



## Evaluation of Research Projects Conducted by King Saud University Medical Students: Does Quality Impact Dissemination?

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### ABSTRACT

**Introduction:** Medical students at King Saud University (KSU) conduct research projects during their undergraduate study. However, only a minority of research projects reports are disseminated. This study aims to evaluate KSU medical students research projects conducted during 2011 and 2012, and to assess the association between research reports' quality and publication propensity. **Methods:** This is a case-control study where cases were defined as published reports and controls were defined as unpublished reports. 25% of the research reports submitted in 2011 and 2012 were targeted for this study. The selected studies were critically and independently appraised by two reviewers. **Results:** Twenty-six research reports were included in this study, where nine reports were published in peer-reviewed journals. All of the included studies were observational, whereas most of the conducted studies were cross-sectional. Quality scores given by each reviewer for each evaluated study were highly correlated (Pearson correlation coefficient = 0.897, p-value < 0.01). The average quality score for published report is 39.3, which is similar to the average quality score of non-published reports (38.5). There is no statistically significant difference in the means of average quality scores of included studies, neither according to the publication status nor the study year. **Conclusions:** These findings suggest that the propensity of a student's research report being accepted for publication does not necessarily rely on the quality of the project report, and that other factors are likely to impact the dissemination rate.

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### Introduction

Teaching medical students principles of research is likely to have an impact on their educational experience, postgraduate opportunity and carrier options. Certain clinical scenarios require sufficient research capacity to respond to unanswered questions. Similarly, education of

medical students about principles of research methodology might enhance their ability to apply Evidence Based Medical care (1).

The impact of teaching research methods to medical students on their research attitude and clinical practice has been investigated. Exposing medical students to research methods is likely to

increase the overall interest of students in research (2-4). Additionally, reports have indicated physician involvement in medical research during their undergraduate studies at medical schools had a positive influence on their involvement in clinical research (5-7). Similarly, a study by Frishman indicated that a six-month research project at the Albert Einstein College of Medicine enhanced the research experience of the medical graduates, where the enhancement was positively reflected on preparedness for the residency training, compared to those who were not involved in the research training (8).

Medical students at KSU in Riyadh, Saudi Arabia, have been educated principles of research methods since 2011, during their 3<sup>rd</sup> year of undergraduate medical training. The content of the research methodology course involves teaching the students the process of formulating research questions, conducting a literature review, selecting research methods, and applying appropriate statistical methods and methods of reporting research results. The education of research methodology has a practical aspect where students conduct a medical research project under supervision of a mentor. Approximately 50 different research projects are conducted by medical students each academic year in KSU. However, only a minority of students' research projects is published in peer-reviewed journals.

There are several factors which might affect the research experience of medical students at KSU. These factors could involve several theoretical and practical areas. The teaching experience could influence the level of knowledge gained by students relating to research methodology. Similarly, selection of appropriate research mentors might affect the theoretical and practical aspects of the students' research experience. Difficulties in conducting research projects could be due to logistics, lack of time (1), and lack of technical support needed to either conduct research projects or publish the findings.

Among the research reports submitted by KSU medical students during 2011 and 2012, only 10% of the research reports were published in

peer-reviewed journals. This proportion is quite low compared to the proportion of students' project reports revealed by other studies, where 90% of the students' reports were accepted for publication in peer-reviewed journals (3, 8). The low proportion of reports accepted for publication among KSU medical students projects might be due to factors affecting the quality of research projects conducted by the students.

It could be argued that the ability of students to publish their work is based on the quality of research conduct and reporting. It might be possible that students' project reports with high quality have a higher propensity of being accepted for publication in peer-reviewed journals, compared to those with low quality. This study is aiming to investigate the quality of KSU medical students research projects conducted during 2011 and 2012, and to compare the quality of the reports published in peer-reviewed journals to those which were not published.

## **Method**

### ***Study Design and Settings***

The Student Research Support Unit initiated a Student Research Database compiling all research activities conducted by medical students at KSU. According to the database, 105 research projects were submitted by KSU medical students during 2011 and 2012 as a completion requirement for the research methods course given during the 3<sup>rd</sup> year of undergraduate medical training. Only nine research projects out of 105 were accepted for publication in peer-reviewed journals.

This investigation is a case-control study where cases were defined as published reports while controls were defined as unpublished reports. A sample of students' project reports submitted during 2011 and 2012 were included in the study. The sample included all reports which were published in peer-reviewed journals, in addition to a random sample of reports which were not published. Twenty-five per cent of the research reports submitted in 2011 and 2012

were targeted to be used in this study. The study was conducted between December 2014 and March 2015. Ethical approval to conduct the study was granted by the Research Ethics Committee at College of Medicine, King Saud University.

