How to use concept mapping to identify barriers and facilitators of an electronic quality improvement intervention

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Abstract. Systematic quality improvement (QI) interventions are increasingly used to change complex health care systems. Results of randomized clinical trials can provide quantitative evidence whether QI interventions were effective but they do not teach us why and how QI was (not) achieved. Qualitative research methods can answer these questions but typically involve only a small group of respondents against high resources. Concept mapping methodology overcomes these drawbacks by integrating results from qualitative group sessions with multivariate statistical analysis to represent ideas of diverse stakeholders visually on maps in an efficient way. This paper aims to describe how to use concept mapping to qualitatively gain insight into barriers and facilitators of an electronic QI intervention and presents experiences with the method from an ongoing case study to evaluate a QI system in the field of cardiac rehabilitation in the Netherlands.

Keywords. Quality of health care; Concept mapping; Cardiac Rehabilitation.

Introduction

There is persistent room for quality improvement (QI) in health care, but the complexity of health care systems makes it difficult to achieve change. A common approach to changing complex systems is systematic QI, which focuses on improving a system’s underlying processes rather than on correcting mistakes of individuals. It relies on data from professionals’ own setting and encourages working in multidisciplinary QI teams. The organization’s performance should guide them in improving their practice by the Plan-Do-Study -Act (PDSA) cycle, which is part of the Model for Improvement [1]. Many (electronic) QI interventions are founded on this model. Quantitative results of randomized clinical trials (RCTs) can provide evidence whether these interventions were effective to achieve QI but they do not teach us why and how these results were achieved. Qualitative research methods can provide these insights but typically involve only a small group of respondents against high resources.

Concept mapping methodology overcomes the drawbacks of qualitative study designs by integrating results from qualitative group sessions with multivariate statistical analysis to represent ideas of diverse stakeholders visually on maps. As the
method is purposefully designed to integrate input from larger groups of participants with differing content expertise or interest in a domain in an efficient way and short time frame, we hypothesized this method can be appropriate to evaluate QI interventions. This paper aims to describe how to use concept mapping to qualitatively gain insight into barriers and facilitators of an electronic QI intervention. The method is illustrated with experiences from an ongoing case study to interpret results and define improvements after an RCT with a QI system in the field of cardiac rehabilitation (CR).

1. Methods

1.1. Clinical setting: Cardiac rehabilitation in the Netherlands

CR is a multidisciplinary therapy to support recovery from a cardiac incident, and aims to improve overall physical and psychosocial condition [2]. CR is offered by multidisciplinary teams which generally include cardiologists, physical therapists, nurses (of whom one acts as rehabilitation coordinator), psychologists, dieticians and social workers. A recent meta-analysis of RCTs shows evidence of the effectiveness of CR with regard to mortality and cardiac events (relative-risk reduction: 21-47%) [2]. However, in many Western countries CR services are under-utilized, and do not follow the available scientific evidence [3]. Also in the Netherlands CR uptake is low as a recent study shows that only a minority of eligible patients actually receive it [4].

To improve CR services an electronic patient record (EPR) with clinical decision support (CDS) facilities, was developed and evaluated in a cluster RCT. It was shown that CDS considerably improved guideline adherence. However, the trial also revealed persisting organisational implementation barriers [5]. We hypothesized that guideline implementation with CDS systems might be more powerful if used in conjunction with other interventions directed at the decision-making processes at the organizational level [6]. As systematic QI is increasingly used to achieve change at this level in health care, we developed a web-based QI system called CARDSS Online, to involve multidisciplinary care teams in QI by guiding them through the PDSA cycle [7].

1.2. The CARDSS Online system

CARDSS Online was designed as a web-based system which can be consulted by all CR clinics that already used an EPR with CDS. Currently the system is used by 18 clinics that all participate in an RCT evaluating the effect of the system on guideline concordance and performance on quality indicators. We designed the system to be primarily employed during quarterly educational outreach visits with the clinic’s QI team during the RCT. The QI team involves the coordinating nurse, minimal one other discipline and is completed by commitment from a cardiologist and manager. CARDSS Online supports (i) monitoring of indicator-based performance, (ii) selecting aspects of care that need improvement, (iii) developing a QI plan, and (iv) periodically adjusting the QI plan. During the visits the system actively involves the team in the QI effort, without needing extensive knowledge of the underlying concepts. At the server side, CARDSS Online consists of a Microsoft SQL Server database and a Java web application. At the client side, clinics can use any web browser. Development and architecture have been described in more detail elsewhere [6; 7].
1.3. Concept mapping methodology

Concept mapping is a graphic technique for promoting social interaction and exchange. It creates the conditions for the understanding of thoughts and how they are linked with each other. Structured conceptualization is a specific form of concept mapping which can be used to develop a conceptual framework for program planning and development, as well as for evaluation [8; 9]. To construct the map, ideas first have to be described or generated, and the relationships between them articulated. This step is accomplished via a focus group or a series of interviews during which participants are asked to develop a set of statements (ideas) that address the focus. Once the ideas have been generated participants independently sort them into clusters having similar meanings and rate them for variables of interest (e.g. importance and feasibility). Next multidimensional scaling is used to generate a point map, wherein statements that are sorted more often together, are located closer to each other. Hierarchical cluster analysis is used to group points reflecting similar concepts together. The final clusters are labelled and in combination with the ratings used to address the research purpose. Hence, both qualitative group processes are combined with a sequence of quantitative analyses to elicit and map out ideas from different stakeholders about complex issues.

