Benefits and challenges of fostering research-focused communities of practice at a specialised health sciences university: An exploratory study

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ABSTRACT

Introduction: Structured undergraduate research, whether mandatory or elective, provides undergraduate students with a unique opportunity to develop their research skills. However, the majority of the students undertake individual research projects rather than working in a group. This study explores the perceived benefits and challenges of fostering research focused communities of practice at a specialised health sciences university in Riyadh, Saudi Arabia. Methods: This cross-sectional study was conducted at the College of Medicine, King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) Riyadh, Saudi Arabia. The study was approved by the Ethics Committee at the King Abdullah International Medical Research Center (KAIMRC). A self-administered questionnaire was developed that assessed the perceived benefits and challenges of doing research in groups. Data were collected using a mixture of a dichotomous and a 5-point Likert scale and were analysed using Statistical Program for Social Scientists (SPSS). Results: Of the 380 medical students invited to participate in this study, 307 completed the questionnaire, with a response rate of 80.7%. The majority of the medical students (87%) agreed on the importance of teamwork in conducting medical research. Almost all medical students (96%) believed patience and tolerance were required to make the team successful. Significant differences were found between junior and senior medical students regarding their perceived benefits (P-value = 0.0001) and challenges (P-value = 0.0007). Conclusion: Although most of the students believed that doing research in groups is essential and that working within such groups enhances their research knowledge, forming these research groups was not without problems. The need for patience and tolerance to keep the group together, the issue of free-riders and the difficulties related to which research group to join were some of the challenges students encountered.

Keywords: Medicine, research, students

Introduction

Over the last few decades, there has been a growing understanding of the importance of multi-disciplinary teams. A research team is defined as “a group of people working together in
Research teams in academia could be in any combination and may be recruited or created from different or same institutions. However, Tuckman’s expanded model of group development, such as forming, storming, norming, performing and adjourning, need to be considered for better group cohesion. Many theoretical frameworks and models that underpin knowledge and practice of group work were proposed to develop participants and structure their formations gradually. As a social learning theory, communities of practice (CoPs) provide a valuable perspective on knowing and learning and allow interactions between collaborating individuals. Wenger defines communities of practice as: “groups of people who share a concern or a passion for something they do and learn how to do it better as they regularly interact”.

The CoPs are routinely used for personal and professional development (PPD), problem-based learning (PBL) and other group activities conducted in health sciences institutions. There are three central features of CoPs: The domain that deals with the common interest of the group, the participating community, and the practice, which is the system that needs to be followed to complete the work. In this context, the domain is the research. The community is the medical students. The practice is the guide to develop the research protocol, collect and analyse the data, and publish the findings. The ultimate aim of the CoPs is to develop a range of interpersonal skills that are increasingly important in clinician scientists’ career and research capability.

Different institutions implement different approaches to provide medical students with a robust research background. Medical research is mandatory in some medical colleges around the world. Because of lower research interest among medical students, the Government of Norway passed legislation in 2001 that instructed all medical schools to establish funded research programs. Similarly, students at some universities in Sweden and Ireland are required to undertake mandatory research at some point in their undergraduate medical education. However, in other institutions, medical students are encouraged to conduct either an optional year-long individual research as an interrupted intercalating year or do summer research projects.

Evidence-based medicine requires individuals from different specialties to work and engage together as a team. In medical schools, implementing and encouraging such a collaborative attitude prepares students to become effective individual team members, conduct evidence-based research and improve patient care. A number of published papers reported on undergraduate students’ perceptions of working in groups. A study conducted at a Medical School in Sydney evaluated the perceptions of tutors and tutees and found that working in small groups provided a framework within which medical students could easily practice their medical knowledge, improve their communication and clinical skills. Another study in South Africa used blended methods to deliver an integrated research program where medical students are grouped to conduct community-based research and implement the findings through health promotion activities.

Although many students gain positive experiences in their group projects, there remain some challenges that may affect the development and functionality of the group. Colbeck and colleagues found several influences that may affect the group dynamics, one of which is the amount of knowledge they received before the conduction of the project.

