4	21.6
	1980	23.2	21.2	24.4	23.0
% FP10 forms with 3 prescriptions	1979	5.9	3.6	6.2	5.3
	1980	5.1	3.4	4.5	4.4
% FP10 forms with 4 prescriptions	1979	0.9	0.9	0.9	0.9
	1980	1.2	0.8	0.8	1.0
% FP10 forms with 5 prescriptions or more	1979	0.3	0.3	0.1	0.3
	1980	0.1	0.2	0.2	0.2

Table 16

CURRENT EDUCATIONAL STATUS:

Frequency of the 209 doctors according to a range of details about current educational and training circumstances.

	No.	Percentage
1. Working in teaching District	69	33
2. Claimed expenses for formal postgraduate education in		
1979 and 1980	142	68
1979 or 1980	50	24
Neither 1979 or 1980	13	6
Not known	4	2
3. GP Trainer 1978 - 1982	35	17
4. 1st/2nd year medical student attached to doctor 1978-1982	11	5
5. 3rd/4th year medical student attached to doctor 1978-1982	18	9
6. 5th/final year medical student attached to doctor 1978-1982	26	12
7. Medical student (any year) attached to doctor 1978-1982	34	16

Table 17

INDICATOR DRUG PRESCRIBING RATES FOR SEPTEMBER 1979/80

Respiratory Compound Preparations - one only per form; oral; under 16 (R):

	1979	1980	1979+1980
Number of doctors prescribing	196	198	205
Percentage of doctors prescribing	94	95	98
Total number of prescriptions/ forms issued	2041	2064	4105
Of doctors prescribing:			
mean number of prescriptions/forms	10.41	10.42	20.02
range	1-84	1-73	1-157
Percentage of all prescriptions	9.4	9.0	9.2
Percentage of all forms	12.8	12.2	12.5

Table 18

INDICATOR DRUG PRESCRIBING RATES FOR SEPTEMBER 1979/80

Respiratory Compound Preparations - two or more per form; oral; under 16 (RR):

	1979	1980	1979+1980
Number of doctors prescribing	14	11	23
Percentage of doctors prescribing	6.7	5.3	11.0
Total number of forms issued	17	12	29
Of doctors prescribing:			
mean number of forms	1.21	1.09	1.26
range	1-2	1-2	1-3

Table 19

RESPIRATORY COMPOUND PREPARATIONS (RCPs):

Cost of prescriptions in September 1979, 1980.

	1979	1980
Average number of RCPs per prescribing doctor	10.4	10.4
Average net cost per RCP prescription	£.83	£.96
Average cost of RCP prescription per prescribing doctor per month	£8.63	£9.98
Average cost of RCP prescription per doctor (prescribing or not prescribing) per month	£8.11	£9.48

Table 20

RESPIRATORY COMPOUND PREPARATIONS (RCPs):

Prescriptions in September 1979 and 1980 by a random sample of 21 doctors according to combination with other drugs.

GP No.	RCPs Only	RCP + Antibiotic	RCP + Something Else	All RCPs
1	14	-	2	16
22	15	2	3	20
25	14	10	9	33
38	16	3	1	20
51	6	55	11	72
84	3	6	2	11
96	4	16	3	23
102	12	-	2	14
134	7	44	10	61
177	2	-	1	3
201	5	1	2	8
255	8	3	-	11
262	9	1	2	12
224	3	5	3	11
408	18	6	6	30
431	7	1	-	8
459	7	3	1	11
510	2	14	2	18
544	1	1	2	4
614	12	7	4	23
633	7	-	6	13
Total	172	178	72	422
Mean per doctor	8.2	8.5	3.4	20.1

Table 21

RESPIRATORY COMPOUND PREPARATIONS (RCPs):
Proprietary names of preparations issued in September 1979 and 1980 by a random sample of 21 doctors

