

# From I.T. to information management with casemix data

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## Abstract

*The Australian investment in technological support for the collection and analysis of hospital data has paid off in the creation of data depositories that can be used for system and policy analysis. Yet the inquiries that would inform decision for quality and efficiency improvement are made at the operational levels where there has not been equivalent investment in developing human capacity. This article suggests strategies and methods for using standard healthcare information that is now so much more readily available.*

## Setting the Scene

The introduction of casemix - Diagnosis Related Groups (DRGs) and their attendant payment structures - created almost overnight an industry of hardware and software developers and a body of technologists (Hovenga & Whymark 1997; Kleinke 1998). This was especially true in Australia, which seized the opportunity strategically to move toward increasing the technological capacity of the health care delivery information system. The progress made under that agenda is truly remarkable. Despite some well-known spectacular failures in tendering and vendor support (Southon, Sauer & Dampney 1997), in all but the very smallest remote area hospitals, professional health information managers convert medical records to computer readable form in a timely, accurate fashion. Supported particularly by the National Centre for Classification in Health (<http://www.cchs.usyd.edu.au/ncch>), health information processing in Australia now leads the world. Australia is the first country to move completely to coding hospital medical records in version 10 of ICD codes in an Australian modification (NCCH 2000).

State governments have made huge investments in information technology (I.T.) which, in Australia and elsewhere, has often been “over-promised and under-delivered” (Kleinke 1998). This has tended to create an atmosphere of suspicion on the part of clinicians and managers about new information solutions raised by vendors or prescribed by government. Even if clinicians were not inherently paranoid about managerial enterprise, they have reservations about the extent to which administrative data can speak to clinical concerns.

Yet data are regularly reported to state and federal health departments as abstracts of medical records and required “indicators” (NSW Health 1999) about hospital utilisation. In NSW much of this data is submitted on an Area Health Service basis. Summaries of data are regularly and publicly reported (for example, NSW Annual Report 1999, Annual Report Victoria Department of Health 1999)

In NSW, the fortunate implementation of the Health Information Exchange (HIE) as from 1 July 2000 makes accessible hospital (and later, other) data as abstracts from medical records at discharge for analysis at the local, Area or state level. The HIE is a remarkably user friendly data depository, with a “point and click” environment. A description of the HIE is available on the NSW Health website (<http://www.health.nsw.gov.au>). Western Australia and Queensland have also developed data depositories.

NSW Health Department commissioned a group chaired by John Menadue to report on the state of the health (hospital) care delivery system in the State. The resultant NSW Health Council Report (2000) emphasises the importance of using available data for health planning and other purposes. In addition, it sets an agenda for creating computer-based data transfer from GP office or consulting room to hospital to nursing home or home care or community agency and back again. This interconnectivity will produce data to build an information system of Brobdignagian proportions as all transactions contained leave their fingerprints.

Australia's Health Ministers have released the National Health Information Advisory Council (NHIMAC) report on the potential of the electronic health record. The key proposal of this report is the establishment of a national health information network HealthConnect, which will further extend the data collection across state borders.

The NSW Health Council Report also mandates "episode based funding" which is NSW's euphemism for casemix (DRG) funding for hospitals. DRGs are a system of defining relatively similar case types using International Classification of Diseases (ICD) codes along with demographic information on patients. The Australian modification is AN DRGs (Australian National DRGs) and as from July 1, 2000, AR-DRGs (Australian Revised DRGs). While AN-DRG data have been collected for several years in NSW, they have not been used for setting funding levels at the patient level. Other states have experienced profound changes in their attention to data as a result of casemix funding (Duckett 1995).

Private hospitals collect AN-DRG data and variable other data according to their need and inclination. All private hospitals and insurers have data standards, the Hospital Casemix Protocol, which is used nationally. At present, private hospitals do not submit their data to HIE. Increasingly, they too are recognising that the successful hospital business will be the one that understands its own data better than the payer or regulators.

There has been little evidence of a strategy to equip those at the Area or hospital level with the knowledge and skill to analyse their own data to increase their understanding of local patterns of practice and outcomes. This need is becoming recognised as a priority critical to improving health service delivery (Reilly & Smith 1999).

In this paper, we go beyond considerations of computer-supported communication and automation, interesting as they are. We argue for developing the human capacity to mine the data produced by previous investments in technology to transform it into information and then knowledge. The next agenda should be in developing "non I.T. solutions" (Reilly & Smith 1999). Those solutions would involve new methods as "managerial epidemiology" (Fos, Fine & Zuniga 1998) or "data mining". "Evidence based management" (Axelsson 1998; Steinwachs 1998) would be the operational implementation of I.T. solutions.

While the focus of this paper is on HIE-type hospital information systems, this potential could equally exist in data systems for nursing homes, community or home care services, rehabilitation, palliative care or ambulatory care, when their data systems are developed to parallel the rich information now resident in hospital discharge data.

