

HEALTH –MIC: WORTH THE EFFORT?

The Argument for an R and D Agenda in Support of Healthcare Management Informatics and Computing

Christopher Bain

*Convenor, SIG in Healthcare Management Informatics and Computing
Information Manager - WCMICS
Albert St. East Melbourne Vic. Australia*

Keywords: Health management, Computing, Informatics.

Abstract: In this paper I make the case for a research and development (R and D) agenda in support of the evolving discipline of healthcare management informatics and computing (HMIC, pronounced “Health-mike”). The aim of the discipline is to provide healthcare managers the information technology (IT) tools they need to address the health needs of our communities, with the often inadequate resources they have at their disposal. Given the needs of our communities in relation to healthcare, the establishment of this agenda and subsequent work towards the relevant goals are critical to improving our healthcare systems, particularly in the Western world.

1 INTRODUCTION

This paper seeks to make the case for a Research and Development (R and D) agenda in support of the discipline of Health Management Informatics and Computing (HMIC). This discipline can be thought of as sitting at the intersection of health management, computing and the relevant sciences.

More precisely, HMIC could be defined as that subset of health informatics dedicated to the study, design and implementation of information technology solutions in support of the practice of healthcare management in all its forms - including, but not limited to, primary care and general practice, sub acute and rehabilitation care, and hospital care. Furthermore, HMIC involves the study of the needs of healthcare management practitioners, including in information presentation and in decision support. Whilst far from complete, that definition should suffice to allow readers to understand the argument that follows.

In the Western world in particular, our communities, our patients, are telling us about the problems they experience as consumers of our healthcare systems. Some of the biggest concerns facing patients, and the cause of many complaints, are in relation to access to care and services, the physical environment in which they receive care,

and the quality of that care. All of these things are in the sphere of influence of healthcare managers.

For the purposes of this paper I will define a healthcare manager as anyone who has at least partial responsibility for the management of a care or support service in the health industry. The key distinction here is with the clinician role which is primarily about the provision of care. Clearly, however, some managers are clinician managers.

2 BACKGROUND

In recent years there has been an increase in interest in using scientific methods, including some techniques well known in the world of management science (Butler 1995) (Fannin 1997) to attempt to address the problems confronting those managing our healthcare systems. By way of illustration is the establishment of the UK based Nosokinetics group (Group 2006)

As stated previously, patients experience a number of problems in our healthcare systems, either identified by them, or evident to those of us who work in the industry. In many cases these problems are clearly in the domain of managers in terms of resolving them, sometimes representing systems failure, but often not the responsibility of

individual clinicians alone. An example is medication errors associated with role overload (Wilkins and Shields 2008).

3 THE RATIONALE

3.1 Drivers for HMIC

Outlined in the section that follows is what could be considered some key drivers of this work. The categorization of these drivers is not to ignore their fundamental interrelationships, but to allow a crystallization of thought around some of the key issues facing healthcare managers.

3.1.1 The Patient Experience

In this section of the paper I will outline some of the patient led drivers for improving healthcare systems in more detail.

By way of scene setting, there is the worrying assertion by certain authors that “In some cases, health care delivery directly contributes to increased suffering“ (Daneault, Lussier et al. 2006)

Certainly many of the problems patients report in relation to the healthcare they receive are related to problems that are under the direct responsibility of healthcare managers. For example, patients have identified staff responsiveness (Tea, Ellison et al. 2008) as a key factor in determining their satisfaction with health services.

In patient satisfaction surveys (Research 2006) for example, some of the following factors have been identified as being positively associated with improved patient satisfaction:

- discharge experience
- waiting experience
- amount of time spent in hospital
- hospital facilities and
- admission experience

These and other complementary findings are also demonstrated in other patient satisfaction surveys (UltraFeedback 2007). In a cancer specific satisfaction survey (Heading, Mallock et al. 2007) – in inpatients, access to care again rated poorly as compared to other dimensions; and in outpatients, waits for radiotherapy and chemotherapy again rated more poorly than other dimensions. Another example from the cancer setting is consumer feedback to a key 2003 report by the Clinical Oncology Society of Australia. (Initiative 2003) In it, it was stated that consumers want their treatment

to be “timely (no unnecessary long waits) and organised around their wider needs, for example, the need to travel.”

