

# Seeding information management capacity to support operational management in hospitals

DONNA DIERS AND DIANNE PELLETIER

Donna Diers is Adjunct Professor, Centre for Health Services Management, University of Technology, Sydney and the Annie W. Goodrich Professor of Nursing, Yale University, New Haven, CT USA. Dianne Pelletier is Senior Lecturer and Deputy Director, Centre for Health Services Management, Faculty of Nursing, Midwifery and Health, University of Technology, Sydney.

## Abstract

*There are vast amounts of regularly reported data in the information systems of hospitals, state and federal governments. The increase in accessibility offered by platforms such as the Health Information Exchange (HIE) in New South Wales (NSW) creates a new level of opportunity. Administrative data can also speak to clinical and managerial issues. The capacity to mine these data and use the information for improving quality and efficiency has not been well developed at the "coal face" of operational management. Whilst it has been both possible and useful to track utilisation of services to hospitals and patients as cost and volume, it has not been of interest to track these same data to the operational locus of care - the nursing unit, the operating room, the imaging department. With HIE-type systems, the information is now more readily available and operational managers know this. The challenge is to develop the interdisciplinary capacity to query administrative data to facilitate clinical and managerial decision-making. We report here a possible model of a systematic approach to developing this capacity and some of the results of equipping operational and clinical managers to study problems in their own work settings. These efforts have required no additional internal resources, while the payoffs have been considerable.*

## Introduction: information management

Information management as used here means the art and science of using standard health care data, usually hospital data, to answer clinical and managerial questions (Diers & Pelletier 2001). Information management is the overarching concept under which one can find practice variance analysis, analysis of clinical pathways and data mining. Information management uses the tools of epidemiology. Information technology or IT provides the platform for information management.

In current parlance, information management is also closely related to casemix management. We have extended the notion to apply particularly to operational management, that is, the analysis and understanding of clinical and managerial operations as process. This is not the same as understanding diagnosis, treatment and personal health outcomes. Operational management is concerned with aggregates of patients whether defined by their hospital ward, their physicians' department, section or Directorate, or their Diagnosis Related Group (DRG). Issues that may surface in operational information management analyses include bed management policy; effects of nursing skill mix or a change in skill mix on patient outcomes as length of stay (LOS), cost and quality; systems problems in delivery of care to defined population groups; evaluation of the need for and results of changes in care delivery systems; and even analysis of "medical errors" as systems problems.

Operational information management proceeds from an understanding of how hospitals work, which is not necessarily the way they are administratively organised. The physical location of the patient throughout the hospitalisation is an important data element but one that has not often been used in health services research or quality assurance. The hospital itself is more often the unit of analysis for benchmarking and for studies of outcomes because most publicly available data systems do not have the ability to track patients to loci of service. This has had the effect of creating an illusion that patterns detected at the hospital level can be solved at the hospital level. An additional consequence is making invisible the operational responsibility particularly of nursing and the effect of nursing's clinical and operational management on patient outcomes of interest.

Some ward-level data are already being regularly reported to operational managers. For example, many hospitals provide reports of the LOS of the top 10 DRGs by volume to managers at quarterly intervals. It is not clear what the senior administrators expect the operational managers to do with this information. Nor is it clear that all operational managers see valid ways of turning the data into useful information.

## Available data

Data elements hospitals are required to collect and report are prescribed by each State. The "Inpatient Hospital Statistics" (in NSW at least) is very rich. It includes about 70 data elements, most of which are specific to patients such as demographic data (age, gender, post code of residence, aboriginality) and information about diagnoses and procedures performed coded from the medical record as ICD-10-AM codes. Costs as cost-modelled or clinical costing-produced costs are part of the data as well. The reportable data also include a number of prescribed "indicators" such as waiting lists, time to treatment in the Emergency Department and so forth. Our interest here is in the patient-level clinical data.

