Group Decision Support System applied to the medical pluri-disciplinary decision group: Usability and Efficacy

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Abstract . Objectives: This paper aims to study whether the application of a Group Decision Support System to medical collective decision committees is possible and to determine which GDSS specifications are convenient.

Backgrounds: we introduce the common knowledge about GDSS and define the process of the collective medical decision. Methods: An experimental GDSS has been tested in an actual medical collective decision committee. A usability analysis has been performed to precise usability and acceptability of the system and to highlight pro and cons of the various functionalities of the GDSS. Results: Information sharing was conveniently supported by the GDSS. All the documents were available for the support of the discussion. But, the introduction of a GDSS in the decision committee added new constraints such as the necessity of an excellent preparation phase. Limits of the system have been revealed: lack of feedback on decision actors, lack of support to obtain the consensus and lack of memorisation. According to these results, we have proposed new GDSS features to improve the decision. Discussion-Conclusion: Using a GDSS supporting the medical collective decision is realistic and may support the process of the consensual decision.

KEY-WORDS: group decision, medical decision, GDSS, collaborative work, decision committee

Introduction

Medical collective committees are necessary to manage patients with complex or specific pathologies, needing experts’ consensus [1]. They are mandatory in specific medical domains as oncology where inter-disciplinary cooperation is essential in the management of the decision process.

Last twenty years, the development of computer technology permitted the emergence of the concept of Group Decision Support System (GDSS). The features proposed by the GDSS (information sharing, decision process support, communication support, group memory) could emphasize group decision to achieve consensual decision. Thus, applying GDSS features to the medical pluri-disciplinary decision committees appears to be an interesting investigation way [2].
The objective of this work is to experiment and evaluate the usability and efficacy of a GDSS prototype in an urological oncology decision committee.

1. Background

GDSS: The concept of GDSS is issued from the confluence of two fields of the Computer Science: the Computer Supported Co-operative Work (CSCW) systems and the Decision Support Systems (DSS) [3]. GDSS is defined as “an interactive computer-based system that facilitates the solution of unstructured problems by a group of decision makers” [4]. Nowadays, the use of a GDSS is widespread in business, government, military and professional services sectors [5]. The traditional concept of GDSS is the decision room or face-to-face GDSS, for real time decision making in a same time meeting [4]. These are electronic meeting rooms containing a large U shaped table with embedded computers linked through a local area network (LAN), a projection system and a large public screen. Multiple projection devices allow interface with simultaneous information sources such as a video teleconference or web pages. The meeting is usually initiated by a human facilitator whose function is to guide the group and to act as an interface between the group and the devices. Participants, independent of each others provide simultaneously and anonymously the system with ideas or propositions. GDSS typically supports some aspects of the decision process such as brainstorming, idea organization, evaluation, prioritization, and voting. Vote is the mean used to reach the consensual decision. At the end of the meeting, the results of the information captured by the system can be delivered in a formatted report to the participants for immediate action.

GDSS attempts to address several negative aspects of the face-to-face group process, such as dominance of discussion by one participant, influence of high status members of the group, low tolerance of minority opinions, pressures toward group consensus and problem of coordination.

Collective medical decision

The collective medical decision is a very complex task and a pluri-disciplinary process [1]. The medical collective decision committees are mandatory in case of complex pathologies, needing different expertises or therapeutic processes [1]. For fifteen years, these decision committees have been more and more developed to assist the management of rare diseases (often concerning people with congenital malformations or dysfunctions) or life-threatening pathologies (cancer), requiring the cooperation of different experts issued from various medical fields.

During medical collective decision making, experts from different medical fields, mostly in a “same place-same time meeting”, share information and discuss to find a consensus: a common diagnosis and a common therapeutic decision. Medical information is shared through text and images. Experts comment and discuss the documents to refine the diagnosis. They have to discuss and to agree about a common decision of treatment. The discussion is often promoted by a leader (an elder or more graduated and experienced expert).
2. Materials and Methods

2.1. Materials

We have studied a medical collective decision committee devoted to the management of patients suffering from urological tumors. This urological oncology consultation (UOC) was assisted by an experimental GDSS (UOC-GDSS).

Description of the decision committee

The urological oncology decision committee (UOC) gathers different experts: urology surgeon, histologist, radiologist, oncologist and students (residents). Meeting takes place once per month. All the discussions are based on various medical and paramedical data issued from numerous pre-existing examinations. Information is made of multimedia data: histological images, CT scans and X-Rays, specific textual summaries of the clinical data.

Scenario of the medical collective decision .

During a session, the experts are around a table; they have access to common documents. Each expert orally presents or comments the exams of his/her speciality. The experts share the various medical documents, discuss then, and establish a consensus to propose the best decision for the patient.

During this procedure, a physician plays the role of a scrivener. His task is to write on a paper the elements of decision and the final decision issued from the collective discussion in order to elaborate the meeting summary.