## Localisation

The patient data abstracted from the medical record form the base for an information system that can relate resources to recipients. Even before an electronic medical record (EMR) is a reality, it is possible to do interesting work with administrative data as abstracts. While HIE-type data depositories constitute a new opportunity for information and management, hospitals have kept much larger datasets as their own administrative data. Area Health Services and State Health Departments have built considerable capacity for using hospital-supplied data especially for financial benchmarking and planning. The capacity to mine their own data is relatively underdeveloped at the local hospital level.

Yet the quality initiatives and decisions that will enable hospitals to survive in increasingly stringent economic times are local decisions. Area or statewide financial and clinical quality indicators can be prescribed and monitored, but those data will never be able to get to the level of local practice where the inefficiencies, systems problems and quality issues lurk, and where potential for change is located. It should be in the interest of any health care providing institution or system to develop the human infrastructure to use local administrative data. Moreover, as we note later, there are interesting implications for internal hospital structures and governance when information on the core business of the institution are available beyond the finance or I.T. department.

## The data

Casemix has brought with it software and data conventions that make medical record abstracts fairly standardised. The data include, at a minimum, patient, hospital and physician identifiers; patient demographic information as age, country of birth or ethnicity; postcode of residence, gender; ICD coded diagnoses and procedures; operational indicators such as length of stay, admission source (emergency vs scheduled, for instance), discharge status (e.g. to home, to nursing home); and payer data. The lowest level of clinical information in an administrative data system is the ICD coded diagnoses and procedures.

Administrative data at the local level also contain information on the “business” aspects of the institution. For example, payroll data such as hours worked or staff classes can be abstracted. Service utilisation data have been available in Australian data systems for some time. Service utilisation includes such items as number and type of radiological examinations, prescribed drugs administered, hours of theatre time, days on particular nursing units, prostheses and so forth. Under an efficiency agenda, financial information, as clinical costing or cost modelled costs, have been the primary administrative data analysed to date.

Administrative data are best used to perform aggregate analyses. They may also be used to find patients of particular types whose medical records can then be searched for the variables of interest. To make administrative data most useful, it is necessary to be able to link data abstracts. Patient data can be linked to cost data, and resource data can be linked to the patients who received the resources. For management purposes, patient and resource data must be able to be aggregated to the appropriate managerial unit level - the department or cost centre or Clinical Directorate. These local operational units are where the questions arise and where the solutions can be tested.

Achieving the ability to produce administrative data has been the triumph of I.T. development to date. The data will do no good unless they are seen to be helpful to improving the quality of health care along all its dimensions (NSW Health, 1999), which go well beyond efficiency as driver.

## Querying administrative data

“Information management” is about being able to ask questions of administrative data to produce summaries of findings that can be used in decision making. It is not simply producing counts of cases by the top ten DRGs by volume on a given hospital unit or in a service line. Those kinds of reports are ubiquitous but meaningless.

The methodological foundations for information management lie in epidemiology since administrative data are “population” data: they include the entire set of discharged patients, for example. In a public healthcare delivery system, hospital data can also be related to actual population data as rates of admission, or rates of disease.

Administrative data systems are so large that they must be approached with a query in mind. It is not possible to “browse” administrative data until one finds something of interest. Where these data systems have been managed by finance and I.T. departments without much connection to clinicians of any stripe, the possibility of using them for clinical and operational management has not been plumbed. Indeed, the isolation of I.T. and information managers from the work of the healthcare delivery system is a new concern. If I.T. do not know what goes on in the wards, the decisions they make about how data are entered or saved or coded will not match the reality of how the work happens.

One does not have to be a nurse or doctor to ask the right questions of the data. But the question must be calibrated so that it matches the data available and the questioner’s purpose. Collaboration between clinicians, finance, I.T. and health record administrators is increasingly being recognised as the interdisciplinary model (Diers et al., 1998b; Diers & Bozzo, 1999). It is particularly important to involve operational managers such as Nursing Unit Managers who know how the operational unit really works as well as understanding the values of clinicians.

For example, a simple question, “how many paediatric patients did your hospital treat last year” (perhaps requested by an inquiring reporter) is not as simple as it looks. How is “paediatric” defined? Does it include newborns, who are in the data system as “age = 0” and, if the hospital has a maternity service, “born in hospital” as an admission source? Age to 13? 17? 21? Should it include persons who are no longer children by age but

whose care is still provided by paediatricians, such as adult patients with cystic fibrosis? Or persons with serious developmental disability still cared for by paediatric services?

These queries can be informed by a combination of knowledge of clinicians who work in the area with health information managers. For example, a request to find all the patients with laparoscopic cholecystectomies was informed by the data manager who knew what the appropriate ICD procedure codes were. That data run, however, produced some anomalies which were solved by a Clinical Chair who knew that one of the surgeons was doing procedures which happen to fall into this group but are done for another clinical purpose. Eliminating those cases produced a clean group for analysis.

Finding cases by operational data fields especially requires local expertise. For example, one study wished to find patients in certain DRGs discharged from specialty nursing units versus those not cared for on those units. Finding patients by DRG is easy but it required local knowledge to flag the nursing units that would have regularly cared for those case types (Czaplinski & Diers, 1998).