The lack of interest in examining administrative data at the operational unit level can be attributed to three factors. First, there has been an international paucity of analysis at the operational level, explained in part by the fact that the data elements available in public data sources such as the Medicare claims files in the US (MedPAR) never can be tracked to the unit level. The bulk of health services research internationally has been conducted on such public use files. Secondly, the hospital data systems themselves, where patient location is a data field, have not been particularly user-friendly, even to the people who operate them. In general, the ATS (Admission, Transfer and Separation) data, once fed into TrendStar-type systems has not been easy to get out. IT experts have neither sought clinicians as colleagues nor been sought by them (Diers & Pelletier 2001). And finally, and most importantly for this paper, clinicians of any stripe have not known the full picture of data collected and how these data once linked to operational location could be used. Until people know what is available and accessible as data, they cannot possibly inquire of it.

Balnave and Palmer (1999) attribute the relatively slow uptake of information from executive management systems to Health Department implementation strategies that focused on hard - and software implementation, without parallel commitment or incentives to use the data. Health Department priorities were to create datasets for managing the payment system, for policymaking and benchmarking, but not for understanding operational or quality issues at the unit level. Having equipped the health service delivery system with information technology, the emphasis may begin to shift to using data to address policy positions such as the NSW Quality Framework proposes (NSW Health Dept.1999).

## Setting

The enterprise described here sprouted from the appointment of one of us (Diers) as Visiting Professor to the University of Technology, Sydney, based in the Faculty of Nursing, Midwifery and Health. She has a long-standing relationship with Australian health care and casemix. Her work during a 7-month Professorship was to build on previous contacts in Australia, and translate parallel activities in the USA to develop academic and clinical capacity to use administrative data to advantage. The other author (Pelletier) has expertise in informatics, local knowledge and contacts that provided the undercarriage for the collaboration. She used a University leadership project award to map the information systems in hospitals in several of the Area Health Services in Sydney to identify resources available to clinicians and managers.

## Method

The goal of the enterprise described was to seed the information management capacity, particularly of nurses, at the operational level. We developed a four-stage strategy built from experience in building a similar capacity at Yale-New Haven Hospital in the USA (Diers & Bozzo 1999; Diers, Weaver, Bozzo, Allegretto & Pollack 1998; Pollack & Diers 1994). It would be nice to be able to claim that this development was as carefully planned in advance as it is described here. Actually, it grew organically from opportunities seized. That the strategy worked gives us confidence to report it as a model.

### Stage 1: Turning the soil

What attracts the attention of clinicians to the value of IT is how administrative data can be used to understand the mysteries and vagaries of their clinical environments and therefore help them to make changes. Once understanding the potential, they need to know what data exist. A specific understanding of administrative data is needed, beyond the elements that clinicians know they contribute.

On at least twelve occasions, Diers was invited to present her studies that had been done at Yale University and Yale-New Haven Hospital which she had brought with her as PowerPoint and overhead presentations. Pelletier orchestrated presentations at the Health Informatics Association of New South Wales (HIANSW). A presentation to the Australian College of Health Service Executives (ACHSE) set the stage for other local presentations at hospitals or other settings, such as the New South Wales College of Nursing and the NSW Nurses' Association.

As word spread, more hospitals and Area Health Services requested presentations. We took advantage of these more local opportunities to suggest that if there was interest, we would be available to help hospitals, Areas or other configurations develop their own projects. We suggested that they might want to bring together a group of interested people, whom we would support to create local equivalents of the information capacity at Yale-New Haven Hospital - the Resource Information Management System or RIMS (Diers et al. 1998). That acronym took on a life of its own.

### Stage 2: Planting the seeds

To take advantage of local interest, we created a "hands on" workshop patterned upon previous workshops conducted in Sydney, Frankston, Vic. and Armidale, which were themselves patterned on workshops and other educational exercises conducted at Yale (Pollack & Diers, 1996). The workshop was designed to give participants an understanding of the standard data elements and what could be done with them (Figure 1). The format creates a short, intensive experience in which it is possible to emphasise the commonality of the data problems participants bring, and the value of networking. The same workshop plan can be done in a half day, using a hardcopy printout of a sample of patient-level data for discussion.

The workshop began with an abbreviated history of how administrative datasets came to be, including the role of DRGs in bringing clinical and financial interests together. To make this history less dry and more engaging, a picture of Professors Thompson and Fetter who "found" DRGs set the stage. Tagging the DRG work to images of the people who did it makes it more understandable, especially when the history and the logic is explained.

