Causal Inference: Implications for physical therapy research and practice
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Description

Causal inferences are arguably the most pervasive in all clinical reasoning. Clinicians reason from effects to most likely cause during their examination and they reason from cause to most likely effect when prescribing interventions. Causal inferences are also central, either explicitly or implicitly, in all research as we attempt to generate understanding about cause and effect relations from our structured observations. This course first demonstrates that causal models are a valid representation of clinical knowledge. Then it demonstrates that the causal models of clinical knowledge are a rationale bridge between evidence based research and knowledge based practice. The course teaches participants how graphical causal models as a representation of causal structure can be used to plan studies, interpret results, combine study findings into existing causal networks, and reason clinically in practice. Based on this approach, participants will also learn how the logical implications of causal structure can be used to consider the complexity of a clinical case and the issues associated with clinical decisions. This gets at the heart of a fundamental question that is, how do we apply sample-based statistics to an individual case? Finally, the application of the approach to clinical practice guidelines will be addressed as a bridge between research and practice and examples of current projects will be presented.

Course Learning Objectives

Participants will be able to:
1. Identify the modes of causal inference being used throughout practice (induction, deduction, abduction) including the dynamic flow of information updates and the inherent limitations and assumptions associated with each.
2. Explain the logic of graphical causal models and how such models represent causal structure and a bridge between research and practice.
3. Interpret a study, a systematic review and a clinical case based on the underlying causal structure; embody that structure into a graphical causal model and interpret the implications including adjustment sets, conditional independences, mutual adjustment, confounding and bias.
4. Describe how conditional independence and adjustment sets can be used to consider the complexity of a clinical case, and therefore research trials on related cases.
5. Describe the use of graphical causal models in the development and use of a clinical practice guideline.
**Tentative Outline of time and content**

Introduction (5 minutes)
Causal Inferences (10 minutes)
Knowledge Representation and Research to Practice Bridge (15 minutes)
Logical Structure of Graphical Causal Models (20 minutes)
  Adjustment, confounding, bias, conditional independence
Applications to Research and Practice (20 minutes)
  Complex patients and complex causal structures
Applications to Clinical Practice Guidelines (20 minutes)
  Application of Sample statistics to a single case

*Note: The above scheduled times are estimates for a 90 minute session. These can be longer for longer sessions with an aim for deeper coverage of the concept, or to include a broader set of practical examples. Any topic can be expanded without an expansion of other topics (i.e. Applications to Research and Practice can be expanded to 50 minutes for a 120 minute presentation without a need to change other times. It is also possible to include only Applications to Research and Practice, or only Applications to Clinical Practice Guidelines based on participant interests.

**Key References**