GPNo.	AC	LE	DS	DT	PH	BE	TR	DC	Other	GRAND TOTAL
1	6		4	2	4					
22	6		3	10	1					
25	1		22	9					Squill, Opiate (1)	
38		1	15	4						
51	19		2	1	23	4	8	11	Alupent Exp.(4)	
84		2	3				1		Eskornade(5)	
96	15	1			Alupent Exp.(4), Eskornade (3)					
102	9	1	4							
134	19		Lotussin (15), Tixylix (25), Pholtex (2)							
177			3							
201	3		4		1					
255	2		2	1	3	1	Pholtex(1), Triotussic(1)			
262	1		1	2			6		Triotussic(2)	
224	1						3	6	Davenol (1)	
408	2						25	3		
431	5			1			2			
459	9			1		1				
510	1				9				Tixylix (8)	
544	4									
614	2		12	2		2	2	1	Dimotane Exp.	
633				6	3				Triogesic (4)	
Total	105	5	81	36	41	8	47	21	78	422
%	25	1	19	9	10	2	11	5	18	100

Key: AC = Actifed, LE = Linctified expectorant,
DS = Dimotapp syrup, DT = Dimotapp LA tabs,
PH = Phensedyl, BE = Benylin, TR = Triominic,
DC = Dimotane plus codeine

Table 22

PERSONAL DETAILS AND HAZARDOUS DRUGS:

Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by sex

	Prescribed			
	No	Yes	(%)	
Female	24	10	(29)	34
Male	106	69	(39)	175
	130	79		209

chi-square = 0.83 p = 0.363 d.f. = 1

Table 23

PERSONAL DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by year of first medical degree

	Prescribed			
	No	Yes	(%)	
1934 - 54	42	25	(37)	67
1955 - 65	41	31	(43)	72
1966 - 75	47	23	(33)	70
	130	79		209

chi-square = 1.58 p = 0.454 d.f. = 2

Table 24

PERSONAL DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by year of full registration

	Prescribed			
	No	Yes	(%)	
1934 - 56	46	27	(37)	73
1957 - 67	40	29	(42)	69
1968 - 76	44	23	(34)	67
	130	79		209

chi-square = 0.89 p = 0.642 d.f. = 2

Table 25

PERSONAL DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by number of persons on NHS prescribing list in 1979

	Prescribed			
	No	Yes	(%)	
less than 2000	37	25	(40)	62
2000 -	69	38	(36)	107
3000 or more	24	16	(40)	40
	130	79		209

chi-square = 0.49 p = 0.784 d.f. = 2

Table 26

TRAINING DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by origin of first medical degree.

	Prescribed			
	No	Yes	(%)	
UK	126	71	(36)	197
Overseas	4	8	(67)	12
	130	79		209

chi-square = 3.30 p = 0.069 d.f = 1

Table 27

TRAINING DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by possession of higher medical degrees.

	Prescribed			
	No	Yes	(%)	
No degree	80	59	(42)	139
Degree	50	20	(29)	70
	130	79		209

chi-square = 3.25 p = 0.072 d.f = 1

Table 28

TRAINING DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether known to have undertaken paediatric training for 6 months or more, or possessed DCH

	Prescribed			
	No	Yes	(%)	
Paediatrics	25	5	(17)	30
No Paediatrics	105	74	(41)	179
	130	79		209

chi-square = 5.64 p = 0.018 d.f = 1

Table 29

TRAINING DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether received vocational training allowance in 1982.

	Prescribed			
	No	Yes	(%)	
Allowance	20	11	(35)	31
No allowance	110	68	(38)	178
	130	79		209

chi-square = 0.01 p = 0.930 d.f. = 1

Table 30

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by number of doctors in the practice

	Prescribed			
	No	Yes	(%)	
Single handed	8	2	(20)	10
Group of 2 - 4	55	33	(38)	88
Group of 5 or more	67	44	(40)	111
	130	79		209

chi-square = 1.51 p = 0.469 d.f. = 2

Table 31

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether the practice was health centre based.

	Prescribed			
	No	Yes	(%)	
Based	29	35	(65)	54
Not based	101	54	(35)	155
	130	79		209

chi-square = 6.60 p = 0.010 d.f. = 1

Table 32

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether the practice dispensed in 1979 or 1980.

	Prescribed			
	No	Yes	(%)	
Dispensing	19	8	(30)	27
Not dispensing	111	71	(39)	182
	130	79		209

chi-square = 0.53 p = 0.468 d.f. = 1

Table 33

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether the practice had changed premises between 1978 and 1982.

