

# Introduction to Research Question and PICO Framework

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## Canadian Chiropractic Guideline Initiative

# Learning Outcomes

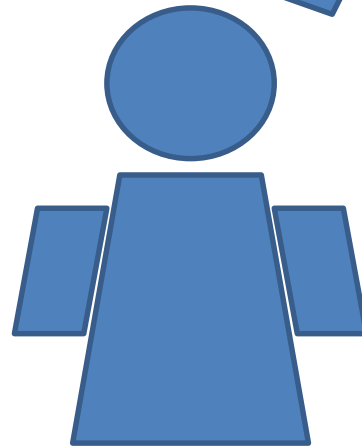
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At the end of this session, you should be able to:

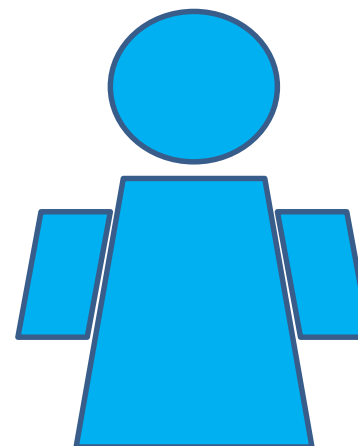
- Define what a research question is
- Describe the components of a research question using the PICO framework
- Analyze other research questions using the PICO framework

# Research Scenario

We are leading a systematic review and would like to collaborate with you to help conduct the review. Would you be interested in being involved?



**Colleague  
(Researcher)**



**Colleague  
(Educator)**

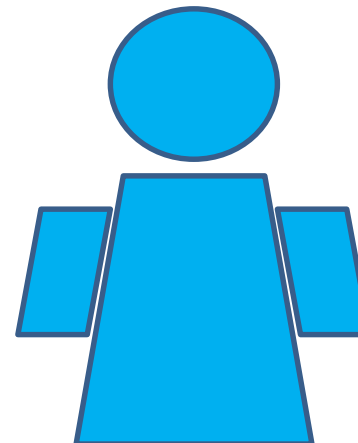
**Knowledge  
translation  
and  
exchange**

# Clinical/Educational Scenario

I have been suffering from neck pain for several months now. My family says exercises would help, but I am not sure if that would make it worse. What should I do?



**Patient**



**Health care provider  
or intern**

**Develop  
research  
question  
using PICO  
framework**

# PICO Workshop Outline

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1. Overview of systematic reviews
2. Introduction to research question
3. PICO framework
4. Examples and small group learning

# Example: CCGI Systematic Review

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- CCGI is conducting a systematic review aimed to:
  - systematically review the evidence on the effectiveness and safety of post-surgical rehabilitation interventions among adults with low back pain

