Evidence Based Practice: Ask, Acquire, Appraise

Frances Chu MSN, MLIS
Associate Director of Reference & Outreach
Harriet K & Philip Pumerantz Library
Western University of Health Sciences

Objectives

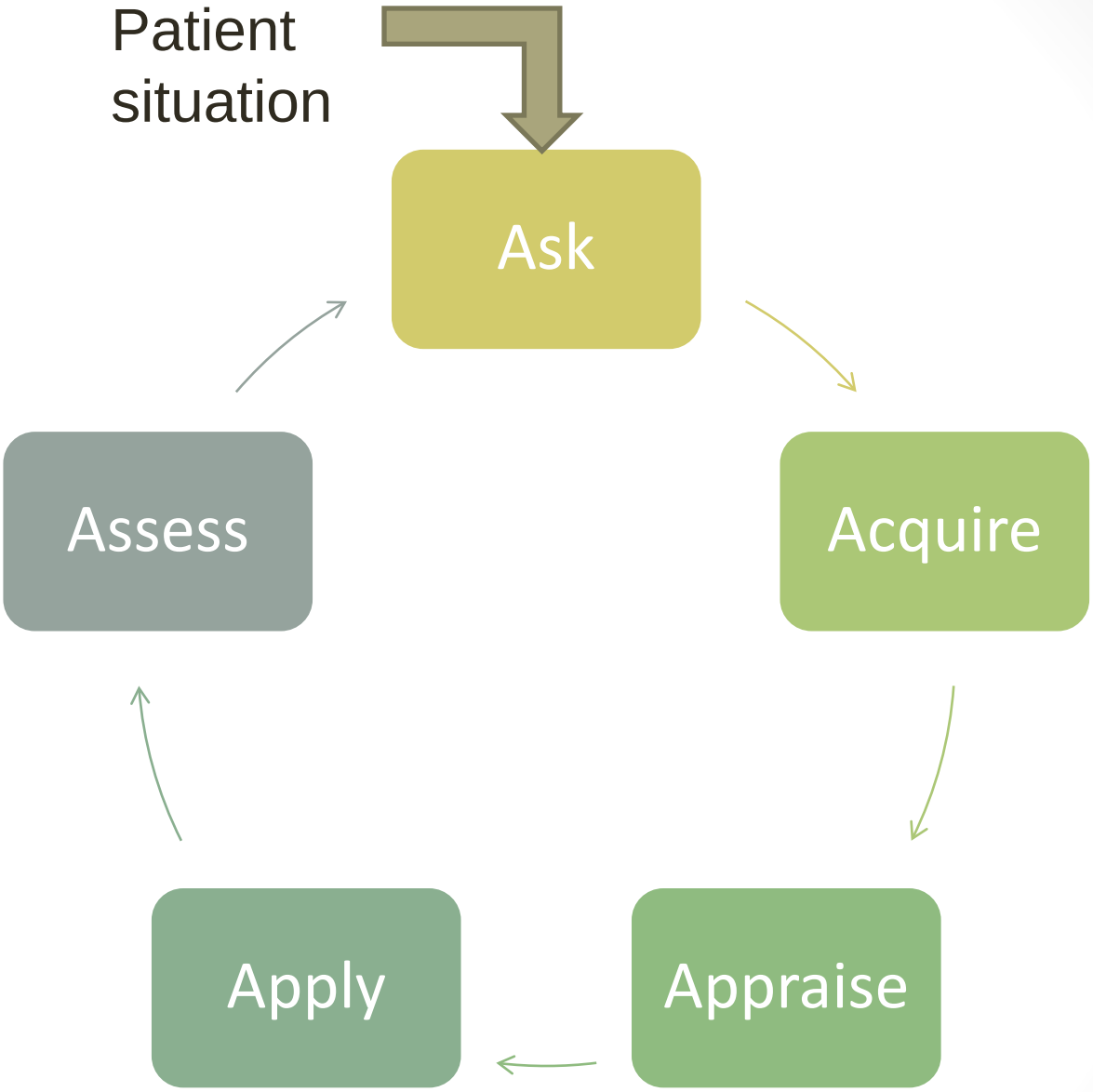
Objectives: Attendees will be able to:

- Define Evidence-Based Practice
- Describe the 5 steps of the Evidence-Based Practice process
- Formulate a research question using PICO
- Employ PICO to develop a search strategy
- Select appropriate databases to search
- Recognize types of research designs that can answer specific types of research questions
- Appraise the research article for validity using a Critical Appraisal Tool (CAT)

What is Evidence Based Medicine?

- Definition:

EBM (EBP) is the “integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances.” (Straus, Glasziou, Richardson, & Haynes, 2011)



(Straus, Glasziou, Richardson, & Haynes, 2011)

ASK

FORMULATING THE QUESTION

Background Questions addresses a knowledge gap

- Asked by those who are relatively inexperienced with a topic; when encountering a problem for the first time (Booth, 2006)
- Asks for **basic information** about a disease, disease process or basic drug information

- EX: "What is the pathophysiology of diabetic foot?"
  "Does Ibuprofen have any drug interactions?"

Foreground Questions addresses clinical decision making

- Asked when a clinician is already aware of two or more competing options and must make a clinical decision. The level of prior knowledge with the topic must be greater to be able to pose this type of question. (Booth, 2006)
- Asks for specific knowledge to inform clinical decisions or actions and must take into consideration the patient and the desired clinical outcome. (Weinfeld & Finkelstein, 2005)

- EX: “Is flap LASIK safer than wave front LASIK for the treatment of myopia in the treatment of a 45 year-old male?”

Foreground Questions…

- Asks for specific knowledge to inform clinical decisions or actions
- Must take into consideration the patient
- Have desired clinical outcomes
- Need to be able to create PICO

PICO(T)

- Use the PICO(T) formula to break a case into it's most basic informational components to create a clinical question
  - Patient or Population group with the condition
  - Intervention
  - Comparison (optional)
  - Outcome
  - Time (optional)

PICO is a formula used to identify specific parts of a patient interaction or scenario prior to searching

P	I	C	O
Patient or Population	Intervention	Comparison	Outcome (clinical)
Who is the patient? What is their problem? What is their concern?	What has the patient been prescribed? What has the patient been told to do?	What alternatives does the patient or healthcare provider want to know about? What alternative does the patient or healthcare provider ask you about?	What is the patient's desired clinical outcome?

A CLINICAL QUESTION is based off of PICO and used to check your search

- The **PICO** acronym is used as a framework for writing answerable clinical questions and includes:
- In “P”, is “I” or “C” “O”?
  In a 30 year-old female with recurring back pain (P), is physical therapy (I) or surgery (C) more effective in relieving pain (O)?

