

# Implementation science meets simulation: Strategies & frameworks for scaling up simulation-based training programmes

## Professor Nick Sevdalis PhD

Professor of Implementation Science & Patient Safety

Director, Centre for Implementation Science

Academic Director, Acute Mental Health Care CAG, South London & Maudsley NHS Trust

Chief Editor, *BMJ Simulation & Technology Enhanced Learning*; Associate Editor, *Implementation Science*

 [nick.sevdalis@kcl.ac.uk](mailto:nick.sevdalis@kcl.ac.uk)

 [@NickSevdalis](https://twitter.com/NickSevdalis)



**9<sup>th</sup> ANNUAL CONFERENCE - *“Maximising Impact”***  
**13-15 NOVEMBER 2018 - SOUTHPORT CONVENTION CENTRE**



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## Some food for thought

- **Simulation science is yet to achieve its full potential impact**
- **This is at least partly because the science is yet to move from efficacy to effectiveness studies**

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**Simulation efficacy:**

**Can a simulation-based intervention work?**

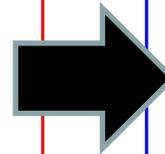
**Simulation effectiveness:**

**Does a simulation-based intervention work?**

## Two parallel universes?

### *Research*

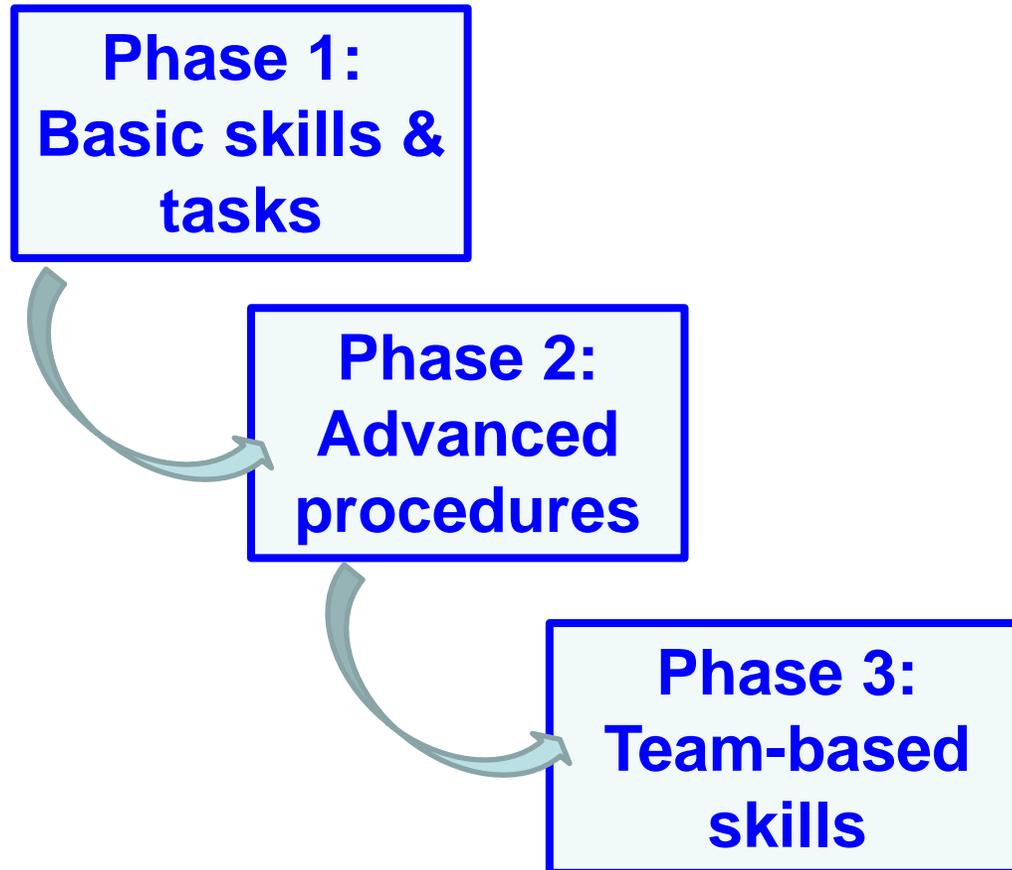
- Intention to maximise intervention efficacy
- Careful selection of faculty/participants
- Specialised+trained faculty educators implementing & measuring
- Research funds



### *Practice*

- Intention to achieve sustainable delivery
- Widespread adoption
- Generalist practitioners, often no further training, no ad hoc measurement
- Education delivery funds (limited)

## Example: ACS / APDS curriculum



AMERICAN COLLEGE OF SURGEONS

*Inspiring Quality:  
Highest Standards, Better Outcomes*

100+years

## Problematic implementation...

**Phase 1:  
Basic skills &  
tasks**

**Phase 2:  
Advanced  
procedures**

**Phase 3:  
Team-based  
skills**

### **Adoption rates:**

**Ph 1: 36%**

**Ph 2: 19%**

**Ph 3: 16%**

The American College of Surgeons/  
Association of Program Directors in  
Surgery National Skills Curriculum:  
Adoption rate, challenges and  
strategies for effective implementation  
into surgical residency programs

# Skills training + coaching+ standardisation

## Association Between Implementation of a Medical Team Training Program and Surgical Mortality

Julia Neily, RN, MS, MPH

Peter D. Mills, PhD, MS

Yinong Young-Xu, ScD, MA, MS

Brian T. Carney, MD

Priscilla West, MPH

David H. Berger, MD, MHCM

Lisa M. Mazzia, MD

Douglas E. Paull, MD

James P. Bagian, MD, PE

**Context** There is insufficient information about the effectiveness of medical team training on surgical outcomes. The Veterans Health Administration (VHA) implemented a formalized medical team training program for operating room personnel on a national level.