### ***Critical Appraisal Process***

Several critical appraisal tools of the medical literature are available. Given that all of the research projects conducted by medical students were observational, Strengthening the Reporting of Observation Studies in Epidemiology (STROBE) statements were used to evaluate the students' reports (9). The selection of STROBE statements was based on the type of study evaluated where statements designated for cross-sectional and case-control studies were used. However, case-series and observational mixed methodology studies were evaluated using a modified STROBE checklist where applicable.

The selected studies were critically appraised by two reviewers. The reviewers were physicians with previous research background and are postgraduate research students at the Saudi Board of Community Medicine. The postgraduate students of the Saudi Board of Community Medicine receive several core training courses in research methodology and critical appraisal of medical literature. The reviewers were blinded to the research investigators and to the publication status of the evaluated reports. Each report was evaluated independently by each reviewer. A quality score was given by each reviewer for each report.

### ***Quality Score Calculation***

The quality of the research reports was mainly based on the ability to produce an informative summary, appropriate construction of a background and rationalisation of the study aims and objectives, appropriate reporting of research methods, including statistical methods, adequate presentation of the results, discussion of the key findings, and the ability to interpret and generalise the findings of the research projects.

A Microsoft Office Excel sheet was designed to facilitate the calculation of quality scores of

evaluated reports where 36 specific quality items were used to evaluate the reports. Each quality item was given three options based on the degree on which the reviewers felt an item has been properly addressed. An appropriately addressed quality item was given a score of two; a partially addressed quality item was given a score of one, where, if the reviewers thought the quality item was not addressed at all, a zero was given. The overall quality score of each report is the sum of all quality scores given by each item.

### ***Statistical Analysis***

Several continuous and categorical variables were used in this study. The categorical variables included status of publication, year of submission, and design of study. The continuous variables were mainly related to the quality score given for each study and the number of studies which achieved selected quality items. Since there are two scores given by each reviewer for each research report, the correlation between the scores given by the reviewers was assessed to detect any presence of disparity in the calculated quality scores. An average value of the two scores was used as a final quality score for each report.

Data analysis was performed by Statistical Package for Social Sciences (SPSS) software version 22 (IBM Corp, Armonk, NY, USA). Descriptive analysis involved calculation of frequencies and proportions for categorical variables and means and standard deviation for continuous variables. Student's t-test was used to test for the presence of any statistically significant difference between the quality of the students' projects. Pearson's correlation coefficient was calculated to assess the correlation of the quality scores given by each reviewer. A p-value of 0.05 or less was designated as statistically significant for applied statistical tests.

### **Result**

Twenty-six research reports were included in this study. The design and publication status of included studies are indicated in table 1. All of the included studies are observational, where

most of the conducted studies were cross-sectional. The high utilisation of cross-sectional design in the students' research projects is expected, given the design simplicity compared to other observational designs. However, only three research reports utilised quantitative and qualitative components in their research methodologies.

As illustrated in table 1, among the research reports which were published in peer-reviewed journals, nine different journals belonging to different medical disciplines were published (10-18). Among the published reports, one was a case series and one was a mixed methodology report, and the remaining were cross-sectional studies. Additionally, it is observed that the number of publications doubled during 2012 as compared to the number of studies published in 2011

Table 1: Study sample characteristics

Study types, n (%)	
Cross-sectional	20 (76.9%)
Case-control	2 (7.7%)
Case-series	1 (3.8%)
Mixed methodology	3 (11.5%)
Publication Status, n	
Published	9
Not Published	17
Publications per year, n	
2011	3
2012	6
Published Reports, n (reference)	
Case-series	1 (10)
Mixed methodology	1 (11)
Cross-sectional	7 (12-18)

Table 2 illustrates the average calculated quality scores of included studies. Quality scores given by each interviewer for each evaluated study were highly correlated (Pearson correlation coefficient: 0.897, P-value: < 0.01). As indicated in table 2, there is no statistically significant difference in the means of average quality scores of included studies, neither according to the publication status nor to the study year. These findings suggest that the propensity of a student's research report being accepted for publication does not necessarily rely on the quality of the project report, and other factors are likely to impact the publication propensity

Most of the included reports were able to provide a good level of description of the scientific background of the research question of interest, and good statements of the overall study aim and objectives. Similarly, as observed in table 3, the students were able to provide justification of the sample size calculations, discussion of the key findings of the projects, and in relation to the similar estimates reported in the literature. However, several operational weaknesses were detected in reporting of the project's conduct and the statistical analysis.