Nurses and doctors will approach an information management system without being quite clear about what they really want. For example, a request to look at the juncture of myocardial infarction and diabetes will produce very different counts of cases and clinical information if one searches first for patients with diabetes, and then filters for patients with MI, or does it the other way around.

As the administrative data systems evolve, it becomes easier to define particular populations by a combination of variables. For example, one can locate children with asthma who were treated with intravenous terbutaline and had an ICU experience (Diers & Bozzo, 1999). Diagnostic information is available in the clinical side of the information system. Information on use of resources (utilisation) is in the financial side of the information system even when costs are not attached.

These kinds of definitional questions will become increasingly important as benchmarking initiatives invite inter-institutional comparisons. The “apples versus oranges” defence can and should be addressed by the structure of the initial inquiry (James, Horn & Stephenson, 1994). The literature on adjusting cases by severity of illness is vast and not important to the point here. At present, apart from hospital peer groupings derived from hospital size, and casemix (Aisbett 1997), there are no “risk adjustments” for management variables at the Clinical Directorate or nursing unit level where changes in practice are made.

## Methods of analysis

Once the sample to be selected has been chosen, administrative data analysis proceeds generally to descriptive and then comparative strategies. Some queries will be answered at the sample level: how many repairs of NOF's (fractures of Neck of the Femur) did we do last year? Is that different from the previous year? If it is, or even if it is not, the analyst searches for explanations.

Once the population (DRGs or other definition) for study has been defined, it will be necessary to create subsets. Subsets can be created by any data element in the administrative data system. For example, patients in a given DRG can be divided by age, if that is clinically relevant, by gender, by admission source or discharge status. Even postcode might be interesting, as for example, in an analysis of patients admitted for treatment of their asthma: do they disproportionately come from certain post code areas? Practice variance reduction analyses will necessarily create subsets by individual physician, or physician department or section. Management analysis often needs to examine cases by discharge hospital unit, or by admission through ED or transfer in from other institutions.

Cost data can be creatively used in ways that can be appreciated by clinicians. One study used a definition of high cost cases that was the cases selected by ranking all cases by total cost, then cutting the array at 20% of total hospital costs (Diers et al., 1998a). High cost cases thus defined were compared with “not high” cost cases to tease out the clinical variables particularly associated with high cost cases. This design brought the clinicians, I.T. staff and managers to the same table, talking the same language.

## Beyond information management

A new job classification has grown up: “case mix co-ordinator.” In general, these hospital staff provide casemix-based reports regularly and upon request throughout the institution. Often case mix co-ordinators have a medical records backgrounds; an increasing number of nurses are coming to these positions. As quality has hit the managerial radar screen, “quality co-ordinators” have emerged as another new job title. These individuals are often grounded in implementation of clinical pathways and may also participate in the examination of data produced by the pathways. Depending on hospital organisation, casemix co-ordinators and quality managers are part of the central forums where data are being used to drive decision-making. As awareness grows about the existence and potential of standard hospital information, the casemix and quality co-ordinators will be very valuable resources.

I.T. is the platform and information management the application of data supplied by I.T. Neither alone nor in combination will they be effective without some consideration of the forums within which the information can be used for decision making. It should be apparent that to the extent information itself is clinical, financial and operational, as it is in modern administrative data systems, the use of such data must involve clinical, financial and operational human capacity. Traditional hospital administrative structures may make it difficult for developing the interdisciplinary expertise suggested here. Clinical silos are as tall and thick as administrative ones. Clinical pathway implementation and other kinds of “process improvement” initiatives increasingly force interdisciplinary collaboration. Such efforts are beginning to call into question traditional hierarchies of administrative decision making and communication.

Movement toward different ways of thinking about the work, supported by data, foreshadow other changes in how we choose to manage patient care decision making and planning. Changes in the way information is shared and used (or not) will change workplace relationships and methods of health care delivery. For example, it is likely that the information about mortality and morbidity traditionally limited to discussions amongst surgeons in “M and M” (mortality and morbidity) conferences will increasingly be accessible to non-surgeons. At the same time, administrative data like rates of complications, costs, and “adverse events” will force new ways of thinking about responsibility and authority. “Errors” (Wilson et al., 1995) are not always attributable to physicians, and length of stay is not a variable managers can much effect.

Interdisciplinary information management is the capacity to collect, store, connect and retrieve data in a way that generates meaningful information for multiple stake holders. This is the same conceptual base from which DRGs originally sprung: production theory and process management. It should be remembered that the original purpose for DRG development was to allow comparisons of quality or cost within relatively similar case types. (Thompson, Fetter & Mross 1975). Information management goes beyond I.T. to actually participate in penetrating the “black box” of health service delivery to understand where and how to make changes. Understanding must precede management decisions. The data are there, in huge numbers. While further development is surely going to happen, the existing human capacity can now be released to prove overtly the value of the current information resources. These actions will provoke the culture change signalled by governments.

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