**Objective** To determine whether an association existed between the VHA Medical Team Training program and surgical outcomes.

**Design, Setting, and Participants** A retrospective health services study with a contemporaneous control group was conducted. Outcome data were obtained from the VHA Surgical Quality Improvement Program (VASQIP) and from structured interviews in fiscal years 2006 to 2008. The analysis included 182,409 sampled procedures from 108 VHA facilities that provided care to veterans. The VHA's nationwide

18% decrease in observed mortality (vs 7%  
in controls)

(2006-08; 74 vs 34 VA hospitals;  
N=182,409)

### Substantial training programme

- ✓ 2 months preparation
- ✓ Checklists
- ✓ 1 day on-site team training session –  
incl skills, telephone coaching/F-UP  
for 1 year

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How much of this do we  
implement routinely in  
our hospitals...?

# Surgical simulation: implementation gap

REVIEW

## Simulation in Surgery *What's Needed Next?*

*Dimitrios Stefanidis, MD, PhD,\* Nick Sevdalis, PhD,† John Paige, MD,‡ Boris Zevin, MD, PhD,§  
Rajesh Aggarwal, MD, PhD,¶ Teodor Grantcharov, MD, PhD,§  
and Daniel B. Jones, MD, MS||; for the Association for Surgical Education Simulation Committee*

**Objective:** To review the current state of simulation use in surgery and to offer direction for future research and implementation of evidence-based findings.  
**Background:** Simulation-based training (SBT) in surgery has surged in recent years. Although several new simulators and curricula have become available, their optimization and implementation into surgical training has been lagging.  
**Methods:** Members of the Association for Surgical Education Simulation Committee with expertise in surgical simulation review and interpret the literature and describe the current status of the use of simulation in surgery, identify the challenges to its widespread adoption, and offer potential solutions to these challenges. The review focuses on simulation research and implementation of existing knowledge and explores possible future directions for the field.  
**Results:** Skill acquired on simulators has repeatedly and consistently been demonstrated to transfer to the operating room, and proficiency-based training maximizes this benefit. Several simulation-based curricula have been developed by national organizations to support resident training, but their implementation is lagging because of inadequate human resources, difficult integration of SBT into educational strategy, and logistical barriers. In research, lack of coordinated effort, flaws in study design, changes in simulator-validation concepts, limited attention to skill retention, and other areas are in need of improvement.  
**Conclusions:** Future research in surgical simulation should focus on demonstrating the cost-effectiveness of SBT and its impact on patient outcomes. Furthermore, to enable the more widespread incorporation of best practices and existing simulation curricula in surgery, effective implementation strategies need to be developed.

leaving some areas of simulation-based training (SBT) less mature than others. We have witnessed, in particular, the development of a vast array of surgical simulators and advancements in simulation technology but have not seen equivalent progress in curriculum development or instructional implementation strategies. To address this issue, the Association for Surgical Education (ASE) Simulation Committee drafted this white paper, which presents the current status of the use of simulation in surgery, identifies the challenges to its widespread adoption, and offers potential solutions to these challenges (Table 1). Furthermore, we explore possible future directions for the field that focus on research and implementation. This article has been written by members of the ASE Simulation Committee, who have significant track records and expertise in surgical simulation.

**CURRENT STATE OF SURGICAL SIMULATION**  
**Historical Context**  
Over the last decade, resident surgical education has witnessed a paradigm shift. The century-old Halstedian apprenticeship model of “see one, do one, teach one” has given way to an objective-driven curricular model best characterized by the maxim “see one, simulate many deliberately, do one.”<sup>7-9</sup> The growing role of SBT in surgical graduate medical education (GME) is reflected in the latest Accreditation Council for Graduate Medical Education Requirements for GME in General Surgery, which state “. . . resources [of a program] must include simulation and skills laboratories. These facilities must address acquisition and maintenance of skills with a competency-

## CONCLUSIONS

1. Cost-effectiveness studies
2. Clinical outcome studies
3. Scaled implementation of evidenced interventions

## From evidence to practice



## From evidence to practice



*“Across most domains in medicine, practice  
has lagged behind knowledge by at least  
several years”*

