Designing Learning Outcomes for Handoff Teaching of Medical Students Using Group Concept Mapping: Findings From a Multicountry European Study

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Abstract

Purpose
To develop, by consultation with an expert group, agreed learning outcomes for the teaching of handoff to medical students using group concept mapping.

Method
In 2013, the authors used group concept mapping, a structured mixed-methods approach, applying both quantitative and qualitative measures to identify an expert group’s common understanding about the learning outcomes for training medical students in handoff. Participants from four European countries generated and sorted ideas, then rated generated themes by importance and difficulty to achieve. The research team applied multidimensional scaling and hierarchical cluster analysis to analyze the themes.

Results
Of 127 experts invited, 45 contributed to the brainstorming session. Twenty-two of the 45 (48%) completed pruning, sorting, and rating phases. They identified 10 themes with which to select learning outcomes and operationally define them to form a basis for a curriculum on handoff training. The themes “Being able to perform handoff accurately” and “Demonstrate proficiency in handoff in workplace” were rated as most important. “Demonstrate proficiency in handoff in simulation” and “Engage with colleagues, patients, and carers” were rated most difficult to achieve.

Conclusions
The study identified expert consensus for designing learning outcomes for handoff training for medical students. Those outcomes considered most important were among those considered most difficult to achieve. There is an urgent need to address the preparation of newly qualified doctors to be proficient in handoff at the point of graduation; otherwise, this is a latent error within health care systems. This is a first step in this process.

Patient handoff has been defined as “the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis.” Improperly conducted handoffs can lead to wrong treatment, delays in medical diagnosis, life-threatening adverse events, patient complaints, increased health care expenditure, increased hospital length of stay, and a range of other effects that affect the health system or patient. Several theoretical frameworks have been proposed to conceptualize patient handoff and are helpful when considering the design of learning outcomes. Two in particular support a generic approach to handoff training and, therefore, may be particularly helpful when considering learning outcome design. The first framework identifies three key elements in handoff. In view of these shortcomings and as a starting point to address these educational deficiencies, we undertook this study to develop, by consultation with experts in medical education, agreed learning outcomes for the teaching of handoff to medical students.
safety culture. The second framework, focusing on a competency-based approach to handoff, makes recommendations for handoff training based on the core competencies of communication and professionalism.14

An important focus of learning outcomes is the student’s ability to put knowledge to use in solving problems, and operating effectively in a chosen field.15 Various methods are used to facilitate definition of learning outcomes by experts. These include survey-based questionnaires, the Delphi method, and expert working groups.16–20 Constraints associated with the Delphi method, and expert working of learning outcomes by experts. These methods are used to facilitate definition respect to this study.21,22 While GCM which we describe in detail below with to use group concept mapping (GCM), to achieve when participants represent on each one may be even more difficult how much emphasis should be placed Agreement on learning outcomes and reaching agreement on them. Agreement on learning outcomes and how much emphasis should be placed on each one may be even more difficult to achieve when participants represent different professional domains. One solution to the issues just mentioned is to use group concept mapping (GCM), which we describe in detail below with respect to this study.21,22 While GCM shares advantages of other methods for consensus building, such as Delphi, the affinity diagram approach, and focus groups, it mitigates against some of their drawbacks. In contrast to the Delphi method, GCM requires only one round of structuring the data, which is generated by the participants themselves, not by the facilitator. Unlike the analysis of focus group data, GCM does not rely on researcher-driven classification schemes and does not need an intercoder discussion. In GCM, researchers use the original intact respondents’ statements as units of analysis and then quantitatively aggregate their contributions through multidimensional scaling (MDS) and hierarchical cluster analysis. Consensus is not forced; it emerges objectively through the multivariate statistical analysis.

Method
Setting, process, and participants
We undertook this study as part of the Patient Project, a multicountry European Union–funded project. The primary focus of this project is to develop a curriculum for handoff training for medical students at a European level; thus, our study was limited to addressing training for medical students.23 We conducted this study at the School of Medicine University College Cork (UCC), Ireland; the Open Universiteit of the Netherlands (OUNL); Rheinisch-Westfälische Technische Hochschule Aachen University (UKA), Germany; and Fundacion Avedis Donabedian (FAD), Barcelona, Spain, during the period of May to June 2013. Because this research was conducted in established educational settings, involving normal educational practices, it was exempt from institutional review board approval from all four participating institutions.

We invited a group of 127 experts to participate in a GCM process, to identify a common understanding about learning outcomes for handoff training for medical students. We invited experts to participate in the GCM via e-mail. As the participants remained anonymous throughout the GCM process, the only record linking the subject and the research would be the consent document, and the principal risk would be potential harm resulting from a breach of confidentiality; therefore, written consent was not sought. Also, the research involves no procedures for which written consent is normally required outside the research context. Participation in the GCM was deemed to indicate that consent had been given. The participants were not offered or given any incentives to participate in the GCM.

