Investigation of Decision Making Issues in the use of Current Clinical Information Systems

Pubudika Mawilmada
Computer Science Discipline
Faculty of Science and Technology
QUT

Susan Smith
Cardiac Surgery Clinical Information Service
Metro North Health Service District
The Prince Charles Hospital

Tony Sahama
Information Security Discipline
School of Electrical Engineering and Computer Science
Faculty of Science and Engineering
QUT

Queensland University of Technology

The Prince Charles Hospital

Outline

BACKGROUND

STUDY METHODS

SURVEY RESULTS

CONCLUSIONS

Background

- IT has been widely accepted and used in healthcare for
  - medical research
  - patient-care and management
  - diagnosis and treatment for diseases (Narasimhan, Wu & Gill, 2007)
- However there is a growing expectation for the contribution of HIT to facilitate
  - use of information
  - support of education and training
  - transformation of health services
  - to support the provision of quality care (Barraclough, 2009)

Background

- Abundance of Clinical Information Systems (CIS) in use however
  - many CIS do not effectively support better decision making at the point of care or through secondary decision making processes for purposes other than for which data were collected (de Mul et al, 2010)
- Data Warehouse (DW) as a potential solution
  - established in non-healthcare sector
  - used in healthcare, but not common
  - commercial tools available
  - facilitates integration, analysis, appropriate reporting of data (de Mul et al., 2010)

Aim

To investigate issues related to the use of Clinical Information Systems in decision making processes in the current clinical environment

Methods

- Part of Masters IT project:
  - 'A Data Warehouse Model For Improved Decision Making Processes in Healthcare'

- Case study: exploration/investigation of a phenomenon within its real-life context
  - Object: Issues related to the use of Clinical Information Systems and secondary use of information in decision making processes
    - Population level

  - Subject: Cardiac Surgery Program at The Prince Charles Hospital, Brisbane
    - Clinical Service Management focus

Methods

- Identify stakeholders in the decision-making process relevant to Cardiac Surgery Unit
- Examine relevant data repositories and relationships in decision making processes
  - Cardiac Surgery Register database (CARPIA)
  - Quality and Safety unit database -electronic discharge summary database (e-DS)
  - ICU database
  - Clinical costing unit DW (Transition II) - manages data in three levels such as the financial level, the departmental level and the patient level
- Develop tools to investigate issues related to the use of data in clinical service decision-making processes.
- Analyse findings thematically and relate to the broader context

Methods

Survey Tools

- instruments
  - Questionnaire
    - 12 questions
    - open ended & multiple choice
    - four categories - current data repositories, decision making process, current issues and data storage and analysis needs
  - Interviews (unstructured)

Methods

- Participants
  - Note: small localised study
  - Stratified distribution of information processing and end-user staff roles in survey population by hospital unit

Unit	Role
Intensive Care Unit	Clinical Director/Clinician
	Clinical Data Manager
Clinical costing Unit	Clinical Analyst/ Unit Manager
Cardiac Surgery Unit	Clinical Director/Clinician
	Clinical Data Managers X3
	Clinical Analyst/ Unit Manager
Quality & Safety Unit	Clinical Director/Clinician
	Clinical Analyst/Unit Manager

- 80% response rate achieved (8 out of 10).
- 70% (7 of 10) contributed to subsequent additional unstructured interviews used to clarify and extend survey results.

Survey Results

- Question 1: Are you satisfied with the support provided for decision-making processes by the current Information Systems?

