SCIENTIFIC MEDICAL RESEARCH

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LECTURE: 1 + 2 + 3 + 4 + 5

Chapter 1: The Health Research Process

1.1 The research process:

Research is the process of **systemically** and **carefully** investigating a subject in order to discover new insights about the world.

The research process is composed of 5 steps:

1. Identify a research question
2. Select a general study approach
3. Design the study and collect data
4. Analyze data
5. Write and share a report about the findings

- no matter what the goals of a research project are or what methods are used to achieve those goals, the five steps of the research process are the same.
- the first two steps are often completed concurrently (في نفس الوقت)

1.2 Health Research:

- **Health research** examines a broad spectrum of biological, socioeconomic, environmental, and other factors that contribute to the presence or absence of physical, mental, and social health and well-being.
- **Population health research** involves **humans** as the unit of investigation, rather than focusing on molecules, genes, cells, or other smaller biological components.
- Population health research ranges from clinical case studies with just a few individuals to global public health studies that may include many thousands of participants.
- Includes many sciences: demography, epidemiology, sociology, immunology etc.

- some studies that are very specific to one population at one place and in one point in time are not particularly helpful for identifying broader patterns. However, most health researchers hope that their findings will reveal trend, relationships, and theories that are generalizable to other populations, places, and times.

↳There is a distinction between routine practice activities and health research, sometimes routine acts in the hospital look as if they are research when they're not

Examples: An outbreak of gastroenteritis took place in a hospital, and they started looking into causes, is this a medical research? The answer is No, because as we previously said, a research is a question and a systematic way of finding the answer. Not just any routine investigation. *Usually such outbreak is not considered a scientific phenomenon it's just a mistake made somewhere*

Another example: satisfaction surveys of a hospital's service quality, which ask the patients how happy they are with the service given, but this is just a hospital feedback query to better their work not a research survey. However, if a group of researchers theorized an intervention that would make the service better and studied it, then it is considered a research.

1.3 Health Research Purposes:

- Needs assessment (community health profiles): What is the health status of this population? What are the major health concerns of members of this population? What health-related needs in this population are not being addressed?
- Risk assessment (risk factors for disease): What are the threats to health in this population? What are the risk factors for morbidity (illness), mortality (death), disability, and other health issues?
- Applied practice (clinical effectiveness): How well are we preventing, diagnosing, and treating health concerns in the populations we serve?
- Outcomes evaluation (impact of interventions): Of procedures, acts, projects, or educational programs used on this population. Is it effective? Is it not?

1.4 Book overview:

- Everyone can do meaningful research!
- The best way to learn about health research is to do real research.

Chapter 2: Selecting A General Topic

2.1 Practical Questions:

- Questions derived from **clinical practice**, community observations, and personal experience often point toward an unmet demand for needs assessments, program evaluations, and clinical effectiveness studies.

➔ Your environment, either you're a student in the classroom, a member in the community or whatever, from a self-point of view of interest as an individual, you might come up with research ideas.

- A good research question:

  1. **ends in a question mark:**

  ↳ This point is arguable, as there's different ways of reporting research in general. When you right a proposal for people to assess and look at to give you permission to do it or give you money, the way you write it is different from the way you write it when you report it as a final result in a journal for example…

  ↳ (Research problem/Research purpose/Research question) They refer interchangeably to each other.

  The difference is the way you state it only:

- A Question ends up with (?) and comes up as a question (what is? Is there? Etc…)

- A Purpose is usually prospective and carries a present tense in a way that investigates a certain clinical or basic problem. It addresses disease, exposure, population and sometimes settings and time frame of doing the research.

2. **Is testable:**

   Can be measured and examined – no measurement tool means no real findings.

2.2 Brainstorming and Concept Mapping:

- Use **brainstorming** to create a long list of possible research topics.
  People who are in the same field look at the problems that are usually encountered in their field, and they decide which project they're doing.
  This is not the stage for eliminating ideas because they do not appear feasible, and the ideas do not need to be well formed.

