TEACHING STATISTICS TO MEDICAL DOCTORS THROUGH RESEARCH METHODS: A CASE OF MEDICAL EDUCATION RESEARCH IN IRAN

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Statistics has gained recognition as an important component of many disciplines including medical and health sciences (MHS). Medical doctors and health related professionals need to understand the process of statistical investigations and be able to plan statistical inquiry in medical and health related decisions. In this respect, statistical knowledge and skills are considered as part of required competencies for medical doctors and health related professionals. Furthermore, planners and policy-makers in the MHS education institutions need to apply research-based information to maintain and improve quality of teaching-learning processes. Toward meeting the above objectives, a medical education research workshop was designed at Shaheed Beheshti University of Medical Sciences and Health Services in Iran. The workshop was developed and implemented to provide medical doctors with opportunities to get their hands on statistical investigations. In doing so, based on three types of research methods in medical education systems, statistical tools were presented through data-oriented approach. In this paper first the curricular structure of the workshop is briefly presented. Then, based on data from interviews with participants, the impact of the workshop on developing statistical knowledge and skills to solve medical education system problems is analyzed. The results indicate that workshop approach motivated the participants to develop a conceptual understanding of statistical ideas and their applications to investigate problems of teaching-learning systems.

1.INTRODUCTION

Statistics has gained recognition as an important component of many disciplines (Moore, 1993). One of these disciplines is medical and health-related sciences. Medical doctors and health-related professionals need to understand the process of statistical investigations, not only in analyzing the impact of different treatments on patients, but also to apply statistical methods to improve the efficiency and effectiveness of systems related to medical and health care services. In this respect, statistical knowledge and skills are considered as required competencies for medical doctors and health-related professionals. Furthermore, planners and policy-makers in medical and health education institutions (MHEI) need to apply research-based information to maintain and improve the quality of the MHEI outcomes (Bazargan, 1999). In this context, a question is raised as « How to improve statistical competencies of professionals in medical and health education institutions? »

Toward answering the above question, this paper first points out major aspects of improvement of the MHEI. In this regard, the role of research and evaluation is elaborated. Then, workshop approach to developing competencies, of medical doctors and health-related professionals, in understanding and applying statistical methods in research and evaluation methods is briefly described. In the second part of the paper, results of an interview with a sample of participants at two workshops are analyzed.

2. NEED FOR RESEARCH-BASED INFORMATION TO IMPROVE THE QUALITY OF MEDICAL AND HEALTH EDUCATION

Medical and health-related education institutions (MHEI) provide initial and continuing education of professionals in medical and health services systems. The MHEI have to be more responsive to the current and future requirements of society. In this respect, the MHEI are expected to consider three issues for their improvements: relevance, quality and equity (Bazargan, 1999). As an example, relevance in medical education is defined as 'the degree to which the most important problems of health care are tackled first' (Boelen & Heck, 1995). To assess and improve 'relevance' in the MHEI there is need for designing and conducting statistical investigations.

Quality of medical and health-related education systems is a culture-bond concept. This concept is composed of: the quality of input; the quality of process; the quality of product; the quality of output; and the quality of outcome (Bazargan, 1999:63). Quality assurance of the MHEI requires the application of evaluation methods. These methods are based on statistical indicator systems (Bazargan, 2000). Furthermore, toward improving equity in the MHEI, attention should be given to a distributed admission pattern of applicants according to socio-economic background. In other words, opportunities at the MHEI should be distributed with greater equity in social and economic terms. Toward achieving these goals, policy-makers and faculty members (medical doctors and health-related professionals) in the MHEI has been motivated to use research-based information. This has made them eager to get a better understanding of statistical investigations.

As a case study, the experience of carrying out a workshop, as continuing professional development in designing medical education research projects and applying appropriate statistical methods, is described here. The experience was carried out in Iran at Shaheed Beheshti University of Medical Sciences and Health Services in 2001. The author assisted in designing the workshop and was responsible for preparing and presenting materials related to teaching statistical modules. Therefore, necessary data for this study was collected by direct observation and an interview with a sample of participants.

3. MEDICAL EDUCATION RESEARCH METHODOLOGY WORKSHOP: AN APPROACH TO IMPROVE STATISTICAL KNOWLEDGE AND SKILLS OF PROFESSIONALS IN THE MHEI

Medical education research methodology workshop (MERMW) is an approach to provide participants with opportunities to understand the process of formulating a research problem related to a medical and health-related education system; then designing an appropriate statistical investigation to solve the problem. Furthermore, in the MERMW process, participants are provided with opportunities to get hands-on experience in carrying out statistical investigation, including statement of the problem, data collection, data analysis and interpretation of results. In doing do, the MERMW process is comprised of twelve learning modules as follows:

1) Selection of a research topic related to a medical and health-related education system,
2) Review of literature,
3) Statement of the problem,
4) Statement of research hypothesis/ question(s),
5) Identification of variables under study,
6) Selection /identification of measurement instruments,
7) Definition of population and sample under study,
8) Selection of appropriate research method,
9) Selection of data collection procedure,
10) Data processing and statistical tabulation,
11) Selecting appropriate statistical analysis,
12) Interpreting results and preparing report.

