Electronic Risk Assessment System as an Appropriate Tool for the Prevention of Cancer: a Qualitative Study

Amir Hossein Javan Amoli, Elham Maserat, Reza Safdari, Mohammad Reza Zali

Abstract

Background: Decision making modalities for screening for many cancer conditions and different stages have become increasingly complex. Computer-based risk assessment systems facilitate scheduling and decision making and support the delivery of cancer screening services. The aim of this article was to survey electronic risk assessment system as an appropriate tool for the prevention of cancer. Materials and Methods: A qualitative design was used involving 21 face-to-face interviews. Interviewing involved asking questions and getting answers from exclusive managers of cancer screening. Of the participants 6 were female and 15 were male, and ages ranged from 32 to 78 years. The study was based on a grounded theory approach and the tool was a semi-structured interview. Results: Researchers studied 5 dimensions, comprising electronic guideline standards of colorectal cancer screening, workflow of clinical and genetic activities, pathways of colorectal cancer screening and functionality of computer based guidelines and barriers. Electronic guideline standards of colorectal cancer screening were described in the 3 categories of content standard, telecommunications and technical standards and nomenclature and classification standards. According to the participants' views, workflow and genetic pathways of colorectal cancer screening were identified. Conclusions: The study demonstrated an effective role of computer-guided consultation for screening management. Electronic based systems facilitate real-time decision making during a clinical interaction. Electronic pathways have been applied for clinical and genetic decision support, workflow management, update recommendation and resource estimates. A suitable technical and clinical infrastructure is an integral part of clinical practice guideline of screening. As a conclusion, it is recommended to consider the necessity of architecture assessment and also integration standards.

Keywords: Electronic risk assessment system - prevention - cancer screening - colorectal

Introduction

Colorectal (CRC) is one of the most common cancers in worldwide (Safaee et al., 2008). But it is one of the most preventable cancers (Atkinson et al., 2008). More studies have proved that colorectal cancer incidence and mortality are reduced with regular screening (Gooran et al., 2010). Colorectal Cancer control program of Shaheed Beheshti research institute for gastroenterology and liver disease of Iran (RIGLD) supports population-based screening efforts in many provinces. The RIGLD’s goal is to increase colorectal cancer screening rates among men and women aged 50 years. But decision strategies for screening have become increasingly complex in recent decades. Screening pathway and guidelines recommended more and new options for cancer management (Masahito et al., 2013). The use of computer technologies facilitate decision making and improve efficiency of screening process (Maserat et al., 2012). Decisions of computer base system could be a suitable tool to help patients understand their risk of developing a particular cancer, the screening approach, survival of cancer, recommended screening time intervals, preferences for a special option, assessment of patients’ needs, treatment option and probabilities of outcome (Bouaud et al., 2014; Dekker et al., 2014; Eccher et al., 2014 Steele et al., 2014; Yilmaz et al., 2015). Computer based guideline and electronic knowledge based system support of medical decision-making, selection of the accurate diagnosis and suitable treatment plan (Tomaszewski et al., 2012). Electronic clinical practice guidelines (CPGs) enhance the quality of screening and reduce health care costs. Computerized CPGs provide patient specific advices when and where needed for health care professionals (Peleg et al., 2013). Colorectal cancer screening management, especially for those with a genetic predisposition depends on patient specific advices. These accurate reports improve quality of care and clear communication among health care providers.
Electronic guideline Standards of colorectal cancer screening were described in 3 categories including content standard, telecommunications and technical standards and nomenclature and classification standard.

Standard documentation systems of cancer screening facilitate quality improvement of control program according to participations’ views. Content standard refer to core data set of guidelines. Content standard was contained colonoscopy, pathology, surgery, genetics and pedigree information. Content standard of colonoscopy includes demographic and medical history data set, administrative data, study data set, finding data set and follow up data set. Content standard of pathology classified to macroscopic and microscopic features. Also content standard of surgery was classified to Specimen and Tumor specification. Genetic information was included IHC (ImmunoHistoChemistry) and MSI (Microsatellite instability) test information, APC (Adenomatous polyposis coli) and MMR (Mismatch Repair Genes) information and HNPCC (Hereditary non-polyposis colorectal cancer) and FAP (Familial adenomatous polyposis;) results. Pedigree information play significance role in planning of colorectal cancer screening especially for indentifying high risk population by perspectives.