- Use **concept mapping** to identify central themes that might be worth exploring.
  It's complementary to brainstorming, they usually put the concept into its components manner. So, they put the major concept for example anemia, then we branch the anemia into different types, and the one type branches to many subtypes of the main type and causes,

Concept mapping: Narrowing down the main research focus into a very specific research question and topic

✦ no investigator can investigate all aspects of any problem on the same project, so usually research projects answer a very specific purpose in a very specific population, situation and timeframe.

FIGURE 2-1 Brainstorming Questions

Area	Questions
Values	• What are my interests and personal values? • What research topics are personally meaningful? • Have some understudied conditions that I could explore significantly affected me, my family, my friends, or my patients/clients? • Have certain health issues sparked my passion because they reflect what I consider to be an injustice?
Skills	• What knowledge and skills do I already have?
Personal growth	• What new skills do I want to develop?
Connections	• What source populations and/or data sources might be available to me through professors, supervisors, colleagues, and other personal and professional contacts?
Job and/or course requirements	• What does my supervisor or professor want me to study?
Gaps in the literature	• What information is not currently available that would make a contribution to the discipline and/or to improving health practices or policies?

2.3 Keywords:

After you have a subject, you start looking up keywords of it.

for example: you want to study child health in Africa, some of the keywords would be 'children' 'Africa' 'malaria' 'measles' 'Uganda' so basically you look up multiple words related to your main theme of the idea to give it more refinement and shape.

- Use the MeSH database (Medical Subject Heading) by the national library of medicine of the US government to identify related ideas and expand or narrow a theme.
- The MeSH dictionary is available from pubMed.org

-The MeSH database can be helpful for identifying the full extent of a research area and also for the narrowing the scope of research area.

-Once a list of keywords has been compiled, the researcher looks for the themes that emerge from them. Some topics may be easily eliminated because they do not fit the researcher's interests.

MeSH Database (by doctor): tree-like concept mapping database that helps identify related diseases and concepts altogether when doing literature search, or when establishing your own research (problem & purpose) to connect variables altogether. it also helps you later by using an international universal terminology to address your problems.

For example:

- instead of using (CVA) you'll use (stroke)

- (post) instead of (after), like post-surgery.

2.4 Exposure, Disease, Population (EDP):

- The "EDPs" form the basis for many research questions: "Is [exposure] related to [disease/outcome] in [population]?"

Example: Are exercise habits [exposure] related to the risk of bone fractures [disease] in adults with diabetes [population]?

EDP is really helpful in two major types of research approaches, which are cohorts and case-control.

Exposures could be anything, could be risk factors for diseases that are physical risk factors, environmental risk factors, biological risk factors, etc...

Example on connection between disease and exposure: contaminated water and cholera

These are examples of types of exposures →

FIGURE 2-2 Examples of Types of Exposures

Socioeconomic Status	Health-Related Behaviors	Health Status	Environmental Exposures
• Income • Wealth • Educational level • Occupation • Age • Sex/gender • Race/ethnicity • Nationality • Immigration status • Marital status	• Dietary practices • Exercise habits • Alcohol use • Tobacco use • Sexual practices • Contraceptive use • Hygiene practices • Religious practices • Use of health care services	• Nutritional status • Immune status • Genetics • Stress • Anatomy and anatomical defects • Reproductive history • Comorbidities (existing health problems)	• Drinking water • Pollution • Radiation • Noise • Altitude • Humidity • Season • Natural disasters • Population density • Travel

FIGURE 2-3 Examples of Types of Diseases

Infectious and Parasitic Diseases	Noncommunicable Diseases (NCDs)	Neuropsychiatric Disorders	Injuries
• Candidiasis • Cholera • *Escherichia coli* • Hookworm • Malaria • Syphilis • Tuberculosis	• Asthma • Breast cancer • Cataracts • Diabetes • Hypertension • Osteoporosis • Stroke	• Alzheimer's disease and other dementias • Autism • Depressive disorders • Posttraumatic stress disorder • Schizophrenia	• Bone fractures • Burns • Crush injuries • Frostbite • Gunshot wounds • Near drownings • Poisonings

Populations sometimes are referred to a group of people who share some biological characteristics or other characteristics like geographical areas.

