

The computer research network of the Royal New Zealand College of General Practitioners: an approach to general practice research in New Zealand

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SUMMARY

Computers are now in widespread use by general practitioners (GPs) in many countries. In New Zealand this development has advanced general practice research by enabling collaboration among a small population of doctors practising in geographically diverse locations. This paper reviews the establishment of the Computer Research Network of the Royal New Zealand College of General Practitioners (RNZCGP) and its development between 1990 and 1995. The Network consists of 181 general practices (approximately 450 GPs) from throughout urban and rural New Zealand. All participants use computers in their practices to record consultation notes and to generate prescriptions, investigations and referral forms. Computer programs developed in the RNZCGP Research Unit are run on commercial software in doctors' surgeries to provide anonymous, individual data. In addition to the routine analysis of utilization for feedback to participants, 13 research projects have been completed. These include investigations of access to general practice care, use of health services by individuals and families, surveillance of immunization uptake, epidemiology of common conditions, and the use of pharmaceuticals in general practice. The RNZCGP Computer Research Network is an example of a computerized general practice research network that has been productive without receiving significant financial resources or having a formal management structure.

Keywords: Royal New Zealand College of General Practitioners; computerized practices.

Introduction

NEW Zealand is similar to the United Kingdom (UK) in land mass, climate, culture and its health system structure. Its population, however, is only one twentieth of the size. In such a dispersed population, forming groups of GPs to collaborate in research becomes problematic.

The RNZCGP Computer Research Network was conceived in 1989 as a tool for general practice research. Having recognized that the country's geography limited our ability to form networks in ways that had been used overseas, it was understood that an increase in the use of computers in general practice offered a way to overcome this barrier. The population of GPs in New Zealand has remained stable at about 2500 for the last decade,

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and in 1988 it was estimated that 17% of all New Zealand general practices relied on computers for at least some accounting and administration functions.¹ At this time, approximately 20 different medical computer systems were in use in New Zealand. They were used for a variety of purposes, were often targeted at different groups of health care providers, and were run under a variety of operating systems. In 1994, 82% of practices in one region used computers in their surgeries.²

Early participation in the Research Network was limited by the requirement that practice computers should hold all consultation records and be used to generate prescriptions and investigation request forms. This restricted the number of available systems that could be included, and participation was further limited by the fact that even where computer systems were capable of carrying out these functions they were often not used for this purpose. Only GPs who used their computers in this way were invited to participate in the RNZCGP Computer Research Network. Although there is still some wariness in the UK about running 'paperless' general practices,³ in the early 1990s in New Zealand this was seen as a primary goal in general practice computerization. Record duplication is uncommon because there are no legal requirements necessitating the maintenance of patient paper records in addition to those held on computer.

This paper describes the philosophy underlying the Network development, its methods and some of its research projects.

Philosophy

The RNZCGP Research Network started from a philosophical base that celebrates the diversity of general practice. Therefore, the tensions between protecting this diversity and preserving scientific rigour had to be dealt with. We aimed to develop a practical, ethical, long-term means of undertaking research in general practice by adjusting research methods to the everyday procedures of general practice teams, rather than asking doctors and nurses to change the way they recorded care in order to accommodate research requirements.

Other computerized general practice research groups use classification systems to help standardize their research data, but this may cause problems. In one study, some computer systems prohibited certain codes and additional notes had to be made as free text in order to convey an accurate message.⁴ These notes were then inaccessible to data extraction programs that depended on the use of codes. The RNZCGP Computer Network was initiated before classification systems were routinely included in New Zealand medical software packages, so although we are not opposed to their use, neither are we reliant upon them. Clinical notes made by practice staff were, and still are, the main source of research data for studies investigating clinical conditions.^{5,6,7} In 1995, Read codes⁸ were introduced by one software system with most other software developers now planning their introduction. However, codes are currently only used to distinguish the free text from the clinical notes.

GPs who contribute to the network are a self-selected group.

An earlier network in this country⁹ had attempted to address fundamental questions of scientific rigour by enrolling a random selection of GPs, but it foundered because the critical personal characteristics that make involvement in research successful were not found in a random selection of participants. In contrast, we sought collaboration with doctors who were enthusiastic to contribute to general practice research and committed to accurately recording information about patients on their computers. We addressed the problem of working with data provided by a non-random selection of GPs from the other end. The issue relates to biases in selected data collections, which could affect the generalizability of results. We tried to identify and understand the direction of these biases in a study that compared data from a group of randomly selected doctors.¹⁰ This study aids an interpretation of results from subsequent research.

