

Research Problems, Research Questions, and Hypotheses

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Basic Terminology

- **Research problem**

- ✓ An enigmatic, perplexing, or troubling situation
- ✓ The purpose of research is to “solve” the problem or to contribute to its solution by accumulating relevant information

- **Problem statement**

- ✓ A statement articulating the research problem and making an **argument** to conduct a new study



Basic Terminology (cont.)

- **Statement of purpose**
 - ✓ The researcher's summary of the overall study goal
- **Research aims or objectives**
 - ✓ The specific accomplishments to be achieved by conducting the study



Basic Terminology (cont.)

- **Research questions**

- ✓ The specific queries the researcher wants to answer in addressing the research problem

- **Hypotheses**

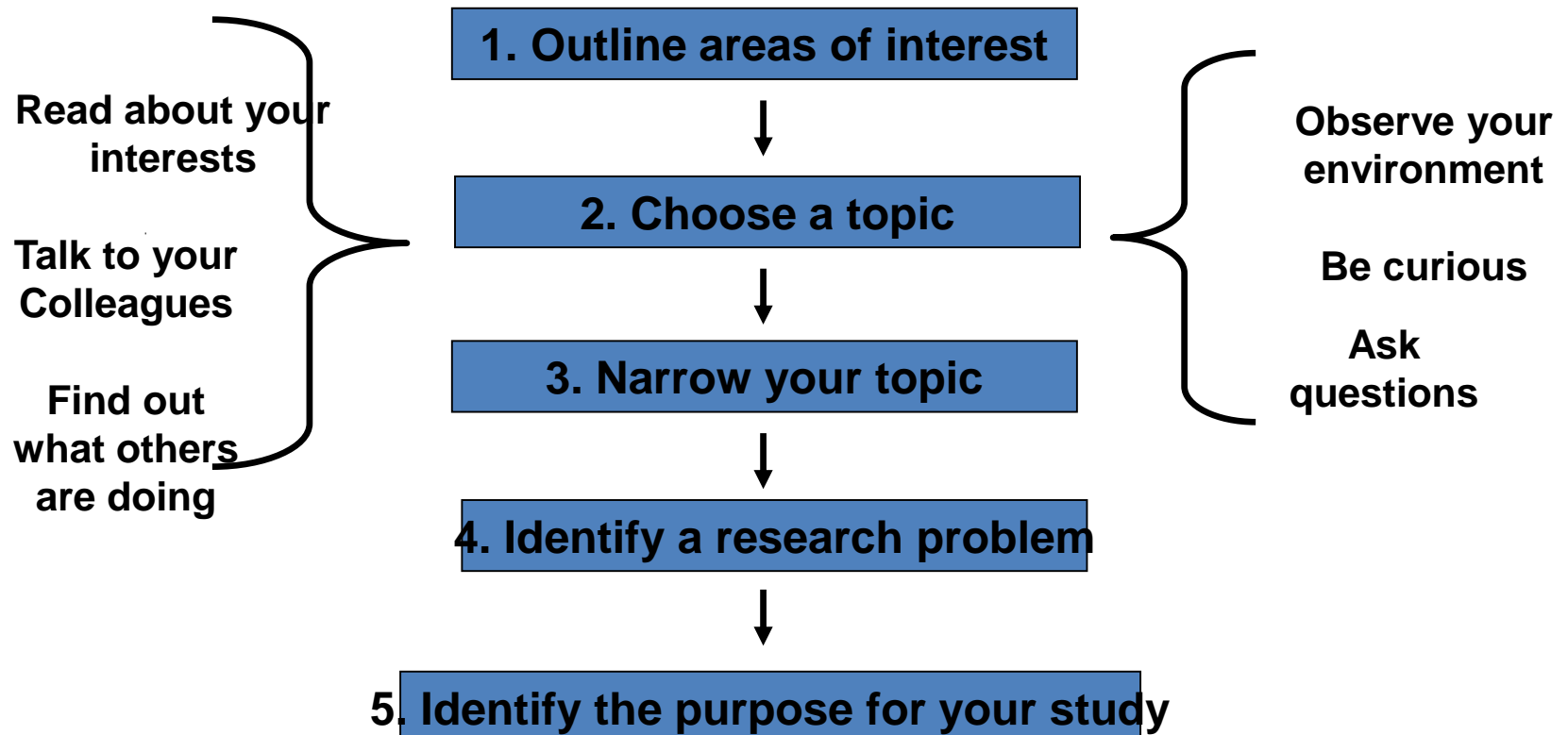
- ✓ The researcher's predictions about relationships among variables