Exposure/Disease/Population this combination of the three things usually formulates a research problem.

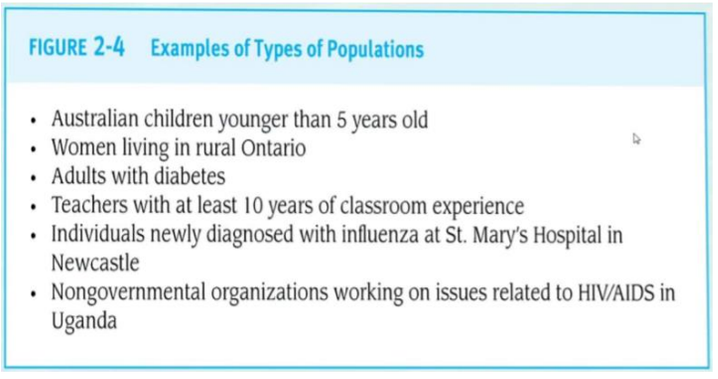


FIGURE 2-4 Examples of Types of Populations

- Australian children younger than 5 years old
- Women living in rural Ontario
- Adults with diabetes
- Teachers with at least 10 years of classroom experience
- Individuals newly diagnosed with influenza at St. Mary's Hospital in Newcastle
- Nongovernmental organizations working on issues related to HIV/AIDS in Uganda

2.5 PICOT:

- "PICOT" is often used for clinical research
  - Patient/Population
  - Intervention
  - Comparison
  - Outcome (It's sometimes called the dependent variable)
  - Timeframe

PICOT (by doctor): it's a framework used to formulate research questions and address them, usually the same framework is used as well to establish a literature search for evidence (to answer clinical questions through the literature, or to support your research arguments and to show the significance of your research topic)

- One benefit of PICOT is that it points toward the selection of key indicators that would provide evidence for the success of the intervention.

After a general research area has been identified, background reading about the topic allows the aim and scope of the research idea to be refined

So as a recap, when you do a general research area like anemia or septicemia, you do narrowing down and focusing research area and problem and looking for literature that supports your research ideas, either with or against and what has been done until this point in the area that you're exploring.

So literature search comes after this and usually it refines and focuses your research question in a better way that makes your research idea more visible and researchable with a timeframe of doing.

CHAPTER 3 : REVIEWING THE LITERATURE

3.1 Informal Sources:

- Nontechnical information from trusted sources (like the CDC and WHO) can provide helpful background on a topic.
  - Those are major reports, they are reviewed internally from the same institution, so there's no peer review. They make so many guidelines and documents and we can rely on them as researchers and we do refer to them
- Factsheets and other informal information are not part of the formal peer-reviewed scientific literature. Do not cite them in formal reports.
  - A very popular example: **Wikipedia**, it's not classified as peer-reviewed scientific literature, although it's very rich in data (it's called open resource).

-Researchers must be cautious about any claims in these files that contradict more formal sources of scientific information.

-These initial background readings can provide a foundation for understanding the more technical scientific literature that will be read later as part of through literature review.

3.2 Statistical Reports:

Statistical reports are usually published by organizations, governments or countries, and **they can be relied on**.

For example: in Jordan, we have department of statistics, they publish reports like epidemiology of distribution of certain aspects of health, or statistics about population count.

- **Examples** on statistical reports:
- World Bank world development indicators
- UN agency reports (World Health Statistics, Human Development Report, State of the World's Children)
- Annual reports from groups like the American Cancer Society and Population Reference Bureau
- Information from state and local health departments

When defining specific exposures, diseases, and/or populations of interest, it may be helpful to identify relevant statistics, such as the estimated prevalence of the exposure in a particular country, the annual global incidence of disease, or the size of a particular population.