Medical students at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) are required to conduct research projects as part of their curriculum. Initially, students were allowed to work individually. When the number of medical students significantly increased, the College of Medicine introduced group research to foster a collaborative attitude and enhance their interpersonal skills. However, students’ perceptions of the benefits of the new approach and the challenges they face during the research conduction have not been investigated. This study aimed to explore the benefits and challenges of doing medical research in groups at King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

**Methods**

**Study design**

This cross-sectional study was conducted at the College of Medicine, King Saud bin Abdulaziz University for Health Sciences (KSAU-HS) Riyadh, Saudi Arabia. The focus of this study was to assess the medical students’ perceived benefits and challenges of doing medical research in groups. A total of 307 medical students completed a self-administered questionnaire that assessed the demographic characteristics and the perceived benefits and challenges of doing medical research in groups.

**Study settings**

King Saud bin Abdulaziz University for Health Sciences is a public institution that was established in 2005. The university offers various specialties in health sciences such as medicine, dentistry, pharmacy, nursing, and applied medical sciences. The College of Medicine offers a six-year medical program which is divided into pre-professional (1st and 2nd years), pre-clinical (3rd and 4th years) and clinical (5th and 6th years). The research unit is one of the various units of the medical education department at the College of Medicine. This unit is responsible for delivering structured basic medical research lectures and tutorials and guiding students to develop a research proposal.

**Sample characteristics**

Each year the College of Medicine admits approximately 300 students (200 males and 100 females). In 2015, the medical research program offered at the College of Medicine moved from one student one project approach to group research. Using Tuckman’s Model of Group Development of forming, storming, norming, performing and adjourning as a guiding
framework, third-year medical students are asked to create groups of five of their choice each year. However, at the end of this process, if some students do not find a group, the Research Unit helps them find groups. Each group is then required to select a topic, formulate a research question, and choose a supervisor or is assigned to them depending on the type of study. All groups and their supervisors are also required to complete and sign a learning contract. The first of this two-year program, groups are expected to develop a proposal and, if approved, continue the second year to collect and analyse the data, interpret the results and write up the manuscript.

Data collection instrument
A self-administered questionnaire was developed, and to ensure the face and content validity, senior medical education experts had reviewed the questionnaire before it was piloted. After receiving the responses, Cronbach's $\alpha$ value was calculated to determine the internal consistency of the items with a value of 0.8. The questionnaire had three sections: The first section of the questionnaire contained eight demographic questions that included gender, age, and the academic year, etc. The second section is comprised of four yes or no questions about the students' past experiences of doing research. The third section consisted of 20 questions that assessed the challenges and benefits of doing research in groups. In this section, students were asked to rate the benefits and challenges they faced in doing medical research in groups using the Likert scale (1 strongly disagree to 5 strongly agree). The designated research group members were responsible for the distribution and collection of the questionnaires. Face and content validity was ensured through the comprehensive development of the questionnaire by literature review, public interviews and expert review.

Statistical analysis
Data entry and data analysis were carried out using Statistical Program for Social Sciences (Version 25). Frequencies and percentages were presented for categorical variables such as gender, year at the medical school, etc., Mean and standard deviation were calculated for quantitative variables such as age and total scores. For inferential statistics, the Chi-square test was used to compare categorical variables and T-test, and ANOVA was used to compare the means of the demographic variables and perceived benefits and challenges. A test with a $P$ value <0.05 was considered to be statistically significant.

Results
Demographic characteristics
Of the 380 medical students invited to participate in this study, 307 completed the survey questionnaire, with a response rate of 80.7%. All of the respondents were from the College of Medicine, KSAU-HS, Riyadh. Three-quarters of the participants were males 227 (73.9%) with a mean (SD) age of 22 (±2) years. Almost half of the participants, 151 (49%), were third-year medical students and the majority, 271 (88.3%), were those who joined the medical school straight from secondary schools. Most of the participants' parents were educated up to the postgraduate level [Table 1].