Sources of Research Problems

- Clinical experience
- Nursing literature:
 - ✓ Few studies have addressed
 - ✓ Previous studies didn't examine
- Social issues
- Theory
- Suggestions from external sources (e.g., priority statements of national organizations or funders, Requests for Proposals)

Steps in identifying a research problem





Examples of research topics

- ✓ Claustrophobia during magnetic resonance imaging (MRI) tests
- ✓ Smoking among university students
- ✓ Infection after surgeries
- ✓ Patients complaining of pain
- ✓ Stress among hospitalized children
- ✓ Morbidity among postpartum women



Reachability, feasibility & significance

- How important to nursing
- Can the problem be studied
- Is the study a feasible one:
 - ✓ Time
 - ✓ Participants
 - ✓ Facilities and resources
 - ✓ Experience of researchers



Research Problems and Questions

- Broad enough to include central concerns
- Narrow enough to serve as a guide to study design



Components of a Problem Statement

- **Identification of the problem** (What is wrong with the current situation?)
- **Background** (What is the nature or context of the problem?)
- **Scope** (How big is the problem, and how many people are affected?)
- **Consequences** (What are the consequences of not fixing the problem?)
- **Knowledge gaps** (What information about the problem is lacking?)
- **Proposed solution** (How will the study contribute to the problem's solution?)



Statement of Purpose: Quantitative Studies

- Identifies key study variables
- Identifies possible relationships among variables
- Indicates the population of interest
- Suggests, through use of verbs, the nature of the inquiry (e.g., to test..., to compare..., to evaluate...)



Statement of Purpose: Qualitative Studies

- Identifies the central phenomenon
- Suggests the **research tradition** (e.g., grounded theory, ethnography)
- Indicates the group, community, or setting of interest
- Suggests, through use of verbs, the nature of the inquiry (e.g., to describe..., to discover..., to explore...)



Research Question



Research Questions

- Research questions:
 - ✓ Are sometimes direct rewordings of statements of purpose, worded as questions
 - ✓ Are sometimes used to clarify or lend specificity to the purpose statement
 - ✓ In quantitative studies, typically pose queries about the relationships among variables



Asking Well-Worded Clinical Questions

Should have 3 components:

1. The *population*

(What are the characteristics of the patients or clients?)

2. The *intervention* or *exposure*

(What are the treatments or interventions of interest? or,
What are the potentially harmful exposures that concern us?)

3. The *outcomes*

(What are the outcomes or consequences in which we are interested?)



Research question in quantitative research

- Most research questions concern relationships among variables, and thus many quantitative research questions could be written using a general question template:

“In (population), what is the relationship between (independent variable [IV]) and (dependent variable [DV])?”



Research Questions (cont.)

- You can start descriptive research questions with any of the following phrases:

How many?

How often?

How frequently?

How much?

What percentage?

What proportion?

To what extent?


What is?

What are?




Research Questions (cont.)

- **How many** calories do American men and women consume per day?
- **How often** do British university students use Facebook each week?
- **What are** the most important factors that influence the career choices of Australian university students?
- **What proportion** of British male and female university students use the top 5 social networks?
- **What percentage** of American men and women exceed their daily calorific allowance?




Descriptive Question (Quantitative)—Use the following script:

- How frequently do (participants) (variable) at (research site)?
- **Application:** How frequently do African Americans feel isolated on college campuses?



Relationship Question (Quantitative)—Script:

- How does (independent variable) relate to (dependent variable) for (participants) at (research site)?
- **Application:** How do feelings of isolation relate to (or influence) the ethnic identity of African Americans in the United States?