- For regional-and country-level population measures and comparisons, the World Bank's World Development Indicators database provides information about a wide range of topics.
- Additional statistical estimates can be found in the annexes of the annual reports issued by United Nations agencies, such as the World Health Organization's **World Health Statistics**, **UNDP's Human Development Report**, and **UNICEF's State of the World's Children**.
- For information about states, provinces, counties, cities, and other smaller governmental units, contact the relevant public health department (this may be the best source of information about **vital statistics**).
- The best place to find very specific information about health-related exposures and diseases may be in published scientific articles.

3.3 Abstract Databases:

- An abstract is a paragraph-length summary of an article, chapter, or book.
- Abstract usually represents a brief description of the publication
- Use keywords to search multiple abstract databases.
  Abstract is very important in indexing beside the article title, because it's the first line search area for you as a researcher.
  Explanation: when you put only one keyword to look for all the article, you'll retrieve a large number of articles on a specific topic, but if you limit your search into title & abstract, you'll find keywords which are in that place only (so you're narrowing down your search, therefore it'll be more focused)

➔ Abstract databases allow researchers to search thousands of abstract for keywords or other terms.

➔ A careful and comprehensive search of at least one major abstract database is the most important component of a careful literature research.

In Abstract databases you should:

- Search with keywords or MeSH terms.
- Use Boolean operators: AND, OR, NOT.
- Carefully consider any limiters related to publication years or languages.

Examples of databases that are **free** to the public:

- PubMed (Which is a service of the U.S. National Library of Medicine of the National Institutes of Health, and provides access to more than 25 million abstracts)
- European PubMed Central (PMC)
- SciELO & LILACS (Central and South America)
- AJOL (Africa)

Examples of other (**usually subscription**) databases:

- **CIHAHL**: For other medical fields, but contains some medicine journals
  the criteria for indexing is different, it's technical rather than anything else, it's related to the journal and its topics, editorials and publishers, etc...
- **Embase**: A product of Elsevier company
- **MEDLINE**: previously called Medicus Index الفهرس الطبي (It's a part of PubMed, it's a very famous and old found in 1960), it's sponsored by the U.S. National library of Medicine and features only journals that have applied for inclusion and passed through a review process.
- **PsycINFO**: 3rd party database, provided by institution that are related to psychology and social sciences. So here most journals are about psycho-social health aspects.
  It's supported by the American Physiological Association (APA)
- **Web of Science**: from the company Thomson Reuters, it's an example of databases that are made by a publisher on their own.

- **EBSCO, JSTOR, Ovid, and ProQuest**: all of these are big companies that make databases, the index contains journals that are published by them, or by other publishers, and they collect all of them in one database for access (It's usually paid, not free)
- **Company-specific databases (LWW, SAGE, T&F, Wiley, others):** smaller companies which have their own databases to search for their only journals

What's the difference between Medline and PubMed?

1. Indexing in Medline is only for peer-reviewed journals, while PubMed includes documents that are not published in peer-reviewed journals, like government reports, institution reports like CDC, WHO, and many things that are not classified as journals
2. Medline uses a system of keywording that is very specific and classified, while in PubMed you can use any keyword from your mind, scientific community, etc...
3. PubMed includes books and short publications that are not classified as books nor articles

➔ **So, PubMed is more <u>comprehensive</u>, while MedLine is a <u>sub-database</u>**

3.4 <u>Full-Text Articles:</u>

The only way to truly understand a study is to read the full text of the article.

Where to find free full-text PDFs:

- Google scholar → a supplement search with general search engine may be helpful for identifying additional relevant abstract, related to journals not published in English

- <u>Google scholar</u> and other search engines
- PubMed Central and other open access repositories
- Journal websites (if the article is open access)
- Library subscription (e-journals) or interlibrary loans when a journal is not in a library's collection
- E-mail the author to politely request a copy
- Elibrary at JU, our university library has access to full texts in several databases, benefit from that.

