Evolution, not revolution: measurement and management of health outcomes in New Zealand through efficient use of national information systems

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Abstract

The development of health information systems is not always successful, and there is an emerging perception that money and time that could be better directed to patient care are being wasted on these systems. This paper examines the difficulties faced in creating successful information systems in health services, and suggests strategies for overcoming these difficulties. The development of information systems is a precursor to the use of data in the management of processes which lead towards improved health outcomes. It is argued that before embarking upon difficult and costly new developments, researchers should treat existing sources of data as their first point of call, and New Zealand’s existing national data sources are described in detail. Ways in which these data are being used to develop outcome measures are discussed, and it is concluded that through a multidisciplinary approach existing resources could be utilised more efficiently and effectively to achieve this goal.

Introduction

Whether information systems can add value to, or be an instrument of change within, the health care (or any other) sector has been hotly debated over recent years. Both academic and industry literature is overflowing with stories of expensive failures in information systems (Heeks, Mundy & Salazar 1999; Myers and Olesen 1999; Joch 1995). This has led one researcher to remark with acerbity that:

...the Health IT literature is dominated with hopeful pilot case studies, subsequently overwhelmed with reviews of failures and with the occasional strategic vision document thrown in as to how it should be done right next time. (Orr 2000: 2).

In academic research one is expected to demonstrate familiarity with the existing body of knowledge before adding one’s own contribution.

If, as suggested above, the literature is dominated by accounts of failure, then it would hardly be surprising if such failure was seen to be the norm and this notion was then perpetuated in subsequent research. Indeed, the industry press and the mainstream media alike do seem to be gripped by the perception that information systems failure is common. This phenomenon is not restricted to the health sector, but seems rather to be a condition of large, complex bureaucracies of all kinds (Collins & Bicknell 1998; Glass 1998).

This paper explores two issues within the New Zealand context. First, the concept of obtaining good outcomes by the use and development of health information systems as a precursor to measuring outcomes in health services is examined. Second, the question of how existing sources of information can be more effectively utilised in this endeavour is considered. The paper concludes with suggested approaches that could be adopted to establish useful information linkages between datasets and the quality-of-care indicators that could result from these strategies.

Success and failure in information systems

There can be little doubt that throughout the world there continues to be difficulty in realising value in the development of information systems (Strassman 1997), and the health care sector is no exception. In fact the health sector has been referred to as ... still a rather immature user of information technology compared to other parts of society (Klein 2002: 103), and the UK Audit Commission has remarked that:

Many [hospital] Trusts are held back by a vicious circle of poor understanding of information issues, negative attitudes and inadequate representation at the top of the organisation. (UK Audit Commission 1995: 41).

Perhaps of greater concern is the suggestion in the same report that in some cases as little as 10% of the facilities of information systems are being used.

Recent research within the New Zealand context has shown that similar issues abound in the primary care setting. It is much easier to find problems and difficulties than to find real benefits that can be attributed to information systems. Stebakova (2001) has concluded:

The results ... within an Integrated Practitioner Association, and doctor’s attitude towards computerisation of General Practice suggest that the existing problems in information technology development within primary care mirror the general problems of computerisation of health care not only nationwide but also in other countries, eg, USA, United Kingdom, Canada and Australia. (Stebakova, 2001: 68).

With respect to successful outcomes in obtaining better information, as opposed to data (Isaac 2002), a superficial scan of the history of health information systems in New Zealand is no more encouraging. The Wave Report, published by the Ministry of Health in 2001, outlined a series of significant structural issues concerning health information in the New Zealand context, and made 79 recommendations along eight separate workstreams (Ministry of Health 2001).

With necessity, such a broad coverage of the issues cannot concentrate on any single area, and the Wave Report...
does not explore in any length the causes of failures. The writers of the report seem to be aware of potential future problems with strategy implementation when they indicate that if the recommendations are not acted upon rapidly...the sector will be writing another large-scale sector information strategy in five years time (Ministry of Health 2001: 63).

Unfortunately, it is precisely this desire to undertake significant change in a short period of time that often creates problems in the first place, and it is easier to devise strategy than to implement it. It has been reported that over 90% of people surveyed in a business context had been involved in developing a strategy, while less than 35% had successfully implemented one (Kaplan & Norton 1992). The Wave Report itself refers to the health sector as being awash in strategy. Researchers have noted that the successful implementation of health information systems is not an impossible task, but it does require considerable expertise as well as patience and tenacity over time (Gamm et al 1998; Gordon & Geiger 1999). Others have suggested that the definition of success is in itself problematic, since conditions that existed when the success was declared can rapidly change (Larsen & Myers 1999).