As indicated in table 3, the most apparent area of weakness detected in the students' reports was related to the ability of the students to illustrate methods of controlling for bias. None of the reports stated using statistical methods to control for confounding factors. Similarly, a majority of the reports did not use confidence intervals when providing estimates. Apart from the ability of the students to calculate sample size, there is an apparent deficiency in statistical skills, as almost half of the reports did not include detailed descriptions of the statistical methods applied.

Table 2: Average quality scores of included studies

Variable	Mean Score (SD)*	p value**
Publication status (n)		
Published (9)	39.3 (7.1)	> 0.05
Not published (17)	38.5 (8.6)	
Study year (n)		
2011 (11)	39.0 (10)	> 0.05
2012 (15)	38.6 (6.4)	

\*SD: Standard Deviation, \*\* Student's t-test for unpaired samples.

Table 3: Description of selected quality components of included research reports:

Quality item	Degree of fulfilment, n (%)		
	Fulfilled	Partially fulfilled	Not fulfilled
Production of informative abstract	7 (26.9%)	15 (57.7%)	4 (15.4%)
Reporting of random sampling	14 (53.8%)	2 (7.7%)	10 (38.5%)
Description of inclusion and exclusion criteria	15 (57.7%)	7 (29.9%)	4 (15.4%)
Description of recruitment method	9 (34.6%)	10 (38.5%)	7 (29.9%)
Description of data measurement method	18 (69.2%)	4 (15.4%)	4 (15.4%)
Description of bias addressing method	2 (7.7%)	1 (3.8%)	23 (88.5%)
Description of sample size calculation	22 (84.6%)	1 (3.8%)	3 (11.5%)
Description of statistical methods	14 (53.8%)	1 (3.8%)	11 (42.3%)
Description of sample demographics	10 (38.5%)	4 (15.4%)	12 (46.2%)
Use of confidence intervals	5 (19.2%)	0 (0%)	21 (80.8%)
Discussion of key findings	21 (80.8%)	2 (7.7%)	3 (11.5%)
Discussion of similar studies	20 (76.9%)	2 (7.7%)	4 (15.4%)
Discussion of limitations	8 (30.8%)	2 (7.7%)	16 (61.5%)

## Discussion

This investigation was conducted to evaluate the quality of KSU medical students' research reports. It was questioned that there could be an impact of students' research quality on publication propensity, as only about 10% of students' reports are published in peer-reviewed journals. Upon comparing the quality of successfully published research reports with unpublished reports, the quality scores were similar.

As far as we are concern, there are no similar investigations conducted to assess the quality of students' research reports in correlation to publication propensity. Most of the reports concerned with medical students' research investigated dissemination rates of students' research projects and factors affecting undergraduate medical research experience (1, 8, 19). However, a study by Al-Shalawy and Abdul Haleem investigated barriers towards research among undergraduate health sciences students in 5 universities in Saudi Arabia. This study revealed that only 7% of 435 students included in their study reported having published a paper during their undergraduate studies (20). This is rather similar to the publication rate among King Saud medical students' research projects where this similarity suggests that difficulties faced by medical students in Saudi Arabia could be similar across universities in the country.

Several reasons can be suggested to explain the reasons for good quality research reports were not published. The students might be properly educated on how to perform a well designed study. However, less attention is given to educating students about the process of preparing manuscripts for submission. This was observed, as most of the research reports were not properly summarised. Similarly, there might have been less emphasis on informing the students about methods of targeting suitable journals, and adherence to manuscript guidelines.

As all of these research reports were conducted as a completion requirement for the research methodology course, the students' motivation was mainly limited to passing this course. It could be possible that the students had no intention of publishing their work in peer-reviewed journals. Similarly, research mentors might not have been effectively involved in the research conduct process, which was reflected in the interest of publishing.

Although this study was able to detect major areas of weaknesses concerning students' research projects, it was not able to establish why several high quality reports were not published. Further investigation is needed to recruit students and their mentors to answer specific questions related to barriers influencing the decision to publish. A qualitative approach is recommended to gather in-depth information of factors hindering dissemination of students' research projects. Identifying these factors is vital to

enhance the students' research experience at KSU medical school.

## Conclusion

This study did not find any association between the quality of students' research reports and dissemination rates. Additionally, there are several methodological weaknesses detected affecting the overall quality of the students' research experience. Further evaluation of factors affecting students' intention to publish their work is needed to increase the dissemination rate of students' research projects.

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