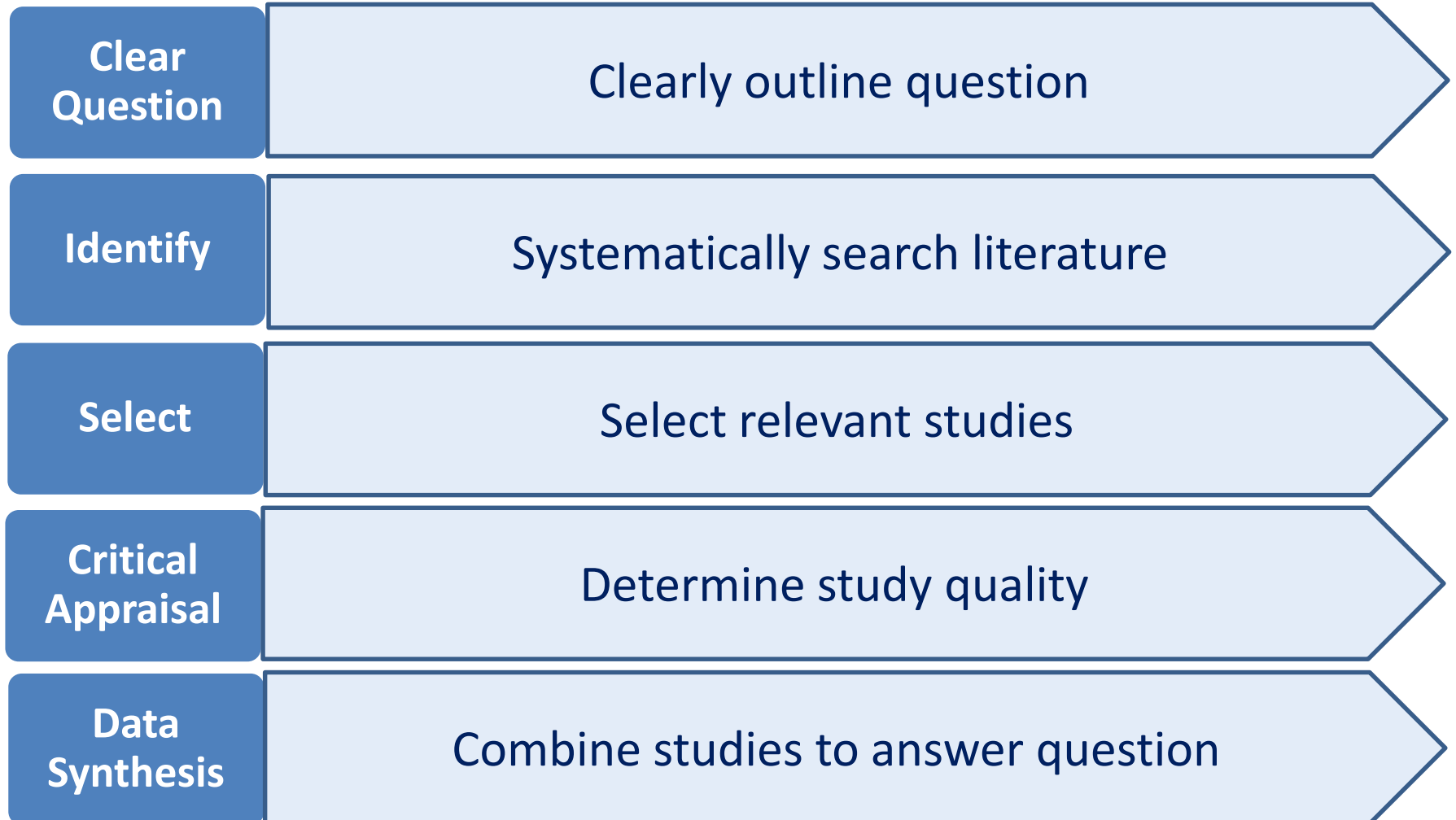
# What is a Systematic Review?

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A review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review.

- NHS Centre for Reviews and Dissemination, 2001

# Components of a Systematic Review





Clear Question

Studies = gold!