The above observations indicate that the difficulty of merely creating an information system in the first place is so great that the ability to make use of it subsequently is impaired, almost as if the original purpose of the system becomes forgotten in the process of building it. People and organisational problems of this nature are not new, nor are they technological (Lorenzi et al 1997). Even with good intentions, failure to understand the complexity of the health sector and the different needs of groups within it can lead to imperfect outcomes in the development of information systems (Myers & Young 1997).

On a more optimistic note, a growing body of evidence indicates that it is possible to obtain good results in this area. Recent studies demonstrate that improvements in the quality of care result from the availability of better information, which, in turn, is derived from better information systems (Gordon & Geiger 1999; Chu 2002; Ondo et al 2002; Nahm & Poston 2002).

**Health informatics and information management**

Health informatics has been described as an evolving discipline that sits at the intersection of rapidly changing fields of health and information systems. As such, the discipline lacks a single, standardised definition. Nevertheless, Ball provides a useful working definition of health informatics as *the demonstration of how organisations can use IT to bring their strategic goals from theory into practice* (Ball 2002: 41).

Lorenzi (2000) has defined the cornerstones of health informatics as comprising:

- structures to represent data and knowledge
- acquisition and presentation of data
- management of change
- integration of information.

Lorenzi notes that these cornerstones extend well beyond the skills associated with traditional data processing and information systems and acknowledges that human factors, not technical considerations, constitute the greatest obstacles to informatics success (Lorenzi 2000: 204). Gardner has reinforced this view by stating: *The success of a project is perhaps 80% dependent upon the development of the social and political interaction skills of the developer, and 20% or less on the implementation of the hardware and software technology* (Gardner 1998: 41).

Smaltz (2000) has established the fact that leaders in the development of health informatics need to have, in addition to credentials in the technology arena, the ability to develop metrics for determining the value of enterprise processes. This role Smaltz calls that of the informaticist, a role crucial to the achievement of good information systems outcomes. This view is reinforced by Ball’s statement that *value resides in the relationship between cost containment, customer service and satisfaction, and superior clinical results or outcomes* (Ball, 2002: 41).

The role of the health informaticist in New Zealand is problematic. The discipline has not, until recently, been well supported in academia. Membership in the professional societies has been limited, and New Zealand has not been particularly visible in international health informatics issues, despite considerable success in certain key areas, for example the establishment of the National Health Index (NHI). Consequently, the number of properly trained and knowledgeable health informatics workers in New Zealand is insufficient to fulfil the demand for these skills.

Skilled health information managers are in short supply. This is partly an economic issue; the relatively small New Zealand population will not support large numbers of highly specialised knowledge workers in any field. It is also an issue of perceived value; District Health Boards striving to remain fiscally responsible and live within their means are forced to make hard choices about what will be supported and what cannot be supported. The value created by the health information manager is realised primarily in the long term, and it can be difficult for a small number of specialists to communicate and justify their needs. Information managers tend to be more oriented toward informatics than technology, but there is generally a greater understanding of, and sympathy for, the latter in the ranks of executive management. As a result, the role of the health information manager has not been well established in New Zealand or has been eroded in favour of the role of the information technician. Information technology managers are in general less effective than information managers, and their roles in organisations are of necessity limited to the implementation of technology.

The true health informaticist has an effective understanding of how the health care system works, combined with knowledge of how information technology can be deployed to enhance that system. This concept has equal application in the delivery of clinical care and the management of public health in the widest sense.

Improvements in informatics will ultimately support improvements in health outcomes. It is thus necessary to have an adequate synthesis of health care knowledge and information systems knowledge, as illustrated by the model in Box 1.
Gaps in the jigsaw

The healthcare system in New Zealand has for years been attempting to bridge some very large gaps in information availability. Box 2 shows a model that could be used as a roadmap of the types of information required to effectively manage the health of a national population.

Unfortunately, the current situation in New Zealand resembles the illustration in Box 3.

