Assessment of Research Quality

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ABSTRACT

Research increasingly pursues both to enhance knowledge and to contribute to the real-world solutions in all professionals' disciplines. Critical appraisal of research quality is an important skill to be mastered not just by academician but also by the other medical professional who involved in clinical practice. In this modern era, the boundaries between different professional disciplines are traversed, and as research involves more with multiple stakeholders in a complex systems, the traditional research criteria's and academic definitions are no longer sufficient. So, there is a need for a comprehensive and robust principles and criteria to evaluate research quality. In this review, we given an overview of assessment of basic principles in research quality.

Keywords: Research quality, Assessment, Peer-review research, Research ethics, Validity, Threats to validity.

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Background: Critical appraisal of a research is a fundamental skill in modern medicine. In fact, it is a skills-set, which developed throughout the professional career, facilitated by professionalism and through clinical experience integration, permits evidence-based practice in medical sciences. As quality research is an ancestor to the statements about medical evidence, provide an agreed standard on quality research[1]. The critical appraisal is a systematic process, which can identify the weaknesses and strengths of a research. This process also enables the medical professionals to assess the usefulness of research and give an idea that whether the findings are trustworthy or not. The most important component of critical evaluation is careful assessment of the research question or hypothesis, its objective, study design; however, the other domains like methodology, study variables, assessment tools, data collection, statistical methods evaluation, results interpretation and potential conflicts of interest are also essential[2]. Finally, consideration of the importance of the research to one's own patients will help the clinicians identifying the high-quality, most relevant, available in literature to guide their clinical judgement[3].

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The quality of medical research published in literature can vary considerably. It is very important that a reader should keep this in mind the quality of that paper when reading the outcome or findings from a research study or in deciding that whether he can use these finding or results for secondary analysis or not [1,4].

Search Criteria: For this review, the literature is searched from Pub Med, Med Scape, Med Line (Ovid), EMBASE, HMIC, Research Gate along with other sources (i.e. Google Scholar, Expert communication etc) by using Research quality, Assessment, Peer-review research, research ethics, Validity. Threats to validity as key words. All these databases contain archives of majority of biomedical journals from all over the world. Among a total of 63 full text published paper, 17 papers were short listed for review. All relevant scientific papers, written in English were included and non-scientific articles, non-scientific commentary and reports were excluded from the review.

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The reviewer and researches should keep in mind the following important aspects or questions while evaluating a research.

1. **Is this a peer reviewed research?**
   The research studies or projects which are peer reviewed, have been evaluated by the experienced scholars, having relevant experience in their field. Similarly, the research papers published in peer viewed professional journals have been reviewed or evaluated by the professional researchers who are experts in their relevant field and who can vouch for the reliability and validity of the methodology and the analysis applied. In developed countries, majority of the research papers or projects have

been scrutinized through a tedious peer review process before approval. Due to this, the peer-reviewed research or publication is considered a high quality research or paper. In spite of this, one should critically analyze or evaluate the study's objective, methodology, results and conclusions of the study while going through paper or research proposal[2,5,6].

2. **Is the study's quality to be evaluated with the information provided?**
In research projects, the methodology should contain a meticulous and precise description of the sample, sample selection technique, main variables, data collection procedures, analytic techniques and operational definitions of key variables, procedures or concepts. The research consumers should be critical when reading or analyzing the research paper that whether sufficient information is provided about the above-mentioned key quality research components or not[5,6].

3. It there any ethical concerns or issues needs to be addressed?
It is mandatory to ensure that research participants or subject's rights and welfare are well protected. Secondly, all ethical concerns or issues encountered or which may be expected during research should be explained along with measures to tackle them appropriately. Moreover, an informed consent of the participants if applicable should be sorted as per standard guidelines. To fulfil this, all research projects should be reviewed by an Institutional Review Board or a comparable institutional body[7-9].

4. **Is there any potential threats to the validity of the study?**
In a valid study, the research questions should be answered scientifically and in a rigorous manner. All possible potential threats which may affect the validity of study should be addressed and sorted amicably. The potential threats to the validity of a study are found in three domains mainly i.e. threat to Internal, external, and construct validity[1,10,11].

Internal Validity [3,12-14] denotes to whether the observed study outcomes are due to experimental manipulations or independent variables examined in the study and are not because of some other factor or set of factors. To find the internal validity of research, one should ask, whether any outcome changes possibly be attributed to an alternative explanation which has not been explored in the research study. An example in this context is that study may show that a change in curriculum has a substantial positive effect on medical students applied basic knowledge. But the methodology must rule out all possible alternative strategies which may be used to increase the students' knowledge like new teacher, other teaching methodologies etc. The studies which specifically explain how alternative options were ruled out, are likely to have more internal validity.