Figure 1 shows medical students' perceived benefits of doing research in groups. Eighty-seven percent of the medical students agreed on the importance of teamwork in conducting medical research, followed by dividing the tasks that allowed the group to achieve more in a short period (72%). Similarly, 71% of the medical students thought it was good to conduct research in a group. Agreements on the atmosphere within

| Benefits                                                                 | Percent of agreement |
|-------------------------------------------------------------------------|----------------------|
| Teamwork is important in conducting medical research.                   | 87%                  |
| Dividing the tasks allowed the group to achieve more in a short period of time. | 72%                  |
| I think it is a good idea to conduct a research in a group.             | 71%                  |
| The total number within my research group is acceptable.               | 67%                  |
| Working as a group enhanced my research knowledge                       | 61%                  |
| Group members attend most of our project meetings.                     | 59%                  |
| Group members give each other feedback on the assigned tasks.           | 58%                  |
| The group atmosphere helped me to work better.                         | 49%                  |
| Tasks were divided based on the skills of the group members.            | 44%                  |
| It was easy to assign a research group leader.                         | 43%                  |

Figure 1: Medical students' perceived benefits of doing research in groups
the group (49%), dividing the tasks based on the skills available (44%) and assigning group leader (43%) were lower among the participants.

Regarding medical students’ perceived challenges of doing research in a group [Figure 2], almost all participants (96%) believed it required patience and tolerance to make the team successful, with only 16% of the students thinking about leaving their group. Furthermore, 84% thought some group members worked more than others, and (90%) felt it was better to choose their group. Lower agreements on negative perceptions were observed for experiencing conflicts with the group members (23%), preferring to work alone (26%) and keeping the group together (31%).

Table 2 shows the perceived benefits and challenges of doing research by the demographic variables. Gender, what type of secondary school attended before joining the university, fathers’ and mothers’ educational background and the cumulative GPA of the participants did not show any significance. Significant differences were found between junior and senior medical students regarding their perceived benefits (P-value = 0.0001) and challenges (P-value = 0.0007). However, the age of the medical students was only significantly associated with the perceived challenges (P-value = 0.0008) when conducting research in a group. Further analysis confirmed that older and senior medical students reported more challenges when compared to younger students.

**Discussion**

The rationale for integrating structured research programs into the medical school curriculum is to foster an interest in medical research and produce clinician-scientists. KSAU-HS is one of the very few universities worldwide and the only one in Saudi Arabia that introduced group research into the curriculum. Medical students are required to select a topic of their choice and collectively formulate a research question. Next, they are expected to develop a proposal, collect the data, and write a project report. To put into practice, this team-based model brings together a group of students and carefully selected supervisors and co-supervisors. It is against this background that this study was conducted to explore medical students’ perceived benefits and challenges when carrying out research in groups at KSAU-HS.
Students also reported that dividing the tasks among themselves helped them achieve more quickly and that they acquired more research knowledge by being part of their group. This attitude of sharing the tasks is an essential factor that may resolve the phenomenon. First, some group members might feel that they are not competent enough to carry out the tasks assigned to them. Others, particularly those whose English language is not at the required level, may find it difficult to effectively communicate in this language. Another reason could be that group members themselves allow some of them to be free-riders to avoid being awarded lower grades for the group project. Other studies also reported that a lack of research interest might lead some members to not contribute to the overall project.

Although there are clear guidelines on the problem of free-riding in group research, over 80% of the participants in this study stated that some group members worked on the project more than others, an attitude that approximately 60% of the medical students thought affected the group’s progress. A number of reasons could be attributed to this phenomenon. First, some group members might feel that they are not competent enough to carry out the tasks assigned to them. Others, particularly those whose English language is not at the required level, may find it difficult to effectively communicate in this language. Another reason could be that group members themselves allow some of them to be free-riders to avoid being awarded lower grades for the group project. Other studies also reported that a lack of research interest might lead some members to not contribute to the overall project.

There was no significant difference between perceived benefits and challenges of doing research in groups and participants’ demographic characteristics such as gender, what type of secondary school attended before joining the university, fathers’ and mothers’ educational background and the cumulative GPA of the participants. However, when we compared the age groups of the participants and the perceived benefits and challenges, senior medical students reported that they encountered more challenges than younger students. This finding is consistent with a study in Ontario, Canada, where investigators found a significant difference between second-year and fourth-year medical students. Similarly, an Australian study also found that junior students were more interested in group research when compared to seniors medical students.