There is no consistent national data collection for primary care contacts or outpatient events. Gaps also exist in other areas, for example prescriptions, laboratory test ordering and information on other diagnostics. The data do exist, but they are held in different systems that do not interface well (Ministry of Health, 2001), and are either coded inconsistently across the sector or not coded at all. This problem is exacerbated by the considerable variety of systems in use in public hospitals. Orr (2000) has observed that problems arise when we try to cross large gaps between current states and future states in a single bound. Instead, we should attempt to make a number of small incremental steps, each valuable in itself, but contributing to a bridge that crosses the gap.

The following sections discuss the existing information systems and data available in the New Zealand environment. It is argued that when seeking information, existing sources of data should be sought first, and approaches that might facilitate this are suggested.

Existing sources of data

No statistician would claim that it is feasible to obtain a perfect data set. Bulk data is by its very nature cumbersome, prone to error and incomplete; nevertheless it cannot be concluded that it is useless. It is therefore necessary to understand the nature of data as indicator rather than fact, although it is commonly assumed that it is not possible to make good decisions in the absence of indisputable data. In health care, this assumption has led to the development of new information systems which are seen as fundamental to the management of the sector. Because health statistics are used to inform key policy initiatives, the fact that strategic managers are accustomed to making decisions from imperfect data needs to be taken into account. In addition, there is a risk that researchers will draw inappropriate conclusions from inherently biased data. Hence there is a need for two levels of data: current data on which management decisions which do not require a high level of rigour are made; and rigorous data used for drawing conclusions relevant to clinical purposes. These levels of data can be derived from the same source, and this is the path taken by the national data collection strategies in New Zealand.

For many years, the New Zealand Ministry of Health and the Health Funding Authority and its predecessors have invested considerably in the collection and dissemination of public health-related data. In recent years, the chief vehicle for this work has been
In general, data within the NZHIS collections are used to provide a mechanism for individually identifying every health care user (HCU) by assigning each a unique number (known as the NHI number). As a registration system, the NHI includes only information needed to identify health care users, such as name, address (including domicile code), date of birth, sex and ethnicity. Coverage is estimated to be 98% of the population.

The unique identifier provided by the NHI is a significant national asset. New Zealand is one of the few countries that has a unique identifier in place for all health users nationally, and was the first country in the world to implement this national unique identifier in 1992. The benefits of a standard unique identifier are well documented. The US Department of Health and Human Services has identified 30 criteria for evaluating a unique identifier (US Department of Health and Human Services, 1998). The New Zealand NHI easily qualifies on 29 of these, with the 30th (cost efficiency) being questionable, and that only in recent years given the steep fall in technology costs since the current NHI was implemented.

**National Health Index**

The National Health Index (NHI) is the cornerstone of health information in New Zealand. It was established to provide a mechanism for individually identifying every health care user (HCU) by assigning each a unique number (known as the NHI number). As a registration system, the NHI includes only information needed to identify health care users, such as name, address (including domicile code), date of birth, sex and ethnicity. Coverage is estimated to be 98% of the population.

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**Contract-based data**

Contract-based data sets are derived directly from hospital information systems in both public and private hospitals. Hospitals are required under their contracts to provide these data. The model is illustrated in Box 4.

Box 5 lists the collections that are contract based.

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**5: Contract-based data sets**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Minimum Dataset</td>
<td>The National Minimum Dataset (NMDS) is a national collection of public and private hospital discharge information for inpatients and day patients. Unit record data are collected and indexed using a valid National Health Index number. The original NMDS was implemented in 1993 and back-loaded with public hospital discharge information from 1988. Data have been submitted electronically in an agreed format by public hospitals since 1993, with limited private hospital discharge information collected since 1997. The current NMDS was introduced in 1999.</td>
</tr>
<tr>
<td>Mental Health Information National Collection</td>
<td>The Mental Health Information National Collection (MHINC) contains information on the provision of secondary mental health and alcohol and drug services purchased by the government. This includes secondary inpatient, outpatient and community services provided by hospitals and non-government organisations (NGOs). The collection does not include information on primary mental health services, for example from GPs. The information collected includes details of services provided and access to services, as well as demographic information (such as sex, date of birth, ethnicity), diagnosis, legal status, and referral and discharge information. The MHINC was started in July 2000.</td>
</tr>
<tr>
<td>National Booking Reporting System</td>
<td>The National Booking Reporting System (NBRS) provides information by health speciality and booking status on how many patients are waiting for treatment, and also how long they have had to wait before receiving treatment. NBRS contains details of all booking status events involving a healthcare user who: ~ receives a priority for an elective medical or surgical service ~ is likely to receive publicly funded treatment. Information about the first specialist assessment, their assessed priority, and their booking status is collected. Hospitals have been required to report data since 1 August 2000.</td>
</tr>
</tbody>
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**6: Model for data sets produced from manual sources**