David Bates et al, 2003; JAMIA

# Time lag between research and practice



BELIE MELLOR 2012

ADAPTED FROM AN ORIGINAL BY B. MELLOR

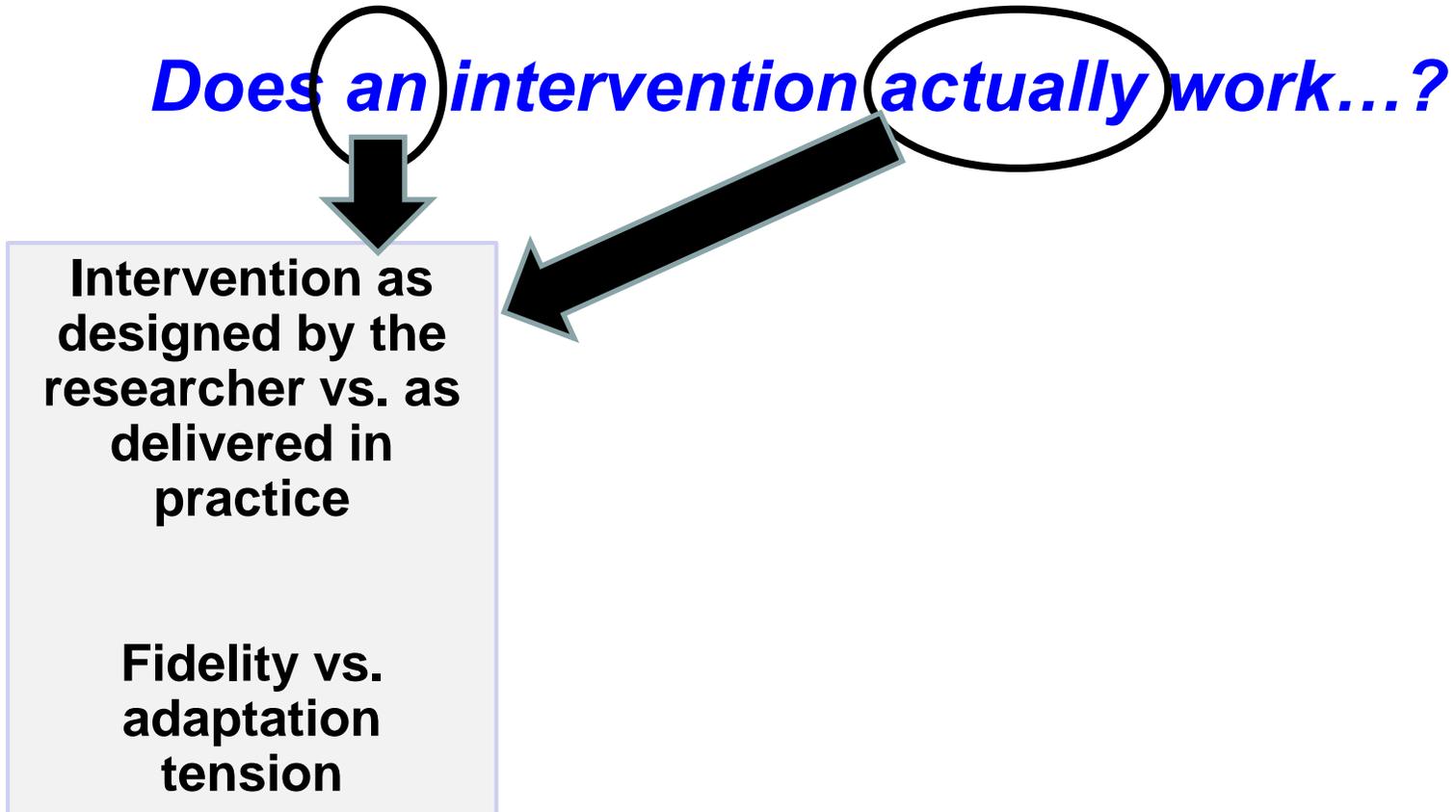
It may have worked in a RCT, but  
here's the tricky question....

***Does a simulation intervention  
actually work for me, at my  
hospital, with my faculty &  
my trainees...?***



## Dissecting effectiveness (i)

*Does an intervention actually work...?*



**Intervention as  
designed by the  
researcher vs. as  
delivered in  
practice**

**Fidelity vs.  
adaptation  
tension**

The diagram features a central question in blue italics: "Does an intervention actually work...?". Two black ovals highlight the words "an" and "actually". A thick black arrow points from the "an" oval down to a grey box. A second thick black arrow points from the "actually" oval to the right side of the same grey box. The grey box contains two lines of bold black text: "Intervention as designed by the researcher vs. as delivered in practice" and "Fidelity vs. adaptation tension".