- Use the clinical question to identify type of research question
- Use research question to identify the best research design
- Identify the articles that answer the clinical question

ACQUIRE

SEARCHING AND OBTAINING ARTICLES

Point of care vs. Research resources

- Point of care resources are where to go for quick answers
- Research resources are used for more complex information, history, studies, and when you cannot find an answer in point of care resources

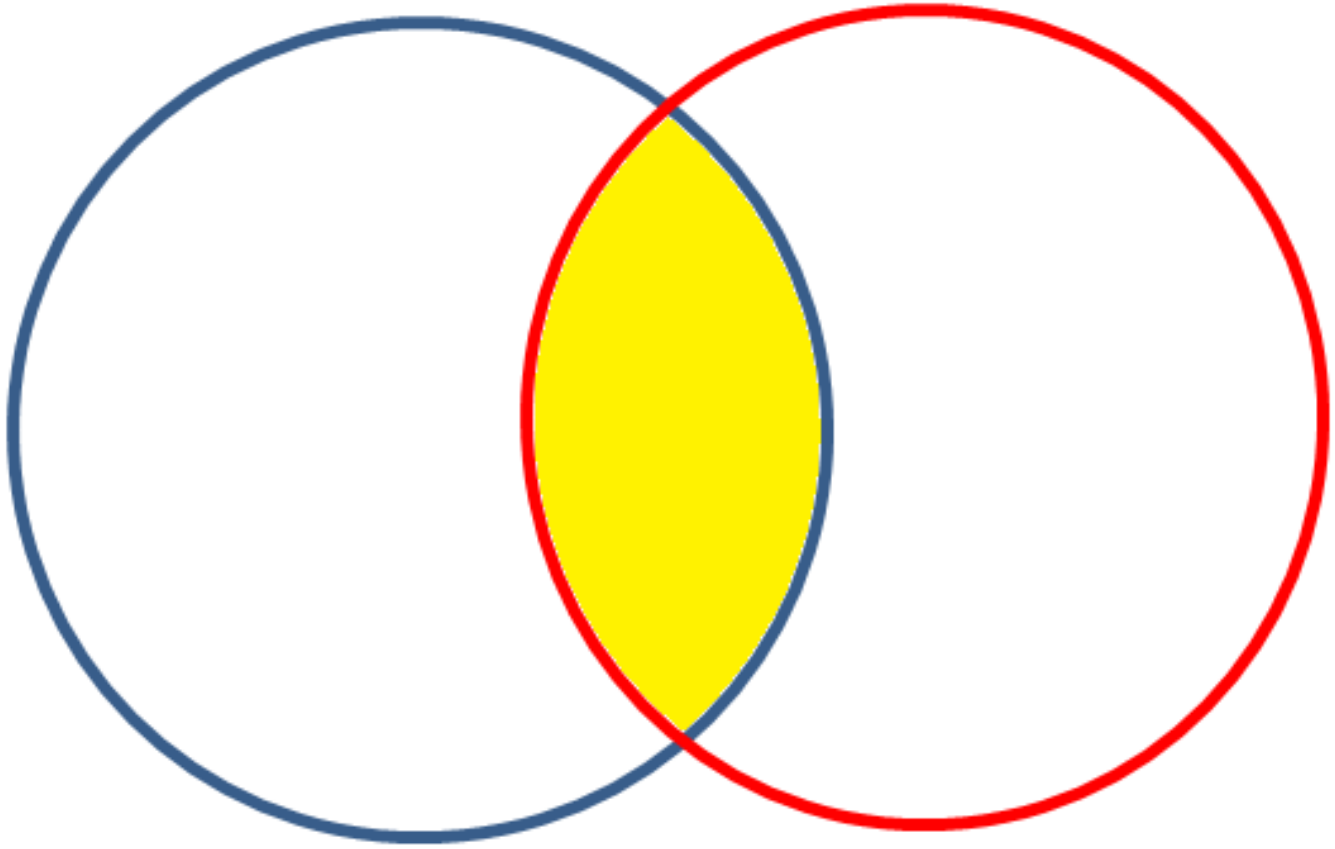
In order to select the best database for your particular question you need to know…

- What each database specializes in
- How it is indexed
- If EBP filters are available
- What format the results are presented in
- What you have access to

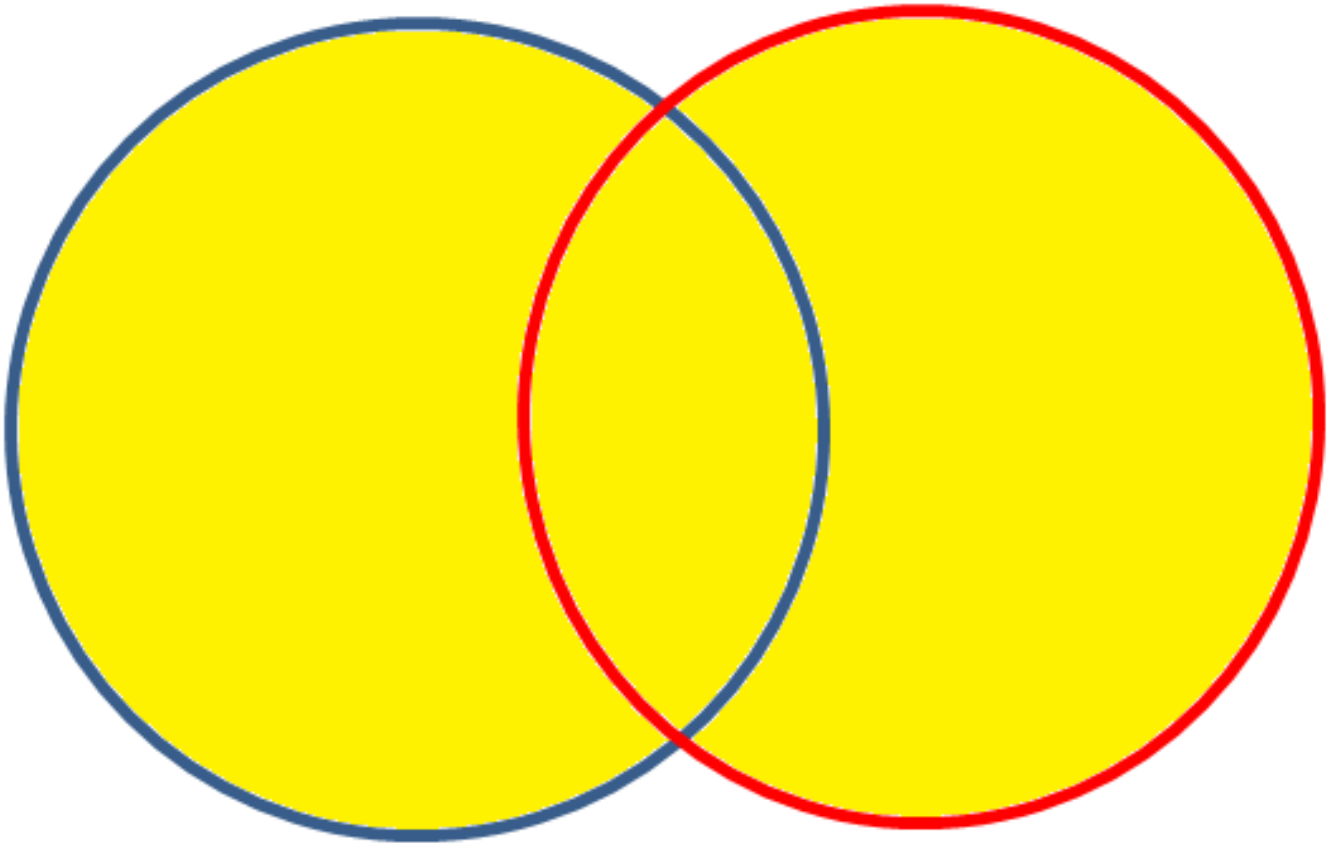
How to search

- Broad search with keywords
  - PICO(T)
- Narrow search with limiters
  - PICO(T)
- Search multiple resources
- Identify specific articles that may answer your question
  - Clinical Question Check
- Obtain full text
- Evaluate article
- Applicability

Boolean Operator - AND



Boolean Operator - OR



Best Practices for Searching

- Broad search
- Boolean and filters
- Alternate terms
- Multiple resources

RULE OF 20

Example

There has been a lot of commercials about supplementing breastfeeding with formula containing Docosahexaenoic Acid (DHA) and Arachidonic Acid (ARA) in newborns. What is the effectiveness of these types of formula with breastfeeding in comparison to breastfeeding for the growth and development of infants?