2. Results

Figure 1 gives an overview of the five major steps in the concept mapping process as described by Kane and Trochim [8]. In this section we describe all steps and our experiences with the first three steps during the evaluation of CARDSS Online.

**Planning** - The focus for the project is identified, participants selected, and schedule and logistics determined. Within our research group we formulated the focus statement as: “To implement QI in a CR clinic by means of CARDSS Online, it is necessary that...”. Overall 115 professionals took part in the QI teams of the 18 clinics using CARDSS Online (range 3–10 per clinic). Most of them concerned nurses (30), physiotherapists (20), managers (18) and cardiologists (15). All of them were considered potential participants. When planning the logistics we tried to minimize the time investment to gain a maximum response.

**Generate ideas** – Idea generation is accomplished through some form of brainstorming, either live or over the web. From each of the first 11 clinics that used CARDSS Online we asked one or two representatives to take part in a live focus group session. Finally three 2-hour sessions were organized with 18 participants (3–8 per session) representing all 11 clinics. Two sessions were organized during national CR meetings (taking no extra travel time). Overall 85 statements concerning QI and CARDSS Online were formulated, such as “The coordinator needs to be equipped to organize the QI process” and “The indicator scores need to be printable”.

**Structure ideas** – The ideas generated are synthesized and structured in this step. During two subtasks participants first sort the statements into
clusters and then rate them for variables of interest. For this step we use the web-based Concept System Global MAX software [10]. As the 85 statements in our study were partially overlapping, they were consolidated by the research team into 42 unique statements beforehand. All 115 QI team members are currently invited to the 45-minute sorting and rating part which can be performed online at the time and place they prefer.

During the sorting subtask participants are supported by the software to group statements into piles of similar ones that ‘make sense to them’ and give them a label. Participants are free to use as few or many piles as they need to arrange the statement set meaningfully. To illustrate: e.g. it is possible that the previous statement about printing is sorted together with a statement like “Improvements on indicator scores over time should be visible” in a cluster labeled as “Presentation of indicator results”. During the rating subtask participants can rate each individual statement on a Likert scale from 1 (not at all) to 5 (very) for two dimensions: its importance during QI in their own CR clinic; and its feasibility within one year in their clinic. Until now we have 43 (37.4%) respondents who are representative for our target population. Data collection on this step runs until the end of November.

Analysis – The representation of ideas in maps is accomplished through a sequence of multivariate statistical analyses. For our study, we expect results of this step in Spring 2015. The analyses will combine all individual clusters in one point map showing all statements in relation to each other (see for an example Figure 2 in [11]). As statements that are sorted more often together will appear closer to each other on the map, the ideas can be organized into clusters. To identify a cluster configuration where separation or merger of clusters will adequately represent the data, the research team will iteratively increasing or decreasing the cluster size by one. After reviewing different configurations, a final cluster map will be determined which provides optimal balance between sufficient detail and meaningful interpretation. In addition to the cluster map other graphs can be used to: compare ratings between importance and feasibility across the clusters (rating bridge map); compare cluster ratings between multiple disciplines and clinics (pattern matching); and compare ratings within clusters between these groups (go-zones) [8].

Interpretation – During the interpretation the computed maps will be used to address the purposes of the project and determine strategies and tactics for future action. We will discuss the maps within our research team to get a comprehensive overview of all barriers and facilitators which will be handled respectively used during the further implementation of QI by means of CARDSS Online.

3. Discussion

This paper describes how to use concept mapping to qualitatively gain insight into barriers and facilitators of an electronic QI intervention. In our ongoing case study with this method we aim to interpret results and define improvements for a QI system in the field of CR, in addition to quantitative results from an RCT. Concept mapping has several strengths in comparison to other qualitative designs as it (i) is purposefully designed to integrate input from larger groups of participants with differing content expertise or interest in an efficient way and short time frame, (ii) creates a series of maps that visually depict the composite thinking of the group, (iii) allows comparison of results across variables such as mono disciplinary groups, and (iv) results in a framework that can be used for both the qualitative evaluation and interpretation of
RCT results on QI interventions and to guide future action planning [12]. As we have no results from our case study yet, for the moment we mainly experienced the first advantage of large group participation against low resources. The method has also some limitations. There is a restriction in the number of statements that can reasonably be processed by the participants. However, it is possible to reduce a large list of statements by combining or eliminating redundant or near-redundant ones. In addition the focus statement should be formulated well and specific, as double-barrelled focus statements may result in incoherent results.

As contemporary health care faces a broad array of challenges (e.g. with limited resources delivering high quality care and the increasing consciousness on the importance of continuous monitoring and working on systematic QI) it is essential both to work across a wide variety of disciplines and to include a collaboration of diverse stakeholders at multiple levels of the health system: including both professionals and their managers. These challenges place considerable burdens on the health care system and require processes and methods that can address the complexity and the demanding requirements of such work [12]. Concept mapping can be a practicable and important tool for participatory collaborative processes that have rigor and scientific credibility. The description of the concept mapping process in this paper and the experiences of our case study can be used by those involved in the evaluation of electronic QI interventions in health care. By enabling professionals to interact with each other’s views in an efficient way the method gives an overview of relevant concepts and their rating by different stakeholders. In addition to quantitative research results, concept mapping results can teach us why and how the results were achieved.

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References