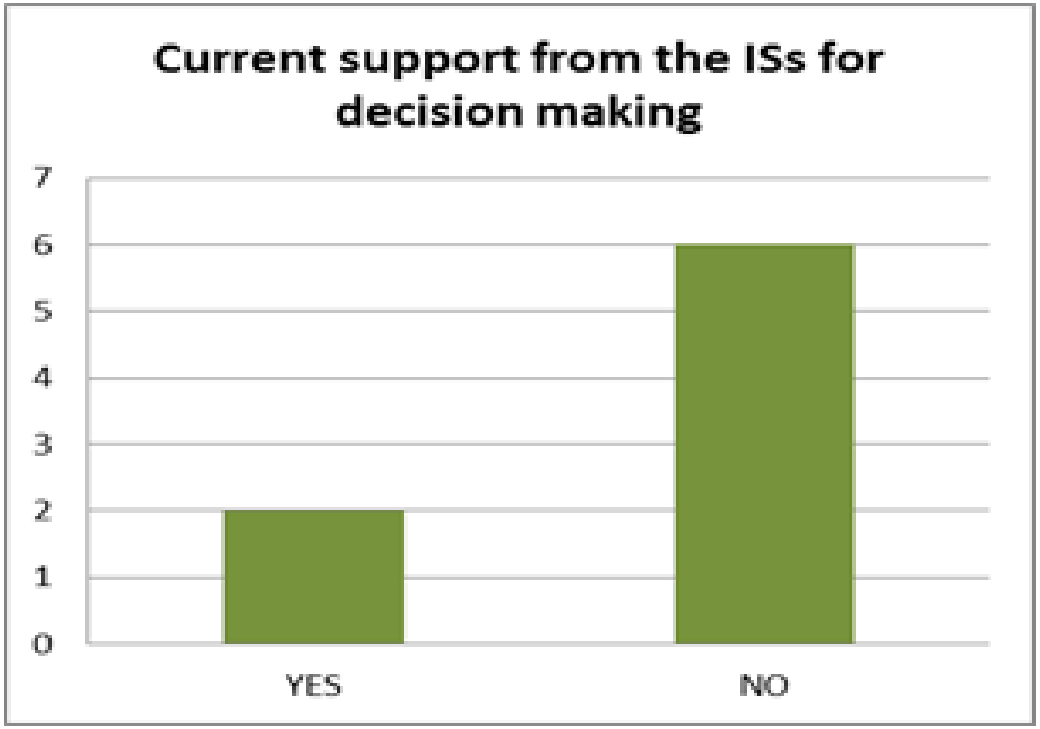

Figure 1. Satisfaction of participants with current support from the information Systems (IS) for decision making processes

Survey Results

Results from unstructured interviews with end users regarding satisfaction with current systems

- systems need to be integrated and should provide easier access to data
- difficulty in reuse of data already held in other data repositories for combination with cardiac surgical data to inform quality improvement studies
- a need for comprehensive data availability at all stages of point of care and current systems do not support this
- "there is lack of support available for the current decision-making process from the current information systems and [we] need a centralised data management [process] to improve decision-making"

Survey Results

- Question 2: What are the main information related problems you have identified in the decision-making process supporting clinical service management in your area?.

Figure 2. Identification of decision making issues with current information systems (IS)

Survey Results

Results from unstructured interviews with end users regarding decision-making process

- is limited access to databases or some end users may have difficulty obtaining authority to access isolated clinical data repositories.
- main reasons identified were security and confidentiality issues or enterprise level information Privacy and Confidentiality related policies.

Survey Results

- Question 3: What are the main data quality issues impacting the trust in clinical data used for the decision-making processes in your area?

