# Basics of Implementation Science

Geoffrey M. Curran, PhD
Director, Center for Implementation Research
Professor, Departments of Pharmacy Practice and Psychiatry
University of Arkansas for Medical Sciences
Research Health Scientist, Central Arkansas Veterans Healthcare System

UAMS
PSYCHIATRIC RESEARCH INSTITUTE
UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES

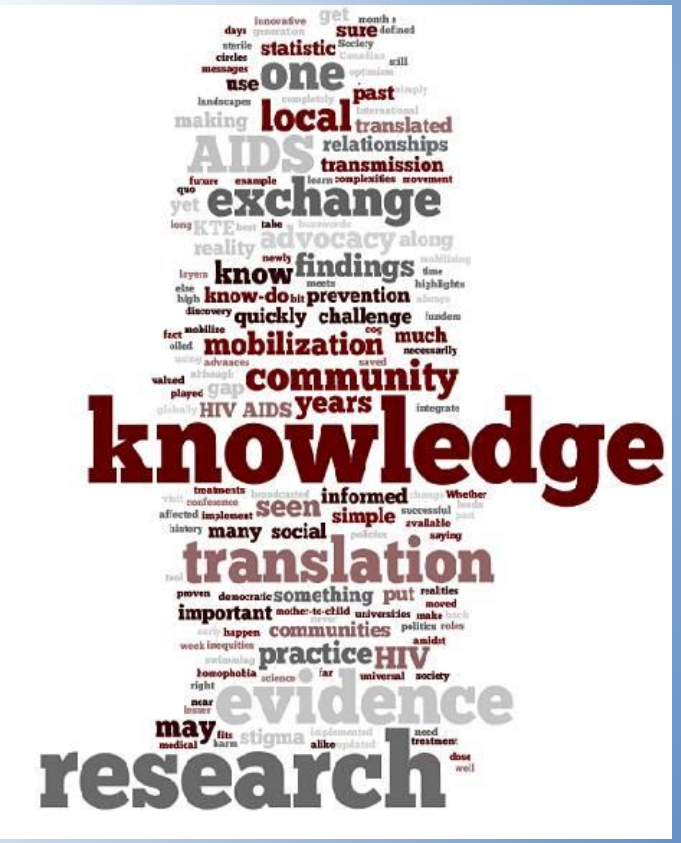
U.S. Department of Veterans Affairs

# Learning Objectives

- **Be able to differentiate implementation science from clinical effectiveness research, improvement science, and quality improvement.**
- **Understand common measurement approaches and frameworks used in implementation research.**
- **Be able to identify categories of implementation strategies and discrete evidence-based implementation strategies, especially those relevant to medication adherence**

# Objective 1: differentiate implementation science from clinical effectiveness research, improvement science, and quality improvement



# Some definitions…

- **Dissemination**: "targeted spread of information" (from the NIH program announcement for Dissemination & Implementation research)
  - ***Passive* approach, focusing on knowledge transfer**
- **Implementation**: "An *effort* specifically designed to get best practice findings and related products into routine and sustained use via appropriate *uptake interventions*." (Curran et al., 2012)
  - ***Active* approach, focusing on stimulating behavior change**

# More defs….

- **Implementation SCIENCE**: "The scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services and care." (Eccles and Mittman, *Implementation Science*, 2006)
  - **Science of how BEST to implement, create generalizable knowledge**

# More defs…

- **Quality Improvement**: "…concerted and ongoing activities that are undertaken systematically by diverse stakeholders to improve care." (Rabin and Brownson, 2018)
  - **Local problem-solving of a specific issue**
  - **Usually small, iterative steps**
  - **Implementation science usually slower, larger in scope, likely to use explicit theoretical/conceptual models, likely to use more rigorous methods, seeking generalizable knowledge**
  - **But both trying to "move the dial" in improving care delivery**

# More defs…

- **Knowledge translation**: "…a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge."(Rabin and Brownson, 2018)
  - **Canadian Institutes of Health…**
  - **Translating knowledge/scientific findings into practice**
- See also: **Knowledge utilization** (Australia), **Research utilization**, **Technology transfer**, **Translational science**…
  - **Each a different *slant* on the idea of using knowledge/evidence to make a change**