P: Infants

I: Breastfeeding supplemented with formula containing Docosahexaenoic Acid (DHA) and Arachidonic Acid (ARA)

C: Breastfeeding only

O: Better for growth and development

Clinical Question:

In Infants, is breastfeeding supplemented with formula containing Docosahexaenoic Acid (DHA) and Arachidonic Acid (ARA) better for the growth and development versus breastfeeding alone?

Search Strategy - Keywords

- Docosahexaenoic Acid AND Arachidonic Acid AND formula AND breastfeeding
- Think about limits: Human, English, Newborn, Research design, etc.
- Use the clinical question as inclusion and exclusion criteria

What if I have a qualitative research question?

- Quantitative – numbers = data
- Qualitative – lived experience, words = data

How do I search for qualitative research?

Form SPIDER and to help you develop search terms

S = sample

PI = phenomenon of interest

D = design

E = evaluation

R = research type

SPIDER vs. PICO

Sample	Patient, Population or Problem
Phenomenon of Interest	Intervention &/or Comparison
Design	
Evaluation	Outcome
Research type	

Example

Why clinicians of any type are reluctant to use EBP? What are some of the barriers?

Qualitative question:
What are the barriers felt by clinicians that lead to the reluctance to use EBP in practice?

S – Clinicians
PI – EBP
D – Focus groups, interviews
E – Barriers to using EBP
R – Qualitative

Search Strategy - Keywords

clinician AND Evidence-Based Practice AND (focus group OR interview) AND barrier AND qualitative

- Think about other synonyms
- Think about plurals

(clinician OR clinicians OR health professional OR health professionals OR doctor OR doctors OR nurse OR nurses) AND Evidence-Based Practice AND (focus group OR focus groups OR interview OR interviews) AND (barrier OR barriers) AND qualitative

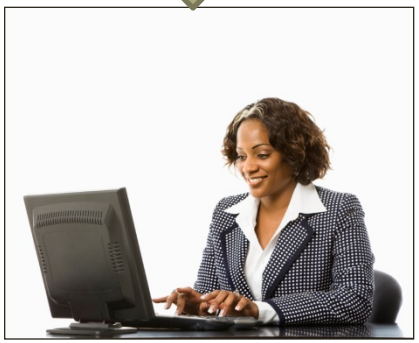
Types of Literature (or, what has been written)

- Primary
  - Original research results generated by experiments or studies
- Secondary
  - Describes, discusses or analyzes the primary literature
- Tertiary
  - Highly synthesized summaries of primary or secondary literature intended for point-of-care use

Idea

Research & Development

Write



Informal distribution to colleagues for feedback.

Revise

Adapted from Colby, A. Economics of information as instructional strategy (2010)

Research published in a journal or conference proceeding or book about the research.

Primary Literature

Another author reviews the original article & synthesizes the information in an article or book.

Secondary Literature

Information synthesized to be used at the bedside or at the point of care, handbooks, reference books

Tertiary Literature

Adapted from Colby, A. Economics of information as instructional strategy (2010)

What is peer reviewed?

“A peer-reviewed paper is one that has undergone the scrutiny of one or more scientific experts. Although peer review provides one type of quality control in the scientific process, it is not the only measure of scientific quality, nor is it a guarantee of excellence. People who read the scientific literature must decide for themselves whether each study meets the standards of the research community.”

(Garrad, 2007)

Appraise

EVALUATING THE VALIDITY OF THE RESEARCH

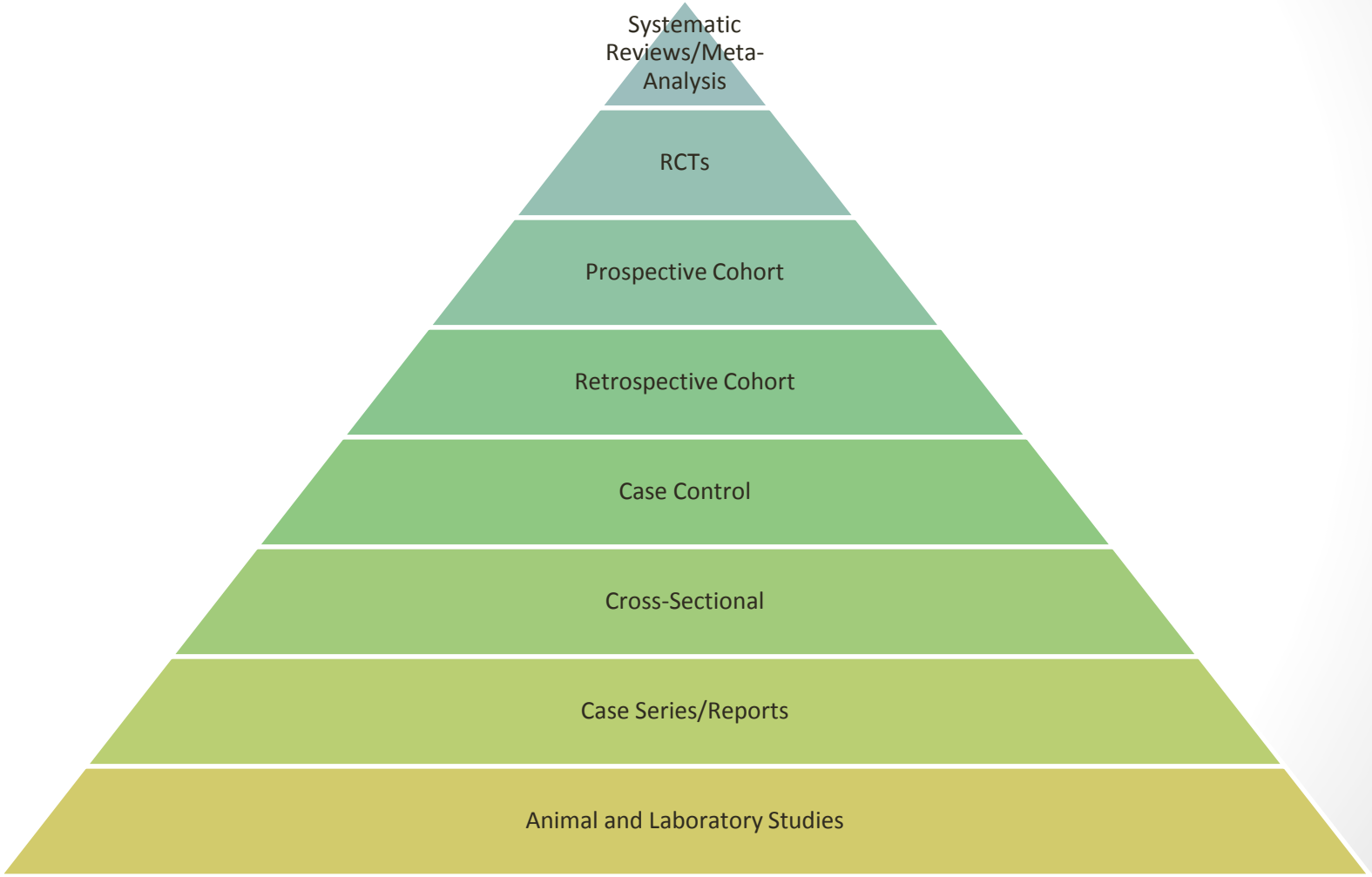
Types of Research Questions in Primary Literature

- Therapy
- Harm/Etiology/Risk
- Diagnosis
- Prognosis
- Clinical Examination
- Prevention
- Cost-Analysis