3.5 <u>Critical Reading:</u>

- Read abstract
- Look at tables and figures
- Read or skim read the full article
- Review article reference list

➔ <u>You have to take 2 values into consideration while reading:</u>

- **Internal Validity المصداقية الداخلية :** How well was the study designed, conducted, interpreted, and reported?

- Generally speaking, internal validity relates to the structure of the article, the topic, quality of writings, time of the journal published, researchers and relevance to the topic and their experience, etc...
- More specifically, internal validity means that to what extent the quality of the paper and the way it's conducted are conducted according to scientific merits and it's being followed, and conclusions follows the introduction written by the researcher, so the conclusion is consistent with population, methodology and purpose that set up to be achieved.
- It's more like a critical judgement that is related to if the research procedures are scientifically correct and consistent with the purpose and the methods, and the conclusion reached by the researcher is appropriate to the level of data that was used.

About the internal validity, a reader should ask:
• What was the goal of the study? Were the methods appropriate for the goal? Was the main study question answered?
• Were the methods used to collect and analyze data scientifically valid? For example, did a study collecting new survey data select an appropriate sample population, recruit an adequate number of participants, use a validated questionnaire, and apply appropriate statistical tests? was the study conducted ethically? Have the authors acknowledged and discussed the limitations of the study methods?
• Do the results seem reasonable? What types of bias I the design, conduct, analysis, and interpretation of the study might have caused some of the results to be inaccurate?
• Are all of the study's conclusions supported by the study's results? If a study was attempting to answer a question about causality, does the article provide sufficient evidence to support that claim?

- **External validity (generalizability) المصداقية الخارجية :** How likely is it that the results of this study apply to other populations?
- Not all studies can be applied to all settings and all populations.
- External validity determines to what extent you can generalize your results to populations other than the population that you studied and the setting you are investigating in, but they should be similar in age group, disease, race, sex, etc...

About the external validity, a reader should ask:
• How well do the findings of this study fit with existing knowledge about the topic? Have **replication studies** in diverse populations supported the generalizability of the findings?
• For experimental studies, how likely is it that the observations from the trial would occur in everyday life outside laboratory conditions?
• To what other populations might the results apply? For example, are results from a study in Canadian men ages 30-49 likely to be applicable to Mexican men ages 30- 49, Canadian women ages 30-49, and/or Canadian men ages 50-69?

3.6 Annotated Bibliographies: • Used to track articles during-literature review

- Annotated bibliographies briefly summarize an article or report and how it relates to the proposed new project.
- it was used mostly in old days when we didn't have enough technology to help us to organize our literature findings, it's still used now adays but it's electronic.

Annotated Bibliography: we summarize findings, procedures, methods and any relevant data & information that we need from an article of interest, we summarize it as points or text either on piece of cards (Bibliographic cards) or Modern softwares like (Mendeley, EndNote or you can use reference manager in Microsoft Word)

- An annotated bibliograph includes, at minimum a full reference for the document being reviewed and a brief summary of the article or report.
- Researchers may also take notes about how a published report relates to the proposed new research project. The goal is not to replicate a document's abstract. **The goal is to summarize the content most pertinent to the new investigation.**