Identify

Select

Critically appraise

Analyze data

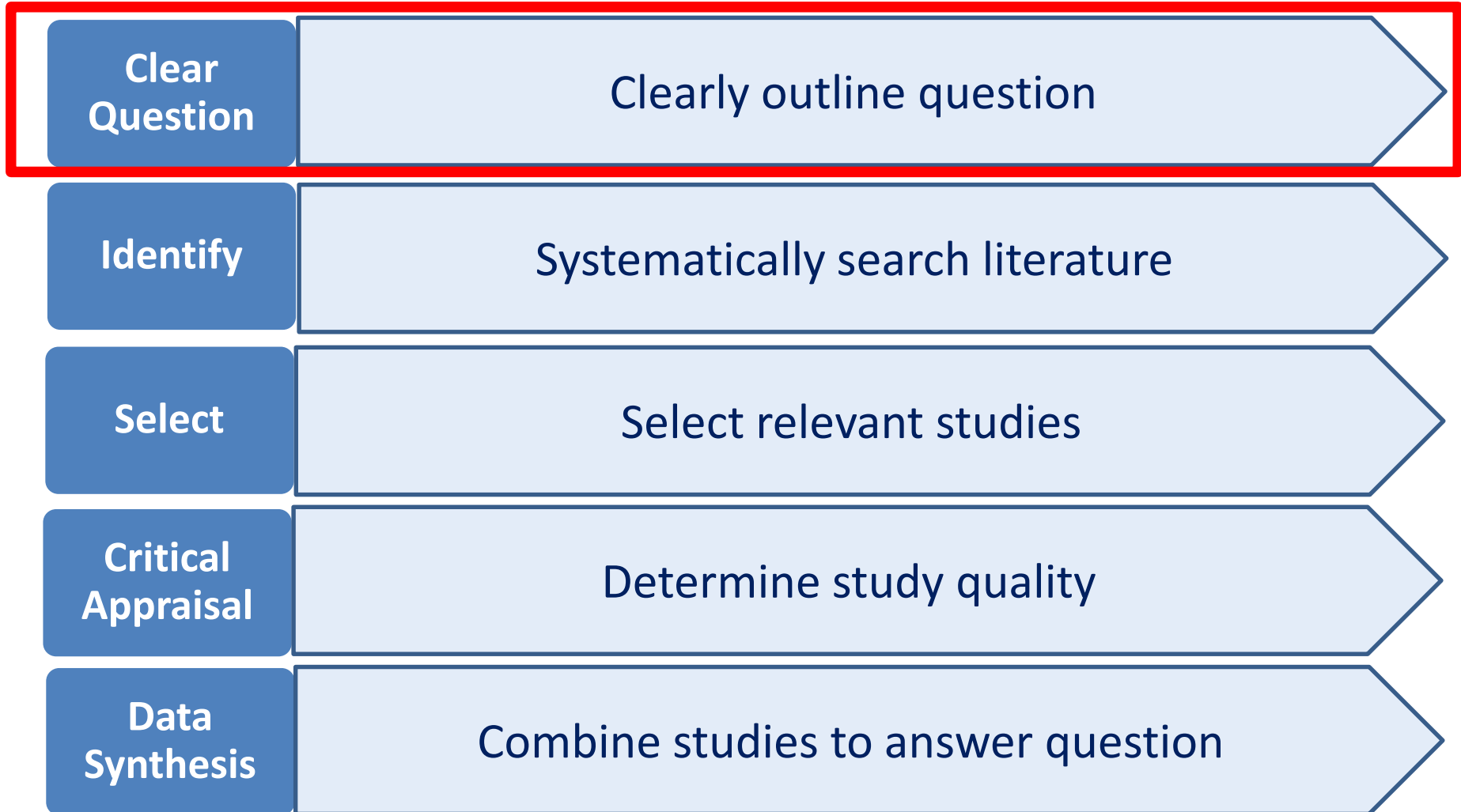


# Why conduct a Systematic Review?

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“The purpose of a systematic review is to sum up the best available research on a specific question. This is done by synthesizing the results of several studies. A systematic review uses transparent procedures to find, evaluate and synthesize the results of relevant research. Procedures are explicitly defined in advance, in order to ensure that the exercise is transparent and can be replicated. This practice is also designed to minimize bias.”

# Components of a Systematic Review



# What is a research question?

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- Purpose of research study in the form of a question
- Can be written in the form of a sentence (often as objective or aim of the study)
- Researcher asks a very specific question; broad questions are usually broken into smaller, testable questions
- Should be specific to frame research study and methods

# Research Question

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## Why is a clear research question important?

- “Well-crafted questions guide the systematic planning of research. Formulating your questions precisely enables you to design a study with a good chance of answering them.”

- Light, Singer, Willett, By Design (1990)

# Where to find the research question?

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- Abstract (usually shortened due to word count limits)
- Last section of the introduction
  - PICO components further defined in the methods



# A good research question will...

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- Clearly convey the overall project goal
- Allow the target population to be identified
- Identify the intervention (or exposure) and comparators that are being evaluated
- Identify the main outcome variables that will be used to measure changes in the population



Have you used the PICO framework before? If yes, how?

If not, what do you think might be involved?



# PICO Framework

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- Helps guide the development of clear research questions
- Helpful for questions related to treatment effectiveness

<b>P</b>	Population of interest
<b>I</b>	Intervention you want to know the effectiveness of
<b>C</b>	Comparison – what the intervention is being compared to
<b>O</b>	Outcome(s) you want to learn about

# PICO Framework

<b>P</b>	Population	Population of interest	E.g., Headaches, flu
<b>I</b>	Intervention/ exposure	Treatment or exposure level of participants	E.g., Exercise, surgery
<b>C</b>	Comparison	Reference group used to compare with intervention/exposure	E.g., Injections, placebo, no treatment
<b>O</b>	Outcome	Measure used to examine effects of intervention/exposure	E.g., Pain, quality of life

# Additional Details of PICO

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- **Population:**
  - Disease or condition; stage, severity
  - Demographic characteristics (e.g., age, gender)
- **Intervention:**
  - Type of intervention
  - Dose, duration, timing, route, etc.
- **Comparison:**
  - Treatment interventions
  - Placebo/sham, waiting list, no intervention
- **Outcome:**
  - Benefit or harm; mean difference, frequency, time to event, etc.
  - Type: mortality, pain, quality of life, disability, etc.

# PICO(T-SD) Framework

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Can be extended to include (where applicable):

- **T:** Time describes the duration for your data collection/follow-up
- **SD:** Study design refers to the appropriate ways to recruit individuals into a study design, give them interventions, and measure their outcomes

# Back to our CCGI example...

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## Research question of systematic review:

- What is the effectiveness and safety of post-surgical rehabilitation interventions compared to other interventions, placebo/sham interventions, or no intervention for improving disability and quality of life among adults with low back pain with or without radiculopathy who were treated with surgery?