The New Zealand Health Information Service (NZHIS). NZHIS is responsible for the collection and dissemination of health-related data and operates the National Health Index (NHI), the Medical Warning System (MWS) and a number of other collections of health data. Although charged with the above responsibilities, NZHIS has a stewardship, rather than an ownership, role. The data are held for the public good, and are available, within the constraints of ethics and privacy considerations, to a variety of researchers.

It is useful to understand the nature of existing data collections, and it is suggested that this should be a minimum precursor to any discussion on the creation of new data sets. A précis of the data collections currently operated by NZHIS is given in the following sections. More details, including full specifications for these data sets, can be found online at www.nzhis.govt.nz.

The NZHIS data collections fall approximately into four categories:

- demographic register (National Health Index)
- contract-based data
- data processed from manual sources
- claim-based data.

In general, data within the NZHIS collections are classified using the WHO International Statistical Classification of Diseases and Related Health Problems (ICD), and the WHO International Classification of Diseases for Oncology (ICD-O).
In addition, practice management software is currently estimated to be in use by 80% of general practices for patient administration. Approximately 50% of general practitioners are using software for clinical purposes, such as the electronic generation of prescriptions and electronic recording of details of patient health encounters. Electronic claims from primary care providers number approximately 66 million per year, excluding Accident Compensation Corporation claims.

Box 10 shows the level of electronic information available for research today. It is acknowledged that there are a number of problems and issues with all of this data. However, creating new information systems is difficult and the risk of failure and the cost involved are high. New developments will not necessarily solve this problem. A better use of resources might be to delve into this mountain of treasure and start to make more efficient use of that which already exists. To facilitate this, resources need to be allocated to increasing the availability of the data. This is partly a technological issue, but mostly an issue of governance and accountability, especially with regard to the issue of privacy.

There are numerous examples of the use of the national data sets by researchers to contribute to the body of knowledge. For example, data from NZHIS have been used in a range of studies, both in New Zealand and overseas, including one (published in the Journal of the American Medical Association) which examined a possible link between vasectomy and prostate cancer (Cox et al 2002; Blakely et al 2002).

The Royal New Zealand College of General Practice (RNZCGP) Research Unit, based in Dunedin, has conducted a preliminary study which demonstrates how primary and secondary data from different sources can be linked using an encrypted NHI number to understand primary/secondary utilisation patterns. Use of encrypted NHI preserves the confidentiality of individual patient records, while allowing the benefit of unidentifiable data analysis (Tomlin, 2002).

Work is being carried out by the Clinical Analysis unit of NZHIS, in collaboration with other Ministry of Health staff and overseas researchers, to extract higher value from the existing collections. The following are examples of this work.

### 8: Model for claim-based data sets

![Diagram of data flow](image)

**Primary care** → **ProClaim engine** → **Payment** → **HealthPac** → **Key data** → **Input driven Warehouse** → **Rejects** → **NZHIS**

### Data processed from manual sources

These data sets are derived from coding and data entry of data provided on paper forms as illustrated in Box 6.

### Claim-based data

A significant portion of the NZHIS data sets is derived from data sent to support claims for payment from primary care. In similar fashion to the contract-based data described above, general practitioners, community laboratories and pharmacies are required to provide this information contractually to support payment. HealthPAC, the payments and processing agency, receives and processes the claims. Once the claims are processed, the associated data are passed to NZHIS for storage in the data warehouses. Box 8 illustrates the process. Box 9 shows the data collections.

### Making use of existing data

As has been observed in the UK, the investment of scarce resources in developing new data sets may not be the most effective way of improving measurement of outcomes. Information can be improved using currently available data (UK Audit Commission 1995).