3.7 What Makes Research Original:

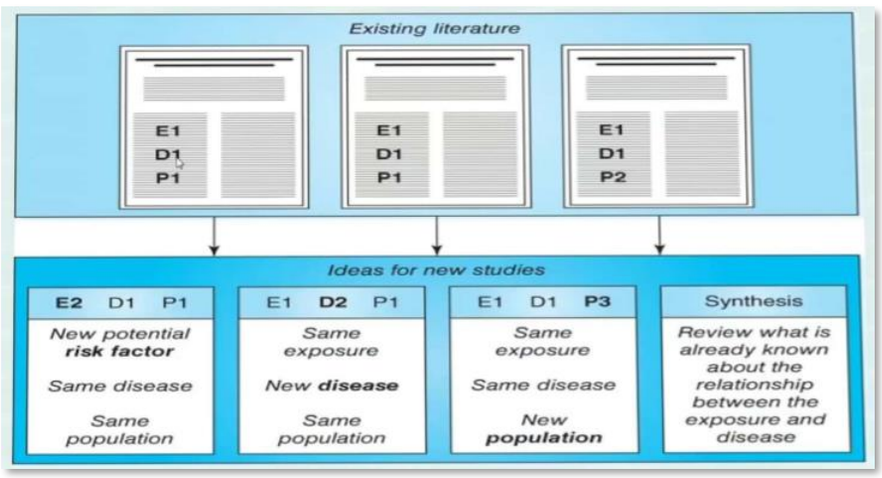
- For a research project to be considered original, it needs to have only one substantive difference from previous work: **a new exposure, a new disease/outcome, a new population, or a new perspective**.

Note:

Replication: has some changes.

Duplication: you copy the same thing, without any changes.

you can have ideas for new studies only by changing one element while the rest is the same (just see what's 'new' in the figure)



For example:

a literature review might find that several studies have shown that older adults (the population) who take 30 minutes walks several times a week (the exposure) score higher on memory tests (the disease or outcome) than adults who do not routinely walk for exercise.

A proposed new study could ask:

• Is playing table tennis (a new exposure) effective at improving memory in older adults (the same outcome and population)?

• Do older adults who walk several times a week (the same exposure and population) improve their balance (a new disease or outcome)?

• Does walking (the same exposure) improve memory (the same outcome) in children (a new population)?

4.1 Study Approach

After identifying a general research topic, the researcher needs to develop a specific research goal and workable research plan.

To answer your questions and achieve your goals, you should first choose the type of study that you are going to do, and it can be:

- **Primary study: collect and analyze a new data,** like collecting data from a hospital records with your criteria (يعني ممكن تكون الداتا موجودة.. بس انت عليك تجمعها بالمعايير والطرق اللي بتناسبك).

- **Secondary study: analyze an existing data,** which collected for a previous study. So, you don't have a flexibility. There is no need to worry about ethical considerations of the collected data as long as you took permission from who have the copyrights

- **Tertiary study: reviews an existing literature,** two major types: Systematic reviews & Meta-analysis (it's considered complete research, not just a review. And it's expensive, so only the companies do it.

If new data will be collected, the researcher has great freedom in selecting study topics but may struggle to recruit adequate numbers of participants

FIGURE 4-2 Key Considerations

Study Approach	Key Questions to Ask
• Collection and analysis of new data	• What are possible source populations? • Will it be possible to recruit enough participants?
• Analysis of existing data	• What are possible sources of usable data files? • What questions can be explored with the available data?
• Review of the literature	• Does the researcher have access to adequate library resources? • Can the researcher reasonably expect to acquire *all* of the needed articles?

4.2 Conceptual and Theoretical Frameworks

- **A Conceptual Framework: illustrates the key relationships between EDPs** (Exposure-Disease-Population) **that will be evaluated during the study. (Much more specific in defining a relationship).**
- **A Theoretical Framework: draws on existing models in the literature to explain key relationships. (Describe a broader relationship between things (when stimulus is applied, response is expected)).**

more clarification: sometimes you may need to use some theories which may help you in your study, so you will need these frameworks. (This will be explained further in the next semester's Qualitative Research course).

- Additional note → conceptual frame work using boxes and arrows that illustrate the various relation ships that evaluated during the study

Common in nursing, social science, and educational research. But not in clinical one.