### Limitations

Despite the comprehensive methodology and the design used in this study, certain limitations need to be considered. First, this study was carried out in one institution (KSAU-HS), limiting the results to be generalised to other institutions. KSAU-HS has separate male and female campuses; access to female students was an issue during the data collection, thereby limiting their participation. Contrary to the junior medical

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**Table 2: Perceived benefits and challenges of doing research in groups by demographic variables**

| Benefits/Challenges | Gender | Age (years) | GPA | High School | Father's education | Mother's education |
|---------------------|--------|-------------|-----|-------------|-------------------|-------------------|
|                     | Mean   | SD          | P   | Mean        | SD                | Mean              |
| Benefits            | 36.4   | 6.9         | 0.43| 35.2        | 5.3               | 0.069             |
| Challenges          | 37.1   | 7.2         |     | 33.8        | 4.9               |                   |
| Gender              | Male   | Female      |     | Age (years) | 20, 21, 22, 23    | 24+               |
|                     | 35.8   | 7.6         |     | 36.6        | 5.1               | 0.176             |
|                     | Batch 12 | 34.2 | 8.2 | 0.001 | 36.1 | 6.1 | 0.007 |
|                     | Batch 13 | 34.9 | 6.5 |     | 36.1 | 5.8 |       |
|                     | Batch 14 | 37.9 | 6.2 |     | 33.9 | 4.4 |       |
|                     | Batch 15 | 37.2 | 7.1 |     | 34 | 5.2 |       |
| Batch level         | Secondary | 36.6 | 6.8 | 0.791 | 34.6 | 5.2 |       |
|                     | Graduate | 36.3 | 8.3 |     | 35.8 | 5.8 |       |
| Entry level         | No education | 37.4 | 7.1 | 0.4 | 35 | 4.9 | 0.142 |
|                     | Primary | 36.4 | 6.4 |     | 33.7 | 5.1 |       |
|                     | Secondary | 36.1 | 7.2 |     | 34.9 | 5.2 |       |
|                     | Undergraduate | 36.8 | 8 |     | 34.2 | 5.8 |       |
|                     | Postgraduate | 36.6 | 6.6 |     | 34.8 | 4.9 |       |
|                     | No education | 34.4 | 8.3 | 0.488 | 36.7 | 5.9 | 0.748 |
|                     | Primary | 39.6 | 3.6 |     | 35.1 | 4.7 |       |
|                     | Secondary | 36.9 | 7.5 |     | 34.6 | 5.5 |       |
|                     | Undergraduate | 36.6 | 7.1 |     | 34.3 | 5.3 |       |
|                     | Postgraduate | 36.4 | 6.8 |     | 34.7 | 5 |       |

Our findings show that medical students overwhelmingly agreed that teamwork is essential in medical research, and over two-thirds of them thought it was a good idea to conduct research in a group. These findings agree with studies that found working in teams would benefit students in improving their clinical skills while at the same time allowing them to successfully carry out multi-disciplinary research and publish the results. Students also reported that dividing the tasks among themselves helped them achieve more quickly and that they acquired more research knowledge by being part of their group. This attitude of sharing the tasks is an essential factor that may resolve the phenomenon. First, some group members might feel that they are not competent enough to carry out the tasks assigned to them. Others, particularly those whose English language is not at the required level, may find it difficult to effectively communicate in this language. Another reason could be that group members themselves allow some of them to be free-riders to avoid being awarded lower grades for the group project. Other studies also reported that a lack of research interest might lead some members to not contribute to the overall project.

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students who were at the College of Medicine at the time of the data collection, senior medical students were in their clinical rotations, which might have affected their perception and limited their participation.

**Conclusion**

Most of the students perceived that doing research in groups is important and that working within such groups enhances their research knowledge. However, the process of forming these research groups was not without problems. Challenges reported include the need for patience and tolerance to keep the group together, the issue of free-riders and the difficulties related to which research group to join. Senior medical students stated more challenges compared to junior students. Taking such issues into consideration will further facilitate this experience of working as a team in conducting research.

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Nil.

**Conflicts of interest**

There are no conflicts of interest.

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