Are Clinicians’ Information Needs and Decision Support Affected by Different Models of Care? Experimental Study

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Abstract
This study explores task- and healthcare model-specific differences in clinicians’ information needs which can affect the uptake of decision support. Results of a web experiment involving 104 general practitioners are presented. Respondents indicated that guidelines were the most important source of information with almost equal weighting for acute, chronic and preventive care. A patient’s quality of life was identified as the most important determinant of decision-making in all three models of care. Risk assessment tools and information about outcomes were more valuable \((P<0.05)\) for chronic and preventive care than for acute cases. The participants accessed electronic risk assessment tools in 54\%, 45\% and 81\% of acute, chronic and preventive care scenarios, respectively. Participants estimated that the electronic decision support would have a significantly higher impact in preventive care than in chronic or acute care settings \((P=0.01)\). The differences in the information needs of clinicians related to different care models have to be considered in the design of clinical decision support systems. Systems that target preventive model decisions may have higher adoption and impact.

Keywords: information needs; information systems; clinical decision-making

Introduction
Lack of knowledge about the information needs of clinicians has been identified as one of the major reasons for the slow uptake of decision support tools in clinical practice [1,2,3]. Evidence suggests that the type of decision task affects the effectiveness of electronic decision support systems (EDSS). The provision of computerised decision support improves the quality of decision-making and outcomes of patients with acute illnesses in a hospital setting. However, the impact of EDSS on care decisions for patients with chronic conditions or genetic risks is less certain [4,5]. Despite the increasing availability of genetic testing and the emergence of new programs for shared genetic risk assessment [6,7], knowledge of clinician’s predictive testing and EDSS use remains limited [8]. A large variety of attitudes and beliefs influence clinical decision-making by clinicians [5]. Our previous research points to task- and healthcare model-specific differences in their information needs, which can affect the uptake of EDSS [9]. To test this hypothesis, three modules of decision support were developed and a web-based experiment was designed to aid clinical risk assessment for acute, chronic and preventive care models. The objectives of this experiment were to explore (a) task specific information needs related to acute, chronic and preventive care, and (b) the free-willed use of computerised decision support tools by clinicians performing the above tasks.

Methods

Study population and design
We surveyed a convenience sample of Australian general practitioners to examine the differences in their information needs and beliefs about the role of EDSS in acute, chronic and preventive care. Participants were recruited among Fellows and Trainees of the Royal Australian College of General Practitioners through the Quality Assurance & Continuing Professional Development Programme. Participation was voluntary and no monetary incentives were offered. Participants were randomised to the EDSS group and the unaided decision-making group and asked to review three clinical scenarios in a random order to avoid learning effect as well as to answer case-specific questions (Figure 1). The first group was provided with access to decision support modules at the time of answering the questions. The modules provided probabilistic patient-specific information about future clinical outcomes. Clinicians were not specifically informed that their use of EDSS modules would be logged. The second group only saw the decision support modules after answering case-specific questions at the end of the survey. The questions were designed using a 5-point Likert scale to identify potential factors affecting EDSS acceptance as well as specific usage patterns on the part of clinicians. At the end of the survey each participant was provided with feedback regarding (a) the distribution of answers from the group of participants, including their own answers, and (b) the impact of the use of decision support tools on this process.

The experiment was conducted between April and August 2006 as an online exercise with interactive decision sup-
port modules accessible from a personal computer over a secure Internet connection to the University of NSW server. This survey can be accessed from: http://129.94.108.23/DSSSurvey/index.jsp

Decision support modules

Three risk assessment aids were built using published scores based on demographic, clinical and behavioural information that is routinely collected when taking a history (Copas, 2002). Community-acquired pneumonia decision support provided risk assessment based on the Pneumonia Severity Index [10] and the genital herpes risk assessment tools was based on local Australian data. The Breast Cancer Risk Assessment module was based on probabilities obtained from two recently validated models: the BOADICEA model of genetic susceptibility to breast cancer from the University of Cambridge [11] and BRCARPO model of genetic testing of BRCA1/BRCA2 and prevalence of breast cancer [12] (Figures 2 and 3). Scenarios of community-acquired pneumonia, genital herpes and breast cancer were designed specifically to represent, respectively, acute, chronic and preventive models of care because of their relative differences in the acuity and complexity of clinical decision-making, as well as the utility of shared decision-making and decision outcomes.

