



Using evaluation research to improve medical education

Mohsen Tavakol, Medical Education Unit, The University of Nottingham, UK

Larry D. Gruppen, Department of Medical Education, University of Michigan Medical School, Ann Arbor, Michigan, USA

Sima Torabi, The Nottingham Emmanuel School, Nottingham, UK

The use of evaluation research findings helps medical educators to make informed decisions regarding a programme

SUMMARY

Background: Evaluation research is a form of applied research that scrutinises how well a particular programme, practice, procedure or policy is operating. Evaluation researchers use both quantitative and qualitative research data to construct a collective picture of the programme under evaluation.

Context: Medical educators need to provide information about a particular programme using the

methods of evaluation research in order to make a decision on the potential adoption, improvements and refinements of the programme. Improving curricula and pedagogical methods using these methods may enhance health care education.

Innovation: We provide an overview of the methods of evaluation research in the context of medical education. We discuss the application, general methodology, methods of collecting data and

analysis for each type of evaluation research.

Implications: The methods of evaluation research described in this article enable medical educators to gain a comprehensive understanding of evaluation research in the context of medical education. The use of evaluation research findings helps medical educators to make informed decisions regarding a programme and any future actions related to it.

INTRODUCTION

Unless an agency does not take its avowed purposes seriously', wrote Stephansome 65 years ago, 'it should be interested to know whether past activity actually produced the results that were expected. It will also be concerned to know how reasonable its expectations of future results may be'.¹ Since that time, there has been increased interest in research that is designed to measure the performance of a programme, practice, procedure or policy. Today's medical educators are faced with a variety of challenges from patients, society, doctors and students.² Such challenges persuade medical educators to change curricula and pedagogical strategies to enhance the quality of patient care, an outcome at the top of Kirkpatrick's hierarchy of evaluation outcomes (Figure 1).³ To achieve this, it is necessary for medical educators to develop evaluation research as a routine tool for making changes and improvements based on experimental data. For the purpose of this paper, evaluation here refers to activities that are composed of both description and judgment of a programme, practice, procedure or policy to improve local medical education development. This is in contrast to the term 'assessment', which is used to describe the measurement of individual learner performance.

Evaluation research is applied research that examines how well a specific programme, practice, procedure or policy is working.⁴ It is a systematic approach to collecting reliable and valid data about the outcomes or effects of a programme through the provision of empirically driven data. Evaluation researchers typically seek to study the application of existing knowledge rather than make contributions to new knowledge.⁵ The research objective in evaluation research is

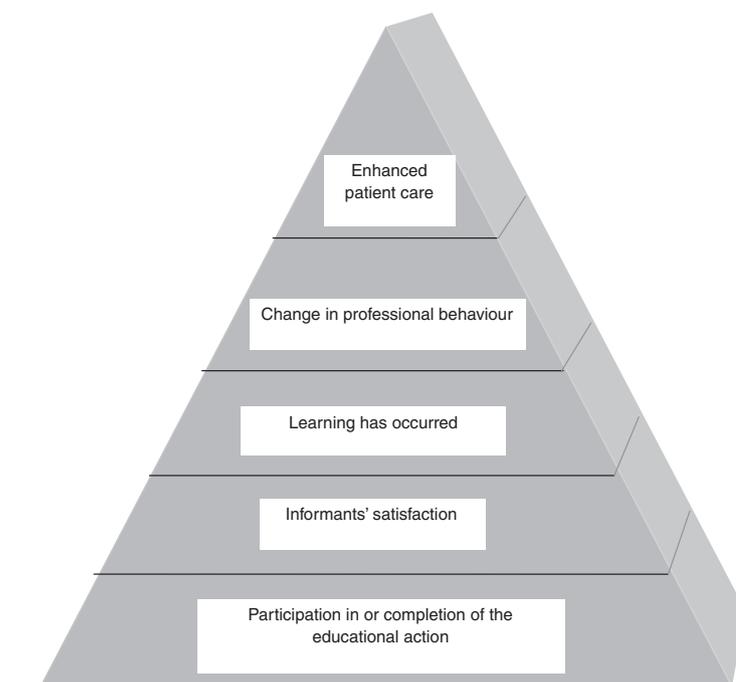


Figure 1. Kirkpatrick's hierarchy in medical education

'utilitarian', and the purpose of the study is to answer the practical questions of the people who will make the decisions regarding programmes.⁶

It is noteworthy that evaluation research uses both quantitative and qualitative inquiry to evaluate a programme, procedure, practice or policy. The data collection methods include interviews, group interviews, journaling, site visits, field notes, documentary evidence and questionnaires. Such tools provide a descriptive and inferential means to determine the effect of the outcomes of a programme, to portray the worth of an action and to revise a specific programme. However, evaluation research can be threatening for people who are implementing a programme. People feel uncomfortable when their work is being evaluated, and may feel that their jobs or reputation are at stake.⁴ For this reason, evaluation researchers need to have not only methodological skills, but also diplomacy and interpersonal communication skills.⁴