## Dissecting effectiveness (ii)

*Does an **intervention** actually work...?*

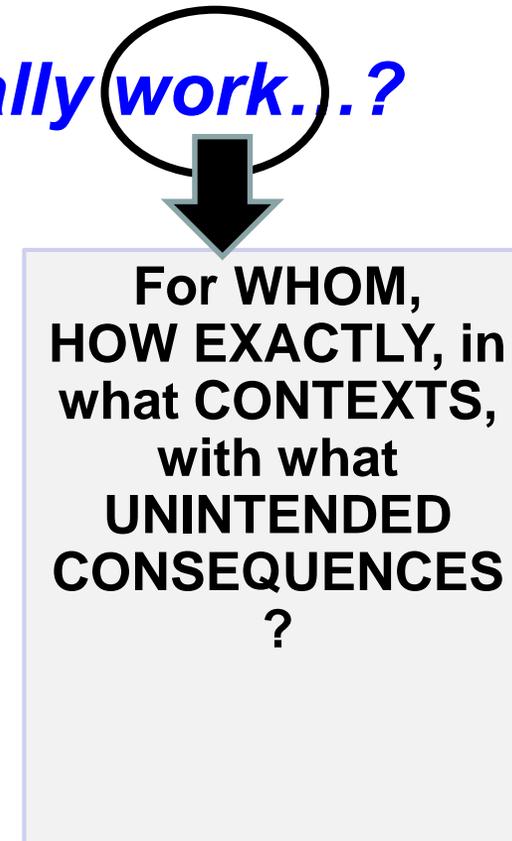


**Multiple  
intervention  
components**

**Education =  
'complex  
interventions'**

## Dissecting effectiveness (iii)

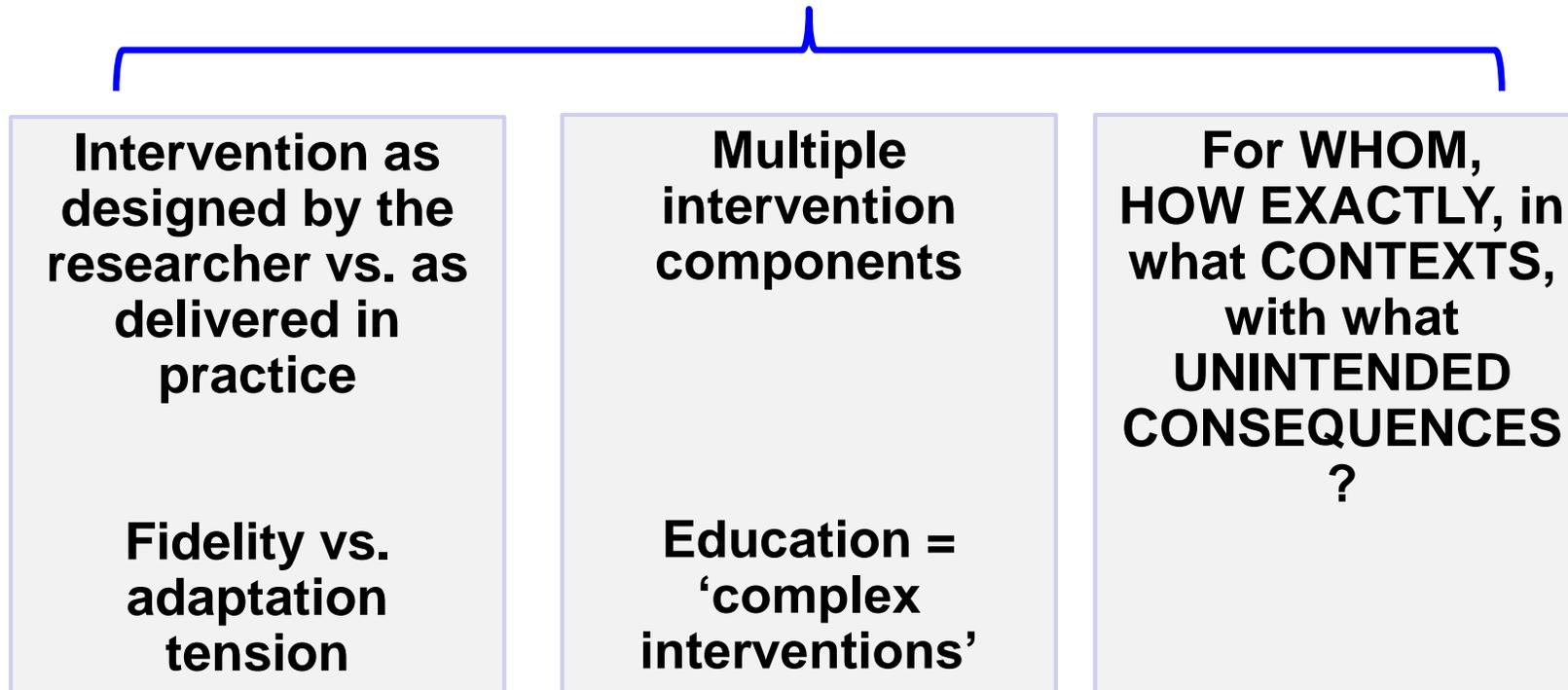
*Does an intervention actually work...?*