	Prescribed			
	No	Yes	(%)	
Changed	20	2	(9)	22
Not changed	110	77	(41)	187
	130	79		209

chi-square = 7.31 p = 0.007 d.f. = 1

Table 34

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether partner(s) left practice between 1978 and 1982 (not due to retirement or death).

	Prescribed			
	No	Yes	(%)	
Left	25	17	(40)	42
Not left	105	62	(37)	167
	130	79		209

chi-square = 0.05 p = 0.824 d.f. = 1

Table 35

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether there was a woman doctor in the practice (including study doctor).

	Prescribed			
	No	Yes	(%)	
Woman	68	43	(39)	111
No woman	62	36	(37)	98
	130	79		209

chi-square = 0.02 p = 0.877 d.f. = 1

Table 36

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether the practice had a GP trainee 1978 - 1982.

	Prescribed			
	No	Yes	(%)	
Trainee	72	42	(37)	114
No trainee	58	37	(39)	95
	130	79		209

chi-square = 0.03 p = 0.866 d.f. = 1

Table 37

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether a 1st/2nd year medical student was attached to the practice 1978 - 1982.

	Prescribed			
	No	Yes	(%)	
Attached	31	15	(33)	46
Not attached	99	64	(39)	163
	130	79		209

chi-square = 0.42 p = 0.516 d.f. = 1

Table 38

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 whether a 3rd/4th year medical student was attached to the practice 1978-1982.

	Prescribed			
	No	Yes	(%)	
Attached	42	16	(28)	58
Not attached	88	63	(42)	151
	130	79		209

chi-square = 2.99 p = 0.084 d.f. = 1

Table 39

PRACTICE DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 whether a 5th/final year medical student was attached to the practice 1978 - 1982.

	Prescribed			
	No	Yes	(%)	
Attached	64	33	(34)	97
Not attached	66	46	(41)	112
	130	79		209

chi-square = 0.82 p = 0.365 d.f. = 1

Table 40

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by ratio of non-manual to manual workers of neighbourhood 1971

	Prescribed			
	No	Yes	(%)	
Less than 0.3	55	26	(32)	81
0.3 -	24	17	(41)	41
0.4 or more	51	36	(41)	87
	130	79		209

chi-square = 1.83 p = 0.400 d.f. = 2

Table 41

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by unemployment rates of neighbourhood 1981.

	Prescribed			
	No	Yes	(%)	
less than 5.5%	43	26	(38)	69
5.5% -	33	23	(41)	56
8.0% or more	54	30	(36)	84
	130	79		209

chi-square = 0.41 p = 0.814 d.f. = 2

Table 42

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by owner occupation of households in neighbourhood 1981.

	Prescribed			
	No	Yes	(%)	
Less than 55%	26	13	(33)	39
55% -	34	23	(40)	57
57% or more	70	43	(38)	113
	130	79		209

chi-square = 0.49 p = 0.782 d.f. = 2

Table 43

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by percentage of households with children without exclusive use of amenities in neighbourhood (ie lack/share bath and/or inside WC) 1981.

	Prescribed			
	No	Yes	(%)	
less than 0.8%	53	41	(44)	94
0.8% -	31	18	(37)	49
1.6% or more	46	20	(30)	66
	130	79		209

chi-square = 2.95 p = 0.228 d.f. = 2

Table 44

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by percentage of households with children living at high room densities in neighbourhood (one plus persons per room) 1981.

	Prescribed			
	No	Yes	(%)	
Less than 18%	47	38	(45)	85
18 - 23%	48	18	(27)	66
23% or more	35	23	(40)	58
	130	79		209

chi-square = 4.92 p = 0.085 d.f. = 2

Table 45

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by youth crime level (offenders per 10 - 16 year olds) 1978.

	Prescribed			
	No	Yes	(%)	
less than 4%	39	13	(25)	52
4 - 6%	52	45	(46)	97
more than 6%	39	21	(35)	60
	130	79		209

chi-square = 6.87 p = 0.032 d.f. = 2

Table 46

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by rate of children in care (per thousand children under 18 years) 1977-78.