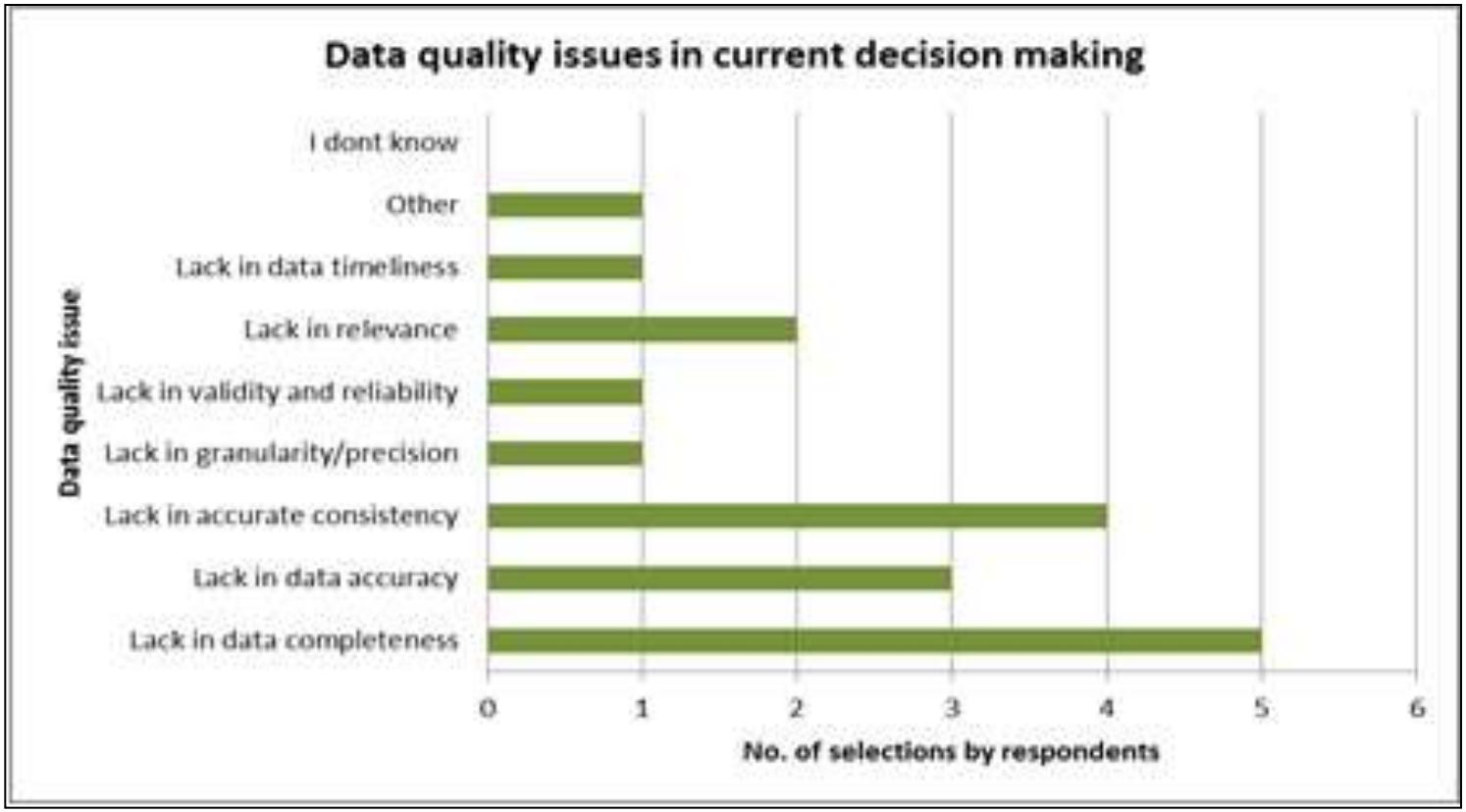

Figure 3. Data quality dimensions considered to be issues by the participants

Survey Results

Results from unstructured interviews with end users regarding data quality issues

- Not all data quality issues result from source data CIS – there are also issues with the daata in the written medical record/chart

Discussion

- This study considers issues relating to current uses of data in information driven decision-making at clinical service level
- Analysis of work processes, survey responses and unstructured interviews showed current decision-making process uses data integration derived from a mostly repetitive manual process with a variety of analytical tools
- Participants considered support provided by the CIS for decision making is limited
- Lack in data integration is considered one of the major issues
  - Lack of integrated healthcare systems may lead to treatment errors, lack of coordination, high costs and duplicate examinations in the patient care environment (Stolba & Schanner,2007)

Discussion

Process Support

- limited accessibility
- lack of efficient reporting tools and analytics tools
- lack of time and resources available to undertake analysis