Comparison Question (Quantitative)—Script:

- How does (Group 1) differ from (Group 2) in terms of (dependent variable) for the (participants) at (research site)?
- **Application:** How do African Americans and European Americans compare in their perceptions of ethnic identity?



Intervention

Questions addressing the treatment of an illness or disability.

In _____ (P), how does _____ (I) compared to _____ (C) affect _____ (O) within _____ (T)?

In _____ (P), what is the effect of _____ (I) on _____ (O) compared with _____ (C) within _____ (T)?

In African American female adolescents with hepatitis B (P), how does acetaminophen (I) compared to ibuprofen (C) affect liver function (O)? (Time is optional)



Therapy

Questions around how to select treatments to offer our patients that do more good than harm and that are worth the efforts and costs of using them:

In _____ (P), what is the effect of _____ (I) on _____ (O) compared with _____ (C) within _____ (T)?

What is the duration of recovery (O) for patients with total hip replacement (P) who developed a post-operative infection (I) as opposed to those who did not (C) within the first six weeks of recovery (T)?



Research Questions (cont.)

- In qualitative studies, research questions often pose queries linked to the research tradition:
 - ✓ Grounded theory: **process** questions
 - ✓ Phenomenology: **meaning** questions
 - ✓ Ethnography: **cultural description** questions



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Research question in quantitative research

2) **Direction & Nature of Relationship:**

- ✓ The variables are all measurable concepts, and the questions suggest quantification

For example:

- ✓ Do Palestinian male nurses wash their hand more often than female nurses?

3) **Strength of relationship**

- ✓ How strong is the relationship between experience and hand washing practice



Research question in qualitative research

1) Process:

- ✓ How the nurse-patient relationship evolved and developed?

2) Meaning:

- ✓ What are the meanings of isolation for cancer patient who are living in infection isolated room?

3) Descriptive

- ✓ What are the life experiences for Palestinian HIV positive?



Quality of Life/Meaning

Questions addressing how one experiences a phenomenon:

How do _____ (P) diagnosed with _____ (I) perceive _____ (O) during _____ (T)?

How do pregnant women (P) newly diagnosed with diabetes (I) perceive reporting their blood sugar levels (O) to their healthcare providers during their pregnancy and six weeks postpartum (T)?

How do 20 something men (P) with a diagnosis



Exercise: scenario

Scenario: Hala is being cared for in the oncology unit. She has severe pain to her abdomen → you are interested in reducing pain and improving patient comfort.

Population: in oncology patients, they complain of severe patients

Intervention: pain management

Comparison: usual care

Outcome: improve pain and reduce discomfort

- **Example:** Patients with unrelieved cancer pain

- ? Inpatient vs. outpatient setting

- ? Specific type of cancer pain

- ? Particular age group (elderly)



Asking the clinical questions

1. In mechanically ventilated patients (P), how does a weaning protocol (I) compared with no weaning protocol affect ventilator days (O) during ICU length of stay (T)?
2. In hospitalized adults (P), how does hourly rounding (I) compared with no rounding © affect fall rates (O)?



PICO(TT) model → Asking “the Question”

The PICO format / PICO(TT) model:

- P -
- I -
- C -
- O -
- T -
- T -



PICO(TT) model

P = Patient, population, problem of interest

- Disease condition
- stage of illness
- Care setting

I = Intervention or interest area

- Type of treatment (drug, procedure, therapy)
- Intervention level (dosage, frequency)
- Stage of intervention (preventative, early, advanced)
- Delivery (who delivers the intervention? where?)



PICO(TT) model

C = Comparison of interest / comparing intervention / status

- Alternative interventions (standard treatment, placebo, another intervention)
- There may not always be a comparison

O = Outcome of interest : The outcome or effects you are interested in.

(desired or of interest)

- Improvement of symptoms, healing
- Side effects
- Improved quality of life
- Cost effectiveness and benefits for the service provider



P I C O(T T) model

T - Type of Question

- (Is this a diagnosis, therapy, prognosis, etiology/harm, or prevention question?)