The ideal number of participants is 24 and the workshop is carried out in fifty contact-hours. The first module is presented in a general session in which all the participants attend. It takes one hour. Then, the participants are divided into four groups, headed by a coordinator. A member of the group is elected as reporter. The coordinator assists the group to have hands-on experience about the topic that was presented in the general session (i.e. selecting a medical education research topic for statistical investigation). In doing so, the group reviews major points of presentation at the general session. Then, based on systems approach, group members reflect on major problems encountered in a medical and health-related education system and enumerate three of the most pressing of them. Based on the criteria for selecting a research topic, which are presented at the general session, each group member ranks his/her proposed topics. Then the group members compare their proposed topics and find out the topic, which has received maximum points in ranking. In other words, the topic that gets the highest ranking is chosen for hands-on experience in designing and conducting statistical investigation. After this exercise, which takes about one hour, group members attend a general session. In this session, each of the group reporters presents a summary of the experiences that the group has gone through. Based on

the discussions and elaboration made at this general session, four research topics are agreed upon, one for each group. Then presentations of other steps (2 to 12) are continued similar to the first step. Among the modules listed above, selection of research methods (step8) and statistical analysis (step11) are directly related to the objectives of this paper. These modules are explained in more details here.

4. STATISTICAL COMPONENT OF MEDICAL EDUCATION RESEARCH METHODOLOGY WORKSHOP

The traditional approach to teaching statistics was probability-based. It was popular until 1960's and 'has changed since 1965 (Moore, 1993)'. The data-oriented approach to teaching statistics, which has replaced the traditional one, is considered an appropriate approach to teaching statistics to medical doctors and health-related professionals. These professionals are not interested in the logic of statistical analysis, but get motivated in learning statistical methods by hands-on experience to solve real-life problems. As mentioned previously, each participant at the workshop starts with statement of a problem related to a medical or health- related education system. Then, as he/she proceeds through the learning modules chooses a research design and statistical model suitable to the research problem.

Furthermore, each of the working groups also chooses a research topic before the second learning module starts. Then, proceeding with steps two through seven, the group members get ready to be introduced to detailed of statistical methods. It should be mentioned that a pre-requisite for attending the medical education research workshop is attendance at a preliminary research methodology workshop. In this way, it is expected that the participants are familiar with descriptive statistical methods, such as collecting, tabulating, presenting and finding central tendency and dispersion of a data set. Based on this, medical education research methods (MERM) are presented in 'learning module number eight'. The MERM are divided into three categories: a) survey method; b) analytical-descriptive methods; c) experimental methods. In survey research method, distribution of variable(s) under study is considered, and exploratory approach to understanding a problem is discussed. In analytical-descriptive methods, four research designs are discussed: correlation design; ex-post-facto design; action research design; case study. In the experimental methods, quasi-experimental designs and true experimental designs are introduced. In presenting each of the above-mentioned research methods, direct reference is made to the problems, which are being chosen by the participants. In this way, the workshop is considered as a problem-posing approach to teaching statistics. In other words, concrete problem from medical education systems are introduced, then based on the problem, from among the three categories of research methods participants choose appropriate statistical model suitable to the problem.

Details of appropriate statistical model for each research design was planned to be presented through learning module eleven (statistical analyses). However, modules eight to eleven were combined and presented in three new modules according to research designs. Therefore, data collection and appropriate statistical analysis for each of the major research designs in medical education research were presented for different designs as follows: a) survey design; b) descriptive-analytical designs; c) experimental designs. In presenting analytical-descriptive methods, correlation and regression analyses are introduced. Furthermore, the concept of test of hypothesis for two sample means is discussed in this module. Finally, in experimental methods, the concept of analysis of variance is presented and other related topics were discussed.

5. IMPACT OF THE WORKSHOP ON THE PARTICIPANTS

The author, who presented the modules on research methods and statistical analysis, conducted an unstructured interview with a sample of participants. Two workshops were conducted during winter and spring 2001. From each of the workshops five participants were sampled with simple random sampling. The interview was conducted by the author at the end of the workshops. The purpose of the interview was to find out: a) the extent to which the participants found the workshop approach made them eager to learn statistics; b) participants perceptions about adequacy of the integrated approach (combining research methods with

statistical analysis) in applying statistics to improve relevance, quality and equity at the medical and health-related education institutions.

Despite some methodological shortcomings in measuring and analyzing the impact of the MERM workshop on the participants, three general findings are drawn from the interviews. Medical and health-related professionals who are engaged in activities of medical and health-related education institutions (MHEI) through workshop approach: 1) get motivated to have a better understanding of the MHEI missions and find out its problems; 2) become eager to apply statistical methods to find solutions to the problems.

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