Quantitative Study Designs

- Case Series and Case Reports
- Cross-Sectional Studies
- Case Control Studies - Retrospective
- Cohort Studies - Prospective or Retrospective (Historical Cohort)
- Randomized, Controlled Clinical Trials (RCTs)
- Systematic Reviews and Meta-Analysis
- Sensitivity and Specificity/Diagnostic Test Studies

Hierarchy of Quantitative Study Designs



Type of Research Question to Ranking of Study Design

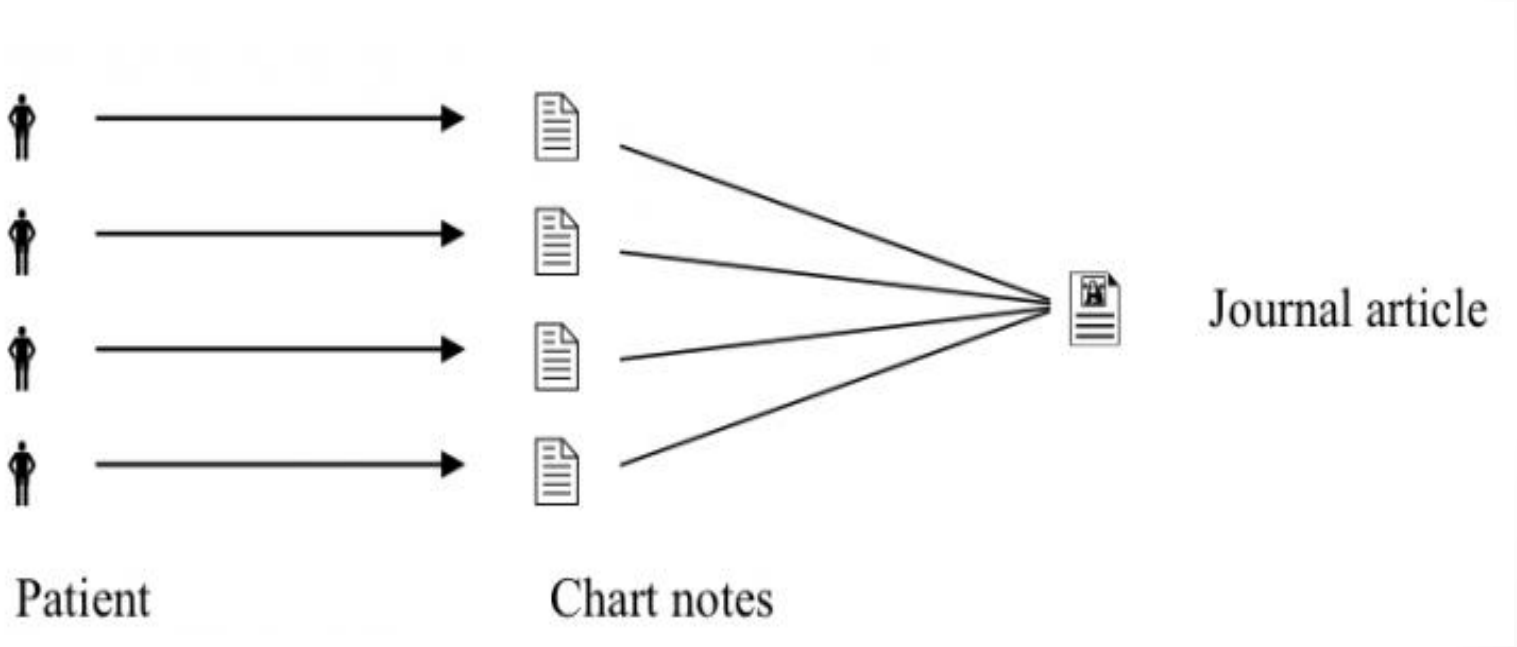
Type of Question	Study Design
Therapy	RCT > Cohort > Case Control > Case Series/Reports
Diagnosis	Prospective, blind comparison to a gold standard or Cross-Sectional
Harm/Etiology	RCT > Cohort > Case Control > Case Series/Reports
Prognosis	Cohort > Case Control > Case Series/Reports
Prevention	RCT > Cohort > Case Control > Case Series/Reports
Clinical Exam	Prospective, blind comparison to a gold standard
Cost-Analysis	Economic analysis

Questions on therapy, etiology and prevention that can best be answered by an RCT, can also be answered by a systematic review or meta-analysis.

Harm/Etiology studies can be answered by RCTs if ethical issues allow it.

Schardt, 2013

Case Series/Case Reports



Koffel, 2011

How can I tell from the abstract that article is Case Series/Case Reports?

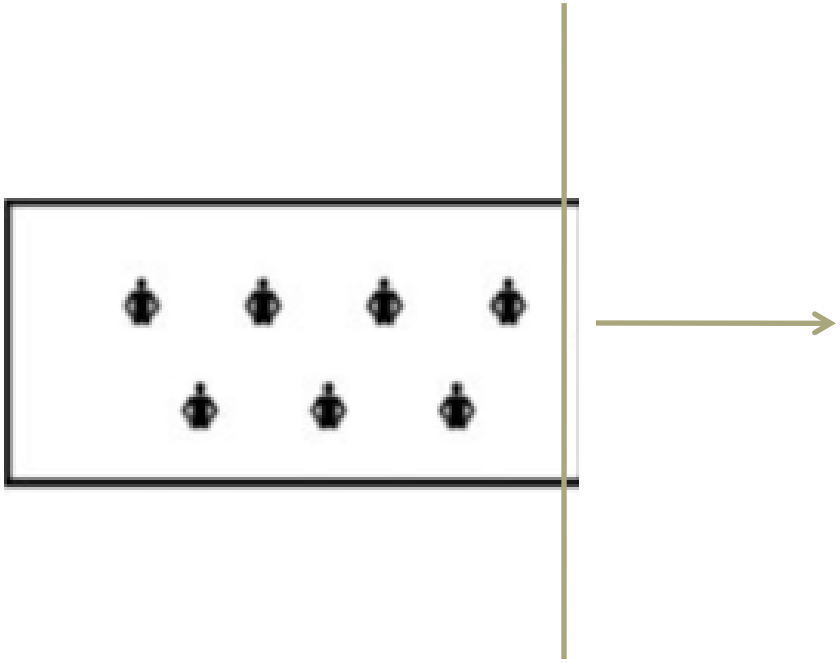
Am J Med. 1979 Sep;67(3):540-6.

Immunodeficiency, malabsorption and secretory diarrhea. A new syndrome.

Dawson J, Hodgson HJ, Pepys MB, Peters TJ, Chadwick VS.

Described here is a patient with severe watery diarrhea associated with common variable immunodeficiency. Malabsorption for fat, bile acids, vitamin B12 and xylose was demonstrated, but the patient failed to respond to all the usual therapeutic maneuvers. The diarrhea responded only to high dose steroid therapy. Intestinal perfusion studies showed a hitherto undescribed, presumably acquired, glucose-stimulated water, sodium and chloride secretion in the jejunum and ileum, whereas normal fluid and electrolyte transport occurred from bicarbonate and mannitol solutions. Glucose absorption itself was normal and no hormonal, morphologic or biochemical defect was demonstrated to account for the phenomenon. The patient was also interesting when compared with other patients with common variable immunodeficiency in having normal plasma cells in the intestinal mucosa and an extensive family involvement.