4.3 Study Goal (purpose/aim) & Specific Objectives

FIGURE 4-3 Examples of Study Goals

- To describe the incidence or prevalence of a particular exposure or disease in one well-defined population
- To assess the perceived health-related needs of a community
- To compare the levels of exposure or disease in two or more populations
- To identify possible risk factors for a particular disease in a population
- To test the effectiveness of a new preventive intervention, diagnostic test, assessment method, therapy, or treatment
- To evaluate whether an intervention shown to be successful in one population is equally successful in a second population
- To examine the impact of a program or policy
- To synthesize or integrate existing knowledge

Breaking down of the main purpose into many objectives…

First, identify ONE clear overall study goal or study question. Then, identify three or more specific objectives, aims, or hypotheses that represent steps toward answering the main study question.

4.4 Checklist for Success

FIGURE 4-4 Questions Essential to the Success of the Project

Area	Questions
Purpose and significance	• What will the study contribute? • What will be new and noteworthy about the study? • Can the importance and necessity of this project be justified? • How will the study enhance the body of knowledge in its discipline? • Who will benefit from the study besides the researcher? • How will the study help individuals and/or communities live healthier lives? • How might the study contribute to improving health practices and/or policies?
Scope and feasibility	• Is the scope of the intended project reasonable and manageable—neither too broad nor too narrow? • Can the proposed study question actually be answered? • Can the researcher answer the proposed study question?

FIGURE 4-4 (continued)

Area	Questions
Capacity and collaborators	• Does the researcher have the knowledge and skills needed to conduct the study? • Does the researcher have access to collaborators who have the expertise needed for the project? (See Chapter 5 for information on assembling a support team.)
Money and materials	• Are there adequate financial resources to conduct the study? • Does the researcher have access to equipment, space, and other physical requirements? • Given the resources available, can the researcher reasonably expect to conduct a scientifically rigorous and valid study?
Time	• Does the researcher have the time to conduct this study? • Does the researcher have the time to make this an excellent study that does not waste health resources?
Population or data	• If the plan is to collect new data from individuals, does the researcher have access to a reasonable source population and an adequate number of participants? • If the plan is to analyze existing data or to write a review paper, does the researcher have access to a reasonable existing data set and/or to an extensive library collection?
Ethics	• Will the researcher be making good use of the resources available? • Has the researcher considered the relevant ethical issues, especially those related to the collection and use of individual-level data? (See Chapter 21 for the ethical issues that should be considered.) • Is the researcher prepared to conduct culturally appropriate and scientifically rigorous research?
Target audience	• Who is likely to be interested in the findings? • Is the resulting paper likely to be publishable?

Good research projects are described by the acronym "FINER":

Feasible (financial and human resources)

Interesting

Novel (originality)

Ethical

Relevant

CHAPTER 5: COLLABORATION & MENTORSHIP

5.1 Collaborators & Consultants

Scientific research is rarely completed by one person working alone.

New investigators benefit from mentorship by several experienced researchers with different areas of expertise.

A lead researcher: the researcher who will do the majority of the work. Sometimes it is instead used to refer to the senior researcher (an experienced researcher who guides the work of a newer investigator).

It's helpful to assemble a team for a research project that is:

Scientifically valid + Ethical & Culturally appropriate + Time & Cost – effective.

Decide about co-authorship vs. acknowledgment. For example, a statistical consultants may ask to be paid by the hour to help a researcher think through analysis options as non-coauthors. These individuals who don't earn co-authorship can be thanked in the acknowledgments sections of manuscripts that benefited from their contributions.

5.2 Finding Research Mentor

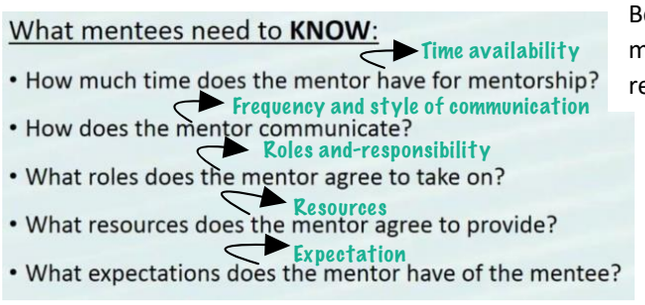
Research Mentorship: formal/informal relationship in which an experienced mentor offers professional development advice and guidance to a less experienced mentee.