An early decision to work with practices using commercially retailed computer systems was made. We developed our own search programs rather than depending on those incorporated in the software. This was to ensure that all the details required for research could be extracted successfully.

Ethical issues — confidentiality

Addressing the ethical principles governing the processes for research by the network has been a major ongoing challenge. When the Computer Research Network was established, New Zealanders were without the protection of privacy legislation. However, the Cartwright Inquiry¹¹ into unethical medical research behaviour has ensured that ethical issues in medical research are treated with sensitivity. In 1994, the Health Information Privacy Code (1994) was enacted. This states that health information obtained for one purpose (e.g. keeping a record of care provided to individual patients) may be used for health research if the approval of an ethics committee is obtained, and if information that will enable the identification of a person has been removed.¹²

Before the Computer Research Network started, the concept was reviewed and approved by the Otago Area Health Board Ethics Committee, which ruled that we could proceed provided the data we dealt with were anonymous. Each subsequent research proposal has been reviewed by this committee (now the Southern Regional Health Authority Ethics Committee) and approved before data gathering or analysis has started.

Using a unique alphanumeric code (the National Health Index number (NHI)), rather than names, has made it possible to individualize records without identifying patients. The NHI has been used in New Zealand since 1976 for patients entering the secondary health care system. It is a method of identification which is applicable throughout an individual's lifetime. The codes are widely used throughout the secondary care system, so complementary primary and secondary health care components can be examined together. NHI codes are now in widespread use in general practices in some parts of New Zealand, although prior to our research in 1990¹⁰ no individual had such a code without having had secondary care contact. Other ethical issues affecting the network relate to the transfer of data, protecting confidentiality, and issues of ownership. These continue to be debated, both among primary care teams and in the literature.^{13,14}

The RNZCGP research unit

The RNZCGP Computer Research Network is a development of the Dunedin RNZCGP Research Unit. This unit was established in 1984 by a single \$7000 grant from the RNZCGP, and is maintained by further research grants from peer-reviewed research-

funding agencies and the pharmaceutical industry.

General practitioners, practices and patients

Initially, GPs were recruited by a letter from one of the authors (MT), which was sent out to those on the mailing lists of medical software retailers. The letter explained the network concept and invited expressions of interest from doctors who used computers comprehensively in their management of practice records. Because many did not use all the functions of their system, only 20% of those originally contacted (50/250) provided an immediate positive response. With growing computer competence, more have indicated their willingness to participate in the network. Additional GPs have become participants after hearing of the network's activities at educational meetings and conferences.

Currently, the network comprises approximately 450 GPs (about 16% of the country's GPs). They practice in 181 practices in a variety of settings and locations throughout the country. Self-selection into the network has resulted in a geographical skew; however, the two biggest clusters of practices are at opposite ends of the country, in Auckland and Otago, providing a reasonable north/south balance. Female GPs are under-represented in the total of network doctors, but no significant difference has been demonstrated in the characteristics of the patients, the reasons for patient attendance, or the outcome from the attendance (prescribing, investigations or referrals) from other practices.¹⁰ The average patient population per GP is 1800. Information is retrievable on the general practice care of about 810 000 people (23% of the country's population).

Structure

The RNZCGP Computer Research Network has little infrastructure. There are no managerial overheads, no fees, and no network board of directors. Apart from their own practice organization, there is no hierarchy among the 450 independent GPs comprising the network. Practices may nominate a network 'representative doctor', or doctors within a practice may choose to interact individually with the network. A core staff of five (administrator, pharmacist, economist, computer programmer and systems developer) work in the RNZCGP Research Unit and assist with the design and implementation of a wide range of research studies, including those conducted by the RNZCGP Computer Research Network. The authors are also involved in the design and analysis of most network studies. The Director of the RNZCGP Research Unit (MT) coordinates and guides network research.

Funding

Funding for research staff and facilities is on a project-by-project basis. Table 1 includes a list of funding sources. This insecure and unpredictable funding has been augmented recently by the Researched Medicines Industry (RMI) of New Zealand, an association of all the research-based pharmaceutical companies operating in New Zealand. They provide an annual grant (administered by the University of Otago) that covers the salaries of core staff and equipment maintenance, and facilitates continued contact with network participants.

Funding for practice computing facilities has come from the participating doctors themselves. Although some public funding to assist with computerization is now available in some regions, the RNZCGP Computer Research Network was established before there was any such assistance.