Factor like these are all influenced by the way facilities and systems are funded, designed and managed, much more so than they are affected by the delivery of care by individual clinicians.

3.1.2 The Professional and Organizational Experience

The following section of the paper outlines some key areas of concern for healthcare professionals and organizations, which support the argument for an R and D agenda in support of HMIC.

As described previously, the interrelated issues of patient satisfaction and management imperatives around quality and safety of care are key areas for healthcare managers.

Managing access problems of various kinds is another ongoing issue for healthcare managers (Allen, Shelton et al. 2008) (Zavagno, De Salvo et al. 2004). The dimensions of this problem include access to services and equipment.

Of course there is always the imperative to manage the bottom line (Young-Schmidt 1999) - particularly in many public institutions that chronically run over budget – but which are arguably, therefore, under-funded. In an era of shortages of skilled staff across the globe, particularly nursing staff, the challenge of finding and retaining sufficient qualified staff to run facilities is a huge concern. (Francis 2008) (Doiron, Hall et al. 2008) (Kober and Van Damme 2006)

Changing care models, for instance the introduction of multidisciplinary (MD) care (Davies, Deans et al. 2006) (Kane, Luz et al. 2007) also have significant workforce and logistic implications for managers, thus increasing the decision making load upon them. Importantly also, patients support the introduction (Initiative 2003) of such models.

Adding to this load on managers is the challenge of integrating these various problems and views from a management perspective given the complex and intertwined relationships between all of them, in the context of the ever advancing competencies required of health managers. (Nishiyama, Wold et al. 2008) (Kleinman 2003)

3.2 An Analogy – The ICU Patient

There is potentially a good analogy when thinking about HMIC in relation to hospitals, although the scope of this agenda could extend far beyond acute hospitals, to healthcare facilities of all types and to

private general practice, and allied health practices. The analogy is that of the intensive care unit (ICU) patient. This analogy is only intended as a framework for thinking about the problems rather than, for instance, an argument for equity of investment.

Using this analogy, many of our public hospitals, in particular, have been on “life support” at different times, in the form of constant management restructures (sometimes government imposed) and extra financial grants and concessions. Arguably if they were private businesses they would have gone into insolvency; but, arguably these hospitals are also under funded. Effectively they are like ICU patients who are very unwell and need constant monitoring.

In terms of information (gages, reports and readouts) available to the manager of the critically ill patient on a ventilator (the ICU specialist, and his or her team), there is a large amount of information available to them. In the case of the respiratory system alone, these pieces of information include for example:

- oxygen (O₂) saturation
- full measurement of all blood elements related to breathing function (arterial blood gases) and
- daily Chest x-rays to visualise the lungs.

In terms of controls (levers, dials and switches) which allow the ICU specialist to control or improve respiratory function, these include:

- the ventilator itself – these have volume, pressure, rate and delivery mode settings, all of which allow optimisation of the patients respiratory status in any given clinical scenario
- the amount of oxygen that is delivered through the ventilator and
- a range of drugs in support of improving respiratory function.

If one now moves to the management of an unwell hospital, the information and controls available to the managers of that system pale into insignificance in comparison.

By way of illustration, let us consider the example of managing the respiratory system of a patient on a ventilator, and specifically the measurement of oxygen saturation (the accepted means of monitoring, in real time, whether the patient has enough oxygen in their blood to sustain life). In this case, the following pre work has been done:

- the basic physiology has been described and understood and the concept defined in a universal way
- the biomedical engineering work to develop

sensors to precisely measure this has been done

- the clinical trialling of the equipment has been done, and
- the real world uptake and acceptance of the evidence around the practical application of the tool(s) has occurred.