A mentor is different according to the status of the new researcher (student, new researcher). New investigators seeking mentorship can identify potential advisors by:

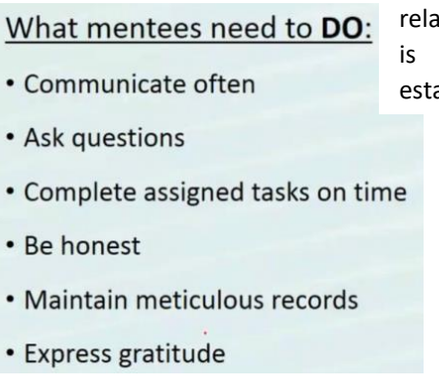
- Asking colleagues, classmates, and others about who might be a helpful mentor.
- Searching the profiles of researchers at one's own institution to see who is publishing on relevant topics.
- E-mailing potential mentors and ask to meet to discuss possible collaborations.

5.3 The Mentor-Mentee Relationship

Before entering a mentor-mentee relationship



After a mentor-mentee relationship is established



5.4 Professional Development

Don't rely on one person to provide professional development and mentoring. To establish a long-term research trajectory benefit, you should:

- **Participate in journal clubs.**
- **Become active in professional organizations.**
- **Attend and present at research conferences.**
- **Enrol in training programs.**

CHAPTER 6: COAUTHORING

6.1 Co-authorship

Most researchers start as "middle authors" before becoming a lead (first) author for the first time.

Co-authors should adhere to standards, pay attention to details, ask questions, provide variable feedback, …

Decisions about who qualifies for co-authorship should be transparent.

Decisions about coauthor ship should be made early in the research process

6.2 Authorship Criteria

ICMJE (International Committee of Medical Journal Editors) criteria for authorship in the health sciences:

All 4 criteria must be met

1- Substantial contributions to the conception and design of the study and/or data collection, analysis, and interpretation.

2- Drafting and/or critically revising the intellectual content of the manuscript.

3- Approve the final version of the manuscript to be submitted.

4- Accept responsibility for the integrity of the paper.

** **No gift authorships** (co-authorship awarded to a person who has not contributed significantly to the study) يعني مثلًا أضيف اسم صاحبي معي بالبحث وهو ما ساهم بشي منه.. أو ممكن أحتاج مصاري للبحث فبخلي ناس تساهم بالتمويل مقابل ذكر أسمائهم مع الباحثين المساهمين في البحث.. وهذا لا يجوز!

** **No ghost authors** (persons who have made a substantial contribution to the research or writing of a manuscript but are not named as authors). يعني مثلًا أحذف اسم باحث شارك معنا في بحث لدواء عشان خلافاته مع شركة معينة ما تأثر عالاعتمادية أو عالمبيعات.. وهذا لا يجوز!

6.3 Authorship order

The person who does most of the writing is often designated as the first author. The remaining authors are usually listed in order of contribution which is usually defined in terms of time dedicated to the project as well as intellectual contribution. When many co-authors with equal contributions are involved, they should be listed in alphabetical order. In prestigious journals, the senior author is often listed as the last author.

6.4 Decisions about authorship

In order to avoid last- minute debates over which individuals have made important contributions to a research project, decisions about the roles and responsibilities of each

member of the research team and who will be listed as co-author on a report, poster, or paper, as well as the order in which those person will be listed should be made as early as possible in the research processes.

قال النبي صل الله عليه وسلم:

‹ سيد الاستغفار أن يقول العبد : اللهم أنت ربي لا إله إلا أنت خلقتني ، وأنا عبدك ، وأنا على عهدك ، ووعدك ما استطعت ،

أعوذ بك من شر ما صنعت ، أبوء لك بنعمتك علي ، وأبوء بذنبي ، فاغفر لي فإنه لا يغفر الذنوب إلا أنت ›