  - Findings elsewhere similarly show that "In many healthcare organizations, comparative effectiveness research and quality improvement (QI) investigations are hampered by a lack of access to data" (Horvath et al., 2011)
  - Efforts are further hampered by the lack of analytics tools and specialist staff resources - paucity of clinical Informaticians and HIT professionals available to perform the required HIT tasks in healthcare (Shacter ,2007, Smith et al., 2011)

Discussion

Data Quality

- Increasingly being recognised as an issue requiring attention as the use of electronic data in healthcare increases
- In this study a majority of participants selected lack in data completeness as one of the most troublesome dimensions
- A high level of data completeness is required as a basis for making good decisions
- Poor data consistency and data accuracy are two other major data quality issues identified by the respondents

Discussion

Data Quality

- Lack of complete data may lead to poor or incorrect conclusions and poor data accuracy, false or incorrect data can potentially lead to medical errors (Chapman, 2005)
  - ex:-
    - resulting in avoidable financial and quality costs to the hospitals
    - reducing clinicians trust of CIS,
    - further reducing the use of available information for evidence-based decision-making

Discussion

Potential Solutions

- Data integration solutions:
  - data warehouses
  - database federations
  - database federation with mediated schemas and
  - peer data management systems (Louie et al. 2007)

- Business Intelligence
  - evolving IT discipline which combines operational, financial, clinical data with analytical tools to present complex and competitive information to planners and decision makers

Discussion

Business Intelligence

- complementary to data integration
- potential to improve the reporting and analytical capacity of CIS
  - Ex:- real time data warehousing, data mining, automated anomaly/exception detection, data visualisation

- Although business intelligence is established in the industrial and commercial sectors it is becoming increasingly relevant for the healthcare sectors and provides a range of potential tools to assist with reporting and analytical processes (Mettler & Vimarlund, 2007)

Conclusion

- Case study examining real-world issues in CIS, data for secondary use in decision-making in the current healthcare setting
  - Limitations of size and generalisability
- Identifies many issues consistent with previous studies are still prevalent in today's healthcare environment
  - Current decision-making analyses are manual and time-consuming
  - need to progress data integration as a basis to improving secondary decision-making processes
  - concerns with data quality
    - Documentation completeness
  - concerns with access, confidentiality
  - Concerns with supporting workforce availability

Conclusion

Our findings add practical evidence that issues relating to data integration are limiting decision making for management of clinical services and in Quality and Safety management in the current Australian healthcare environment

References

- Barraclough B. Challenges for health services. 2009
- Chapman A.D. Principles of Data Quality: Global Biodiversity Information Facility, Copenhagen; 2005.
- de Mul, M., Alons, P., van der Velde, P., Konings, I., Bakker, J., & Hazelzet, J. (2010). Development of a clinical data warehouse from an intensive care clinical information system. Computer Methods and Programs in Biomedicine. 2012; 105(1): 22–30.
- Horvath M.M., Winfield S., Evans S., Slopek S., Shang H., Ferranti J. The DEDUCE Guided Query tool: Providing simplified access to clinical data for research and quality improvement. Journal of Biomedical Informatics. 2011;44(2):266-76.
- Louie B., Mork P., Martin-Sanchez F., Halevy A., Tarczy-Hornoch P. Data integration and genomic medicine. Journal of Biomedical Informatics. 2007;40(1):5-16.
- Mettler T., Vimarlund V. Understanding business intelligence in the context of healthcare. Health Informatics Journal. 2009 September 1, 2009;15(3):254-64.
- Narasimhan L., Wu D., Gill N.S. Meta-analysis of clinical cardiovascular data towards evidential reasoning for cardiovascular life cycle management. Issues in Information Science and Information Technology. 2007;4.
- Shacter S. Data Integration: Past & Future. Applied Clinical Trials. 2007.
- Stolba, N., & Schanner, A. (2007). eHealth Integrator -Clinical Data Integration in Lower Austria. In the Third International Conference on Computational Intelligence in Medicine and Healthcare (CIMED 2007).

Questions?