# When teaching this stuff, some very non-scientific language can also be helpful…

- The intervention/practice/innovation is **THE THING**
- Effectiveness research looks at whether THE THING works
- D&I research looks at how best to help people/places **DO THE THING**
- *Implementation strategies* are the stuff we do to try to help people/places DO THE THING
- Main implementation outcomes are **HOW MUCH and HOW WELL they DO THE THING**

(Curran, 2020, Implementation Science Communications)

# Objective 2: Understand common measurement approaches and frameworks used in implementation research.



# What to measure in implementation research?

# What are the outcomes we care about then?

- We are trying to measure changes in the delivery of care
  - Did the place/people implement the intervention?
    - Did they get started? Did they start and stop?
  - Did everyone get it who should have gotten it?
    - Was the intervention/practice delivered as much as it should have been?
    - Were all indicated patients approached? Given intervention/practice?
  - Did they do it right when the were delivering the intervention?
    - Did they deliver the intervention as intended… with "fidelity"?
    - How close did they get?
- Do we also look at the "effectiveness" of the intervention?
  - Among those who got it, did they get better?
  - Symptoms, functioning
    - If the field does not have "enough" evidence on THE THING, then yes…

# Common Measures in Impl Research

- **Adoption**
  - "Counts and amounts"
    - Raw count of delivery
    - Rates of delivery
- **Fidelity**
  - "How well performed"
  - LOTS of different ways to measure this
    - Checklist; Expert rating (e.g., for MTM, motivational interviewing for adherence)
- **Sustainability**
  - "Stick with it or dropped it?"
  - Adoption and Fidelity measures *over time*

# Common Measures in Impl Research

- **Adoption**
  - "Counts and amounts"
    - Raw count of delivery
    - Rates of delivery
- **Fidelity**
  - "How well performed"
  - LOTS of different ways to measure this
    - Checklist; Expert rating (e.g., for MTM, motivational interviewing for adherence)
- **Sustainability**
  - "Stick with it or dropped it?"
  - Adoption and Fidelity measures *over time*

If we are doing pilot/early work, then also look at:

-Feasibility
-Acceptability
-Satisfaction

} Intervention *and* strategies

# Models, Theories, Frameworks…

*Yeah, I know…*

Nilsen *Implementation Science* (2015) 10:53
DOI 10.1186/s13012-015-0242-0

IMPLEMENTATION SCIENCE

DEBATE Open Access

# Making sense of implementation theories, models and frameworks

Per Nilsen

**Table 1 Five categories of theories, models and frameworks used in implementation science**

| Category | Description | Examples |
|---|---|---|
| Process models | Specify steps (stages, phases) in the process of translating research into practice, including the implementation and use of research. The aim of process models is to describe and/or guide the process of translating research into practice. An action model is a type of process model that provides practical guidance in the planning and execution of implementation endeavours and/or implementation strategies to facilitate implementation. Note that the terms "model" and "framework" are both used, but the former appears to be the most common | Model by Huberman [40], model by Landry et al. [41], model by Davies et al. [43], model by Majdzadeh et al. [44], the CIHR Model of Knowledge Translation [42], the K2A Framework [15], the Stetler Model [47], the ACE Star Model of Knowledge Transformation [48], the Knowledge-to-Action Model [13], the Iowa Model [49,50], the Ottawa Model [51,52], model by Grol and Wensing [53], model by Pronovost et al. [54], the Quality Implementation Framework [27] |
| Determinant frameworks | Specify types (also known as classes or domains) of determinants and individual determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables). Some frameworks also specify relationships between some types of determinants. The overarching aim is to understand and/or explain influences on implementation outcomes, e.g. predicting outcomes or interpreting outcomes retrospectively | PARIHS [5,64], Active Implementation Frameworks [63,68], Understanding-User-Context Framework [62], Conceptual Model [17], framework by Grol et al. [22], framework by Cochrane et al. [59], framework by Nutley et al. [21], Ecological Framework by Durlak and DuPre [57], CFIR [60], framework by Gurses et al. [58], framework by Ferlie and Shortell [61], Theoretical Domains Framework [66] |
| Classic theories | Theories that originate from fields external to implementation science, e.g. psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation | Theory of Diffusion [107], social cognitive theories, theories concerning cognitive processes and decision making, social networks theories, social capital theories, communities of practice, professional theories, organizational theories |
| Implementation theories | Theories that have been developed by implementation researchers (from scratch or by adapting existing theories and concepts) to provide understanding and/or explanation of aspects of implementation | Implementation Climate [116], Absorptive Capacity [117], Organizational Readiness [118], COM-B [119], Normalization Process Theory [120] |
| Evaluation frameworks | Specify aspects of implementation that could be evaluated to determine implementation success | RE-AIM [124]; PRECEDE-PROCEED [125]; framework by Proctor et al. [126] |