Nomenclature and classification standards facilitate electronic transmission of results to laboratory, hospital, physician, third party payers, and other users of data. The LOINC (Logical Observation Identifier Names and Codes) and SNOMED (Systematized Nomenclature of Medicine Clinical Terms) were selected as nomenclature standards by managers and ICD-O (International Classification of Diseases for Oncology ) as classification standard was selected. Nomenclature and classification standards allow a consistent way to index, store, retrieve, and aggregate clinical data across health care professionals and sites of care. These standards provide comprehensive and precise clinical content for documentation and reporting.

HL7 and DICOM were introduced as telecommunications & technical standard by studied experts. XML and RDF are examples for standard syntactic frameworks. NLP was introduced as mapping tool that match with UMLS (Unified Medical Language System) metathesaurus.

**Work flow of clinical and genetic activities**

Table 1 was illustrated work flow of clinical and genetic activities by participations’ views. Functions of colorectal cancer screening contain research, education, clinical activities and health information management and other activities. Education department contain contentious education to patients and high risk people. Educational tools were website, forum, newspaper, educational package, workshops and conference. Clinical and genet activities include.

i) Colonoscopy and other related activities. Target population is fist degree relatives of proband. ii) Pathology examination and CRC block analyzing. iii) Genetic testing: Surveying IHC, MSI and detection of hereditary non-polyposis colorectal cancer (HNPCC) and (familial adenomatous polyposis) FAP. One of positive view of
plan is special attention to genetics because this issue has impacted on high risk populations diagnostics.

**Pathways of colorectal cancer screening**

FAP and HNPCC are two syndromes of colorectal cancer predisposition. Figure 1 and 2 were presented Genetic pathway by participations’ views.

**Functionality of computer based guidelines**

According to participations’ views, computer based guidelines of screening comprises seven functions of information management of screening, defined as follows:

- **Registration**: The collection, storage of administrative and demographic data related to uniquely identify the patient, health care provider(s), and encounter.
- **Recommendation based on clinical guidelines**: Guideline-specified functions that should occur under specific clinical circumstances for example: identify high risk population (FAP, HNPCC), identify average and at risk population, planning colonoscopy times, early detection, recurrence prediction, burden prediction and survival prediction.
- **Managerial decision making**: The provision of background information for resource requirements estimate, time management of personnel, measures of quality or cost and finally quality improvement of process.
- **Presentation**: the creation of effective output from integrated genetics, pathology, colonoscopy and surgery information.
- **Analyzing and disseminating**: the manipulation of numeric or nominal data, or both, to derive required information (e.g., observations, pedigree assessments, and interventions related to clinical care).

**Barriers of computer based guidelines implementing**

According to participations’ views, transformation of screening guideline to computer program can be difficult from a technical aspect. Adoption of terminologies and data exchange standard was a difficult process. Also prioritization for recommendations and categorizing of screening protocol was complex. User interface for the presentation of reminders and recommendation of pathway was not user friendly. Other main barriers were inappropriate architecture and evaluation methods.

**Discussion**

Standard of clinical practice guidelines for driving care management are becoming increasingly important (Lobach et al., 1994). The use of the standard model for representation of sharable computer guidelines is integral part of guideline implementing. The Guideline Interchange Format (GLIF) is a one of the standard model (Boxwala et al., 2004). This study was surveyed content standard, telecommunications & technical standard, nomenclature and classification standard. According to participations’ views, adoption of terminologies and other standards was
a difficult process. We need comprehensive standards for
the sharing of screening content.

