Using nursing information systems to enhance quality service across multiple service providers

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Abstract

This study explored the key requirements identified by stakeholders for the integration of Nursing Information Systems (NIS) in three public hospitals in the southern suburbs of Adelaide. The study used a qualitative approach of semi-structured interviews, focus groups, site visits to the hospitals and review of relevant literature to ascertain what participants saw as the necessary ingredients to create regional NIS. Study findings showed that the current NIS are not sustainable in terms of staffing levels, physical resources or the capacity of the two currently-used computer products to interface with newer generation products. A critical issue for adopting a regional model is the willingness of local sites to revise their current internal structures and functions. This restructuring towards a regionalised NIS would improve overall communication, education, security, efficiency and sustainability.

The limited integration of information system products

Since 1992 the major public hospitals in South Australia have had access to two Nursing Information System (NIS) electronic software products: Excelcare, a clinical application with a primary product of clinical care planning and secondary by-products of costings, outcome management and measurement and acuity determination; and ProAct, a computerised rostering management tool. While both these products provide clinical data readily relayed to the Department of Human Services (DHS), there has been little collaboration between hospitals or groups of hospitals in using this data to compare costings, assess nursing hours, develop rostering measures or ascertain the potential of the products for quality assurance. This paper reports on a proposal to merge the management component of the NIS of three hospitals in the southern region of Adelaide - Flinders Medical Centre (FMC), the Repatriation General Hospital (RGH) and Noarlunga Health Service (NHS). The study did not critically examine the sustainability or capacity of either product. This issue was addressed by the DHS in a subsequent Enterprise Bargaining round when an agreement was made to replace Excelcare with a newer product that would extend to allied health services and interface with products such as OASIS (an open architecture clinical information system) that enable integration with a full range of clinical information.

Historically, Flinders Medical Centre (FMC) and the Repatriation General Hospital (RGH) have managed NIS independently of one another and Noarlunga Health Services (NHS) did not implement Excelcare and ProAct until 2000. In early 2000 two changes provided the impetus for considering a regional NIS structure: the successful business case from NHS to implement NIS, and RGH's inability to recruit to a vacancy in NIS staffing. As a consequence the RGH looked to engage the services of staff from FMC to provide expertise in the short-term management of the nursing systems. This led nursing management staff to explore the benefits of extending this collaboration beyond temporary staffing assistance to evaluating the advantages of increased integration through regionalisation of NIS across the three hospitals. This paper presents a literature review and then outlines the major principles and best practice components that stakeholders saw as necessary to successful integration of NIS.

Review of the literature on principles informing integrated information systems

This review draws primarily on the literature from the USA where integrated delivery systems (IDS) have been in place for over a decade, and Britain. We also draw on a small amount of literature reflecting the current state of play in Australia (England et al. 2000, Ritchie 1997) where coordinated information technology systems are part of an overall strategy to reduce fragmentation and duplication of existing health services (South Australian Generational Health Review 2003:14). The observations of commentators in the government-financed National Health Service, the Australian mixed public/private health care system and the various privately run health care services in the USA, such as health maintenance organisations, are surprisingly similar.

In commenting on the literature we distinguish between information technology (IT), information systems, integrated delivery systems and community health information networks. 'IT' refers to single products, for example Excelcare or ProAct. 'Information system' is used to refer to the ways in which 'information collections and flows meet the defined information requirements of the organisations' (Willcocks & Lester 1993 cited in Jayasuriya 1997). A pertinent example is the interface and data movement between Excelcare and ProAct and between ProAct and Trendstar. (Trendstar is a financial management product that utilises data from Excelcare and ProAct to calculate nursing costs.) 'Integrated delivery systems' are organisations 'that unite various players to offer continuous health care for a defined population with minimal outside intervention' (Manus 1995:49). The proposed regionalisation of nursing information systems for the Southern region is one example; another would be the integration offered under the banner of the DHS. 'Community health information networks' provide the technical infrastructure solutions that allow patients, clinicians and managers to communicate over shared and seemingly disparate platforms through the provision of an integrating network across the region. In each of the examples outlined above, maximisation of product usage requires well-trained staff either on-site or readily accessible.