Nilsen *Implementation Science* (2015) 10:53
DOI 10.1186/s13012-015-0242-0

IMPLEMENTATION SCIENCE

DEBATE Open Access

# Making sense of implementation theories, models and frameworks

Per Nilsen

**Table 1 Five categories of theories, models and frameworks used in implementation science**

| Category | Description | Examples |
|---|---|---|
| Process models | Specify steps (stages, phases) in the process of translating research into practice, including the implementation and use of research. The aim of process models is to describe and/or guide the process of translating research into practice. An action model is a type of process model that provides practical guidance in the planning and execution of implementation endeavours and/or implementation strategies to facilitate implementation. Note that the terms "model" and "framework" are both used, but the former appears to be the most common | Model by Huberman [40], model by Landry et al. [41], model by Davies et al. [43], model by Majdzadeh et al. [44], the CIHR Model of Knowledge Translation [42], the K2A Framework [15], the Stetler Model [47], the ACE Star Model of Knowledge Transformation [48], the Knowledge-to-Action Model [13], the Iowa Model [49,50], the Ottawa Model [51,52], model by Grol and Wensing [53], model by Pronovost et al. [54], the Quality Implementation Framework [27] |
| Determinant frameworks | Specify types (also known as classes or domains) of determinants and individual determinants, which act as barriers and enablers (independent variables) that influence implementation outcomes (dependent variables). Some frameworks also specify relationships between some types of determinants. The overarching aim is to understand and/or explain influences on implementation outcomes, e.g. predicting outcomes or interpreting outcomes retrospectively | PARIHS [5,64], Active Implementation Frameworks [63,68], Understanding-User-Context Framework [62], Conceptual Model [17], framework by Grol et al. [22], framework by Cochrane et al. [59], framework by Nutley et al. [21], Ecological Framework by Durlak and DuPre [57], CFIR [60], framework by Gurses et al. [58], framework by Ferlie and Shortell [61], Theoretical Domains Framework [66] |
| Classic theories | Theories that originate from fields external to implementation science, e.g. psychology, sociology and organizational theory, which can be applied to provide understanding and/or explanation of aspects of implementation | Theory of Diffusion [107], social cognitive theories, theories concerning cognitive processes and decision making, social networks theories, social capital theories, communities of practice, professional theories, organizational theories |
| Implementation theories | Theories that have been developed by implementation researchers (from scratch or by adapting existing theories and concepts) to provide understanding and/or explanation of aspects of implementation | Implementation Climate [116], Absorptive Capacity [117], Organizational Readiness [118], COM-B [119], Normalization Process Theory [120] |
| Evaluation frameworks | Specify aspects of implementation that could be evaluated to determine implementation success | RE-AIM [124]; PRECEDE-PROCEED [125]; framework by Proctor et al. [126] |