Cross-Sectional Study



Look for:
Exposed, have disease
Exposed, do not have disease
Not exposed, have disease
Not exposed, do not have disease

At one point in time, gather data

Koffel, 2011

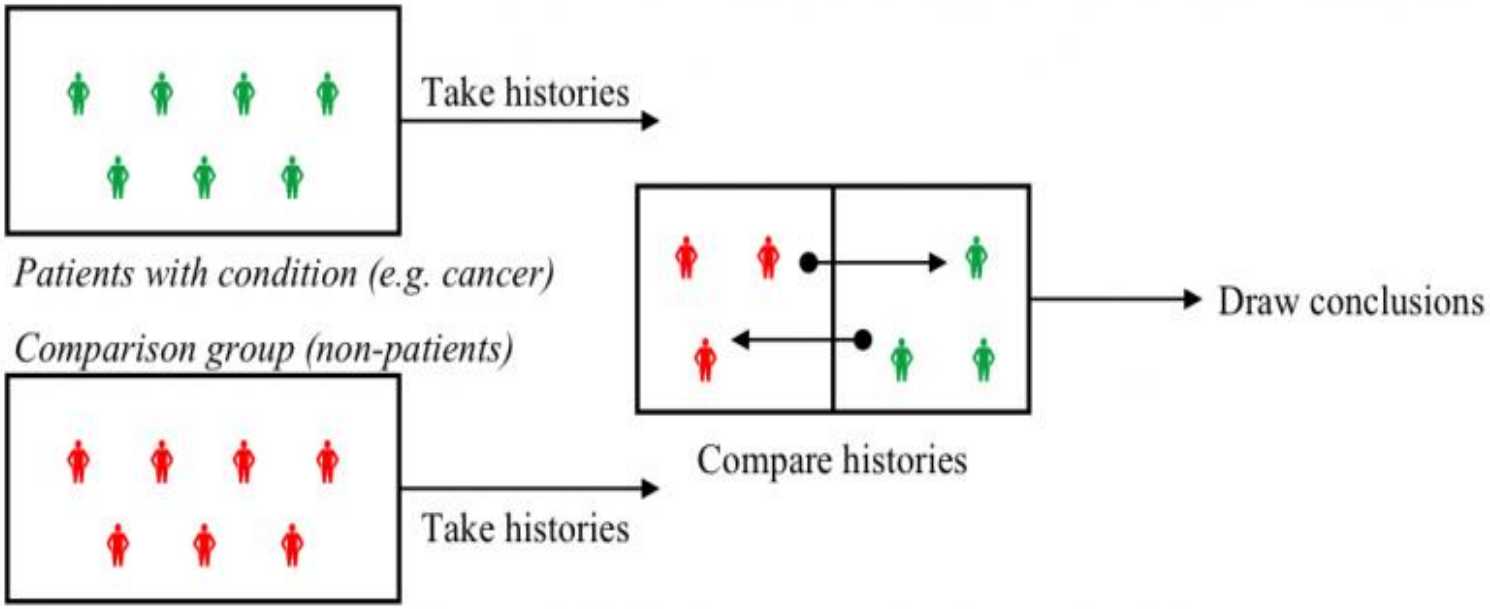
How can I tell from the abstract that article is Cross-Sectional Studies?

J Emerg Manag. 2013 Jan-Feb;11(1):25-37.

Nurses' willingness and readiness to report for duty in a disaster. Fung OW, Loke AY

Inadequate healthcare workforce during a disaster affects the survival and health outcome of victims. During disaster strikes, nurses may face a dilemma regarding whether or not to report for duty, facing professional duty and their personal and/or family safety that may be at stake. This is a cross-sectional descriptive study. This study seeks for a better understanding of the factors affecting nurses' willingness and readiness to report for duty in a disaster. A total of 269 currently practicing registered nurses completed the questionnaire. Results showed that only 68.7 percent and 53.2 percent of nurses were willing to report to work during a disaster. Male nurses were more likely to report to work than females during disaster ($p = 0.007$) and infection outbreak ($p = 0.002$) situations. Nurses with young children were less likely to report to work during an infectious disease outbreak (34.5 percent vs 55.4 percent, $p = 0.033$). It is concluded that about one-third of nurses indicated that they would not report to work when a disaster strikes. This raises a warning signal for healthcare managers that they need to plan ahead to maintain an adequate workforce when disasters strike. Managers are urged to do more to understand the factors leading to nurses' unwillingness to report to work and to undertake realistic staffing planning to cope with the extra demand.

Case Control Studies



Koffel, 2011

How can I tell from the abstract that article is Case Control Studies?

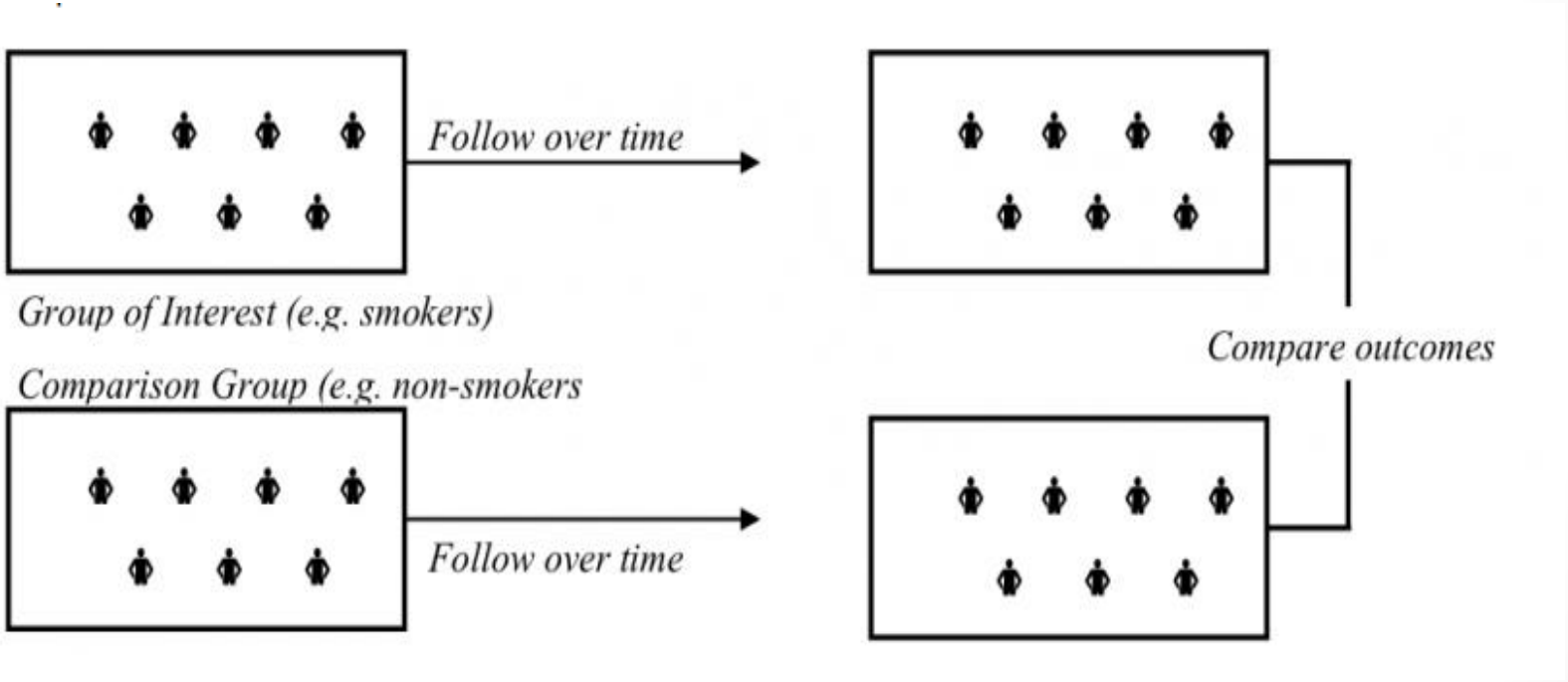
J Nurs Adm. 2014 Jan;44(1):10-6. doi: 10.1097/NNA.0000000000000015.