In a rapidly changing health care sector, information systems are seen as one of the keys to service enhancement and seamless integration of care (Department of Health UK 2001a, Department of Health UK 2001b). In the past, various IT products operated in isolation from one another or were left to IT specialists or centralised offices to manipulate. As a result financial and planning information was not shared, patient tests and procedures were often repeated or information was not aggregated to provide timely informed data for clinical health decision-making (Department of Health UK 2001b). There now exists a set of clear management principles and the necessary technology to guide health care planners and clinicians at national, regional, local or enterprise level. These principles make explicit what is needed in terms of organisational structures, best practice, key performance indicators, service objectives and economic considerations to create integrated information and delivery systems. Drawing on the literature we outline some of these principles below.

Infrastructure and organisation of integrated delivery systems

A major issue for any health care service is how to create a shared network across a number of merged hospitals or within a state or region, given that past developments have often been patchy and implemented without the

foresight or the opportunity to develop effective information systems. The tendency has been for individual hospitals and health providers, for example nursing or pathology services, to use tailored products that interface with accounting departments, but not necessarily with products used by others clinicians. The result has been limited information sharing capability across disciplines as well as limited use of the product within the professional group (Department of Health UK 2001a, Moynihan & Norman 1994).

A number of US experts have argued that the solution lies in community health information networks (Stripe 1996; Moynihan & Norman 1994). Community health information networks are interfaced multiple software applications that allow products that are working well to remain in place and be integrated into the network, provided they meet HL7 standards. Users are able to continue to use familiar local products yet take up the advantages of increased integration across regions (Department of Health UK 2001a); thus the need for standardisation is reduced and staff resistance is more easily resolved. HL7 standards were developed in the US by a group of vendors and hospital IT professionals, to enable interfacing by complying applications. The HL7 standards have been adopted by the NHS in Britain and the South Australian Department of Human Services as well as many other jurisdictions (Moynihan and Norman 1994, Work and Pawola 1996, Department of Health UK 2001a). Adherence to the HL7 standards allows the various health care providers as well as clinical professional groups free choice in terms of IT products, within a framework of standards that allow broad interfacing of multiple applications across regions. Costs are controlled by avoiding the need to replace costly IT, or through replacing them when resources are available (Stripe 1996, Moynihan & Norman 1994). In effect community health information networks allow for centralisation of administration services and flexibility in selection of products.

Best practice information systems within integrated delivery systems

In order to provide standardisation and flexibility to accommodate new products, enhance risk management and accommodate cultural differences, information systems interfacing across hospitals and regions must be robust and reliable. They should be able to deliver information with minimum complexity and maximum security in terms of patient confidentiality and privacy (Department of Health UK 2001b, Heathfield et al. 1998). While there is still considerable disquiet about confidentiality and privacy, the technology does exist to set limits to what information can be accessed by various professionals within the health care sector. It is possible to build into patient record databases encryption and decryption capacities, audit trails and other protections for personal records (Weaver 1995).

Service objectives of information systems within integrated delivery systems

The primary objective for integrating information systems in hospitals and other community based health services is enhanced communication between providers of care, patients and funding bodies in a format that is rapidly accessible and meaningful (McNamara 2000). Lack of communication can fragment care resulting in poor quality care and inefficient use of resources (Moynihan & Norman 1994). Information technology systems that inter-connect patient care plans, patient records, test results or payment procedures facilitate patient management through limiting repetition, waiting and duplication. Health professionals have ready access to the results of diagnostic tests and procedures. Coordinated IT systems provide doctors, nurses and allied health care professionals with the technical tools for increased multi-disciplinary team work across the continuum of care, across geographical regions and time zones, while managers have the necessary data for timely decision making (Department of Health UK 2001a, Department of Health UK 2001b, Work & Pawola 1996).

