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KARNATAKA RADIOLOGY EDUCATION PROGRAM

CLINICAL RESEARCH – BRIDGING IMAGING & INNOVATION

SESSION – 4 – AVOIDABLE MISTAKES IN RESEARCH

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COMMON MISTAKES IN RESEARCH METHODS

- ✓ CLINICAL RESEARCH IS A CORNER STONE OF MEDICAL ADVANCEMENTS
- ✓ DESPITE ITS IMPORTANCE, CLINICAL RESEARCH IS SUSCEPTIBIBLE VARIOUS ERRORS
- ✓ IDENTIFYING AND UNDERSTANDING THE COMMON RESEARCH METHOD ERRORS IS IMPORTANT
- ✓ ADDRESSING THE COMMON MISTAKES CAN LEAD TO MORE ROBUST AND RELIABLE MEDICAL RESEAARCH
- ✓ IMPROVED RESEARCH METHODS RESULTS IN IMPROVED PATIENT CARE

1. FAILURE TO EXAMINE SIMILAR PRIOR RESEARCH

PROBLEM STATEMENT

NOT THOROUGHLY REVIEWING EXISTING LITERATURE CAN LEAD TO REDUNDANT STUDIES THAT DON'T CONTRIBUTE NEW KNOWLEDGE. THIS OVERSIGHT CAN RESULT IN WASTED RESOURCES AND MISSED OPPORTUNITIES TO BUILD ON PREVIOUS FINDINGS.

HOW TO AVOID?

CONDUCT A THOROUGH AND SYSTEMATIC REVIEW OF EXISTING RESEARCH BEFORE DESIGNING YOUR STUDY. USE DATABASES, ACADEMIC JOURNALS, AND OTHER REPUTABLE SOURCES TO GATHER RELEVANT STUDIES. CRITICALLY EVALUATE THE QUALITY AND FINDINGS OF THESE STUDIES TO IDENTIFY GAPS AND OPPORTUNITIES FOR NEW RESEARCH. THIS ENSURES THAT YOUR STUDY ADDRESSES UNANSWERED QUESTIONS AND BUILDS ON EXISTING KNOWLEDGE.

2. INADEQUATE ASSESSMENT OF LITERATURE

PROBLEM STATEMENT

FAILING TO CRITICALLY EVALUATE PREVIOUS STUDIES CAN LEAD TO RELIANCE ON FLAWED OR OUTDATED INFORMATION, AFFECTING THE QUALITY AND RELEVANCE OF YOUR RESEARCH. THIS OVERSIGHT CAN RESULT IN MISGUIDED HYPOTHESES AND METHODOLOGIES.

HOW TO AVOID?

AFTER CONDUCTING A COMPREHENSIVE LITERATURE REVIEW, CRITICALLY ASSESS THE QUALITY AND RELEVANCE OF THE STUDIES YOU FIND. LOOK FOR POTENTIAL BIASES, METHODOLOGICAL FLAWS, AND THE ROBUSTNESS OF THE RESULTS. IDENTIFY THE STRENGTHS AND WEAKNESSES OF PRIOR RESEARCH TO ENSURE THAT YOUR STUDY BUILDS ON SOLID FOUNDATIONS AND ADDRESSES ANY GAPS OR LIMITATIONS IN EXISTING KNOWLEDGE.

3. LACK OF A CLEAR RESEARCH QUESTION

PROBLEM STATEMENT

NOT HAVING A WELL-DEFINED RESEARCH QUESTION CAN LEAD TO AMBIGUOUS OBJECTIVES AND A LACK OF FOCUS IN THE STUDY. THIS CAN RESULT IN COLLECTING IRRELEVANT DATA AND DRAWING CONCLUSIONS THAT ARE NOT MEANINGFUL.

HOW TO AVOID?

FORMULATE A SPECIFIC, FOCUSED RESEARCH QUESTION BEFORE BEGINNING YOUR STUDY. ENSURE THAT THE QUESTION IS CLEAR, CONCISE, AND ADDRESSES A GAP IN EXISTING KNOWLEDGE. THIS PROVIDES A CLEAR DIRECTION FOR YOUR RESEARCH AND HELPS IN DESIGNING A STUDY THAT EFFECTIVELY ADDRESSES THE RESEARCH OBJECTIVES.