2.2. Description of the prototype of GDSS

This system has been implemented on the concept of a local server based upon the peer-to-peer principle: the system checks patient’s documents on different servers of the hospital Information System (X-rays, histological report, letters, lab results...). If a document for a patient is found, it is then downloaded in the GDSS system for possible display. (Figure 1)

![Figure 1: The architecture of the GDSS Prototype](image)

During the meeting, the pilot chooses to display them for presentation, for expert’s comments and for discussion. Three different documents can be simultaneously displayed on a shared public screen.
2.3. Methods

Two usability engineers trained in cognitive psychology and ergonomics from the Usability Lab “EVALAB” [6] have realized the “task and activity analysis” in the OUC. The methodology of the study was based on (i) repetitive natural observations, (ii) audio and video recorded observations, (iii) analysis of tracks of the activity and (iv) user interviews. All participants in the project were given a full report of the task and activity analysis’ results.

Natural Observation of the meeting

4 meetings were observed. A meeting gathered at least five participants: one surgeon, one oncologist, one radiologist, one histologist and one student.

Interview of the participants

8 usual participants of the meeting have been observed and interviewed: 3 urologists, 1 oncologist and 1 radiotherapist, 2 radiologists, 1 histologist, 1 resident. The medical secretaries of each involved department have also been observed and interviewed: they do not intervene during the meeting process but during the preparation task of the meeting. User interviews were individually conducted.

Activity evaluation in the Usability Lab

An activity evaluation of the different members of a multi-disciplinary meeting assisted by the UOC- GDSS was conducted integrating usability engineering methods [6] in the usability lab. 4 participants were involved in this test: one surgeon, one radiologist, one histologist and one resident.

3. Results

3.1. Usability study

From the usability study, we obtained the following results. Two successive phases compose the decision process: the preparation task and the decision meeting itself see (Figure 2).

The Preparation task

This first consists, in opening a new meeting session: (date, list of patient’s name). The collection of medical is mainly realized by the medical secretary. Unlike the common idea (4/8 of the interviewed physicians) that the preparation task is time- consuming, the secretaries found this phase really efficient as this task did not exceed 15 minutes.

The meeting

It is a same time, same place meeting with a pluri-disciplinary expertise (small group of 4 to 9 participants). From the observations realised in the Usability Lab, it was demonstrated that the GDSS prototype fulfilled the main functions required by the users for the realisation of a completed session of pluri-disciplinary decision meeting.
Display of documents: The modalities for displaying documents have to be discussed: which documents to display? In which format? It was proposed to display document in the 100% format and to introduce a special procedure to give a rapid access to various documents when they are too many.

Errors: the patient’s identity must be closely linked to the different documents to avoid confusion amongst the documents of various patients.

Flexibility: the display of documents must be as flexible as possible so that the experts can have a simultaneous access to different elements of the record and display them on different parts of the screen.

“Private” space for the radiologist: the radiologist wants to have a “private session” to prepare the images to be displayed for the other participants. This could avoid lack of time and d better choice of the relevant images.

Generalization: Currently, the system is available in special rooms of the University Hospital. To be successful, the application should be available in all the decision rooms within the hospitals.

3.2. Benefits and Limits

More generally, the main benefits, limits and constraints of the system are summarized in table 1.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limits and constraints</th>
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<tbody>
<tr>
<td>Equal access to the information for each participant by a public shared screen.</td>
<td>Necessity of an excellent preparation</td>
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<tr>
<td>All the documents are available for the support of the discussion</td>
<td>No memorization of the results of the decision</td>
</tr>
<tr>
<td>Experts are free of any manipulation thanks to the “pilot”</td>
<td>Lack of feedback and gap of time for integrating the new information</td>
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<td>(thus they can remain focused on the discussion and decision task)</td>
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Table 1: Benefits, limits and constraints of the introduction of the UOC GDSS in the urological oncology decision committee.
4. Discussion and Conclusion

GDSS are gaining widespread acceptance. Business managers spend as much as 70 to 80 percent of their time in meetings. GDSS improve the process of the meeting by quickly generating, organizing and evaluating large amounts of information. Medical collective decision committees are more and more often required in the medical domain to help the management of patients with complex or specific pathologies needing experts’ consensus.

We wondered whether the application of a GDSS concept to a medical pluridisciplinary decision committee, could be acceptable and useful for the medical staff.

The proposed experimental GDSS has been well accepted and has successfully supported the information sharing. In fact, GDSS propose many features that seem to be convenient to the different phases of the medical collective decision process.

But the current system is imperfect and our study has pointed out some limits: this has led us to propose a refined model of medical collective decision supported by a GDSS and to define some new specifications for the medical GDSS. Our development perspectives are now to improve the GDSS prototype, while being restricted with the appropriate features for the medical collective decision.

Nevertheless, new prospects remain not considered by our study of the existing. One could for example, take into account some possibilities of innovation, such as access to the Web, use of mobile tools, integration in the HIS...etc...The GDSS could allow to enlarge the possibilities of organisation of medical collective decision meetings. For example, supporting the meeting by a Web-based GDSS could make it possible for other distant experts to join the meeting without any displacement or to imagine an asynchronous mode of decision in order to avoid the problems of agenda synchronization.

Thus, a medical GDSS consisting in (Web-published) shared medical data bases, public visualization features, easy access to documentation tools, mobile voting system (avoiding the unlike keyboard’s use) to support consensual decision and memorisation features appears to be an interesting and realistic development project to support the medical collective decision.

References