# Back to our CCGI example...

<b>P</b>	Population	Population of interest
<b>I</b>	Intervention	Treatment provided to participants
<b>C</b>	Comparison	Reference group used to compare with intervention
<b>O</b>	Outcome	Measure used to examine treatment effectiveness



# Back to our CCGI example...

<b>P</b>	Population	Adults with low back pain with or without radiculopathy who were treated with surgery
<b>I</b>	Intervention	Post-surgical rehabilitation interventions
<b>C</b>	Comparison	Other interventions, placebo/sham interventions, no intervention
<b>O</b>	Outcome	Disability and quality of life



**Other or no treatment, placebo/sham**

**Disability, quality of life**

# Analyzing RQs: Question 1

- What is the effectiveness of exercise compared to massage for improving pain in adults with chronic neck pain?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?



# Analyzing RQs: Question 1

- What is the effectiveness of exercise compared to massage for improving pain in adults with chronic neck pain?

<b>P</b>	Population	Adults with chronic neck pain
<b>I</b>	Intervention	Exercise
<b>C</b>	Comparison	Massage
<b>O</b>	Outcome	Pain

# Analyzing RQs: Question 2

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- What is the effectiveness of exercise compared with other interventions, placebo/sham interventions, or no intervention for the management of adults or children with neck pain or whiplash-associated disorders?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?

# Analyzing RQs: Question 2

- What is the effectiveness of exercise compared with other interventions, placebo/sham interventions, or no intervention for the management of adults or children with neck pain or whiplash-associated disorders?

<b>P</b>	Population	Adults or children with neck pain or WAD
<b>I</b>	Intervention	Exercise
<b>C</b>	Comparison	Other interventions, placebo/sham interventions, no intervention
<b>O</b>	Outcome	?

Southerst et al, 2016

# Analyzing RQs: Question 3

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## Discussion

Is manual therapy clinically effective to treat low back pain?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?

# Analyzing RQs: Question 3

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Is manual therapy clinically effective to treat low back pain?

<b>P</b>	Population	Low back pain (missing some details)
<b>I</b>	Intervention	Manual therapy
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?

# Analyzing RQs: Question 4

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What are the effects of caudal epidural steroid injections compared with subcutaneous sham injections in patients with chronic radiculopathy, by measuring improvements in physical function, health related quality of life, and pain at short term (6 weeks), intermediate term (12 weeks), and long term (52 weeks) follow-up?

**PICO?**

# Analyzing RQs: Question 4

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<b>P</b>	Population	Patients with chronic radiculopathy
<b>I</b>	Intervention	Caudal epidural steroid injections
<b>C</b>	Comparison	Subcutaneous sham injections
<b>O</b>	Outcome	Physical function, health related quality of life, pain
<b>T</b>	Time	6 weeks, 12 weeks, 52 weeks follow-up

# How is PICO defined?

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- We can look to the methods section of the paper for detailed definitions of the PICO components





# Back to our CCGI example...

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## Research question of systematic review:

- What is the effectiveness and safety of post-surgical rehabilitation interventions compared to other interventions, placebo/sham interventions, or no intervention for improving disability and quality of life among adults with low back pain with or without radiculopathy who were treated with surgery?

# CCGI Example: Population Definition

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**Adults ( $\geq 18$  years) who underwent surgery for LBP with or without radiculopathy:**

- LBP: Pain and discomfort below costal margin and above inferior gluteal folds, with or without referred leg pain.
- Radiculopathy: Inflammation, injury, or compression of spinal nerve roots with pain, weakness, or numbness in a myotomal or dermatomal distribution.

# CCGI Example: Intervention Definition

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## Post-surgical rehabilitation interventions:

- Rehabilitation: a set of interventions that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimal functioning when interacting with their environments
- Can be hospital- or community-based and include: Education, pharmacological or non-pharmacological interventions (e.g., manual therapy, modalities), support and counselling, psychological interventions, environment modifications, resources, assistive devices

# CCGI Example: Comparison Definition

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- Other non-pharmacological or pharmacological interventions
- Placebo or sham interventions
- Wait list
- No intervention