A second service objective is financial. There is no doubt that integrated information systems, whether dedicated to clinical care or financial accounting, reduce duplication of tests, procedures and administrative processes by decreasing manual handling of paper and providing more accurate data for determining the cost of care (Stripe 1996; Work & Pawola 1996; Moynihan & Norman 1994). However, a number of authors caution that the direct financial benefits of IT integration are not yet established or optimised (Perisly & Gottlieb 1999, Heathfield et al. 1998, Ritchie 1997, Work & Pawola 1996). Important factors influencing financial benefit include the size of the hospital and the level of IT use within the venue. Real financial gains come from maximum IT use including both the number of staff using a product, the number of patients whose data is handled by the product, and the number of users taking advantage of the full range of product features.

Where regional or national health care systems exist, economies of scale can be realised. This requires the allocation of resources for staff training as new products are introduced. These points raise further questions about the commitment of health care providers, both managers and clinicians, to information systems (IS). It is difficult to allocate money to resources or to allocate adequate IS staff to assist clinicians in optimising the clinical benefits of the various technologies if the direct benefits to patient care are not clear. Centralised or regional leadership is required to coordinate the timely implementation of the appropriate range of resources to meet identified needs (Department of Health UK 2001a). Regional offices also need to be adequately resourced to justify the financial outlay and maximise usage (Heathfield et al. 1998; Ritchie 1997). This includes resources for continuous IT and IS education for clinical staff as well as adequate back-up staff for Help Desks. As Ritchie (1997) commented on the Australian health care system, there are still too few professionals who understand the clinical and IT interface and maximise its usage.

Evaluation of IT, IS and community health information networks

Evaluation of IT, information systems and community health information networks has tended to focus on issues of cost effectiveness and clinical use. While these are vital components to any assessment of a new tool, it needs to be acknowledged that computers are pieces of equipment embedded in bureaucracies and webs of social relationships. Comprehensive research must take account of organisational issues, political processes and the interests of stakeholders. Research that seeks answers to changes in management and organisational structures requires interpretative methodologies and approaches as well as sound data on use (Heatherfield et al. 1998, Jayasuriya 1997). These requirements are pertinent whether the evaluation is being conducted at the local, regional or central level.

The study aims

This study explored the key requirements identified by stakeholders as necessary for the integration of NIS for three hospitals in the southern region of the metropolitan suburbs of Adelaide. The study focused on the options and potential for development of a co-ordinated approach to the management of NIS taking into account the political, social, cultural and financial context in which this regional service would be implemented. More specifically, the study sought to elicit from key stake holders a set of principles that would guide a proposal for a regional collaborative structure, for operational and strategic management of NIS, incorporating but not limited to, best practice principles, service objectives, key performance indicators and organisation and structure of NIS.

Methods

Given the exploratory nature of the study and its aim to understand and interpret the context of the NIS from the perspective of participants, qualitative data collection and analysis techniques were employed. The research method included group and individual semi-structured interviews, a focus group workshop with key nurses and DHS staff engaged in the management or policy development of NIS and site visits to all three hospitals in order to understand the management and resource implications. Sampling was conducted in two stages using a snowball technique to follow new leads and explore new insights. Data from these qualitative sources was analysed for common themes and differences and compared with key findings in the literature. Analysis and key findings are presented, starting with those aspects of service provision that were identified as problematic followed by the identified advantages of regional co-ordination and sharing of resources. The service objectives identified during the interviews and workshop reflected the individual hospital organisational priorities, their history with the two products and their varying experiences in relation to NIS, including the expertise of staff in manipulating the products.

Findings and Discussion

In this study, findings from the focus groups and individual interviews mutually reinforce one another. As qualitative analysis involves the interpretation of data it is not possible to separate 'results' from 'interpretation'.

Regionalisation was seen by the participants to:

- provide opportunity for maximising knowledge of product capacity
- enable broader based in-service education
- enhance collegial relationships between regional hospitals
- eliminate duplication of services
- enable smaller services to focus on priorities
- provide for system security
- enhance efficiency and sustainability.