Let’s now compare that to the concept of hospital occupancy (think of it as “bed saturation”) as an example. This analogy again highlights the size of the gap between this knowledge and application area, and the clinical domain:

- the drivers and definition of hospital occupancy are not described in a universally accepted and scientifically proven way.
- there are no universally accepted and robust tools to allow monitoring of hospital occupancy in real time
- there have been few real world trials of many developed tools (as opposed to in vitro tools e.g. - simulation studies, see (Sobolev and Kuramoto 2005) (Ledlow and Bradshaw 1999)), and
- there has been limited, if any, real world uptake and acceptance into routine use, of the tools that are available

It bears a much more in depth analysis as to the reasons for these differences, and that is beyond the scope of this paper – in effect that is the work of HMIC, or at least an important example of it.

4 WHAT WOULD AN “R AND D” AGENDA ACHIEVE

4.1 Overview

There has certainly been work relevant to HMIC going on for 30 or more years, especially in core business areas like nursing scheduling systems (Ballantyne 1979) and patient acuity and classification systems (Coetsee 1985) (Cochran 1979)

Many of the major problems confronting the health care industry in the Western world remain management problems, rather than problems directly in clinical care provision (Armstrong, Gillespie et al. 2007) which is generally of a good standard. Given that, there seems to be a distinct lack of coordinated effort in terms of understanding what role information technology (IT) can have in supporting solutions to these problems. This is particularly the

case when compared with the clinical informatics domain.

4.2 Establishing Answers to Core Questions

More specifically are the following unanswered questions in this regard:

- what are the key information and decision support requirements of health care managers?
- how do we harness some of the groundbreaking work in scheduling, forecasting, and data presentation (Duckett, Coory et al. 2007). In particular, how can such innovations be operationalized and incorporated into robust, integrated IT systems?
- we know that standards based approaches can have significant benefit in facilitating IT development (Ludwick and Doucette 2008) (Bouhaddou, Warnekar et al. 2008) but are there standard definitions for management concepts such as "congestion", for example; and how do we represent them in a way that IT practitioners and developers can incorporate them into practical IT systems?
- how do we ensure that HR, finance, PAS and predictive systems (Bottle and Aylin 2008) (Emendo 2006) can work in an inter-operable fashion given the complex and intertwined relationships between issues such as staffing, finance and bed management in health care organizations?

The establishment of an R and D agenda for HMIC would seek to answer these questions amongst others.

4.3 Coordination

Arguably there has been no coordinated effort since then especially in comparison with clinical informatics; hence it is a good time before there are too many vendors in the space, to create common definitions and standards, to define use cases and common management scenarios that systems can be built to support. These kinds of activities can only assist in achieving greater coordination of effort in regard to solving some of the core problems outlined previously in this paper.

4.4 Flow on Effects

There are some potential flow-on effects from the establishment of this agenda that include:

- Attracting further funding
- Attracting technological development
- Attracting interested and skilled people to work on these problems
- Fostering the kind of scientific and industry collaborations that can allow the closure of the gap between real world problems and viable solutions.

5 WHY NOW?

In the context of what I have stated previously, a fair question from a sceptic may be – “why now?” Why is it important to define, establish and implement this R and D agenda at this point in time? The following represent some of the key reasons:

- The available technologies, now more than ever, offer a great opportunity to advance this agenda. New, especially mobile, devices (Garrett and Jackson 2006) (Lin and Vassar 2004) (Siracuse and Sowell 2008) capable of supporting rich levels of functionality, make it easier than ever to deliver functional software solutions to managers at the point of decision making, whilst accommodating their workflows.
- It is time to operationalize many of the scientific innovations in this area. Too much work has not been translated into practice, international experts in the area acknowledge this (Brailsford 2005). Even the lessons from the work performed in this space have not been drawn together to inform practice. For example, where are the systematic reviews of, and lessons from, the multiple simulation studies regarding management problems? The work by Fone et al is one notable exception. (Fone, Hollinghurst et al. 2003)
- The dire financial state (Frizelle 2008) (Werntoft, Hallberg et al. 2007), and complex financial environment (Wagner, Valera et al. 2008) (Buchan and Evans 2008) that public health care, in particular, operates in is a key reason to act in this area now. The availability of funding to support healthcare will be under ever greater pressure as expensive care delivery technologies and products continue to evolve.
- If we do not move quickly towards establishing and working on this agenda, the danger is that the core needs, and robust standards and approaches will not be defined before vendors and solutions proliferate, leaving us with the same sorts of inter-operability problems and debates (Wright and Sittig 2008) (Hammond 2008) (Engel, Blobel et al. 2006) that plague clinical informatics.