Evaluation research is applied research that examines how well a specific programme, practice, procedure or policy is working

EVALUATION VERSUS RESEARCH

Both evaluation and research in medical education seek evidence for developing practice, setting policy, planning standards for education and making educational decisions. Fain said it best, 'Evaluation and research are closely related and should be synergistic'.⁷ However, it is important to differentiate between evaluation and research. Evaluation provides an overview of medical education issues; research is a biopsy of medical education practice.⁸ The major differences between evaluation and research have been presented in different dichotomies: evaluation particularises, research generalises;⁹ evaluation makes decisions for programmes, research makes a systematic inquiry to validate old knowledge and generate new knowledge.¹⁰ Evaluators tend to focus on context, localised results, politics, the audience(s) and the decision-making process. Researchers, on the other hand, focus more on

Several models have been developed to guide the evaluation of a given programme

Table 1. Distinguishing between the types of evaluation research

	Process analysis (PA)	Outcome analysis (OA)	Impact analysis (IA)	Cost-benefit analysis (CBA)	Cost-effectiveness analysis (CEA)
Application	Answers questions regarding the functioning of a programme.	Answers whether a programme is fulfilling its goals. Used to decide whether to discard, replace, modify, continue or replicate the programme.	Identifies the net impact of an intervention and describes relative efficiency.	Identifies whether the benefits of a programme outweigh the cost. Used to decide whether to continue or discontinue a programme.	Estimate the costs and educational effects of an intervention. This helps to compare the costs with the associated costs from other interventions to select the best educational intervention.
Analysis of evaluation	If used to improve the function of a programme, the evaluation is called formative evaluation. A descriptive analysis.	A summative analysis. A descriptive analysis. Spells out effectiveness. Typically descriptive to evaluate a programme.	A formative analysis.	A summative analysis.	A summative analysis Preferred analytical approach over CBA.
Methodology	Uses both qualitative and quantitative approaches. A combination of the two might be best to achieve confirmation and completeness of findings.	Randomised controlled trials. Pre-post design. Epidemiological studies.	Uses quantitative approaches, such as experimental designs (randomised controlled trials) and quasi-experimental design (pre-test/post-test experimental design).	Weighs the positive elements against the negative, and then chooses the most profitable option. Uses retrospective and prospective methods.	Retrospective and prospective methods.
Methods of collecting data	Uses a range of methods of data collection, such as questionnaire surveys, depth interviews, group interviews and observations of the programme.			See CEA	Data collection is typically grounded in economic evaluation and experimental data, such as randomised trials. In the absence of dedicated trials, the researcher draws on the existing literature. More detailed information regarding collecting data can be found in the work of Muennig and Robinson. ^{16,17}

methodological rigour, replication, generalisable results and theory building.¹⁰

EVALUATION RESEARCH MODELS

Several models have been developed to guide the evaluation of a given programme, each emphasising a particular aspect of the programme or outcomes. Table 1 shows the types of evaluation research models that use both qualitative and quantitative inquiry approaches to answer evaluation questions. The main evaluation research models are summarised below.

Process or implementation analysis

Process analysis is the most frequent form of programme evaluation. Process (or implementation) analysis, as stated by Scheirer,⁷ verifies what the programme is and whether or not it is delivered as intended to the targeted recipients.¹¹ It does not analyse the effects of the programme on those recipients.¹² Process or implementation analysis considers inputs, activities, processes and structures. Process analysis informs education decision makers what is happening in the programme, how the programme has developed, and how and why programmes deviate from original plans and expectations.¹³ A process or implementation analysis may be a formative evaluation if the aim of analysis is to improve a new or ongoing programme. Sometimes the purpose of the process analysis is mainly to spell out a programme carefully so that decision makers can better understand why the programme was or was not effective in achieving its objectives.⁴

Outcome analysis

Outcome analysis evaluates a programme in terms of its effect upon recipients, but does not focus significantly on the reasons why the outcome occurred. The



intent of such analysis is to help programme directors or policy makers decide whether the programme or policy should be discarded, replaced, modified, continued or replicated.⁴ Outcome analysis simply documents the extent to which programme goals are attained.

Impact analysis

Impact analysis involves producing an estimate of the net effect of an intervention; that is, the impacts that can be attributed exclusively to the intervention rather than to the effects of other factors (e.g. standard education). Impact analyses often involve subgroup analyses to identify the types of participants for whom an intervention is most effective. For example, the researcher might compare problem-based learning (PBL) impacts for girls and boys, for school leavers, graduate entry medicine and so on.