Importantly for this collaborative group, regional arrangements shift the focus of control away from the interface with centralised state bureaucratic personnel, whose concerns are sometimes seen to be primarily surveillance, measurement and benchmarking. Rather, the regional system creates a network that focuses on sharing clinical data, information for quality assurance and human resources. Stakeholders in this study had clear ideas of what was required for effective regionalisation of IT services. These are outlined below, along with their perceptions of current limitations.

The need to maximise knowledge of the product capacity and communication

In order to implement an effective regional collaboration, communication both up and down and across the regional system must be free-flowing and multi-faceted. Specific examples of how the current service is limited by inadequate communication include:

- Limitations in understanding the capabilities of current system therefore users do not know what questions to ask to achieve their needs
- Lack of coordination for the first tier help desk support process resulting in duplication of services and sub-optimal resource allocation
- Lack of agreement about the priorities for local and regional NIS development
- Independent development of the systems between the three sites resulting in lack of consistency in the data collected and the generation of reports.

Expected levels of NIS service are undefined and differences in executive reporting mechanisms contribute to the complexities of the current approach.

Maximising resources for education

The establishment of a regional service and implementation of an educational program including web delivery could serve to ensure an acceptable educational standard for users on all sites. Development of user manuals, including information on the types and uses of reports generated by NIS, and regular dissemination of new developments through regional meetings and local users' groups would facilitate continuing educational development. The accounting and reporting mechanisms linked with the resourcing recommendations should serve to enhance patchy local knowledge, increase the understanding of the overall system, improve users' awareness of the system's capabilities, provide a coherent approach to reporting and facilitate development of proactive local and regional strategies.

In addition to user manuals, short courses such as Advanced Excelcare, Enrolled Nurse Orientation to Excelcare, Reporting using Excelcare and ProAct, Introduction to Access, Evidence-basing Units of Care and Procedures, Introduction to Excel and Introduction to AIMS (Australian Incident Monitoring System) would cater for a

range of educational requirements across the region and could be developed in collaboration with IT and other departments. Intranet based training was suggested as the most cost-effective and easily accessible over the long term, but developing such programs will require a minimum of 6 to 9 months.

Enhancing strong collegial relationships

Development of collaborative working relationships within a supportive and successful work environment presents an important service objective. These relations and environment were identified both within sites and between sites, regions and the DHS. Within sites, a strong collegial relationship between staff of NIS and the computing departments was identified as imperative. While NIS and support services focus on functionality issues, IT focuses on the technical issues. A close working environment enhances the skill level and job satisfaction of both groups, serves as a model for other local user groups and potential regional groups, facilitates setting local and regional priorities, and informs NIS/IT developments at the Department of Human Services (DHS) corporate level.

Rationalisation of duplicate services

Currently, there are four separate Help Desk processes: IT Help Desk, NIS Help Desk, after hours IT on call and after hours NIS on call. This overlap of responsibilities results in an unnecessarily high workload for all parties and contributes to user confusion. Development and implementation of a regional NIS/IT Help Desk with shared staffing was identified by many study participants as a key requirement.

Setting priorities

Establishment of a regional NIS with a shared culture would enhance unity amongst the sites and promote identification of regional priorities. The development of regional policies would promote collaborative prioritisation. Arrangements for reciprocal sharing of data and human resources would support a collaborative work environment. Sharing of human resources for on-call, sick leave and annual leave would assist to relieve some of the current system pressures, and provide growth of skills, knowledge and information sharing across the region, but must be adequately resourced. However one area in which participants demonstrated a high degree of agreement was the need to ensure that local priorities and initiatives were protected from being engulfed by regional priorities. Clearly identifying the scope and boundaries of regional and local authority and responsibility, with well-defined accountability and reporting mechanisms for ongoing evaluation, is integral to harmonious regional relationships. Differences in culture, clinical services and service requirements, business processes and applications across the region are expected, and local needs must be understood and supported.