6 CONCLUSIONS

In conclusion, the rationale for this work is that:

- patients continue to experience problems as consumers of healthcare, and there are also problems identified by those of us working in the healthcare system
- there are often insufficient resources available in our systems to address these problems
- this combination of factors represents a complex challenge for healthcare managers
- information technologies can have a role in assisting with the rationale use of limited resources and system management, and
- there has been little of the scientific ground work done in this area to underpin the development of robust tools, even in the presence of adequate funding and interest in these problems.

This is the remit of HMIC, and an R and D agenda in support of this discipline would assist enormously in solving some of these very important practical problems in healthcare.

ACKNOWLEDGEMENTS

I wish to acknowledge Prof Peter Millard, founder of the UK Nosokinetics group, who has shown the drive and vision necessary to take the international health community to its' current point of evolution in relation to these issues. I also wish to acknowledge the assistance of Assoc Prof Caroline Brand and Dr Gitesh Raikundalia in reviewing the manuscript.

REFERENCES

- Allen, J., R. Shelton, et al. (2008). "Follow-up of abnormal screening mammograms among low-income ethnically diverse women: Findings from a qualitative study." *Patient Educ Couns.* 2008 **72**(2): 283-92. Epub 2008 May 19.
- Armstrong, B., J. Gillespie, et al. (2007). "Challenges in health and health care for Australia." *MJA* **187**(9): 485-489.
- Ballantyne, D. (1979). "A Computerized Scheduling System with Centralized Staffing." *Journal of Nursing Administration* **9**(3): 38-55.
- Bottle, A. and P. Aylin (2008). "Intelligent information: a national system for monitoring clinical performance." *Health Serv Res.* **43**(1 Pt 1): 10-31.
- Bouhaddou, O., P. Warnekar, et al. (2008). "Exchange of computable patient data between the Department of Veterans Affairs (VA) and the Department of Defense (DoD): terminology mediation strategy." *J Am Med Inform Assoc* **15**(2): 174-83.
- Brailsford, S. (2005). "Overcoming the barriers to implementation of operations research simulation models in healthcare." *Clin Invest Med* **28**(6): 312-5.
- Buchan, J. and D. Evans (2008). "Assessing the impact of a new health sector pay system upon NHS staff in England." *Hum Resour Health* **6**(12).
- Butler, T. (1995). "Management science/operations research projects in health care: the administrator's perspective." *Health Care Manage Rev* **20**(1): 19-25.
- Cochran, J. (1979). "Refining a patient-acuity system over four years." *Hosp Prog* **60**(2): 56-8, 60.
- Coetsee, M. (1985). "[Computers in nursing. 3. Level of care and cost-effective service delivery using an computerized patient classification]." *Curationis* **8**(1): 44-8.
- Daneault, S., V. Lussier, et al. (2006). "Primum non nocere: could the health care system contribute to suffering? In-depth study from the perspective of terminally ill cancer patients." *Can Fam Physician* **52**(12): 1574.
- Davies, A., D. Deans, et al. (2006). "The multidisciplinary team meeting improves staging accuracy and treatment selection for gastro-esophageal cancer." *Diseases of the Esophagus* **19**: 496-503.
- Doiron, D., J. Hall, et al. (2008). "Is there a crisis in nursing retention in New South Wales?" *Australia and New Zealand Health Policy* **5**(19).
- Duckett, S., M. Coory, et al. (2007). "Identifying variations in quality of care in Queensland hospitals." *MJA* **187**(10): 571-575.
- Emendo (2006). Cap Plan: Capacity Planning Software.
- Engel, K., B. Blobel, et al. (2006). "Standards for enabling health informatics interoperability." *Stud Health Technol Inform* **124**: 145-50.
- Fannin, T. (1997). "Reality check: using stimulation modeling to plan and sell change." *Ambul Outreach Winter*: 29-31.
- Fone, D., S. Hollinghurst, et al. (2003). "Systematic review of the use and value of computer simulation modelling in population health and health care delivery." *Journal of Public Health Medicine* **25**: 325-335.
- Francis, K. (2008). "Reflections on nursing." *Australian Journal of Advanced Nursing* **25**(4): 6-8.
- Frizelle, F. (2008). "Resourcing for the growing burden of elderly patients with cancer." *ANZ J. Surg* **78**: 428-429.
- Garrett, B. and C. Jackson (2006). "A mobile clinical e-portfolio for nursing and medical students, using wireless personal digital assistants (PDAs)." *Nurse Education Today* **26**: 647-654.
- Group, T. N. (2006). Nocokinetics Web Site.
- Hammond, W. (2008). "eHealth interoperability." *Stud Health Technol Inform* **134**: 245-53.