4. LACK OF CLEAR INCLUSION AND EXCLUSION CRITERIA

PROBLEM STATEMENT

FAILING TO CLEARLY DEFINE WHO CAN PARTICIPATE IN THE STUDY CAN RESULT IN A NON-REPRESENTATIVE SAMPLE, AFFECTING THE VALIDITY AND GENERALIZABILITY OF THE RESEARCH FINDINGS. WITHOUT CLEAR CRITERIA, THE STUDY POPULATION MAY INCLUDE INDIVIDUALS WHO ARE NOT RELEVANT TO THE RESEARCH QUESTION.

HOW TO AVOID?

DEFINE DETAILED INCLUSION AND EXCLUSION CRITERIA BEFORE RECRUITING PARTICIPANTS. INCLUSION CRITERIA SHOULD SPECIFY THE CHARACTERISTICS THAT PARTICIPANTS MUST HAVE TO BE INCLUDED IN THE STUDY, WHILE EXCLUSION CRITERIA SHOULD OUTLINE CHARACTERISTICS THAT DISQUALIFY POTENTIAL PARTICIPANTS. THIS ENSURES A WELL-DEFINED AND REPRESENTATIVE SAMPLE, LEADING TO MORE ACCURATE AND APPLICABLE RESULTS.

5. IGNORING CONFOUNDING VARIABLES

PROBLEM STATEMENT

OVERLOOKING CONFOUNDING VARIABLES CAN LEAD TO MISLEADING RESULTS BY MASKING THE TRUE RELATIONSHIP BETWEEN THE VARIABLES OF INTEREST. THIS CAN RESULT IN INCORRECT CONCLUSIONS AND REDUCE THE VALIDITY OF THE RESEARCH.

HOW TO AVOID?

IDENTIFY POTENTIAL CONFOUNDING VARIABLES DURING THE STUDY DESIGN PHASE. USE TECHNIQUES SUCH AS RANDOMIZATION, MATCHING, AND STATISTICAL CONTROL TO ACCOUNT FOR THESE VARIABLES. CLEARLY REPORT ANY CONFOUNDERS AND HOW THEY WERE MANAGED IN YOUR STUDY TO ENSURE TRANSPARENCY AND ACCURACY.

6. SKIPPING SAMPLE SIZE ANALYSIS

PROBLEM STATEMENT

FAILING TO CONDUCT A SAMPLE SIZE ANALYSIS BEFORE STARTING A STUDY CAN RESULT IN A SAMPLE THAT IS TOO SMALL OR TOO LARGE. THIS CAN LEAD TO INSUFFICIENT POWER TO DETECT SIGNIFICANT EFFECTS OR UNNECESSARY EXPENDITURE OF RESOURCES.

HOW TO AVOID?

PERFORM A SAMPLE SIZE CALCULATION DURING THE STUDY PLANNING PHASE. THIS INVOLVES DETERMINING THE NUMBER OF PARTICIPANTS NEEDED TO ACHIEVE SUFFICIENT STATISTICAL POWER TO DETECT MEANINGFUL EFFECTS. UTILIZE STATISTICAL SOFTWARE OR CONSULT WITH A BIOSTATISTICIAN TO ENSURE THAT YOUR SAMPLE SIZE IS APPROPRIATE FOR THE RESEARCH OBJECTIVES AND HYPOTHESES.

7. NOT REPORTING MEASUREMENT ERRORS

PROBLEM STATEMENT

NEGLECTING TO REPORT POTENTIAL MEASUREMENT ERRORS CAN LEAD TO MISLEADING CONCLUSIONS AND REDUCE THE CREDIBILITY OF THE RESEARCH. MEASUREMENT ERRORS CAN OCCUR DUE TO VARIOUS FACTORS SUCH AS INSTRUMENT CALIBRATION, OBSERVER VARIABILITY, OR ENVIRONMENTAL CONDITIONS.

HOW TO AVOID?

ALWAYS REPORT ANY POTENTIAL MEASUREMENT ERRORS IN YOUR STUDY. INCLUDE INFORMATION ON HOW MEASUREMENTS WERE TAKEN, THE INSTRUMENTS USED, AND ANY KNOWN LIMITATIONS OR POTENTIAL SOURCES OF ERROR. TRANSPARENTLY DISCUSSING MEASUREMENT ERRORS HELPS OTHER RESEARCHERS UNDERSTAND THE RELIABILITY OF YOUR DATA AND PROVIDES A BASIS FOR FUTURE IMPROVEMENTS.