Regional collaboration would also provide a stronger voice with DHS in regards to business processes. The generation of meaningful and consistent reports (e.g. funding applications) across the region would strengthen the region's position in negotiations. Indications from the participants in this study are that some personnel within the DHS are very interested in this regional approach to IT management, and consider it a pilot for other such developments. However, this support was not evident across all areas within the DHS.

A service area identified by participants as key to the development of NIS regional was improved quality and timeliness of nursing information. Currently, software, IT interfaces, databases and outputs vary across the sites. For example, despite the common use of Excelcare as a nursing care planning and costing system, each site uses different units of care, timings, updating processes and reporting mechanisms. Through agreement on a common set of regional reference files with authoring access limited to regional personnel, fewer resources would be required to develop, update and maintain these files. Further, local data could be benchmarked against local and regional data, regional initiatives for nursing quality improvement could be developed, and regional nursing education and research could be implemented. Initiatives developed and evaluated at one site can be considered for implementation across the region. Increased opportunities for skill development and improved use of resources would provide the region with improved access to information and NIS support. Local NIS maintenance and support requirements would be decreased and could be managed in collaboration with regional maintenance. In addition, a regional approach provides greater opportunity for nursing research by facilitating access to integrated clinical data sets.

System security that limits potential for system failure

The participants in this study, most commonly those with an IT background, described the vulnerability of the current NIS. There are no clear specifications for levels of access to the system, and the authority to modify information within and between sites is not well defined or monitored. As a result, those with responsibility for maintaining system integrity do not have adequate control to ensure that integrity. With regionalisation the levels of authorisation for system access could be clearly defined, indicating clear lines of responsibility and accountability. Documentation of formalised user roles and system access procedures would be most appropriately undertaken in collaboration between staff of regional NIS, local NIS and local IT departments.

Efficiency

NIS data is currently backed up independently on each site. This process is demanding of time and IT resources. With regionalisation, a substantial portion of NIS data would be backed up for all sites as one package, and only a smaller local portion would require back up at each site. The actual location of servers is becoming less important as technology provides improved access and is not an issue for NIS regionalisation. A technological solution to virtual access and simultaneous display of remote and central data, network messaging, and remote product updates is desirable and should be explored in the context of overall IT requirements and resources.

Change management (people and processes) is often the hardest component of IT implementation. A lot of the benefits are intangible or spread between providers, patients and organisations making them difficult to identify and realise. Major challenges in realising potential financial advantage will be to identify benefits to direct patient care, educate clinical staff in the optimum use of IT to obtain clinical benefits, maximise use of the IT resources across clinical arenas and professional boundaries, and coordinate the timely implementation of IT resources (Richie 1997). We estimate a cost saving of 0.5% on salaries. However, this underestimates the real savings which come out of the shared development of NIS, including pathways, clinical practice guidelines and business process reorganisation.

Enhanced sustainability

To be sustainable NIS and support services require adequate staffing levels, and physical and financial resources. None of these resource areas are sufficient to maintain current levels of service. Staff workloads are overwhelming and include numerous hours of overtime and on-call. Ad hoc reports are commonly requested, often require innovative data retrieval and sorting processes, and additional data cleansing and manipulation. Minimal standardisation between sites requires NIS staff to work efficiently with a variety of processes, many (but not all) of which could be standardised in a regional system.

Conclusion

A critical issue for adopting a regional model is the willingness of local sites to revise their current internal structures and functions. Adopting a regional approach to NIS as outlined would require revision of structures both within and without the partners' organisations. However, this restructuring towards a regionalised approach to NIS would improve overall communication, education, security, efficiency and sustainability. Business benefits identified in this study add value to the debate on rationalised service delivery and economics of scale. However, attempts to achieve sustainability in the integration and delivery of systems should also consider the impact of changing population demographics, client self-management and optimisation of skills and services to meet local needs.

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