Outcome measures

Using a log-file, the participants’ choice to use a decision support tool was monitored. The attitudes and self-reported information needs of subjects were recorded. The impact will be assessed using one-way analysis of covariance (ANOVA) and chi-square statistics. Statistical significance was set at P<0.05.

Results

Characteristics of participants

104 general practitioners completed the experiment. Twenty-five of respondents (25%) also treated residents of aged care facilities and 15 (14%) served as sessional hospital medical officers. All respondents were accredited practitioners representing all States and Territories of Australia. Half of the participants (n=53) indicated that they use a computer in for keeping medical records and electronic prescribing. General practitioners familiar with computers were equally distributed in the two study groups.

Figure 2 - Snapshot of the decision support module for the risk assessment of breast cancer

Information needs for acute, chronic and preventive care

Overall, participants were positive about the value of probabilistic EDSS in primary care. All clinicians rated clinical guidelines, condition-specific risk calculators and computerised decision support as important sources of evidence (Table 1). The potential impact on a patient’s quality of life and his or her satisfaction were the two most important determinants of clinicians’ decision-making in all three models of care. Respondents indicated that clinical guidelines were the most important source of information with almost equal weighting for acute, chronic and preventive care.

Condition-specific risk calculators and information about outcomes of care for previous patients with similar problems were more valuable (P<0.05) for chronic and preventive care situations than for acute cases (Table 1). When two arms of the study were compared, the participants in the decision support arm of the experiment accessed electronic risk assessment tools in 54%, 45% and 81% of acute, chronic and preventive care scenarios,
respectively. The majority of general practitioners who used decision support tools also felt that EDSS could have a high impact on the quality of decision-making in different models of care (Figure 3).

**Information gaps in acute, chronic and preventive care**

When specifically asked about information types essential for optimal decision-making, participants agreed that a documented patient history, relevant test results and clinical protocols were the most relevant pieces of information.

Respondents felt that the cost of care to a patient was also a contributor to chronic care decisions and was more important for chronic care than for other models (P=0.001). When asked to identify the specific types of information most often lacking at the time of clinical decision-making, respondents indicated that a relevant patient history and test results were more often lacking in acute and chronic care. In contrast, clinical protocols (P=0.002) and cost information (P=0.02) were more often lacking in preventive care (Table 1).

Participants estimated that the electronic decision support would have a significantly higher impact in preventive care than in chronic or acute care settings (P=0.01) (Figure 4).

**Discussion**

This study showed that perceived information needs between acute, chronic and preventive care models in general practice were similar. The main differences in information needs in these settings were related either to the availability of information or to access to decision support.