	Prescribed			
	No	Yes	(%)	
2.7 and less	46	36	(44)	82
More than 2.7	83	43	(34)	126
	129	79		208

chi-square = 1.62 p = 0.203 d.f. = 1

Table 47

NEIGHBOURHOOD DETAILS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by population density (persons per hectare) 1978.

	Prescribed			
	No	Yes	(%)	
less than 5.0	25	12	(32)	37
5.0 -	38	23	(38)	61
25.0 or more	67	44	(40)	111
	130	79		209

chi-square = 0.61 p = 0.736 d.f. = 2

Table 48

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by number of FP10 forms issued to anyone in September 1979.

	Prescribed			
	No	Yes	(%)	
less than 800	35	15	(30)	50
800 - 1099	40	24	(38)	64
1100 - 1399	37	17	(32)	54
1400 or more	18	23	(56)	41
	130	79		209

chi-square = 8.05 p = 0.045 d.f. = 3

Table 49

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by average net ingredient cost per FP10 issued to anyone in September 1979 - 1980.

	Prescribed			
	No	Yes	(%)	
less than £2.20	49	25	(34)	74
£2.2 -	45	28	(38)	73
£2.50 or more	36	26	(42)	62
	130	79		209

chi-square = 0.97 p = 0.616 d.f. = 2

Table 50

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by number of FP10 forms issued to children (under 16 years) in September 1979.

	Prescribed			
	No	Yes	(%)	
20 -	43	11	(20)	54
51 -	48	30	(38)	78
81 and over	39	38	(49)	77
	130	79		209

chi-square = 11.36 p = 0.003 d.f. = 2

Table 51

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by average number of prescriptions per FP10 form issued to children (under 16 years) in September 1979 - 1980.

	Prescribed			
	No	Yes	(%)	
less than 1.25	41	17	(29)	58
1.25 -	49	27	(35)	76
1.35 or more	40	35	(47)	75
	130	79		209

chi-square = 4.45 p = 0.108 d.f. = 2

Table 52

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by percentage of FP10 forms written by ancillaries for children (under 16 years) in September 1979.

	Prescribed			
	No	Yes	(%)	
less than 10%	53	30	(36)	83
10% -	40	26	(39)	66
20% or more	37	23	(38)	60
	130	79		209

chi-square = 0.18 p = 0.916 d.f. = 2

Table 53

GENERAL PRESCRIBING BEHAVIOUR AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by percentage of FP10 forms issued to children (under 16 years) with age stated in September 1979.

	Prescribed			
	No	Yes	(%)	
less than 50%	43	24	(36)	67
50% -	49	35	(42)	84
70% or more	38	20	(34)	58
	130	79		209

chi-square = 0.92 p = 0.632 d.f. = 2

Table 54

CURRENT EDUCATIONAL STATUS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether they claimed expenses for formal postgraduate education in 1979 and 1980.

	Prescribed			
	No	Yes	(%)	
Claimed	84	58	(41)	142
Not claimed	43	20	(32)	63
	127	78		205

chi-square = 1.17 p = 0.279 d.f. = 1

Table 55

CURRENT EDUCATIONAL STATUS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether they were a GP Trainer 1978-1982.

	Prescribed			
	No	Yes	(%)	
GP trainer	23	12	(34)	35
Not trained	107	67	(39)	174
	130	79		209

chi-square = 0.08 p = 0.780 d.f. = 1

Table 56

CURRENT EDUCATIONAL STATUS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether a 5th/final year medical student was attached to the doctor 1978 - 1982.

	Prescribed			
	No	Yes	(%)	
Attached	16	10	(38)	26
Not attached	114	69	(38)	183
	130	79		209

chi-square = 0.02 p = 0.887 d.f. = 1

Table 57

CURRENT EDUCATIONAL STATUS AND HAZARDOUS DRUGS:
Number of doctors prescribing one or more 'Hazardous' drugs in September 1979 or 1980 by whether a medical student (any year) was attached to the doctor 1978-1982.

	Prescribed			
	No	Yes	(%)	
Attached	21	13	(38)	34
Not attached	109	66	(38)	175
	130	79		209

chi-square = 0.02 p = 0.892 d.f. = 1