**For WHOM,  
HOW EXACTLY, in  
what CONTEXTS,  
with what  
UNINTENDED  
CONSEQUENCES  
?**

## Key point: effectiveness $\neq$ efficacy

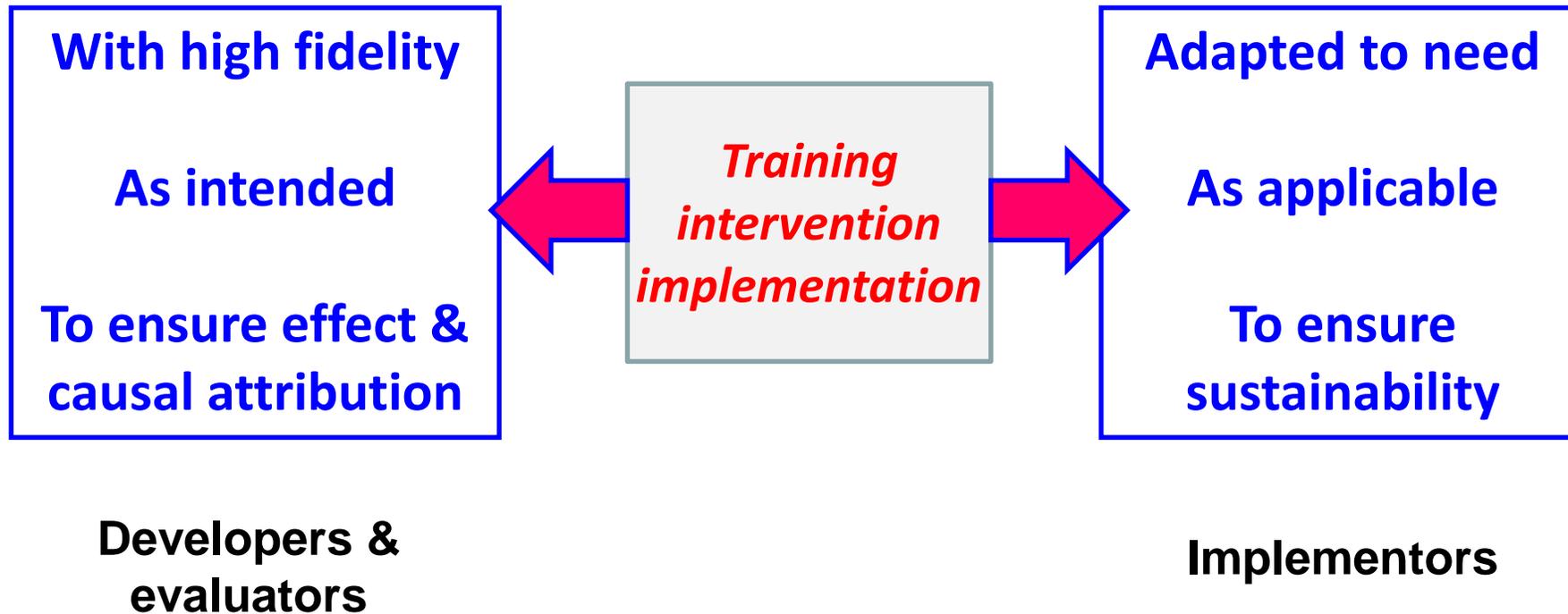
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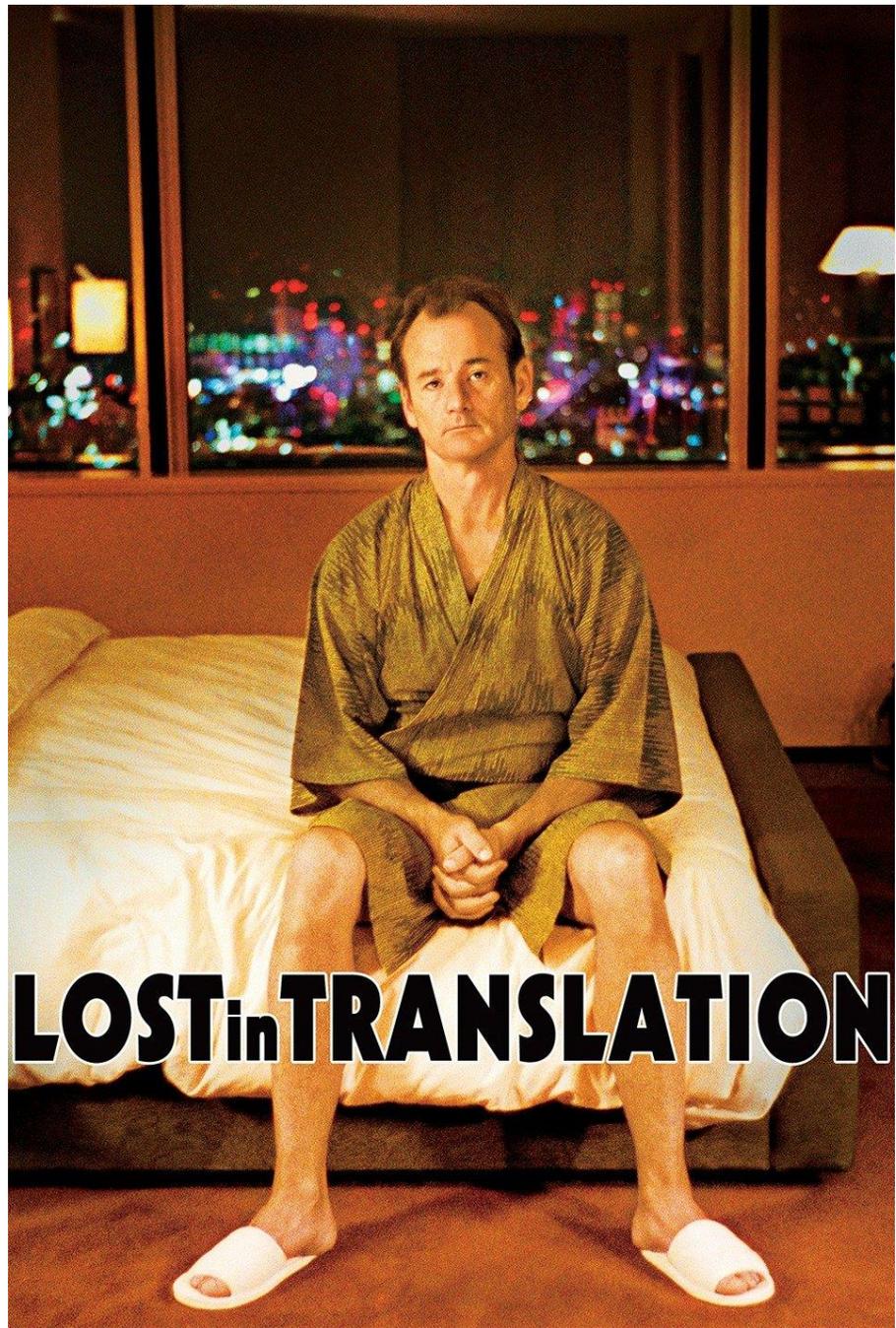


# Implementation fidelity

- **The degree to which an intervention is delivered as intended**
  
- Five key aspects:
  1. **Adherence:** intervention delivered as designed/written
  2. **Exposure (dose):** how much of the intervention was received (i.e. frequency, duration, coverage rate)
  3. **Quality of delivery:** manner in which intervention is delivered
  4. **Participant responsiveness:** reactions of recipients to intervention
  5. **Programme differentiation:** identifying which elements of the intervention are actually essential (**'active ingredients'**)
    - Relevant for complex interventions (curriculum, faculty, etc)