Economic analysis

An economic analysis evaluates the relationship between the cost of a programme and its effects. Decision makers' concerns include whether a programme induces sufficient benefits in relation to its costs, and whether other interventions or delivery systems can generate the same benefit at a lower cost.¹² There is a large and

growing literature on educational cost studies in both developed and developing countries that show how cost analysis can improve policy making and evaluation in education.¹⁴ Medical educators should recognise the importance and usefulness of cost analysis in educational policy making and evaluation by asking questions such as: are the economic benefits of the programme more important than the economic costs; is it worth conducting at all?

Cost-benefit analysis and cost-effectiveness analysis are the two most common economic analyses. Cost-benefit analysis attempts to identify all the costs and benefits arising from a programme to provide an overall evaluation of its impact. However, it is not easy to gauge the benefits of educational services, nor the value of human life in monetary terms.¹⁵ However, if fiscal costs are part of the evaluation research question, a cost-benefit analysis is the best method for evaluating costs and benefits. Cost-effectiveness analysis shows the effects of education (such as student learning) relative to the costs incurred in accomplishing the educational outcomes. The costs for similar intervention methods are then compared in order to select the best (most cost-effective) educational intervention. Applications of this method have been made to lecturer selection, visual learning-based education, choice of a curriculum, distributed interactive learning environment and the use of educational strategies.

CONCLUSION

One of the responsibilities of medical educators is to determine how well a complex programme operates in medical education practice. This awareness may persuade medical educators to

If fiscal costs are part of the evaluation research question, a cost-benefit analysis is the best method for evaluating costs and benefits

Medical educators need to become familiar with methods of evaluation research

develop curricula and pedagogical practice to enhance the quality of patient care, an outcome at the top of Kirkpatrick's pyramid in medical education. Medical educators need to become familiar with methods of evaluation research as part of everyday work life. Evaluation research is applied research that involves learning how well a specific programme, practice, procedure or policy is working. A variety of methods of evaluation research are compared. There is clearly a strong demand for such evaluation and a need for knowledge-based economic evaluation.

REFERENCES

1. Stephan F. Training for research in social welfare *Journal of Educational Sociology* 1936;**9**:284–290.
2. Dent J, Harden M. New horizons in medical education. In: Dent J, Harden R, eds. *A practical guide for medical teachers*. London: Elsevier Limited; 2005.

3. Wall D. *Evaluation: improving practice, influencing policy*. Edinburgh: ASME; 2007.
4. Polit D, Beck C. *Nursing research: Generating and assessing evidence for nursing practice*. New York: Lippincott Williams & Wilkins; 2007.
5. Luker K. An overview of evaluation research in nursing. *Journal of advanced nursing* 1981;**6**:87–93.
6. Rossi P, Lipsey M, Freeman H. *Evaluation: A Systematic Approach*. London: Sage Publications; 2003.
7. Fain J. Is there a difference between evaluation and research? *The Diabetes Educator* 2005;**31**:154–155.
8. Woody M. An evaluator's perspective. *Nursing Research* 1980;**29**:74–77.
9. Morrison J. Evaluation. *BMJ* 2003;**326**:385–387.
10. Holzemer W. Research and evaluation: an overview. *Quality review bulletin* 1980;**3**:31–34.
11. Scheirer M. Designing and using process evaluation. In: Wholey J, Hatry H, Newcomer K, eds. *Handbook of practical programme evaluation*. San Francisco: Jossey-Bass; 1994; pp. 40–68.
12. Rossi P, Lipsey M, Freeman H. *Evaluation: A Systematic Approach*. Thousand Oaks, CA: Sage Publications; 2004.
13. Patton M. *Qualitative research and evaluation methods*. London: Sage Publication; 2002.
14. Chang W, Henry B. Methodological principles of cost analysis in the nursing, medical and health services literature, 1990–1996. *Nursing Research* 1999;**48**:94–104.
15. Russell LB, Gold MR, Siegel JE, Daniels N, Weinstein MC. The role of cost-effectiveness analysis in health and medicine. Panel on Cost-Effectiveness in Health and Medicine. *JAMA* 1996;**276**:1172–1177.
16. Muennig P. *Cost effectiveness analysis in health: A practical approach*. San Francisco: Jossey Bass; 2007.
17. Robinson R. Cost-effectiveness analysis. *BMJ* 1993;**307**:793–795.

Corresponding author's contact details: Dr Mohsen Tavakol, The University of Nottingham, Medical Education Unit, Nottingham, UK. E-mail: m_tavakol@yahoo.com, Mohsen.tavakol@nottingham.ac.uk

Funding: None.

Conflict of interest: None.

Ethical approval: This paper does not describe research on human subjects, therefore ethical approval was not necessary.