Understanding the role of the professional practice environment on quality of care in Magnet® and non-Magnet hospitals. Stimpfel AW, Rosen JE, McHugh MD

OBJECTIVE: The aim of this study was to explore the relationship between Magnet Recognition® and nurse-reported quality of care. BACKGROUND: Magnet® hospitals are recognized for nursing excellence and quality patient outcomes; however, few studies have explored contributing factors for these superior outcomes.

METHODS: This was a secondary analysis of linked nurse survey data, hospital administrative data, and a listing of American Nurses Credentialing Center Magnet hospitals. Multivariate regressions were modeled before and after propensity score matching to assess the relationship between Magnet status and quality of care. A mediation model assessed the indirect effect of the professional practice environment on quality of care. RESULTS: Nurse-reported quality of care was significantly associated with Magnet Recognition after matching. The professional practice environment mediates the relationship between Magnet status and quality of care. CONCLUSION: A prominent feature of Magnet hospitals, a professional practice environment that is supportive of nursing, plays a role in explaining why Magnet hospitals have better nurse-reported quality of care.

Cohort Studies



Koffel, 2011

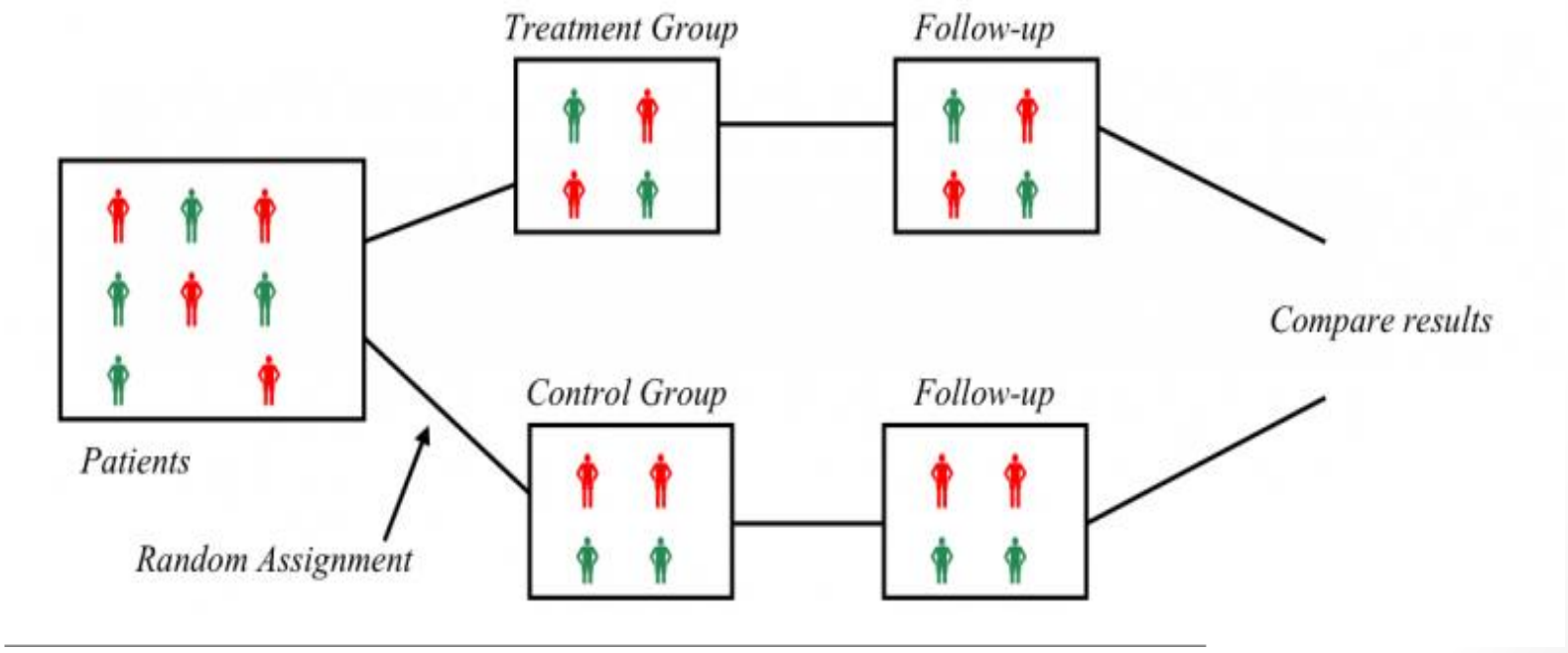
How can I tell from the abstract that article is Cohort Studies?

N Engl J Med. 2014 Jan 16;370(3):233-44. doi: 10.1056/NEJMoa1304501.

Body-mass index and mortality among adults with incident type 2 diabetes. Tobias DK(1), Pan A, Jackson CL, O'Reilly EJ, Ding EL, Willett WC, Manson JE, Hu FB.

BACKGROUND: The relation between body weight and mortality among persons with type 2 diabetes remains unresolved, with some studies suggesting decreased mortality among overweight or obese persons as compared with normal-weight persons (an "obesity paradox"). METHODS: We studied participants with incident diabetes from the Nurses' Health Study (8970 participants) and Health Professionals Follow-up Study (2457 participants) who were free of cardiovascular disease and cancer at the time of a diagnosis of diabetes. Body weight shortly before diagnosis and height were used to calculate the body-mass index (BMI, the weight in kilograms divided by the square of the height in meters). Multivariable Cox models were used to estimate the hazard ratios and 95% confidence intervals for mortality across BMI categories. RESULTS: There were 3083 deaths during a mean period of 15.8 years of follow-up. A J-shaped association was observed across BMI categories (18.5 to 22.4, 22.5 to 24.9 [reference], 25.0 to 27.4, 27.5 to 29.9, 30.0 to 34.9, and ≥35.0) for all-cause mortality (hazard ratio, 1.29 [95% confidence interval {CI}, 1.05 to 1.59]; 1.00; 1.12 [95% CI, 0.98 to 1.29]; 1.09 [95% CI, 0.94 to 1.26]; 1.24 [95% CI, 1.08 to 1.42]; and 1.33 [95% CI, 1.14 to 1.55], respectively). This relationship was linear among participants who had never smoked (hazard ratios across BMI categories: 1.12, 1.00, 1.16, 1.21, 1.36, and 1.56, respectively) but was nonlinear among participants who had ever smoked (hazard ratios across BMI categories: 1.32, 1.00, 1.09, 1.04, 1.14, and 1.21) (P=0.04 for interaction). A direct linear trend was observed among participants younger than 65 years of age at the time of a diabetes diagnosis but not among those 65 years of age or older at the time of diagnosis (P<0.001 for interaction). CONCLUSIONS: We observed a J-shaped association between BMI and mortality among all participants and among those who had ever smoked and a direct linear relationship among those who had never smoked. We found no evidence of lower mortality among patients with diabetes who were overweight or obese at diagnosis, as compared with their normal-weight

Randomized Controlled Clinical Trial (RCT)



Koffel, 2011

How can I tell from the abstract that article is RCT?

Diabetes Obes Metab. 2011 Nov;13(11):1047-55.

Comparative long-term efficacy and tolerability of pitavastatin 4 mg and atorvastatin 20-40 mg in patients with type 2 diabetes mellitus and combined (mixed) dyslipidaemia.