## Fidelity tensions





**LOST in TRANSLATION**

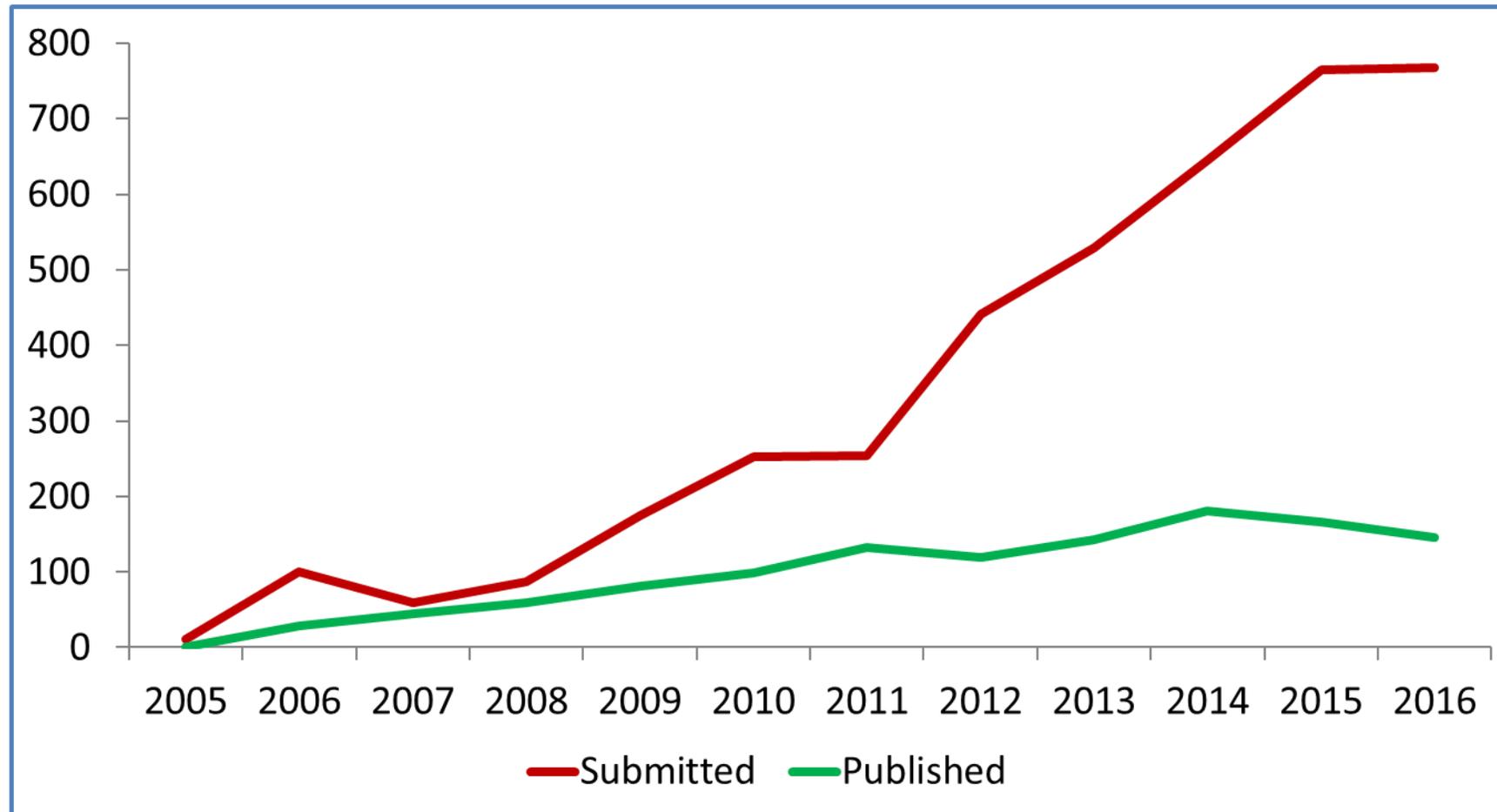
# Closing the gap: Implementation science

Implementation science supports innovative approaches to **identifying, understanding, and overcoming barriers to the adoption, adaptation, integration, scale-up and sustainability of evidence-based interventions, tools, policies, and guidelines**

