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Research is a systematic process, which uses scientific methods to generate new knowledge that can be used to solve a query or improve on the existing system. Any research on human subjects is associated with varying degree of risk to the participating individual and it is important to safeguard the welfare and rights of the participants. This review focuses on various steps involved in methodology (in continuation with the previous section) before the data are submitted for publication.

Data collection: Data includes the information that is systematically collected by the investigator during the study. The primary data are those which are originally done for the first time. The secondary data are a compilation of information done by someone else and have already been passed through the statistical process. A Data Monitoring Committee or Data and Safety Monitoring Board may be appointed, independent of IEC for interim analysis; their report forms the basis for early termination of planned study when there is compelling evidence of beneficial effectiveness or harmful side effects or for major flaws in the study.

The two main types of data are qualitative and quantitative, and most studies will have a combination of both. While quantitative data are easy to analyse and fairly reliable, qualitative data provide more depth in the description of the sample.

Interview: This method allows face to face contact with respondents, exploring the topic in depth. It allows the interviewer to explain or help to clarify questions increasing the usefulness of a response. It can be of different types-structured, unstructured (informal, conversational approach), semi-structured, focused and standardised There can be disadvantages-interviewer clarifications can lead to inconsistencies and influence the responses; the subject may distort information through recall error, selective perceptions and in the desire to please the interviewer. Sometimes, the data may be too voluminous to record or reduce it.

Observation: This method provides direct information about the behaviour of individuals and groups. It allows the investigator to understand the situation and

context. It could be 'Participant' observation: The observer takes part in the situation he or she observes or 'Nonparticipant' observation: The observer watches the situation, openly or concealed, but does not participate.

- Questionnaire: It is a simple and inexpensive method not even requiring any research assistants. More honest responses may be available when anonymity is provided. Written questions are presented that are to be answered by the respondents. A written questionnaire can be administered in different ways, such as by sending questionnaires by mail with clear instructions on how to answer the questions and asking for mailed responses; gathering all or part of the respondents in one place at one time, giving oral or written instructions, and letting the respondents fill out the questionnaires; or hand-delivering questionnaires to respondents and collecting them later. The disadvantage of this method are observer bias and breach in confidentiality; also, this cannot be used on illiterate subjects. As with other types of outcome measurements, questionnaires and interviews are to be assessed for validity (accuracy) and for reproducibility (precision)-using 'face validity, content validity and construct validity'.
- Documents: It is an inexpensive and unobtrusive method of data collection from locally available records or documents (existing research, hospital records, databases, videotapes, etc.) There is disadvantage of accuracy, authenticity and availability (missing data/omission of needed data). Anaesthesia information management systems used in modern practice have the ability to collect data automatically, in large volumes, which can be converted for specific, focused outcome assessments for research purposes.

Compilation of data includes systematic arrangement of data to facilitate the presentation and analysis. The data collected are entered in a database where the information about subjects and variables are stored. Simple study database can be maintained in a spreadsheet (MS Excel®) or statistical software (e.g., Statistical Analysis System (SAS®) (NC, USA), IBM SPSS (Statistical Package for the Social Sciences) Statistics® (IBM Inc., NY, USA). More complex database require integrated database management software (e.g., Access® (Windows) and Filemaker® Pro (Apple Inc.,)). Database 'queries' sort and filter the data as well as calculate values based on the raw data fields. Queries are used to monitor data

entry, report on study progress and format the results for analysis. Data must be stored in 'secure servers' so that confidentiality is maintained. Backup files and off-site storage may be necessary to prevent any data loss. Common methods of summarising and presenting data are tables, pie charts, bar charts, histograms, frequency and cumulative frequency curves, dot plots and x-y scatterplots.

Types of Research:

- Descriptive
- Analytical
- Applied
- Fundamental
- Quantitative
- Qualitative
- Conceptual
- Empirical
- Other

Defining Research Methodology:

Research methods:

All those methods/techniques that are used for conduction of research. Research methods or techniques, thus, refer to the methods the researchers use in performing research operations.

Research methodology:

It is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically.

Objectives of Research:

1. To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as exploratory or formulative research studies).

2. To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as descriptive research studies).

3. To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as diagnostic research studies).

4. To test a hypothesis of a causal relationship between variables (such studies are known as hypothesis testing research studies).

Research Process:

The research process comprises of

1. Formulating the research problem
2. Extensive literature survey
3. Developing the hypothesis
4. Preparing the research design
5. Determining sample design
6. Collecting the data
7. Execution of the project
8. Analysis of data
9. Hypothesis testing;
10. Generalizations and interpretation
11. Preparation of the report or presentation of the results, i.e. formal write-up of conclusions reached.

Significance / Relevance of Research:

“All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention” Hudson Increased amounts of research make progress possible. Research inculcates scientific and inductive thinking and it promotes the development of logical habits of thinking and organization. To students who are to write a master’s or Ph.D. thesis, research may mean a careerism or a way to attain a high position in the social structure; To professionals in research methodology, research may mean a source of livelihood; To philosophers and thinkers, research may mean the outlet for new ideas and insights; To literary men and women, research may mean the development of new styles and creative work; To analysts and intellectuals, research may mean the generalizations of new theories.

Criteria of Good Research:

1. Purpose should be clearly defined.
2. Research Process (source of data etc.) should be described in sufficient detail (except when secrecy is required).
3. There is a clear statement of research aims, which defines the research question.
4. Design (Sampling, questionnaire, observation etc) should be thoroughly planned so as to yield objective results.

5. High ethical standards.

6. Limitations should be frankly revealed (e.g. flaws in design) so that the decision maker is made aware.

7. Analysis of data should be adequate and methods of analysis appropriate. Should check for reliability and validity, and probability of error

8. Unambiguous presentation

9. Conclusions should be confined to those justified by the data of the research.

A good research is,

- Systematic
- Logical
- Empirical
- Replicable

Research process: The chart indicates that the research process consists of a number of closely related activities, as shown through I to VII. But such activities overlap continuously rather than following a strictly prescribed sequence. At times, the first step determines the nature of the last step to be undertaken. If subsequent procedures have not been taken into account in the early stages, serious difficulties may arise which may even prevent the completion of the study. One should remember that the various steps involved in a research process are not mutually exclusive; nor are they separate and distinct.

STEP-1

Defining the research problem:

What is a research problem?

The term 'problem' means a question or issue to be examined.

Research Problem refers to some difficulty /need which a researcher experiences in the context of either theoretical or practical situation and wants to obtain a solution for the same.

The first step in the research process – definition of the problem involves two activities:

- Identification / Selection of the Problem
- Formulation of the Problem

How do we know we have a research problem?

- Customer complaints
- Conversation with company employees
- Observation of inappropriate behaviour or conditions in the firm
- Deviation from the business plan
- Success of the firm's competitor's
- Relevant reading of published material (trends, regulations)
- Company records and reports.

The 'methodology' in a research strategy outlines the steps involved in research process. The research problem is identified, aims and objectives are formulated, sample size is calculated; Ethics Committee approval and informed consent from the subject are taken; data collected are summarised. The research design is planned, and the collected data are then analysed using appropriate statistical tests. The derived evidence is put into clinical practice once the reader is convinced that the clinical study is valid and reliable.