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**Table 1 - Attributes affecting the quality of clinical decision-making for different models of care, mean scores**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Acute care</th>
<th>Chronic care</th>
<th>Preventive care</th>
<th>P**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The importance in decision-making</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance with clinical guidelines</td>
<td>1.793</td>
<td>1.526</td>
<td>1.758</td>
<td>NS**</td>
</tr>
<tr>
<td>Cost to taxpayer</td>
<td>2.414</td>
<td>2.069</td>
<td>2.379</td>
<td>NS</td>
</tr>
<tr>
<td>Impact on quality of life</td>
<td>1.448</td>
<td>1.345</td>
<td>1.276</td>
<td>NS</td>
</tr>
<tr>
<td>Patient satisfaction</td>
<td>1.448</td>
<td>1.241</td>
<td>1.310</td>
<td>NS</td>
</tr>
<tr>
<td>Access to clinical guidelines</td>
<td>1.862</td>
<td>1.757</td>
<td>1.758</td>
<td>NS</td>
</tr>
<tr>
<td>Access to condition-specific risk calculators</td>
<td>2.345</td>
<td>2.034</td>
<td>1.862</td>
<td>0.04</td>
</tr>
<tr>
<td>Information about outcomes of care of previous patients with similar problems</td>
<td>2.276</td>
<td>1.793</td>
<td>1.861</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Information essential for optimal decision-making</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document patient history</td>
<td>1.621</td>
<td>1.413</td>
<td>1.552</td>
<td>NS</td>
</tr>
<tr>
<td>Clinical protocols</td>
<td>2.034</td>
<td>1.758</td>
<td>1.621</td>
<td>NS</td>
</tr>
<tr>
<td>Cost of care to a patient</td>
<td>2.793</td>
<td>1.897</td>
<td>2.931</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Information most often lacking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document patient history</td>
<td>2.414</td>
<td>2.414</td>
<td>2.931</td>
<td>0.03</td>
</tr>
<tr>
<td>Clinical protocols</td>
<td>2.655</td>
<td>3.310</td>
<td>1.828</td>
<td>0.002</td>
</tr>
<tr>
<td>Cost of care to a patient</td>
<td>2.517</td>
<td>2.655</td>
<td>1.931</td>
<td>0.02</td>
</tr>
</tbody>
</table>

* Items rated on scale of 1 (Strongly agree) to 5 (Strongly disagree). Statistics were calculated by ANOVA.
** NS, not significant.
While the lack of documented patient history and test results has been judged as more important in acute and chronic care, finding appropriate clinical protocols and information about the cost of care was of higher priority in preventive care. Furthermore, medical professionals indicated that the successful information searching has a more significant impact on clinical decision-making in preventive care than in other setting. It could reflect differences in the goals of management or variations in risk preferences for different scenarios shown to influence clinical decisions [5]. Although physician uncertainty has been cited as a cause of practice pattern variations [5,9], differences in physicians’ objectives concerning the goals of treatment and management in different models of care have received less attention [13]. However, these differences imply that clinicians may use different information seeking strategies for acute, chronic and preventive care tasks.

Many decision support systems are based on electronic guidelines or protocols. However, this experiment gathered further evidence to support the suggestion that the impact of computerised decision support exceeds that of guidelines [9]. Our results also suggest that the uptake of decision support may be affected by differences in acute, chronic and preventive care tasks. Our participants more frequently used a decision support tool for the breast cancer risk assessment than for acute or chronic care conditions. Our findings about the use of condition-specific risk calculators using pathology testing data are of particular significance as diagnostic tests account for about 25% of ambulatory health care costs, with 80% of all health expenditures directed by physicians [14].

Previously undocumented facts have emerged from our experiment: a higher utility and uptake of decision support for preventive decision tasks than for acute care decisions; a gap in decision support for preventive medicine; significant differences in the perceived impact of information on the clinical decision-making process for acute, chronic and preventive models of care.

These conclusions should be interpreted in light of the limitations in the study design. First, the experiment relied on self-reported behaviour without verification that clinicians actually practice in the manner described. Our study was experimental and did not take into account operational issues concerning the application of EDSS in a clinical setting. It is also possible that clinicians in the intervention arm used EDSS relatively often because they felt they were participating in a new study. Second, we used a convenience sample of primary care practitioners. Participation was voluntary and clearly the study may be biased towards those who felt more comfortable with electronic decision support. However, clinical vignettes as a method for measuring the competence of physicians and the quality of their actual practice have been validated [15] and interactivity in the web-based questionnaires increased compliance [16,17]. Lastly, we surveyed general practitioners. Specialist clinicians are likely to differ from primary care providers in decision-making styles and information needs [18]. However, this has the advantage of representing the point of view of professionals who see the whole spectrum of problems at the front end of health care delivery and do not necessarily represent “early adopters” of new concepts.

In conclusion, the differences in the information needs of clinicians related to different care models have to be considered in the design and implementation of clinical decision support systems. Systems that target preventive model decisions may have higher adoption and impact. These findings discover the relative value of different types of information needed for the optimisation of clinical decision-making in primary care and identify key strate-
gies for the design and implementation of successful EDSS for genomic medicine.

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