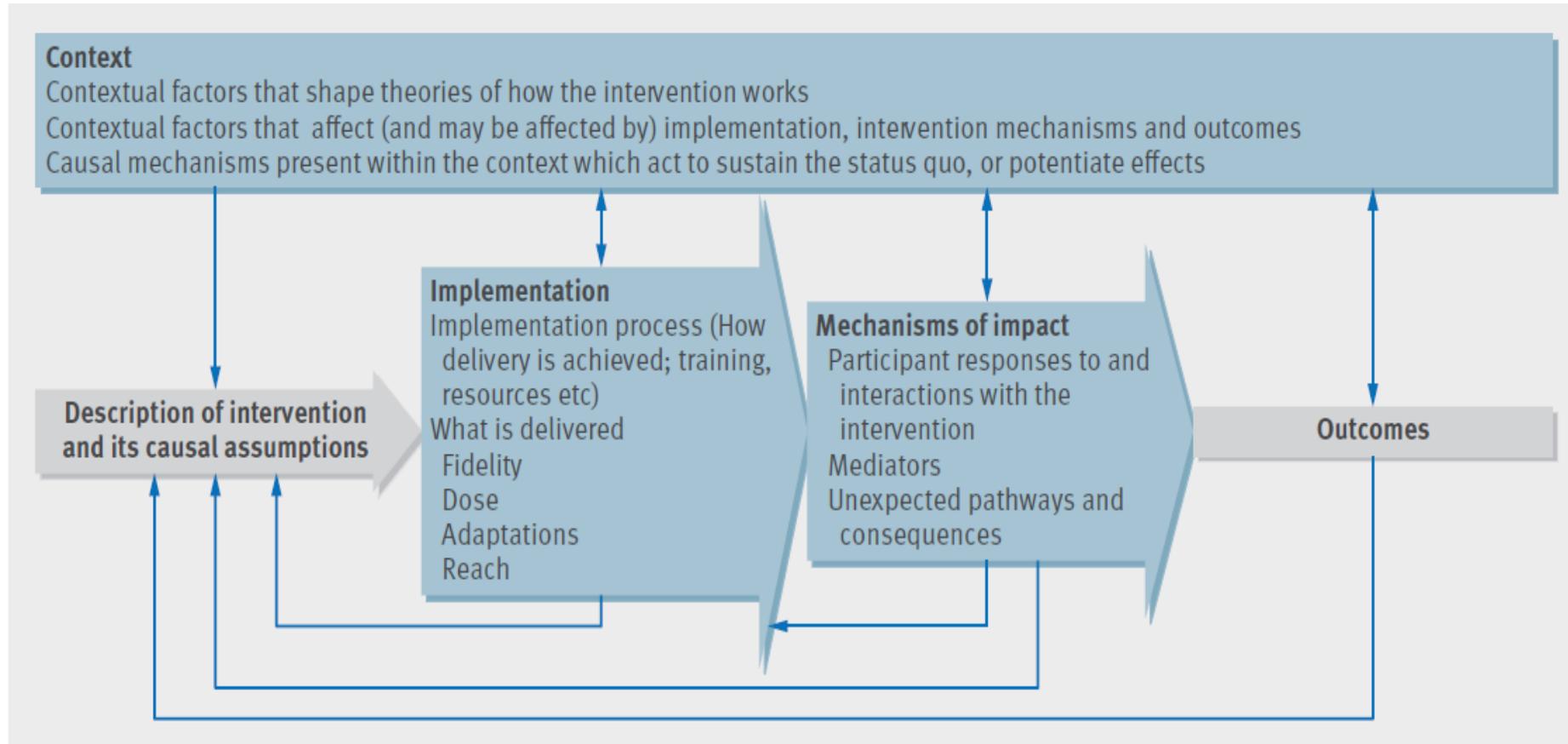
NIH, 2015



## New-ish science, gathering pace



## Evaluation framework: overdue in simulation research



# Implementation effectiveness

$$I = fE + IO's$$

$I$  = Implementation effectiveness

$E$  = Effectiveness of the educational intervention being implemented

$IO's$  = Implementation factors or outcomes

# Implementation outcomes framework

<b>Acceptability</b>	Perception amongst stakeholders new intervention is agreeable
<b>Adoption</b>	Intention to apply or application of new intervention
<b>Appropriateness</b>	Perceived relevance of intervention to a setting, audience, or problem
<b>Feasibility</b>	Extent to which an intervention can be applied
<b>Fidelity</b>	Extent to which an intervention gets applied as originally designed / intended
<b>Implementation costs</b>	Costs of the delivery strategy, including the costs of the intervention itself
<b>Coverage</b>	Extent to which eligible patients/trainees/population actually receive intervention
<b>Sustainability</b>	Extent to which a new intervention becomes routinely available / is maintained post-introduction

# Implementation strategies

**Methods or techniques used to enhance the adoption, implementation, and sustainability of a clinical programme, practice or intervention**

Powell et al, *Implement Sci* 2015;10:21

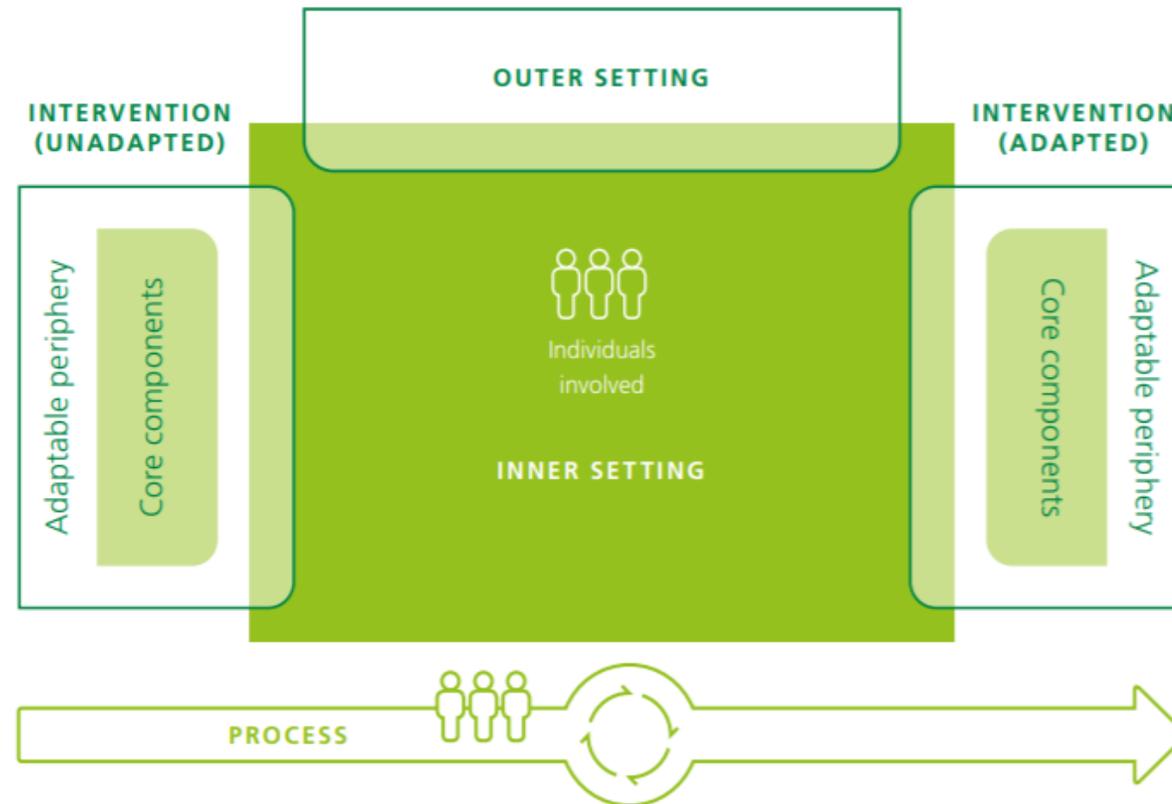
- 73 strategies in evidence base (review+Delphi)
- **Audit & feedback** – Structured adaptation & tailoring – **Establishing champions** – Training & education – **Creation of new contracts** – Patient engagement – **Financial strategies** – etc etc
- Using more strategies increases intervention uptake ( $r = 0.43$ )