External Validity [2,11,13,14] denotes to the degree to which the outcome or results of a study can be generalized to other settings, other people and over a period. To assess this one should ask whether the study findings can be applied to those individuals whose place and circumstances may differ from those of the study participants. An example in this regard is that the improved applied clinical knowledge after change in curriculum can also be applied to the students of other medical colleges in the country. The external validity is much higher if sample is selected randomly, from most diverse and representative participants and is conducted in a natural setting. Different threats to external validity may include:

a) Sample is not representative of the population to be studies which could be due to incomplete list of participants or duplication of the participants.
b) Some study participants demographically may not adequately represent the sample.
c) Poor compliance or willingness to participate or if participating may not understanding the exact rationale of participation in study.
d) Sample selection by using non-probability methods like volunteer or purposive samples, which most likely tend to over- or under-represent certain groups in the population.
e) The findings of one study may be difficult to replicate across other groups or locations. An example in this aspect is, in spite of the best efforts, it may be extremely difficult to introduce and implement new curriculum in exactly the same way in different institution.
f) Reported attitudes and behavior changes (Hawthorne effect) among study participants need to be included in a research study.

Construct Validity [11,13,15]of research denotes to the degree to which a variable, questionnaire, test or an instrument used in methodology will measures as compared to that the researcher is expecting to measure. It is very important for a reader to assess whether the study has construct validity by looking that whether the key variables or concepts were assessed adequately in the research or not. For example, a study of revised curriculum should give substantial evidence that applied knowledge has improved after assessment. The assessment measures of outcome used in the study, if have been independently validated from other studies done before, are more likely to have construct validity.
The different threats to construct validity can be observed during the planning and designing, during administration of assessment tools and data analysis or processing. During data analysis or processing, commonly include threats are coding errors (i.e. especially the errors which are systematic as compared to random - are more problematic) and poor inter-rater or inter-coder reliability

especially while coding open ended item responses or assigning scores to observed behaviors. It is very important that different rater or coders should assign the same score or code for the same behavior or response.

5. **Is there any inconsistency in data collection and analysis?** [5,6,10,16]

Inconsistencies in how data collected, analyzed and in handling of missing data should also be considered in assessing the quality of research. Some of these factors are attributed to researchers while the others to the subjects of the research. Some of the more common threats that can occur during planning or designing a research includes:

a) The greatest threat to the validity of a research is the poorly defined construct or tool especially which are defined too narrowly or broadly.
b) The validity can also be affected by the methods used to measures a variable. Especially in a questionnaire or a survey the construct which comprises of too few items to represent poses a threat to validity of data. Ideally, a valid measure should cover all aspects of the variables adequately.
c) Poorly constructed assessment tools especially questionnaires are also threat to the validity of a study. An example is the questions constructed in language which is above the understanding or reading level of the respondents like use of professional jargon or difficult to understand. The validity can be improved by including double-barreled questions i.e. to ask multiple questions within a single item.
d) Too many items especially which are outside the ability to understand are also threat to the validity of assessment.
e) During administration of assessment tool different threat which may affect the validity are the threats posed by assessment staff or interviewers if they diverge from the research protocol or point out towards a correct response to the participant by their actions. An example is that in multiple choice items by giving praise or smile at correct response and 'staring' at the incorrect response.
f) Threats can also be introduced by the participants to the validity like showing anxiety or apprehension which most likely results in poorer performance or to give ambiguous responses in succession to items being assessed or interviewed. These threats should be considered seriously and to be minimized while administering standardized assessments.

Summary: The exercise of the appraisal of research quality should be robust and meticulous from the beginning because addition of reliable and valid scientific knowledge is a prime aim of the research. Moreover, researching funding and use of resources along with institutional integrity and rating also depends upon the quality research. Tomlinson[17] has emphasized on the significance of the effects of the assessment exercises on the research and suggested that the universities and medical institutes should develop pro-active strategies in streamlining the quality research and to concentrate on week areas. Successive research appraisal exercises show an increasing proportion of high quality and high rated research. The institution who are not monitoring research quality would be unlikely that their credentials are internationally competitive and to aspire to international excellence.

AUTHOR'S CONTRIBUTION

Ahmed I: Conceived idea, Literature review, Manuscript writing
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