The basics of ICD coding in the Australian version was intended only to help participants read the data they would see later in the laboratory experience, not to turn them into medical records coders. The theory of DRG construction was explained, including the hierarchy of groups within MDCs (Major Diagnostic Categories) and the funding definitions in Australia and in the USA. We emphasised particularly the Australian experience, which is wonderfully idiosyncratic. The morning concluded with presentations of completed projects from the Yale examples initially with Australian examples added as they emerged.

A patient database extracted from TrendStar consisting of 500 patients from one financial period and de-identified as to patient, hospital and dates of service was a critical learning resource. The patient-level data included the basic demographic and service information (eg. admission source, discharge disposition) and the ICD coding, plus the relevant DRG assignment. No cost data were included.

A short hardcopy manual developed to go with the dataset included translations of codes for admit source, discharge disposition, aboriginal status and other fields that were not intuitive or which did not have English descriptors. A complete list of DRGs was supplied and several sets of ICD code books were kept available in the computer laboratory.

This portion of the workshop took place in the computer laboratories on the Kuring-gai campus. This is the rate-limiting step for the size of the workshop. It is most effective if two students work at each terminal; more than that tends to become crowded. Computer laboratories are essential in this format and they must also have LCD presentation capacity. Technical assistance is also necessary to deal with the inevitable workstation that doesn't work.

This part of the workshop began with a short (1/2 hour or so) introduction to the dataset. Data were supplied in a Microsoft Access format. Access is very easy to navigate and its logic is essentially the same as TrendStar and other database programs for healthcare data. This program is relatively user-friendly for beginners. We did not want to have to spend scarce time teaching the data management program as well as the content. For each workshop, we had teaching expertise in Access. We both acted as teaching assistants in the labs and there were often participants with some degree of Access skill who could also be called upon.

After an introduction to Access, participants were to work through supplied exercises at their own pace for about 2.5 hours. At the end of this period, there was another presentation of a project involving integrated clinical and financial information, as further inspiration and a hint of things to come in the connection to finance.

A set of questions we knew the data could answer was developed. Some examples are as follows:

There is one patient in the dataset with a LOS of 119 days. Can you figure out why?

Examine the patients who died (discharge disposition 6 or 7 - with or without autopsy). Is there any pattern here?

DRG 003 is for patients who become "train wrecks." Find the patients in this DRG and study why it might be that they ended up in this category.

There are some indications that certain geographic areas may have higher proportions of patients with respiratory illness. Do an analysis of patients with respiratory problems (but think: how to define them?) by DRG? By ICD code? And then by postcode? By age?

The evaluations were positive with participants enthusiastically advocating the program for all those interested in handling health care data but particularly the Nurse Unit Managers. Participants indicated that they appreciated the role of coders more and felt the "clinical" experience in the computer laboratory gave an important reality base. Lack of familiarity with Microsoft Access was problematic for many.

### Stage 3: Fertilising

The public presentations and the workshops were intended more for inspiration, engagement and demystification than for actual training in how to use the data. While some participants from the workshops did go on to work on analyses in their own institutions, we also developed formal curricular offerings.

We expanded the workshop concept extensively to develop a 6 credit point graduate subject *Using Healthcare Data for Decision-Making*. It was designed to be applicable to any health (or business) professional from disciplines other than nursing; a clinical background was not required. This and subsequent subjects can be taken as credit towards any UTS Master level course as a set subject or an elective.

The subject was offered for the first time in the autumn term, 2000. It enrolled 42 students, all of them nurses but from a wide variety of clinical and administrative settings in hospitals, community health agencies, and midwifery. The course was offered in "intensive mode": four 8-hour day sessions over four weeks, on three Fridays and one Saturday. A laboratory session similar to the one described for the workshops above was included in the first day.

Unlike the workshops, the subject included a good deal of methodological and conceptual material in health services research using administrative data. Guest speakers supplemented the Faculty input. Concepts of clinical costing and cost modelling were introduced.