Rogal et al, *Implement Sci* 2017;12:60

# Framework to identify barriers/drivers

## Consolidated Framework for Implementation Research

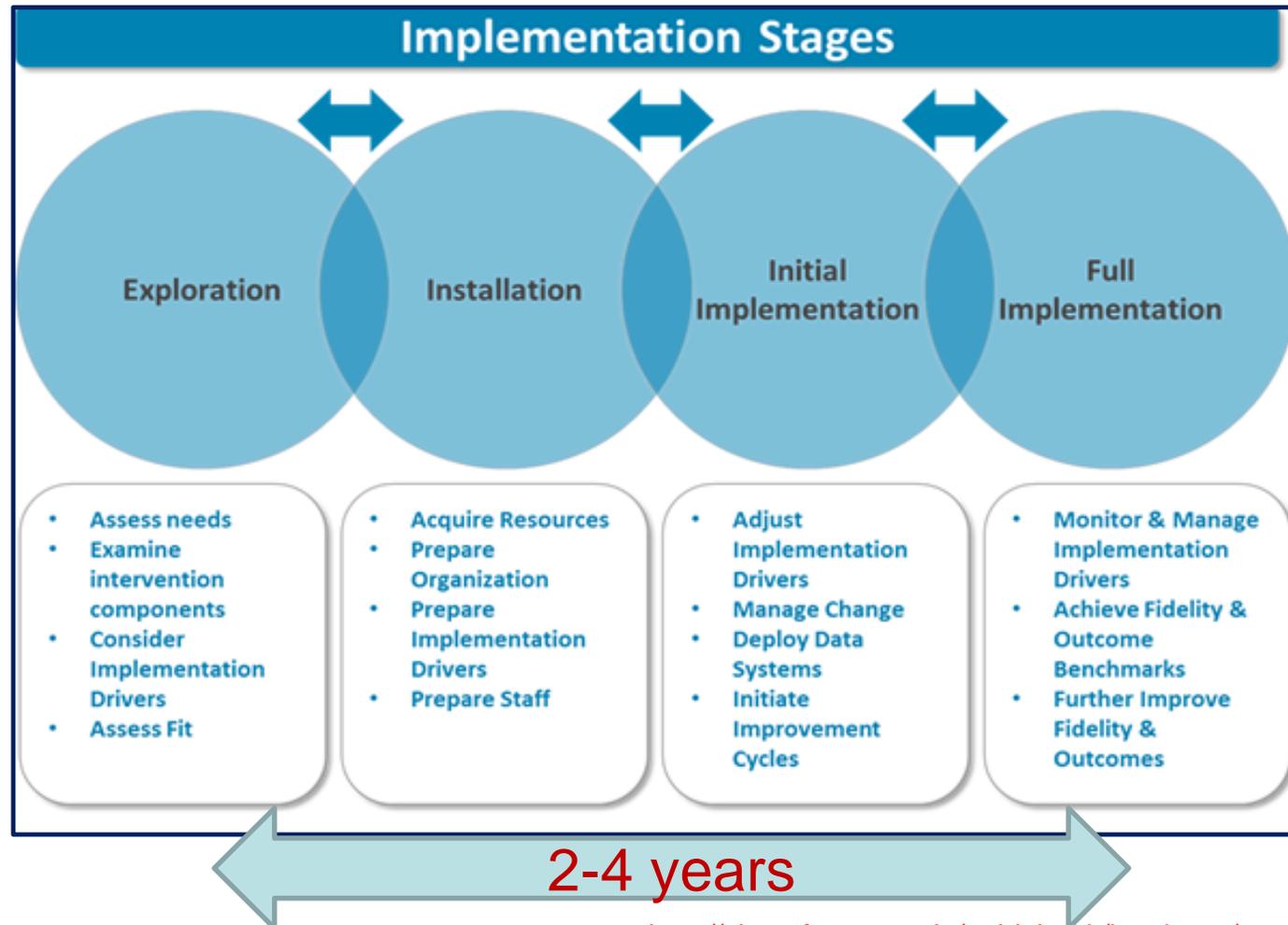
1. Intervention characteristics
2. Inner setting
3. Outer setting
4. Individuals involved
5. Process of implementation



## Validated questions: based on CFIR

- Interview questions, to cover (sample items):
  - 1. Intervention characteristics**
    - What do influential stakeholders think of [...]?
    - How complicated is [...]?
  - 2. Outer setting**
    - To what extent are other organisations implementing [...]?
    - Have you heard stories about the experiences of participants with [...]?
  - 3. Inner setting**
    - How would you describe the culture of your organisation? Of your own unit?
    - What is the general level of receptivity in your organisation to implementing [...]?
  - 4. Characteristics of individuals**
    - How confident are you that you will be able to use [...]?
  - 5. Process**
    - Can you describe the plan for implementing [...]?
    - Who are the key individuals to get on board with [...]?

# Implementation has a time element



## Reflections – for discussion

- Producing more '*can work*' research in simulation is not an efficient investment; **focus on '*does work*' research** instead
- Clinical research is discovering **implementation science to embed evidenced interventions** – simulation research needs to follow
- **Implementation parameters need to become primary outcomes** of simulation evaluations
  - Fidelity, acceptability, cost and context assessment, etc



THANK  
YOU!



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