Gumprecht J, Gosho M, Budinski D, Hounslow N.

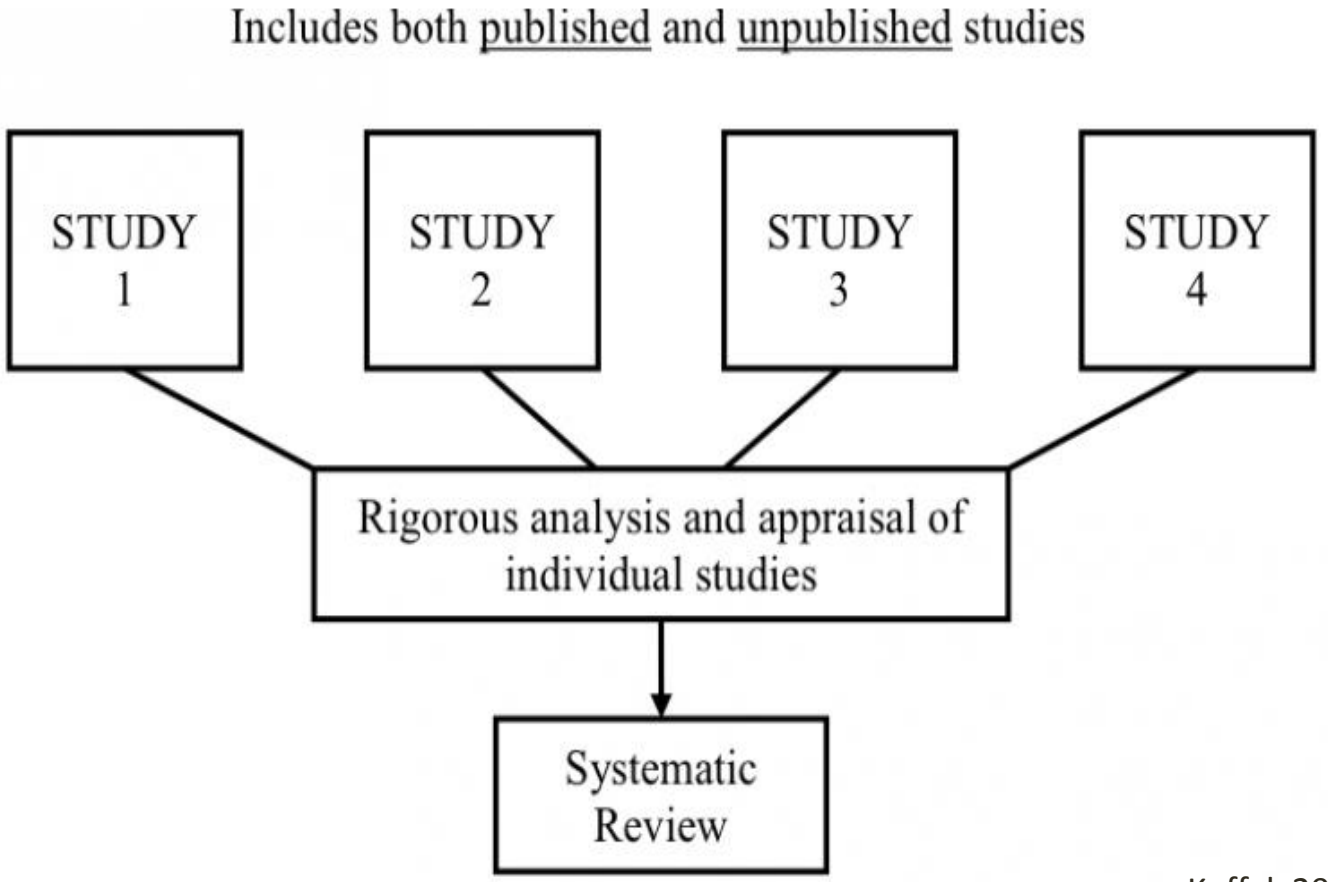
AIM: To compare the long-term efficacy and safety of pitavastatin with atorvastatin in patients with type 2 diabetes and combined (mixed) dyslipidaemia.

METHODS: **Randomised, double-blind, active-controlled**, multinational non-inferiority study. Patients were randomised 2 : 1 to pitavastatin 4 mg (n = 279) or atorvastatin 20 mg (n = 139) daily for 12 weeks. Patients completing the core study could continue on pitavastatin 4 mg (n = 141) or atorvastatin 20 mg (n = 64) [40 mg (n = 7) if lipid targets not reached by week 8] for a further 44 weeks (extension study). The primary efficacy variable was the change in low-density lipoprotein cholesterol (LDL-C).

RESULTS: Reductions in LDL-C were not significantly different at week 12 between the pitavastatin (-41%) and atorvastatin (-43%) groups. Attainment of National Cholesterol Education Program and European Atherosclerosis Society targets for LDL-C and non-high-density lipoprotein cholesterol (non-HDL-C) was similarly high for both treatment groups. Changes in secondary lipid variables (e.g. HDL-C, apolipoprotein B and triglycerides) were similar between treatments. Post hoc analysis showed that adjusted mean treatment differences for pitavastatin vs. atorvastatin were within the non-inferiority margin at weeks 16 (+0.11%; 95% confidence interval (CI), -5.23 to 5.44) and 44 (-0.02%; 95% CI, -5.46 to 5.41) of the extension study. Both treatments were well tolerated; atorvastatin increased fasting blood glucose from baseline (+7.2%; $p < 0.05$), whereas pitavastatin had no significant effect (+2.1%).

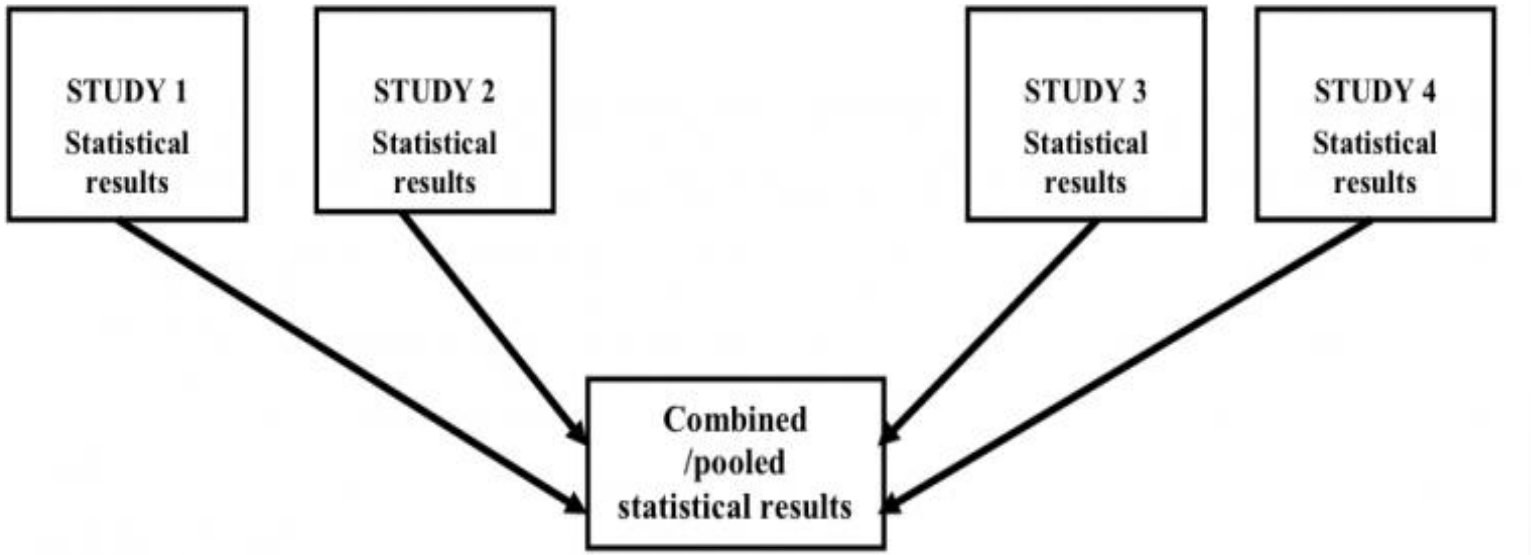
CONCLUSIONS: Reductions in LDL-C and changes in other lipids were not significantly different in patients treated with pitavastatin 4 mg or atorvastatin 20 or 40 mg. Pitavastatin may, however, have a more favourable effect on the glycaemic status.