The more studies demonstrate the importance of
evaluating workflow and information flow in health
information technology design and implementation (Unertl et al., 2009). The study demonstrates work flow of clinical
and genetic activities for colorectal cancer screening
participations’ views. Pathways of colorectal cancer
screening identified gaps between the existing guidelines
functionality and the needs of providers of screening
program. The authors demonstrated two pathways of
screening including FAP and HNPCC. Appropriate
cancer management requires an understanding of several
features that help to early detection. CPG direct and
identify features (R. Collado et al., 2014). Functions of
PGP support of features such as differentiation, behavior
and histology of tumors. Computer-guided consultations
are practicable in chronic disease (Angus et al., 2012).
Recommendation based on clinical guidelines help to risk
assessment and scheduling of colonoscopy times.

In Conclusions: Study was demonstrated the effective
role of computer-guided consultation for screening
management. Electronic risk assessment systems facilitate
real-time decision making during a clinical interaction.
Electronic pathways have been applied for clinical and
genetic decision support, workflow management, update
recommendation and resource estimates. One of the
key aspects to achieve comprehensive computer based
guideline of colorectal cancer screening are the usage of
common or interoperable content (colonoscopy, pathology
and genetic terminology), data exchange standards and
technical integration. Also a suitable technical and
clinical infrastructure is integral part of CPG of screening.
Screening guidelines need to be integrated with the
care flow for providing suitable patient-specific advice.
After more than a decade of development of numerous
computerized systems, studies on the most effective
implementation of Electronic risk assessment systems is
still lacking. Considering to findings of this study is useful
for optimal implementing of Electronic risk assessment
system of colorectal cancer screening. As a conclusion, it
is recommended to consider the necessity of architecture
assessment and also integration standards

Acknowledgements

This study was supported by the Research Institute of
Gastroenterology and Liver Diseases, Shahid Beheshti
University of Medical Science. We thank Fatemeh
Ghafarnejad, Mohammad Amin Pourhosseingholi for
providing counseling.

References

and impact of a computer-guided consultation on guideline-
based management of COPD in general practice. *Prim Care

Atkinson W (2008). Study aims to improve colorectal cancer

information technology: use it well, or don’t! Findings
from the use of a decision support system for breast cancer

format for sharable computer-interpretable clinical practice

Collado Martin R, García Palomo A, de la Cruz Merino L,
Borrrega García P, Barón Duarte FJ (2014). Clinical guideline
SEOM: cancer of unknown primary site. *Clin Translational
Oncology*, 16, 1091-7.

in practice: a lung cancer survival decision support system in

Eccher C, Seyfang A, Ferro A (2014). Implementation and
evaluation of an Asbru-based decision support system for
adjuvant treatment in breast cancer. *Comput Methods

Eriksson H, Tu SW, Musen M. Semantic clinical guideline

Chicago, IL: Aldine.

Heselmans A, Van de Velde S, Donceel P, Aertgeerts B,
Ramaekers D (2009). Effectiveness of electronic guideline-
based implementation systems in ambulatory care settings - a

Lobach DF, Hammond WE (1994). Development and evaluation
of a computer-assisted management protocol (CAMP):
improved compliance with care guidelines for diabetes

current decision aids on cancer screening? *CA: A Cancer

Endoscopic electronic record: A new approach for improving
management of colorectal cancer prevention. *World J
Gastrointest Oncol*, 4, 76-81.

Maserat Elham, Reza Fatemi, Mohammad Reza Zali (2009).
New perspective for integrated information management
in national colorectal cancer screening in Iran. *Asian Pac J

The role of information systems in cancer prevention.
Gastroenterology and Hepatology From Bed to Bench, 3,
164-168.


Shiffman RN1, Brandt CA, Liaw Y, Corp GJ (1999). A design
model for computer-based guideline implementation based
on information management services. *J Am Med Inform
Assoc*, 6, 99-103.

estimates of recurrence and survival in colon cancer: clinical
decision support system tool development for adjuvant
therapy and oncological outcome assessment. *Am Surg*,
80, 441-53.

Tomaszewski W (2012). Computer-based medical decision
support system based on guidelines, clinical pathways and

Describing and modeling workflow and information flow in

Yilmaz AA, Ozdemir L (2015). Development and implementation
of the clinical decision support system for patients with
cancer and nurses’ experiences regarding the system. *Int J
Nurs Knowl*. 