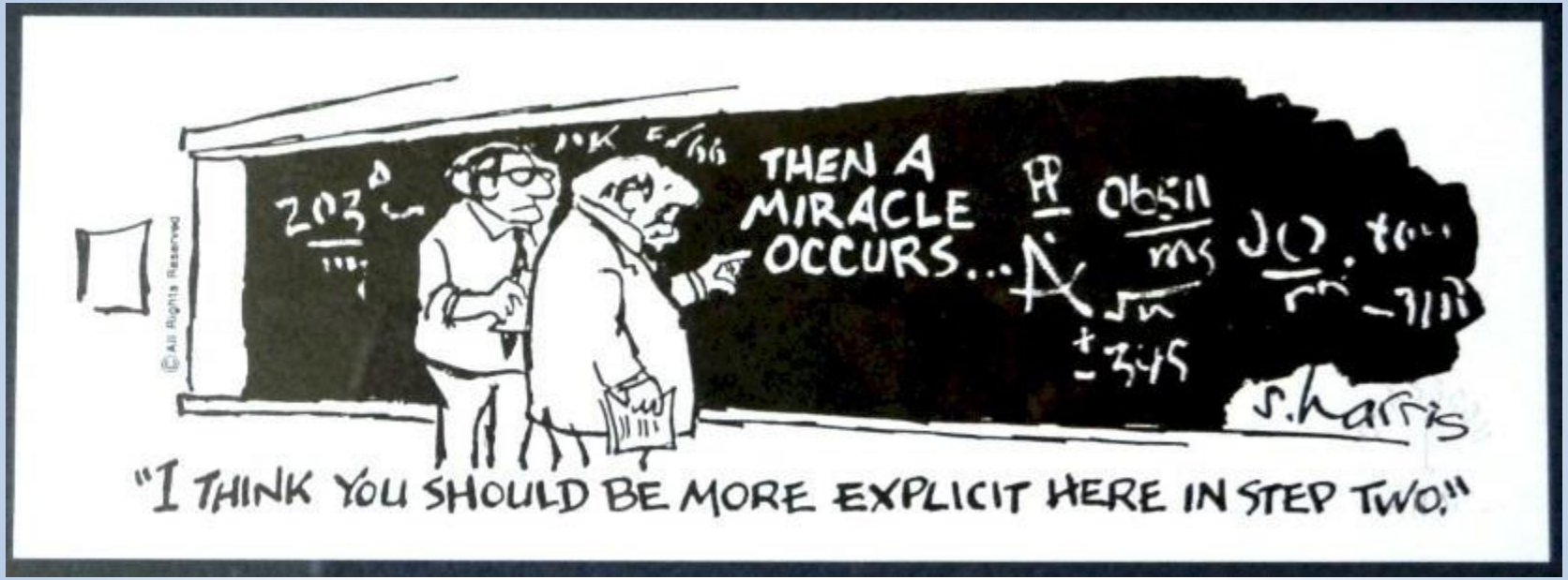
# *Determinant* Frameworks

- *"…understand or explain influences on implementation."*
- **Consolidated Framework for Implementation Research (CFIR)**
  - **Characteristics of the intervention**
    - Complexity, cost, relative advantage…
  - **Outer setting**
    - External policies, guidelines, incentives...
  - **Inner Setting**
    - Organizational culture and climate, readiness for implementation, infrastructure…
  - **Characteristics of Individuals**
    - Knowledge, beliefs, self-efficacy…
  - **Process**
    - Planning, executing, reflecting…

# OK, few more frameworks, *that's it*

- **Process models**
  - **EPIS: Exploration, Preparation, Implementation, Sustainment**
    - **Why important? Think about what kinds of strategies you'll need for each "step"**
- **Evaluation frameworks**
  - **RE-AIM: Reach, Effectiveness, Adoption, Implementation, Maintenance**
  - **Proctor framework: See above slides…**
    - **Why important: Helps answer the question, "How do I show this strategy worked or didn't?"**

# Implementation strategies



# Everybody needs some **help**, and some need **a lot of help…**

- **Depending on the characteristics of the practice, context, and people… *uptake interventions* of some kind are usually necessary to support adoption– we call those implementation strategies**
- **There are numerous types of implementation strategies available, many with research evidence supporting their use across contexts**
- **We will now discuss a taxonomy presented by Powell et al., and Waltz et al., 2015, *Implementation Science***
  - **They cover 73 strategies across 9 categories…**