We chose GCM because it is a structured, mixed-methods approach applying both quantitative and qualitative measures to identify an expert group’s common understanding about a particular issue.14–16 The method involves the expert participants in idea generation, sorting of ideas into groups, and rating the ideas on some values—for this study, importance and difficulty to achieve. The participants work individually. The GCM method does not need interexpert discussion to come up with an agreement. When sorting the statements into groups, the participants, in fact, “code” the text themselves. Then it is the advanced statistical techniques of MDS and hierarchical cluster analysis, performed by the research team, that quantitatively aggregates individual inputs from the participants to reveal objective patterns in the data.27,28 One of the distinguishing characteristics of GCM is visualization, which is a substantial part of the analysis. Visualization allows for grasping at once the emerging data structures, their interrelationships, and their interpretation to support decision making.

Expert selection
We designed a selection framework for identifying experts in medical education to contribute to the GCM process. They were mainly from, but not exclusively so, the medical schools and the related hospitals associated with UCC, UKA, and FAD. They were academics (non-discipline-specific) or were clinicians (doctors or nurses) involved in medical education at the undergraduate or postgraduate level. Using this framework, we constructed a list of experts to participate in the GCM. We avoided duplication of experts by undertaking a cross-check process. We then invited the experts to participate in the GCM via e-mail with one subsequent reminder e-mail and asked the five demographic questions: country of experts; discipline of experts; professional experience in clinical health care; years teaching in medical education; and years in curriculum development in health care.

Group concept mapping
The GCM procedure consisted of five phases: idea generation (brainstorm) and idea pruning, sorting of ideas into groups, rating on two values (importance and difficulty to achieve), analysis of the data, and interpretation of the results. The first three steps were performed by the experts; the last two steps were performed by the research team. We invited the experts through the project’s online management system and explained the rationale for the study. We assured the experts of anonymity with regard to their inputs and provided them with a link to the brainstorming page of a Web-based tool for data collection and analysis (Concept System Global, 2013). They could visit the Web site as many times as they needed using their own username and password. On the brainstorming page we asked them to generate ideas by completing the following trigger statement: “One specific learning outcome of the Handoff module is …” by using short phrases or statements expressing one thought. We gave the experts two weeks to complete the idea generation task.

When the idea generation phase was completed, we used convenience
Data analysis

Idea generation

Idea pruning

Sorting and ranking

Data interpretation

Phase 1

Phase 2

Phase 3

Phase 4

Phase 4

Data generation

Data analysis

We used MDS and did agglomerative hierarchical cluster analysis using Ward's algorithm to analyze the data. Nonmetric MDS uses the group proximity matrix and symbolizes it as a point map on which statements are displayed as points on a two-dimensional space with distances between them replicating the frequency with which they were grouped together by participants. Cluster analysis uses the x, y coordinates from the MDS to group statements into clusters that represent underlying themes. Hierarchical cluster analysis starts with the assumption that all ideas are individual clusters,
aGCM is a structured mixed-methods approach, indicating group concept mapping.

Results

We invited 127 experts to participate. Of these, 74 (58%) registered initially for online data collection. Of these 74 experts, 45 (61%) contributed effectively to the brainstorming session. Twenty-two of the 45 (49%) experts who contributed to the brainstorming phase completed the sorting and rating phases (17% of the initial 127 invitees). The 45 experts produced 229 statements during the brainstorming phase. The 4 experts we selected reduced these to 107 statements after the pruning phase. The Ward agglomerative hierarchical cluster analysis placed the statements in 10 clusters for labeling. For the demographic characteristics of experts who participated in brainstorming, see Tables 1 and 2.

Primary outcome measures

We identified themes for the 10 clusters which serve as labels for learning outcomes, shown in List 1. The themes cover knowledge (e.g., “Being aware of errors and risks in handoffs”), skills (e.g., “Demonstrate proficiency in handoff in simulation”), and attitudes (e.g., “Engage with colleagues, patients and carers”).

Secondary outcome measures

The group of experts rated the statements using a 1–5 ranking scale on importance (1 = not at all important; 5 = very important) and on how difficult they would be to achieve (1 = easiest to achieve; 5 = most difficult to achieve). List 1 shows the clusters on importance and difficulty to achieve. The clusters entitled “Being able to perform handoff accurately” and “Demonstrate proficiency in handoff in workplace” were rated as most important. “Demonstrate proficiency in handoff in simulation” and “Engage with colleagues, patients, and carers” were rated most difficult to achieve.