New Zealand already holds a vast mountain of information in the national systems alone. Roughly 70% of laboratory results are sent from community laboratories by electronic messaging to general practitioners.
9: Claim-based data sets

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Maternal and Newborn Information System</td>
<td>The Maternal and Newborn Information System (MNIS) contains data relating to maternity services provided under either section 51 of the Health and Disability Act 1993 or section 88 of the New Zealand Public Health and Disability Act 2000, and inpatient health data from the NMDS. Before 1 July 2002, approximately 70% of pregnancies were recorded (the other 30% were funded through non-standard contracts). From October 2002, all pregnancies are recorded in the MNIS. The MNIS also contains census and geographical information provided by Statistics NZ. The MNIS contains information from March 1998. The data in the MNIS are loaded from the HealthPAC maternity claims system, and the data quality of clinical information provided is variable. The clinical meaning of many of the input records must be inferred, as the records relate to payment for a service rather than to a clinical treatment. Data quality is expected to improve in the future.</td>
</tr>
<tr>
<td>Pharmaceutical Information Database</td>
<td>The PharmHouse contains claim and payment information from pharmacists for subsidised prescriptions that have been processed by HealthPAC. The PharmHouse holds over 270 million claims. Approximately 3.5 million rows of data are added each month. The collection was started on 1 July 1992. Records from before 1996 have been archived, but can be made available on request. The PharmHouse contains claim and payment information from pharmacists for subsidised prescriptions that have been processed by HealthPAC. The PharmHouse holds over 270 million claims. Approximately 3.5 million rows of data are added each month. The collection was started on 1 July 1992. Records from before 1996 have been archived, but can be made available on request.</td>
</tr>
<tr>
<td>Laboratory Claims Data Warehouse</td>
<td>The Laboratory Claims Data Warehouse (Labs) holds data on the primary-care laboratory tests. This data set contains claim and payment information for laboratory tests that have been processed by HealthPAC. It also contains laboratory test information from Pegasus IPA providers. In October 2002, this amounted to over 56 million. Labs was established in 2000 and contains data from July 1997. The Laboratory Claims Data Warehouse (Labs) holds data on the primary-care laboratory tests. This data set contains claim and payment information for laboratory tests that have been processed by HealthPAC. It also contains laboratory test information from Pegasus IPA providers. In October 2002, this amounted to over 56 million. Labs was established in 2000 and contains data from July 1997.</td>
</tr>
<tr>
<td>Immunisation Data Warehouse</td>
<td>The Immunisation Data Warehouse (Imms) was created for use by Ministry of Health policy analysts to measure the actual coverage against the target of 95% of 2-year-olds being fully immunised. Imms contains data on claims from GPs and clinics for subsidised (and some non-subsidised) immunisation visits. The primary focus is on children under the age of 2 years. In October 2002, Imms held over 1.2 million rows of data on vaccine dispensing and visits. Data collected after 1999 are all at a detailed level, and include provider, patient, and immunisation detail. The Immunisation Data Warehouse (Imms) was created for use by Ministry of Health policy analysts to measure the actual coverage against the target of 95% of 2-year-olds being fully immunised. Imms contains data on claims from GPs and clinics for subsidised (and some non-subsidised) immunisation visits. The primary focus is on children under the age of 2 years. In October 2002, Imms held over 1.2 million rows of data on vaccine dispensing and visits. Data collected after 1999 are all at a detailed level, and include provider, patient, and immunisation detail.</td>
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</table>

In-depth Analysis – Fracture of Neck of Femur Part II

The results of this analysis are currently undergoing clinical validation. Surgeons nominated by the New Zealand Orthopaedic Association are assessing work in progress, as well as providing continuing consultation. The objective is to add value to the data collected in the NMDS and assist clinicians with decision making and the identification of areas for improvement. There is evidence of large variation in clinical practice and inconsistent outcomes in terms of complications and deaths.

Cancer Survival Analysis

A feasibility assessment of cancer survival analysis, both relative and cause-specific, is fully completed. The New Zealand Cancer Registry holds over five years of data with robust information regarding clinically relevant prognostic factors. The records can be linked to the NZ Mortality Registry, which contains reliably coded information on the underlying cause of death.

Clinical Benchmarking Data

This benchmarking and performance initiative has been undertaken with the aim of improving quality and cost-effectiveness of health care services, as well as the achievement of better health outcomes. The indicators representing the main aspects of health care are calculated at a Diagnostic Related Group (DRG) level from the hospital discharge data in the NMDS. Data are distributed annually to all District Health Boards, which are encouraged to monitor their performance against benchmarks determined for the same groupings (eg, tertiary hospital in relation to all tertiary hospitals). The benchmarks are set at either the 20th or the 80th centile. This approach provides an indication of possible issues and potential areas of improvement that may be worth looking at in more detail.