# Waltz et al Taxonomy of Impl Strats

- **Train and educate stakeholders**
  - Develop educational materials
  - Conduct educational meetings
  - Conduct educational outreach visits (academic detailing)
    - Personalized 1 on 1 sessions on intervention
  - Provide ongoing consultation
    - In person, telephone, televideo…; usually about implementation progress
  - Use “train-the-trainer” strategies
    - More for widespread “roll-outs”; Train local trainers/mentors
  - Create a learning collaborative
    - Groupings of learners/practitioners supported by trainers/experts
    - Over time, experienced users teach new users (self-sustaining)

# Waltz et al Taxonomy of Impl Strats

- **Provide interactive assistance**
  - Provide clinical supervision
    - Expert supervision focused on the intervention/practice being adopted
  - Provide local technical assistance
    - Needed usually for medical record, dispensing software tools…
  - Provide facilitation
    - Interactive problem-solving; recommend and supply additional strategies
- **Support clinicians**
  - Remind clinicians
    - Electronic reminders in EMR or dispensing software; or manual
    - "This patient due for screening…"
  - Revise professional roles
    - E.g., expand role of pharmacy technician
  - Create new clinical teams

# Waltz et al Taxonomy of Impl Strats

- **Change infrastructure**
  - Change physical structure and equipment
    - Need new tech? Record system? Adequate space to provide interventions to patients??
  - Mandate change
    - Create policies supportive of adoption of intervention/practice; *Make people…?*
  - Change credentialing/licensing standards
    - Make way for changing scope of practice, e.g., prescribing privileges to PharmDs
- **Utilize financial strategies**
  - Place intervention on formulary/"covered" list
  - Alter incentive/allowance structure
    - E.g., pay for performance of practice
    - Penalize for not doing the intervention/practice
  - Make billing easier

# Waltz et al Taxonomy of Impl Strats

- **Engage consumers**
  - Prepare patients/consumers to be participants
    - Educate and prompt them to act; “ask your pharmacist about…”
  - Intervene with patients/consumers to enhance uptake/adherence
    - Proactively approach patients; “Let’s talk about your adherence to this medication…”
  - Use mass media
    - Spread the word… TV, posters, etc.
- **Develop stakeholder relationships**
  - Identify and prepare champions
    - Champion = local an enthusiastic supporter of intervention; driver of change
  - Inform and use local opinion leaders
    - Recruit “influential” practitioners to support the implementation
  - Recruit, designate, and train for leadership
  - Build a coalition
    - Make a team that works together on the implementation

# Waltz et al Taxonomy of Impl Strats

- **Adapt and tailor to context**
  - Promote adaptability of the intervention
    - Adapt intervention to match local needs, but don't sway from evidence-based-ness
  - Tailor implementation strategies
    - Tailor implementation strategies for local needs too
- **Use evaluative and iterative strategies**
  - Audit and feedback
    - Measure and feedback performance of practitioners/sites
  - Conduct local needs assessment
    - Before you start; identify barriers/facilitators to change and target strategies
  - Conduct small cyclical tests of change
    - Iterate your change process based on data (*Plan/Do/Study/Act* anyone?)

# Strategies: What do we know?

- Disseminating and Training… not so great on their own
- Many work "OK" (5-10% change in adoption)
  - Reminders, Audit & Feedback, Academic detailing, Facilitation…
- No combo offers a guarantee of success
- Many studies support the use of multi-component strats
  - But some do not!
- Most multifaceted strategies involve 2 or more of these: education/training, prompts of some kind, audit and feedback
- Highly regarded, only somewhat supported, is the idea that strategies work better when matched to barriers/needs identified through diagnostic analysis