T -Type of Study Design

- (What study design would best answer this question? RCT, Cohort, Case Series, etc.)

Question: In POPULATION, does INTERVENTION as compared to COMPARISON/CONTROL GROUP result in OUTCOME?



Description of the PICO strategy

Acronym	Definition	Description
P	Patient or problem	Can be only one patient, a group of patients with the a particular condition or a health problem
I	Intervention	Interventions of interest, can be therapeutic (e.g. several kinds of dressings, preventive (e.g. vaccination), diagnostic (e.g. blood pressure measure), prognostic, administrative or related to economic issues.
C	Control or comparison	Standard intervention, the most used intervention or no intervention
O	Outcome	Expected result



Asking A question with PICO

Acronym	Definition	Description
P	Population	Describe as specifically as possible
I	Intervention	Describe the intervention of interest, this may be a treatment, risk factor, perception
C	Control or comparison	Use a comparison if it fits to do so, this may be a alternative, a placebo, usual care
O	Outcome	What is the clinical outcome- add the timeframe if important (T)

Using the PICO model

	P	I	C	O
	POPULATION Problem	INTERVENTION	COMPARISON	OUTCOME
Example	In post cardiac surgery patients	Do identification protocols	As compared to usual care	Reduce risk of skin tears?
Example	In patients undergoing diagnostic procedures	Does listening to taped music	As compared to live music	Reduce anxiety and increase patient satisfaction?
Example	In acute care units	Does nurse walking rounds	As compared to taped report	Increase patient satisfaction and missed treatments?
Example	Neck wound dehiscence (problem)	Honey therapy (proposed intervention)	Conventional debridement therapies (comparative treatment)	Wound healing (outcome)



Research Hypothesis



Review terminology

- ✓ **Research problem:** There is a problem “troubling situation” to solve by doing this research. What is this problem?
- ✓ **Problem statement:** your argument
- ✓ **Statement of purpose** = overall goal
- ✓ **Research aims or objectives:** specific to your study
- ✓ **Research questions:** what Qs your study will answer
- ✓ **Hypotheses:** Your predictions/expected answers



Hypotheses

- ✓ States an expectation, a **predicted answer** to the research question
- ✓ Should almost always **involve two or more variables**
- ✓ Suggests the predicted relationship between the independent variable and the dependent variable
- ✓ Is articulated almost exclusively in quantitative (not qualitative) studies



Hypotheses (cont.)

- ✓ Is tested through statistical procedures
- ✓ Derived from the research question
- ✓ Present answer of research question
- ✓ Always be written before the study and should not be changed after the study result examined



Examples on hypothesis

- ✓ Staff nurse with high knowledge demonstrate higher compliance rate with infection control practice than those with low knowledge
- ✓ Students who study the textbook score more in their exam than who don't study from textbook



Question

- Is the following statement True or False?
- A hypothesis most commonly involves one or two variables.



Answer

- False
- Rationale: A hypothesis should almost always involve at least two variables and possibly more.



Directional Versus Nondirectional Hypotheses

- **Directional hypothesis**

- ✓ Predicts the direction of a relationship

- Example:** The more you eat, the heavier you become

- **Non-directional hypothesis**

- ✓ Predicts the existence of a relationship, not its direction

- Example:** There is a relationship between eating and gaining weight



Research Versus Null Hypotheses

- **Research hypothesis**

- ✓ States the actual prediction of a relationship

- **Null hypothesis**

- ✓ Expresses the absence of a relationship (used only in statistical testing)

Example: There is no relationship between eating and gaining weight



Hypothesis criteria

- Written in declarative sentence
- Written in past tense
- Contain population
- Contain variables
- Reflect the problem statement and the purpose
- Empirically tested



Hypotheses and Proof

- Hypotheses are never **proved** or **disproved**
 - ✓ Statistical hypothesis testing cannot provide absolute proof—only probabilistic information to support an inference that a hypothesis is **probably correct (or not)**
- Hypotheses are **supported**, or not, by the study data



End of Presentation