The ACE Star Model

The ACE Star Model of Knowledge Transformation©

The ACE Star Model of Knowledge Transformation© is a model for understanding the cycles, nature, and characteristics of knowledge that are utilized in various aspects of evidence-based practice (EBP). The Star Model organizes both old and new concepts of improving care into a whole and provides a framework with which to organize EBP processes and approaches. Known as the ACE Star Model, it is a simple, parsimonious depiction of the relationships between various stages of knowledge transformation, as newly discovered knowledge is moved into practice. It is inclusive of familiar processes and also emphasizes the unique aspects of EBP. The ACE Star Model places nursing’s previous scientific work within the context of EBP, serves as an organizer for examining and applying EBP, and mainstreams nursing into the formal network of EBP.

The Star Model depicts various forms of knowledge in a relative sequence, as research evidence is moved through several cycles, combined with other knowledge and integrated into practice. The ACE Star Model provides a framework for systematically putting evidence-based practice processes into operation.

Configured as a simple 5-point star, the model illustrates five major stages of knowledge transformation: 1) discovery research, 2) evidence summary, 3) translation to guidelines, 4) practice integration, and 5) process, outcome evaluation. Evidence-based processes and methods vary from one point on the Star Model to the next.

Knowledge Transformation
**Knowledge Transformation**: the conversion of research findings from primary research results, through a series of stages and forms, to impact on health outcomes by way of evidence-based care.

**UNDERLYING PREMISES OF KNOWLEDGE TRANSFORMATION**

1. Knowledge transformation is necessary before research results are useable in clinical decision making.

2. Knowledge derives from a variety of sources. In healthcare, sources of knowledge include research evidence, experience, authority, trial and error, and theoretical principles.

3. The most stable and generalizable knowledge is discovered through systematic processes that control bias, namely, the research process.

4. Evidence can be classified into a hierarchy of strength of evidence. Relative strength of evidence is largely dependent on the rigor of the scientific design that produced the evidence. The value of rigor is that it strengthens cause-and-effect relationships.

5. Knowledge exists in a variety of forms. As research evidence is converted through systematic steps, knowledge from other sources (expertise, patient preference) is added, creating yet another form of knowledge.

6. The form ('package') in which knowledge exists can be referenced to its use; in the case of EBP, the ultimate use is application in healthcare.

7. The form of knowledge determines its usability in clinical decision making. For example, research results from a primary investigation are less useful to decision making than an evidence-based clinical practice guideline.

8. Knowledge is transformed through the following processes:
   
   - summarization into a single statement about the state of the science
   - translation of the state of the science into clinical recommendations, with addition of clinical expertise, application of theoretical principles, and client preferences
   - integration of recommendations through organizational and individual actions
   - evaluation of impact of actions on targeted outcomes

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**The ACE Star Model Stages**

**Star Point 1. Discovery Research**

This is a knowledge generating stage. In this stage, new knowledge is discovered through the traditional research methodologies and scientific inquiry. Research results are generated through the conduct of a
single study. This may be called a primary research study and research designs range from descriptive to correlational to causal; and from randomized control trials to qualitative. This stage builds the corpus of research about clinical actions.

**Star Point 2. Evidence Summary**

Evidence summary is the first unique step in EBP—the task is to synthesize the corpus of research knowledge into a single, meaningful statement of the state of the science. The most advanced EBP methods to date are those used to develop evidence summaries (i.e., evidence synthesis, systematic reviews, e.g., the systematic review methods outlined in the Cochrane Handbook) from randomized control trials. Some evidence summaries employ more rigorous methods than others, yielding more credible and reproducible results.

This stage is also considered a knowledge generating stage, which occurs simultaneously with the summarization. Evidence summaries produce new knowledge by combining findings from all studies to identify bias and limit chance effects in the conclusions. The systematic methodology also increases reliability and reproducibility of results. The following terms are used to refer to various forms of evidence summaries: evidence synthesis (Agency for Healthcare Research and Quality), systematic review (Cochrane Collaboration), meta analysis (a statistical procedure), integrative review, review of literature, and state of the science review (less rigorous and therefore less reliable summary process). This field of science is referred to as the 'science of research synthesis.'

The rigorous evidence summary step distinguishes EBP from the old paradigm of research utilization. Largely due to the work of the Cochrane Collaboration, rigorous methods for systematic reviews have been greatly advanced, using meta analytic techniques and developing other statistical summary strategies, such as Number Needed to Treat (NNT).

**Advantages of an Evidence Summary**

An evidence summary has the following advantages:

- Reduces large quantities of information into a manageable form
- Establishes generalizability across participants, settings, treatment variations and study designs
- Assesses consistency and explains inconsistencies of findings across studies
- Increases power in suggesting the cause and effect relationship
- Reduces bias from random and systematic error, improving true reflection of reality
- Integrates existing information for decisions about clinical care, economic decisions, future research design, and policy formation
- Increases efficiency in time between research and clinical implementation
- Provides a basis for continuous updates with new evidence (Mulrow, 1994)
**Star Point 3. Translation to Guidelines**

The transformation of evidence summaries into actual practice requires two stages: *translation* of evidence into practice recommendations and *integration* into practice.

The aim of translation is to provide a useful and relevant package of summarized evidence to clinicians and clients in a form that suits the time, cost, and care standard. Recommendations are generically termed *clinical practice guidelines (CPGs)* and may be represented or embedded in care standards, clinical pathways, protocols, and algorithms.

CPGs are tools to support informed clinical decisions for clinician, organization, and client.
Well-developed CPGs state benefits, harms, and costs of various decision options. The strongest CPGs are developed systematically using a process that is explicit and reproducible. Summarized research evidence is interpreted and combined with other sources of knowledge (such as clinical expertise and theoretical guides) and then contextualized to the specific client population and setting. Evidence-based CPGs explicitly articulate the link between the clinical recommendation and the strength of supporting evidence and/or strength of recommendation.

**Star Point 4. Practice Integration**

Integration is perhaps the most familiar stage in healthcare because of society's long-standing expectation that healthcare be based on most current knowledge, thus, requiring implementation of innovations. This step involves changing both individual and organizational practices through formal and informal channels. Major aspects addressed in this stage are factors that affect individual and organizational rate of adoption of innovation and factors that affect integration of the change into sustainable systems.

**Star Point 5. Process, Outcome Evaluation**

The final stage in knowledge transformation is evaluation. In EBP, a broad array of endpoints and outcomes are evaluated. These include evaluation of the impact of EBP on patient health outcomes, provider and patient satisfaction, efficacy, efficiency, economic analysis, and health status impact.

As new knowledge is transformed through the five stages, the final outcome is evidence-based quality improvement of health care.

**Bibliographic Citation for the ACE Star Model**


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