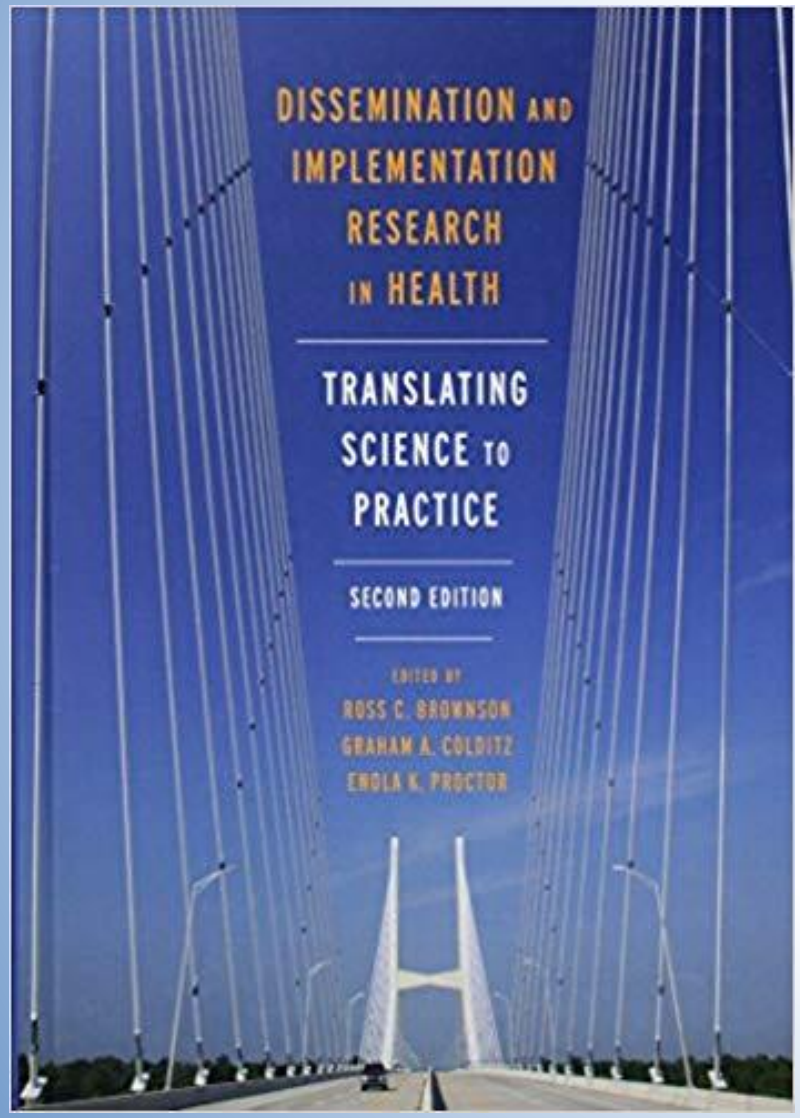
# Strategies:  Med Adherence

- **Reduce complexity of med regimen**
  - **“therapeutic simplification”**
- **Make easier to take**
  - **Affordable *(US thing?)***
  - **Blister packaging**
  - **Reminders**
- **Monitor and intervene**
  - **Solving problems reported by patients**
  - **Counseling, Motivational Interviewing…**

# Back to: *the thing, do the thing…*

- **Medication Adherence is a unique case where *the thing* and *do the thing* can get confusing, and can be framed in different ways…**
- **Is Med Adherence *the thing*?**
  - **Reminders, education, audit+feedback, etc… are implementation strategies for this *("facing"* both providers and patients)**
  - **Adherence could be patient-level, or context-level measure of "adoption"**
  - **Would we look at symptoms/functioning as a result of good adherence?**
- **What if we frame one or more of these as "interventions"?**
  - **Lots of folks do… see McCreight et al…**
  - **Adherence considered patient-level, "effectiveness" measure**
  - **Also look at "next level" effectiveness outcomes like symptoms/ functioning**

# *Deep dive* resources…




Pinto *et al. Implementation Science* (2018) 13:120
https://doi.org/10.1186/s13012-018-0810-1

Implementation Science

RESEARCH Open Access

## Effectiveness of educational outreach visits compared with usual guideline dissemination to improve family physician prescribing—an 18-month open cluster-randomized trial

Daniel Pinto[1*], Bruno Heleno[1], David S. Rodrigues[1], Ana Luísa Papoila[2], Isabel Santos[1] and Pedro A. Caetano[1]