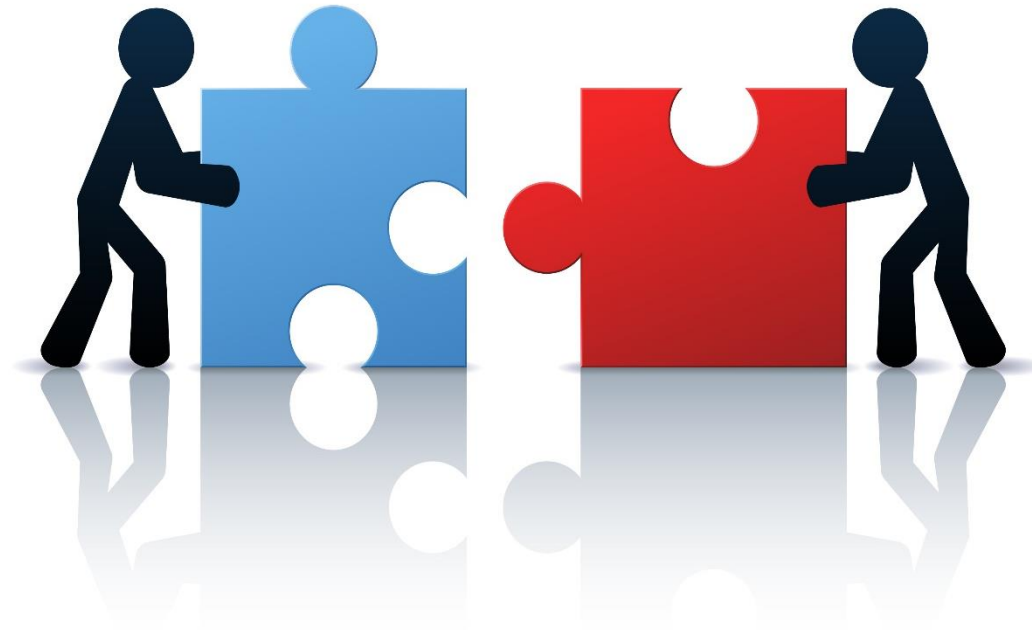
# CCGI Example: Outcome Definition

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## Outcomes classified according to ICF framework:

- Body function and structure (e.g., pain, range of motion, psychological outcomes)
- Activity and participation (e.g., disability, interpersonal interactions, self-care, applying knowledge, return to work/activities/school)
- Additional surgeries (e.g., for revisions, complications)
- Adverse events

# Small Group Learning



# Small Group Learning: Exercise 1

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1. What is the research question from the assigned paper?
2. What are the PICO components of this research question?
3. How was PICO defined in this paper?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?

# Small Group Learning: Exercise 2

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1. What is the research question from the assigned paper?
2. What are the PICO components of this research question?
3. How was PICO defined in this paper?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?



# Small Group Learning: Exercise 3

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1. What is the research question from the assigned paper?
2. What are the PICO components of this research question?
3. How was PICO defined in this paper?

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?

# Summary

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- An appropriate research question clearly states the purpose of the research study in the form of a question
- PICO framework outlines the population, intervention, comparators, and outcomes of a research question
- PICO framework can guide the development of clear research questions
  - Can apply to systematic reviews and primary studies investigating treatment effectiveness

# Resources

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- Farrugia P, Petrisor BA, Farrokhyar F, Bhandari M. Practical tips for surgical research: Research questions, hypotheses and objectives. Canadian journal of surgery Journal canadien de chirurgie. 2010;53(4):278-81.
- Haynes RB. Special series: guidance for young investigators - Forming research questions. Journal of clinical epidemiology. 2006;59:881-6.

# Learning Outcomes

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At the end of this session, you should be able to:

- Define what a research question is
- Describe the components of a research question using the PICO framework
- Analyze other research questions using the PICO framework

# Thank you!

Email: [carolina.cancelliere@uoit.ca](mailto:carolina.cancelliere@uoit.ca)



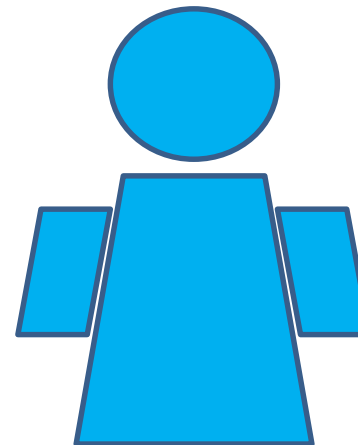
# Additional Exercise (Time Permitting)

# Exercise 4: Clinical Scenario

I have been suffering from neck pain for several months now. My family says exercises would help, but I am not sure if that would make it worse. What should I do?



**Patient**



**Health care provider**

**Develop  
research  
question  
using PICO  
framework**

# Exercise 4: Translating practice-based question to research question

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- Develop a research question based on the clinical scenario

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?



# Exercise 4: Translating practice-based question to research question

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- Define the PICO components of your research question

<b>P</b>	Population	?
<b>I</b>	Intervention	?
<b>C</b>	Comparison	?
<b>O</b>	Outcome	?