Discussion

There are several implications from our GCM study. We identified 10 themes with which to select learning outcomes and operationally define them to form a basis for a curriculum on handoff training for medical students. In contrast to the traditional position on learning outcomes seen as only expected and consequently merges ideas until it arrives at one cluster. Subsequently, human experts need to look at the solution proposed and decide on the number of clusters that represents the data in the best possible way and reflects the context of the study. See Figure 1 for an overview of the GCM process.
results of the teaching and learning, our findings emphasized the need to consider the means by which to achieve the desired learning outcomes, reflected by the two clusters on performing in simulated and real settings. The results of our current study are in line with some other studies. We identify similar issues such as need for skills in application of structured handoff methods and tools, standardization of handoff procedures, effective communication and collaboration between different stakeholders, and the role of workplace learning. At the same time, our study extended the scope of handoff topics and teaching methods to performing handoff accurately, minimizing errors and risks, understanding the effect of good practices in handoff, and recognizing the consequences of improper handoff. Our study emphasized the idea of creating a simulated environment for teaching and learning handoff. Learning outcomes have also been ranked in terms of how important they are, and on how easy or difficult they may be to achieve. For example, some learning outcomes, such as “Being able to perform handoff accurately,” “Demonstrate proficiency in handoff in workplace,” “Demonstrate proficiency in handoff in simulation,” and “Engage with colleagues, patients, and carers” were rated very important but were considered difficult to achieve. This discrepancy between importance and difficulty to achieve in relation to these learning outcomes may reflect issues in relation to the costs and manpower resources need for simulation and the challenges such as supervision and indemnity encountered in involving undergraduates in work-based clinical practices within the participants’ organizations.

Our study has several strengths. We used a structured, mixed-methods approach applying both quantitative and qualitative measures to provide an expert informed basis for defining learning outcomes. Our study included experts from four European countries, who generated the groups of statements that provided the themes for the learning outcomes. According to a meta-analytical review containing 69 GCM studies, conducted in the last 10 years, a sample of 20 to 30 participants is optimal for generating valid and reliable results from sorting data. The variability of stress value increased when 15 or fewer sorters were involved; no improvement of the stress value was detected when more than 35 sorters were included. Twenty-two participants in our study were involved in sorting the statements, which is within the recommended range. The stress index of our study of 0.338 is also in the suggested borders and indicates good internal representation validity.

The limitations of our study include a small sample and the generalizability of our study’s findings. A higher number of experts involved in the rating phase was desirable; however, sorting is the primary activity in the GCM studies, and rating is the secondary one. Also, although our study suggests what we could expect from learners in terms of knowledge, skills, and attitudes, the level of these categories needs to be determined—for example, using taxonomies in the cognitive and

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**List 1**

**Themes identified by Participants for Learning Outcomes From the Group Concept Mapping, Rating of the Themes by the Participants on Importance to Achieve, and Rating by Difficulty to Achieve, From a Multicountry European Study of Group Concept Mapping and Learning Outcomes for Medical Student Handoffs, 2013**

**Themes identified for learning outcomes**

- Application of structured handoff methods
- Demonstrate proficiency in handoff in workplace
- Being able to perform handoff accurately
- Demonstrate proficiency in handoff in simulation
- Learn how to communicate effectively
- Prepare clinical documentation
- Engage with colleagues, patients, and carers
- Being aware of errors and risks in handoff
- Understand the benefits and challenges of handoff
- Clinical performance

**Rating on importance: Range 1–5 with 1 indicating lowest on importance and 5 indicating most important**

1. “Application of structured handoff methods”
   - “Learn how to communicate effectively”
   - “Prepare clinical documentation”
2. “Clinical performance”
3. “Engage with colleagues, patients, and carers”
   - “Understand the benefits and challenges of handoff”
4. “Being aware of errors and risks in handoff”
   - “Demonstrate proficiency in handoff in simulation”
5. “Being able to perform handoff accurately”
   - “Demonstrate proficiency in handoff in workplace”

**Rating on difficulty to achieve: Range 1–5 with 1 indicating easiest to achieve to 5 indicating most difficult to achieve**

1. “Understand the benefits and challenges of handoff”
2. “Application of structured handoff methods”
3. “Being able to perform handoff accurately”
   - “Being aware of errors and risks in handoff”
4. “Prepare clinical documentation”
5. “Clinical performance”
   - “Learn how to communicate effectively”

**Group concept mapping is a structured mixed methods approach, applying both quantitative and qualitative measures to identify an expert group’s common understanding about the learning outcomes for training medical students in handoff.**
The significance of our study is that future handoff training curriculum for medical students might be designed on the basis of these learning outcomes, possibly at a European or international level, similar to the World Health Organization’s Patient Safety Curriculum Guide. Assessing the competencies associated with the learning outcomes is paramount. Valid assessment of competencies in these learning outcomes may be achieved within the traditional objective structured clinical examination setting and the high-fidelity simulated environment with the use of valid and reliable metrics for assessment. Further research should focus on the effects of handoff training on medical practice. The next step is the design of the curriculum and its implementation, followed by assessment of the success or not of this educational strategy in preparing new medical graduates to be proficient in the handoff process. Further research might focus on the following, for example: Has patient safety benefited? Has there been a decrease in reported medical errors? Has the quality of discharge improvement?

Our GCM study identified expert consensus on 10 themes for designing learning outcomes for a handoff training curriculum for medical students. Those learning outcomes considered most important were also among those considered most difficult to deliver. We believe that there is an urgent need to address the issue of preparing newly qualified doctors to be proficient at handoff at the point of graduation; otherwise, this is a latent error within health care systems.

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