Table 1. RNZCGP Computer Research Network studies

Research area	Research topic	Publication	Funding agency
Methods	Biases in network studies	Tilyard 1995 ¹⁰	HRC
Clinical areas	Hepatitis B immunizations	Wilson 1995 ⁷	NZCDC
	Upper respiratory tract infections	McGregor 1995 ⁶	HRC
	Influenza immunizations	in press	HRC
	Urinary tract infections	not yet published	HRC
	Contraception	not yet published	RNZCGP RU
	Diabetes	not yet published	RNZCGP RU
Prescribing studies	Presentation of abdominal pain in general practice	in press	HRC
	NSAID use	Taylor 1994 ⁵	Otago University
	Antihypertensives	Penrose 1996 ²¹	RMI
Utilization studies	Differences between prescribed and dispensed medicines	Gardner 1996 ²²	HRC
	Total health care of a general practice population	Tilyard 1991 ¹⁵	RNZCGP RU
	Effect of socioeconomic factors on total health care utilization	Dovey 1992 ¹⁶	RNZCGP RU
	Effect of the 1989 health benefits package on consulting/prescribing	Tilyard 1991 ²²	RNZCGP RU
	General practice fees	Dovey 1991 ²³	RNZCGP RU
	Changes in general practice fees	Tilyard 1996 ²⁰	RNZCGP RU

HRC = Health Research Council of New Zealand; NZCDC = New Zealand Communicable Diseases Centre; Otago University = Otago University Student Project; RMI = Researched Medicines Industry of New Zealand; RNZCGP RU = RNZCGP Research Unit (Dunedin); no outside funding sought.

Search programs and data

Initially, search programs were written and compiled in Pascal by the Research Unit programmer and posted to contributing general practices on diskette. Programs were run overnight in the practice, and relevant information was copied from the computer onto diskette or tape, which was then returned to the Research Unit. The free text in the consultation notes field is electronically searched for terms referring to conditions, using specific search strategies involving synonyms and similar words. Records identified by this process are then visually scanned and redundant records removed. As an alternative to running individual search programs that address specific questions, we are now developing a definitive database that holds all records from each participating practice. This database permits an examination of trends in activity rates over time, as well as investigations of specific types of event. Electronic data downloading via wide area networks is not yet a reality, but it is a logical extension of the data gathering methods that we are currently developing.

We have collaborated with our local public hospital to develop software to allow an interrogation of their database. This linkage depends on the allocation of the NHI to patient records held in general practice. Differences between the hospital and primary care computer systems are substantial in terms of the platforms they run on, the languages they are written in, and the structure they use. These differences are accommodated by our search programs, which deliver DOS-readable ASCII files that are then read into databases similar to those coming from general practice computers, and matched using the NHI field. In this way, we can access both primary and secondary health care data of individuals without identifying them by name. This process has been used in two studies of health care utilization to date.^{15,16}

Data entries are made by doctors and their staff. Generally, practice software systems ensure that data is complete with entries in all fields. This is an important difference between

'computerized' and more traditional general practice research. In a study of the biases in estimates from the RNZCGP Computer Research Network,¹⁰ we found that 7% of data were missing data from the control group (doctors from practices not fully computerized), compared with only 1.7% missing from Computer Research Network practices. Having all the data recorded diminishes the problem of meaningless data – a problem noted by others involved in computerized general practice research.¹⁷

In the RNZCGP Research Unit, conversion programs are run to transform ASCII files from practices using different medical software systems into relational databases with a standardized format. The database management system used is Paradox (version 4.5, Borland International Corporation). These databases are then analysed using one or both of the statistical packages SPSSX (Statistical Package for the Social Sciences) and SAS (developed by the SAS Institute, Cary, NC).

Routine data analysis

On receipt of data from the practices, the first response is to create a general report for early feedback to participants. This report summarizes each participant's practice characteristics and presents these results alongside a similar analysis for all practices. In this way, participants may make judgements about their own practice population, consultation, prescribing and investigation rates, using a larger population of their peers as a reference.

Research projects

To date, 13 separate projects have been completed using data from the network (Table 1), with a further four currently being undertaken. We have found that a wide range of analytic approaches is possible.

The procedures are now in place for a continuous monitoring of health service utilization. We have reported on the total (pri-

mary and secondary) care of one practice population in a pilot study¹⁵ and have examined the use of public health care services by different groups of families.¹⁶ In a health system undergoing rapid change, research from the network has indicated that the effect of one government policy change was as predicted with regard to increasing access to general practice care and reducing expenditure on pharmaceuticals.¹⁸ We have also shown that the impact of patient charges differs between some groups of patients,¹⁹ and that, over the first three years of the New Zealand health reforms, changes in the subsidy regimes reduced access to general practice care for some, in spite of GPs subsidizing an increased number of consultations themselves.²⁰

Prescribing studies have also been undertaken. These include a study of non-steroidal anti-inflammatory drug use,⁵ the pattern and costs of antihypertensive prescribing over a three-year period,²¹ and a study of upper respiratory tract infections and the outcome of pharmacological treatment.⁶ Another project investigated the differences between medicines prescribed by doctors and dispensed by pharmacists, identifying groups of patients who were less likely than others to have their prescription filled.²²

Future projections

The RNZCGP Computer Research Network provides an example of a productive, economical research tool that has avoided, accommodated or overcome many of the problems in computer-based general practice research. Until now, questions such as 'Who uses general practice services? What care do they receive? and with what result?' have been difficult to address in a meaningful way. The network is starting to tackle these questions and we believe that it will continue to do so in the future.