Students were supplied a database on disc that they could take home. The students had three “workbook” exercises to complete. The first was on technical details of ICD coding and DRGs and was intended to help students dig deeper into coding and DRG issues. The second took students into some of the controversies about using administrative data and the third dealt with issues in application. Suggested readings were supplied as were web-based information sources.

The key assessment task centred on questions such as those described for the workshop. For the subject, greater analysis of the problem presented, including the relevant literature and the implications of the overall findings were required. A formal paper and presentation of findings were required. They were evaluated on the logic and completeness of the analysis and the quality of the conclusions and implications.

To extend their resources and their networks, we encouraged students to find the data managers in their practice settings, and especially the medical records professionals. We structured an ungraded question in one of the workbooks about what surprised them most about these contacts. Here are some examples of student responses.

This work has opened up another world...Clinical Information Services at my hospital is now out there for all to see. Our clinical newsletter is spreading the word on the uses of healthcare data...We also decided to combine forces to address the issues with our medical staff and look at implementing some form of education for junior medical offers and interns to improve documentation in patient notes and in their discharge summaries. This has begun with the help of a doctor who is also interested in health data and its effects on our hospital.

The fact that nurses are unaware of this very important information which is critical for the functioning of the organisations we work in is astounding. I have had some informative sessions with the manager of our small medical records department and have been able to change the information gathering process at ward level so the hospital can access more funding.

[Information systems are] a tool of measurement that any nurse can use. In discussing what I have learnt with others...they were amazed at the potential of data analysis. They did not know it existed, or that so much could be gained from accurately filling out the MRN forms. It opened their eyes like it opened mine. I found the medical records people excited by my interest...They were more than happy to help. I found them invaluable. I think it made them feel very important...to know that more nurses are becoming involved and aware of what they do. That their job is really important and that the data they are collecting is being used...

Sourcing information has made me explore in greater depth the clinical information (medical records) department and get to know the staff there...I found them very receptive to my questions and very happy to help. As a result...I found that they had some questions and needs of their own. I was able to provide them with some information to make their coding of ICU patients easier. We have also discussed the possibility of them visiting the unit if they want to, to visualise some of the things they are coding.

There is considerable ignorance within the health care system about the existence of HIE, DRGs, ICD 9 and 10 codes. Many clinical staff are also unaware of the fact that all the medical records are coded on a patient's discharge, what those codes can be used for, the information they contain and the importance of accurate and clear documentation. ...There is ... a need to set up some information exchange and feedback loops so that people understand the consequences of not recording information well.

If the only effect of this subject had been to improve the quality of data capture; the experience would have been worth it. Some students requested contact with colleagues in the US after hearing about projects in class. A network among the students themselves started to be woven. We knew that with a database of only 500 cases, students would be limited in the extent to which any analysis could be credible. We were stunned at the quality of the students' work. They seized the opportunity to explore on-line databases, Health Department resources, relevant literature, and they presented their findings with clever use of presentation graphics. For some, this was the first time they had ever used PowerPoint. The students were also generous in their evaluation of their colleagues' work.

UTS has a subject evaluation support system in which faculty may select items from a standard list to produce a generic evaluation for particular subjects. On those items, the course was highly rated. Written comments showed that many students were daunted by their lack of familiarity with Access and with data manipulation. We had allowed students to work either alone or in small groups on their final assessment. For some, the challenge of working in a group created problems particularly with meeting schedules and distance. That we provided data on a disc so that the assignment could be completed without travelling to Lindfield was appreciated. Indeed the "intensive mode" method worked extremely well for this group of students, nearly all of whom were working full time. They could make their work schedules accommodate the Friday/Saturday timing and use the Internet for literature searching and email to communicate with Faculty. The subject was actually offered in the break between the autumn and spring semester, which meant that students taking the subject toward degree credit could accumulate 6 credit points between semesters.

A second subject on offer in 2001 will build on the Using Data by creating individual placements for students in the healthcare information system in NSW in which they will propose and conduct fairly large projects under the guidance of the Faculty and local preceptors.