Systematic Review



Koffel, 2011

Meta-Analysis



Koffel, 2011

How can I tell from the abstract that article is Systematic Reviews or Meta-Analysis

Eur J Intern Med. 2011 Oct;22(5):478-84.

Efficacy of statin therapy in chronic systolic cardiac insufficiency: a meta-analysis.

Zhang S, Zhang L, Sun A, Jiang H, Qian J, Ge J.

BACKGROUND: Conflicting results currently exist on the clinical use of statins in patients with chronic systolic heart failure (CHF). This study aimed to investigate the effect of statins on clinical outcomes of CHF by a meta-analysis based on randomized controlled trials (RCTs).

METHODS: We **searched PubMed, MEDLINE, EMBASE, and Cochrane** databases through 2010 and renewed in February 2011. We **included RCTs of subjects who underwent statin or placebo treatment for established CHF, and provided data on clinical outcomes.** Risk ratios (RR) were calculated using a random effects model.

RESULTS: Thirteen trials involving 10,447 CHF patients were included in the meta-analysis. The pooling analysis showed that statin treatment did not significantly reduce the risk of all-cause death (RR=0.93, 95% CI: 0.81-1.07, p=0.31), death for cardiovascular cause or pump failure (p>0.10), and rehospitalization for heart failure (RR=0.90, 95% CI: 0.78-1.04, p=0.15). In addition, statin therapy had a non-significant trend towards reduced risk of nonfatal myocardial infarction (RR=0.84, 95% CI: 0.68-1.02, p=0.08). When restricted to various statins and patients' age, the analysis demonstrated that atorvastatin was associated with reduced all-cause mortality (p=0.009) and readmission rate for heart failure (p=0.005), and the superiority of statin therapy was significant in CHF patients less than 65years (both p<0.01). CONCLUSIONS: Although statin has little impact on clinical outcomes in overall CHF patients, statin administration if needed is feasible to CHF patients, and the treatment might be effective when restricted to specific statins or populations.

Diagnostic Tests Evaluation

- Use one of the above study designs to evaluate the new diagnostic test with or without a gold standard.
- Many statistics possible, but commonly performing Sensitivity/Specificity

How can I tell from the abstract that article is Diagnostic Test Evaluation

Aust Vet J. 2012 Apr;90(4):122-9.

Comparison of three diagnostic techniques for detection of rotavirus and coronavirus in calf faeces in Australia. Izzo MM, Kirkland PD, Gu X, Lele Y, Gunn AA, House JK.

OBJECTIVE: Compare real-time reverse transcription polymerase chain reaction (qRT-PCR), a commercially available enzyme-linked immunosorbent assay (ELISA) and lateral flow immunochromatography assay (LAT) for the detection of rotavirus and coronavirus in faecal samples collected from diarrhoeic calves.

DESIGN: Prospective survey.

METHOD: Samples were tested at two separate facilities using a commercial ELISA and an in-house qRT-PCR. Simple logistic regression was performed to examine the relationship between the two tests. A subset of samples was screened using qRT-PCR, ELISA and a commercial LAT dipstick (132 faecal samples were tested for coronavirus and 122 samples for rotavirus).

RESULTS: Of the 586 samples tested, 131 (22.39%) and 468 (79.86%) were positive for coronavirus and group A rotavirus, respectively, using qRT-PCR. The number of samples positive on ELISA for coronavirus and rotavirus was 73 (12.46%) and 225 (38.40%), respectively. Using LAT, 30 (22.73%) and 43 (35.35%) samples were positive for coronavirus and rotavirus, respectively. Simple linear regression revealed a statistically significant ($P < 0.05$) but weak ($r(2) = -0.07$ and -0.40) correlation between the rotavirus/coronavirus qRT-PCR and ELISA, respectively. There was also poor agreement between the LAT and qRT-PCR assays.

CONCLUSION: **The sensitivity and specificity of the commercial ELISA and LAT assays evaluated in this study were low compared with qRT-PCR.** The low positive and negative predictive values of the assays suggests that they were of limited diagnostic benefit in the population sampled.

Type of Research Question to Ranking of Study Design

Type of Question	Study Design
Therapy	RCT > Cohort > Case Control > Case Series/Reports
Diagnosis	Prospective, blind comparison to a gold standard or Cross-Sectional
Harm/Etiology	RCT > Cohort > Case Control > Case Series/Reports
Prognosis	Cohort > Case Control > Case Series/Reports
Prevention	RCT > Cohort > Case Control > Case Series/Reports
Clinical Exam	Prospective, blind comparison to a gold standard
Cost-Analysis	Economic analysis

Questions on therapy, etiology and prevention that can best be answered by an RCT, can also be answered by a systematic review or meta-analysis.

Harm/Etiology studies can be answered by RCTs if ethical issues allow it.

Schardt, 2013

Critical Appraisal Tools

- Need to grade the quality of the individual studies before drawing conclusions about the strength of the aggregate evidence
- No one “best approach”
- Match the topic and types of study under review to grading tool

(Lohr, 2004)

CASP Tools

- http://www.caspinternational.org/?o=1012
- Let's look at these tools to appraise:
  - Systematic Reviews
  - Randomized Control Trials
  - Cohort Trials
  - Qualitative Research Study

References

Booth, A. (2006). Clear and present questions: formulating questions for evidence based practice. *Library Hi Tech, 24*(3), 355-368. doi: 10.1108/07378830610692127

Cooke, A., Smith, D., & Booth, A. (2012). Beyond PICO: the SPIDER tool for qualitative evidence synthesis. *Qual Health Res, 22*(10), 1435-1443. doi: 10.1177/1049732312452938

Garrad, J. (2007). Health sciences literature review made easy: The matrix method (2nd ed.). Sudbury, MA: Jones and Bartlett Publishers.

Koffel J. Understanding Research Study Design [Internet]. Twin Cities, MN: University of Minnesota. c2011 – [cited 2013, May 29]. Available from: http://hsl.lib.umn.edu/biomed/help/understanding-research-study-designs

Lohr, K.N. (2004). Rating the strength of scientific evidence: Relevance for quality improvement programs. *International Journal for Quality in Health Care.* 16(1): 9-18.

Schardt, C. (2013). Evidence-Based Practice. 2013, from http://guides.mclibrary.duke.edu/content.php?pid=274373&sid=2262222

Straus, S. E., Glasziou, P., Richardson, W. S., & Haynes, R. B. (2011). *Evidence-based medicine : how to practice and teach it*: Edinburgh : Elsevier Churchill Livingstone, 2011.

Weinfeld, J. M., & Finkelstein, K. (2005). How to answer your clinical questions more efficiently. *Fam Pract Manag, 12*(7), 37-41.