Computerization of general practice in New Zealand is now well established and will continue to expand with the health system's increased demands for information. This has positive implications for the future of the network in that computer use will increasingly become the norm rather than the eccentric activity it was when the network started.

In the future, ethical issues relating to the collection, transfer, collation, and use of data from general practice computers must be clarified and standards uniformly applied and accepted. The RNZCGP Computer Research Network demonstrates that research data from computerized general practices is already a viable option for the 1990s. We believe that the achievements of this network demonstrate the potential of computer based research networks in exploring primary health care.

References

1. Wallis C. Computer usage amongst New Zealand general practitioners. *New Zealand Family Physician* 1988; **16**: 88-90.
2. Tilyard MW, Dovey SM, Simmers D. *Report to the Southern Regional Health Authority on computerization*, Otago, New Zealand: University of Otago Press, 1994.
3. Purves IN. The paperless general practice. *BMJ* 1996; **312**: 1112-1113.
4. Hobbs FDR, Hawker A. Computerized data collection: practicability and quality in selected practices. *Fam Pract* 1995; **12**: 221-226.
5. Taylor D, Clark DWJ, Dovey SM, Tilyard MW. The prescribing and adverse reactions of nonsteroidal anti-inflammatory drugs in general practice: a Dunedin study. *N Z Med J* 1994; **107**: 263-266.
6. McGregor A, Dovey S, Tilyard M. Treatments for upper respiratory tract infections in New Zealand. *Fam Pract* 1995; **12**: 176-180.
7. Wilson N, Dovey S, Bandaranayake D, Tilyard M. Delivery of hepatitis B immunizations in a selection of computerized practices. *N Z Med J* 1995; **108**: 36-38.
8. Chisholm J. The Read clinical classification. *BMJ* 1990; **300**: 1092.
9. Kljakovic M, Seddon TDS, Reinken JA, McLeod DK. The rise and fall of a general practice information network. *New Zealand Family Physician* 1992; Autumn: 73-76.

10. Tilyard MW, Dovey SM, Spears GFS. Biases in estimates from the RNZCGP Computer Research Group. *N Z Med J* 1995; **108**: 118-121.
11. Cartwright SR. *The report of the committee of inquiry into allegations concerning treatment of cervical cancer at National Women's Hospital and into other related matters*. Auckland: Government Printing Office, 1988.
12. New Zealand Government. *Information Privacy Code* 1994. Auckland: Privacy Commissioner, 1994.
13. Buchan H, Paul C. When important social interests compete with privacy. *N Z Med J* 1992; **105**: 492-493.
14. Townsend T. Information transfer on general practice - ethical issues. *New Zealand Family Physician* 1993; Spring: 159-160.
15. Tilyard MW, Phillips DE, Dovey SM, et al. The health services utilization of a general practice population. *N Z Med J* 1991; **104**: 463-465.
16. Dovey SM, Tilyard MW, Phillips DE, Whitney RK. The effect of employment status and household composition on health care utilization in a New Zealand general practice. *N Z Med J* 1992; **105**: 188-190.
17. Sackett DL. Bias in analytic research. *Journal of Chronic Disorders* 1979; **32**: 51-63.
18. Tilyard MW, Dovey SM. The effects of the 1989 health benefits package on prescribing and consulting patterns in general practice. *N Z Med J* 1991; **104**: 204-206.
19. Dovey SM, Tilyard MW. Fees charged to a consulting population in general practice. *N Z Med J* 1991; **104**: 222-225.
20. Tilyard MW, Dovey SM. Changes in charges for general practice consultations 1989-1993. *N Z Med J* 1996; **109**: 252-254.
21. Penrose A, Dovey SM, Tilyard M. Trends in antihypertensive prescribing. *N Z Med J* 1996; **109**: 4-7.
22. Gardner TL, Dovey SM, Tilyard MW. Differences between prescribed and dispensed medications. *N Z Med J* 1996; **109**: 69-71.

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