#### **Stage 4: Growing**

The various public presentations (many of which preceded the subject just described) began to flower, first at the Sydney Children's Hospital. There, the Director of Nursing and the UTS Clinical Chair for Children and Adolescent Nursing took advantage of the stimulus of Diers' presentation, as well as a configuration of talent on the ground, to ask volunteers to form a group of Nursing Unit Managers (NUMs), those in Casemix and others with an interest in data use. The group elected to call themselves CHRIMS - Children's Hospital Resource Information Management System.

The CHRIMS group illustrates the strategy we have used both at the local level and at the AHS networks. First, it is essential to involve operational managers, and in nursing that is NUMs. The intent here is not to add more job responsibilities to NUMs, but to build their capacity to use existing information and collaborate with information experts. It is equally important to involve people who can actually manage the data. These information professionals are not found in the same place in every organisation. In some hospitals, there are special roles for nurses in information management. In other hospitals, nurses have moved sideways into roles as casemix coordinators or other titles. Clinical information systems experts are critical; medical records coders, financial experts, or IT personnel know how to make the computers hum. After a bit of orientation to the data, clinicians know how to ask the right question, which information professionals can help them answer.

The Director of Nursing and Community Services for the South East Sydney Area Health Service (SESAHS) elected to bring together representatives from the entire area (six hospitals including the CHRIMS group). Facilitated initially by Diers and latterly by Pelletier, the network in the South East Sydney Area came to be called RIN, the Resource Information Network.

The RIN group comprised mostly nurses. RIN established terms of reference and met monthly. Because this group involved more than one hospital, it was necessary to find a data mining exercise that could help build the participants as group. One of the participants suggested looking at intra-hospital transfers, especially of patients with chronic illnesses, and even more specifically, AN-DRG 177 (chronic obstructive airway disease). This early exercise made it imperative to involve information management professionals from the Area as well. They helped the group develop an interdisciplinary approach to data acquisition and understanding. From these fumbling beginnings a consensus began to emerge to look more deeply into bed management issues, of which intrahospital transfer is just one instance.

While the RIN group explored data questions and findings at their fortnightly meetings, they also developed an educational agenda so that all members would be up to speed on the systems in use in the area. Information sessions were held on Trendstar, the Health Information Exchange, Costing, Casemix and other topics.

In the Central Coast Area Health Service, the Area Director of Nursing and one of the hospital Directors of Nursing fostered the development of a group that includes most of the NUMs of the four hospitals in the area, plus the information management and financial management leaders. They have named themselves INCC - Information Network, Central Coast. In this Area a number of free standing projects evolved, with INCC serving more a role of publicising and facilitating than teaching. Again Faculty from the UTS support the group at their regular meetings.

All of the groups, RIN, INCC AND CHRIMS generally began with an exercise that has turned out to be very powerful. They asked the local information experts to supply to the NUMs a printout of all (not just the top 10) DRGs by volume for the most recent completed financial year for their own units. That exercise revealed how difficult it can be to get unit-specific data out of TrendStar, but it can be done. When the groups met, then, the task was to use those data to understand the work of the unit, in clinical terms. A bit of translation of ICD codes and DRGs was all that was necessary to make the discussions bloom.

NUMs have rarely had information about their units to this level of detail with the capacity to work in a group to “drill down” as their questions require with technical expertise in the room, and some presence from consultants who had used these data before. For example, the Sydney Children’s Hospital group wanted to track down their LOS for orthopaedic patients. As they sorted the data by age, it became obvious that part of the reason for longer LOS was having younger patients, who simply need more time to adjust to their casts and crutches.

The hospital treats a number of children with cancer and thought there was one unit that was oncology-specific. But when DRGs were examined across all units, it became clear that whilst children with cancer were concentrated on the designated unit, there was one other unit that had a large proportion of children with cancer as well. Hospital inservice and training resources to equip nurses to care for children with cancer had been targeted only to the specialty unit. Questions began to fly: Why are T and A (tonsillectomy/adenoidectomy) patients on nearly every inpatient unit? Why are patients transferred among units so often? The range of questions grew exponentially as the group became more familiar with the data and how to use them. Similar experiences occurred in the other groups.

Indicative of the spread of interest and expertise, another hospital level group is emerging at St George Hospital under the guidance of the UTS SESAHS Professor of Acute Care Nursing. This group is adopting the acronym GRIN.