- Heading, G., N. Mallock, et al. (2007). New South Wales Cancer Patient Satisfaction Survey 2007. Interim Results, Cancer Institute NSW.
- Initiative, N. C. C. (2003). Optimising Cancer Care in Australia: A consultative report prepared by the Clinical Oncological Society of Australia, The Cancer Council Australia and the National Cancer Control Initiative. Melbourne, National Cancer Control Initiative.
- Kane, B., S. Luz, et al. (2007). "Multidisciplinary team meetings and their impact on workflow in radiology and pathology departments." *BMC Medicine* **5**(15).
- Kleinman, C. (2003). "Leadership Roles, Competencies, and Education: How Prepared Are Our Nurse Managers?" *JONA* **33**(9): 451-5.
- Kober, K. and W. Van Damme (2006). "Public sector nurses in Swaziland: can the downturn be reversed?" *Hum Resour Health* **31**(4): 13.
- Ledlow, G. and D. Bradshaw (1999). "Animated simulation: a valuable decision support tool for practice improvement." *J Healthc Manag* **44**(2): 91-101.
- Lin, B. and J. Vassar (2004). "Mobile healthcare computing devices for enterprise-wide patient data delivery." *International Journal of Mobile Communications* **2**(4): 343-353.
- Ludwick, D. and J. Doucette (2008). "Adopting electronic medical records in primary care: Lessons learned from health information systems implementation experience in seven countries." *Int J Med Inform.*
- Nishiyama, M., J. Wold, et al. (2008). "Building competencies for nurse administrators in the Republic of Georgia." *International Nursing Review* **55**: 179-186.
- Research, R. M. (2006). Queensland Health State-wide Patient Satisfaction Survey.
- Siracuse, M. and J. Sowell (2008). "Doctor of Pharmacy Students' Use of Personal Digital Assistants." *Am J Pharm Educ* **72**(1): 7.
- Sobolev, B. and L. Kuramoto (2005). "Policy analysis using patient flow simulations: conceptual framework and study design." *Clin Invest Med.* 2005 **28**(6): 359-63.
- Tea, C., M. Ellison, et al. (2008). "Proactive patient rounding to increase customer service and satisfaction on an orthopaedic unit." *Orthop Nurs* **27**(4): 233-40.
- UltraFeedback (2007). Victorian Patient Satisfaction Monitor. Year 6 Annual Report - 1 March 2006 to 28 February 2007.
- Wagner, A., M. Valera, et al. (2008). "Costs of hospital care for hypertension in an insured population without an outpatient medicines benefit: an observational study in the Philippines." *BMC Health Serv Res* **8**: 161.
- Werntoft, E., I. Hallberg, et al. (2007). "Prioritization and resource allocation in health care: the views of older people receiving continuous public care and service." *Health Expect* **10**(2): 117-28.
- Wilkins, K. and M. Shields (2008). "Correlates of medication error in hospitals." *Health Rep* **19**(2): 7-18.
- Wright, A. and D. Sittig (2008). "SANDS: A service-oriented architecture for clinical decision support in a National Health Information Network." *J Biomed Inform.*
- Young-Schmidt, D. (1999). "Financial and Operational Skills for Nurse Managers." *Nurs Admin Q* **23**(4): 16-28.
- Zavagno, G., G. De Salvo, et al. (2004). "Sentinel node biopsy for breast cancer: is it already a standard of care? A survey of current practice in an Italian region." *BMC Cancer.*