Multi-dimensional approach – a template for success

To achieve successful outcomes in health informatics, it is necessary to have an adequate synthesis of health-care knowledge and information systems knowledge, as illustrated by the model in Box 1. How then can we achieve progress in an action-oriented way? If the merit of the model shown in Box 1 is accepted, it becomes necessary to establish adequate synthesis of healthcare knowledge and information systems knowledge to achieve progress.

An example of what can be achieved is illustrated by the Elective Services Performance Indicators website (www.electiveservices.govt.nz/). This initiative uses the data from the National Booking Reporting System (NBRS) and the National Minimum Dataset (NMDS), among other sources, and delivers a series of key performance indicators using business intelligence technology tools. The data provided by NZHIS and other Ministry units, combined with the knowledge of the health care domain provided by the Clinical Ser-
10: Volumes of health transactions and percentages processed electronically

<table>
<thead>
<tr>
<th>Service</th>
<th>Annual volume</th>
<th>% Electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunisation</td>
<td>142,800</td>
<td>95</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>41,538,000</td>
<td>97</td>
</tr>
<tr>
<td>Maternity</td>
<td>414,000</td>
<td>34</td>
</tr>
<tr>
<td>General</td>
<td>6,808,000</td>
<td>97</td>
</tr>
<tr>
<td>Medical</td>
<td>17,602,800</td>
<td>100</td>
</tr>
<tr>
<td>Lab tests</td>
<td>66,505,600</td>
<td></td>
</tr>
</tbody>
</table>

serves Directorate of the Ministry of Health (MoH) and the technical expertise of the website provider, have resulted in an online key performance indicator system that was developed in a matter of months.

Both dimensions of the model are of critical importance. In the absence of clinical interpretation, the data are without context, which is a requirement for good information. Without the technical ability to deliver a sound and useable technology platform, the information cannot be processed and disseminated, and its value is constrained.

**Barriers and enablers**

Performance indicators in health care must be developed within the constraints of consumer privacy and information security. New Zealand has comprehensive privacy legislation and regulation with regard to health information; despite this, the level of consumer concern around privacy is considerable. This has been highlighted by Professor Jocelyn Chamberlain in a review of Breastscreen Aotearoa, in which she wrote that:

> . . . the offer of preventative service is regarded with extreme suspicion, fearing that a paternalistic medical profession is taking away people’s freedom of choice . . . I found the level of concern about protecting privacy extraordinary . . . If the popular view remains “Privacy at all costs”, then it must be recognised that one of those costs is ineffective and inefficient Public Health systems (Chamberlain 2002: 16).

The gulf between the desire of the consumer for total privacy and the desire of clinicians and researchers to make use of individual data for the public good is considerable. The result is that the latter groups are reluctant to engage in constructive discussion on the issues. This reluctance is understandable, given the general lack of awareness in the general population of basic scientific methods and issues. However, unless such debate takes place, some consumers will remain uninformed, suspicious and hostile towards initiatives designed to improve outcomes for all.

One possible avenue to overcoming these concerns is the adoption of alternative strategies to the centralised collection of data. The RNZCGP Research Unit is one such alternative. For nearly five years, this unit has maintained a rich detailed database of activities in general practice. Data are supplied from a limited number of practices as extracts from the GP Practice Management Systems (PMS). Because it is attached to the University of Otago, ethical considerations regarding privacy are easier to manage. Close working relationships between public and academic organisations on this model may be one means to overcome privacy concerns.

**Conclusion**

Significant improvements in the measurement of health outcomes do not necessarily require extensive monetary investment. History has demonstrated that large investments in new information systems do not necessarily pay off as expected, or that they benefit only in the long term.

Although there are problems with many of the existing data sets, there are also very useful sources of data that are currently underutilised. At the national level, New Zealand holds two years of mental health contact data, nearly five years of laboratory tests, 10 years of pharmaceutical dispensing data, 17 years of hospital discharge information, 30 years of mortality data and over 50 years of cancer diagnoses. We have robust technology and governance mechanisms for protecting individual privacy while allowing analysis of these data to the most sophisticated degree. Few other countries in the developed world can boast as much. It is a national treasure and an epidemiologist’s dream.

Researchers, clinicians, administrators and educationalists must work together with skilled health information managers to achieve the best outcomes. Evidence indicates that where this multi-dimensional approach is used, the outcomes are very worthwhile indeed.

**Acknowledgments**

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