## Stage 6: Harvesting

The evolution of these efforts coincided with the creation of the Centre for Health Services Management (CHSM) at UTS. The Faculty of Nursing, Midwifery and Health has had a history of innovative nursing management education and consultation as well as close interdisciplinary connections to the Faculty of Business.

The CHSM at UTS took the responsibility for overseeing these groups and promoting another level of intradisciplinary development. As the groups and networks began to form, UTS offered affiliation to the Centre as Senior Fellows and Fellows to those actively involved in their projects. Those positions come with University privileges such as library and email access.

On December 8, 2000, the networks and local groups came together for a day to present their work to each other and recognise the progress. There were 10 formal presentations, including a late entry from the John Hunter Hospital in Newcastle. The presentations ranged from a study of intrahospital transfers in one of the SESAHS hospitals, to two presentations from the Sydney Hospital, which has an unusual casemix consisting of eye and hand surgery, sexually transmitted diseases and a huge outpatient service. Their presentations dealt with patient access and flow and drug and alcohol inpatient service review, comparing a specialty team versus the general medical treatment of drug and alcohol patients. One SESAHS hospital studied “chest pain” patients and found them in all wards, including the maternity wards! The hospital that studied DRG 177 found LOS was longest for patients with more than 3 intrahospital transfers. The Sydney Children’s Hospital team identified the consequences of non-specialised nursing units for recruitment of staff, development of expertise and organisation of care.

One of the INCC studies examined the effect of creating a 30 bed “geriatric” unit without increasing nursing resources for these patients. Dementia patients were especially prominent and accounted for a nursing weight that was considerably above the budgeted nursing resources. Another INCC study looked at the prevalence of morbidly obese patients to determine an association with worker back injuries among the nursing staff.

Evaluations by attendees indicated a good deal of excitement and commitment to continue the work and the networking. The informality and the realisation of the common problems and experiences shared by all were noted frequently. As a result of the day another group at the John Hunter Hospital is now emerging and intends to obtain guidance from one of the established groups in their early set up phase.

## Discussion

Building an information management capacity shares common elements with implementing an information system in one institution. The same factors of shared vision, leadership, communication and compatibility with other demands (Page 2000) apply. Because we are nurses, we grounded this model in our sense of the nature of the work of nursing, which is both clinical and operational.

We have learned that if the information agenda can be linked to clinical and operational “lived experience”, the barriers that often inhibit use of the enormous power of executive management systems fall away. When managers see data that speak to the way they experience professional life, they cannot help but want for more. What has been built here is a translation or bridging service between nurses as operational managers and information, and to a lesser extent, finance professionals.

So far, our work has not involved economic analyses. This was a deliberate choice based on long experience working with clinicians who really do not wish to think about money. In addition, the financial data in Australian data systems is difficult to explain as cost modelled or clinical costing exercises. Clinicians have also been suspicious of the cost agenda that surrounds the implementation of casemix-based information systems. We constructed our workshops and subjects to concentrate on the clinical and managerial implications of these data, rather than the costs. Money is simply a way of keeping score, in this view, not the driving force. This approach has the effect of bringing clinicians on board without having to wield the economic club.

This effort is new - hence the title for this article, “Seeding...” and the subsequent extension of the metaphor. The progress made in less than one year is remarkable. That leads us to believe that the general strategy outlined here has promise for addressing what many believe is the challenge in health services management: mining existing data for decision-making.

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## Figure 1: Workshop Program

8.45 - 9.00am	UTS Northshore Conference Centre, Kuring-gai Campus Registration and Coffee
9.00am	Introduction and Welcome
9.15am - 1030am	History and Application of AN-DRGs and ICD Coding
10.30am - 11.00am	Morning Tea
11.00am - 11:45	Examples of Casemix Studies and Applications
11:45 - 12:15	Overview of Data Management Programs & Data Sets
12.15pm - 1.00pm	Lunch
1.00pm - 4.00pm	Orientation and supervised experience in the Computer Lab Afternoon Tea
4.00pm - 5.00pm	Applying Data to Clinical Decisions - Reviewing the Past and Looking to the Future.