Implementation Science:

Introduction and examples From Zurich

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Why implementation science?

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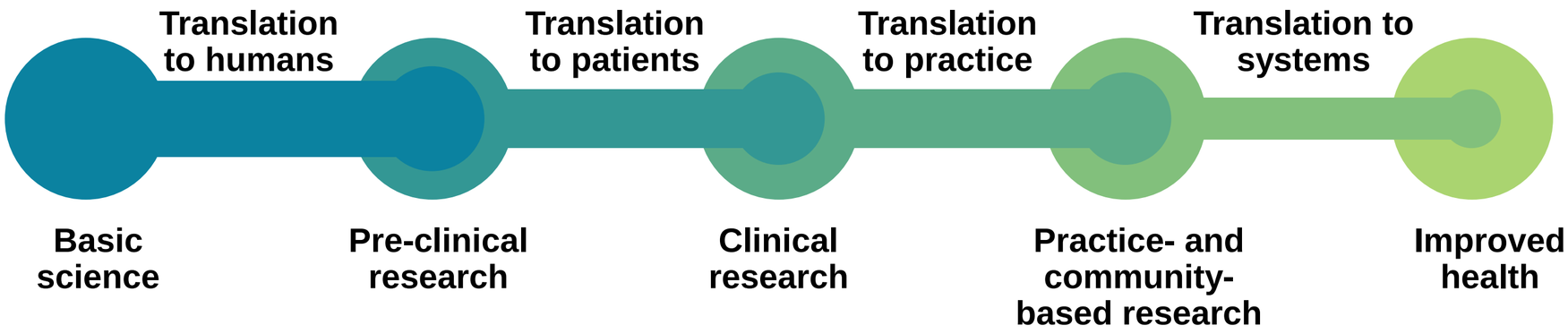
Research pipeline



Quantifying leaks in the pipeline

<50%

clinical innovations make it into regular use

17

years

80% of $

do not make public health impact

Morris ZS, Wooding S, Grant J. The answer is 17 years, what is the question: understanding time lags in translational research. Journal of the Royal Society of Medicine. 2011 Dec;104(12):510-20. |
Mosteller F. Innovation and evaluation. Science. 1981;211(4485):881-6.

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Quantifying leaks in the pipeline

Cancer Causes & Control (2021) 32:221–230
https://doi.org/10.1007/s10552-020-01376-z

ORIGINAL PAPER

Revisiting time to translation: implementation of evidence-based practices (EBPs) in cancer control

Shahnaz Khan[1,2] · David Chambers[2] · Gila Neta[2]

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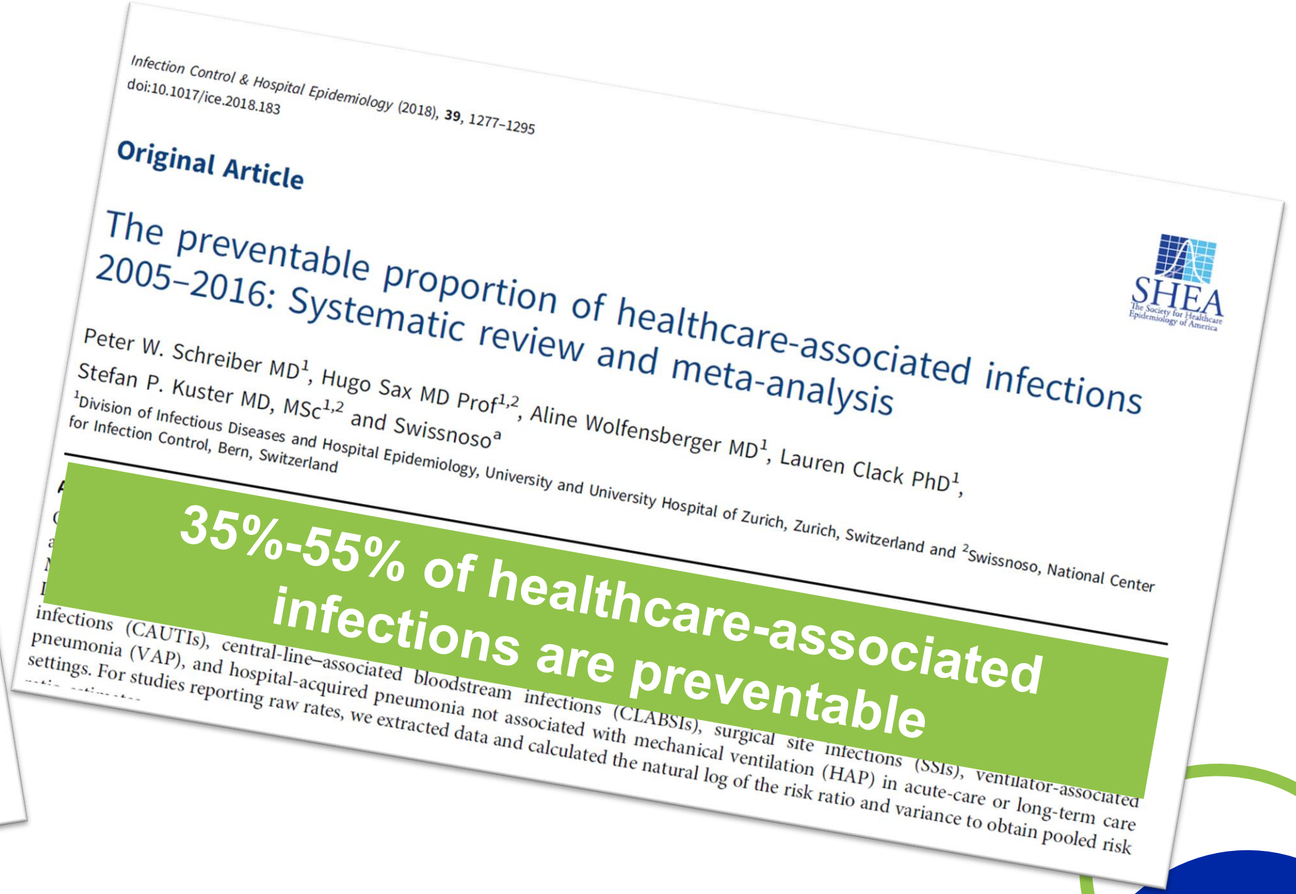
Abstract

averaging 15 years. Time from publication to guideline issuance ranged from 3 to 17 years, and from guideline issuance to implementation, – 4 to 12 years. Clinician's advice to quit smoking, HPV co-testing, and HPV vaccination were most rapidly implemented; colorectal cancer screening and mammography were slowest to implement.

Conclusion The average time to implementation was 15 years for the five EBPs we evaluated, a marginal improvement from prior findings. Although newer EBPs such as HPV vaccination and HPV co-testing were faster to implement than other EBPs, continued efforts in implementation science to speed research to practice are needed.

Time from publication to implementation averaged 15 years in cancer control



Infection Control & Hospital Epidemiology (2018), **39**, 1277–1295
doi:10.1017/ice.2018.183

Original Article

The preventable proportion of healthcare-associated infections 2005–2016: Systematic review and meta-analysis

Peter W. Schreiber MD[1], Hugo Sax MD Prof[1,2], Aline Wolfensberger MD[1], Lauren Clack PhD[1], Stefan P. Kuster MD, MSc[1,2] and Swissnoso[a]

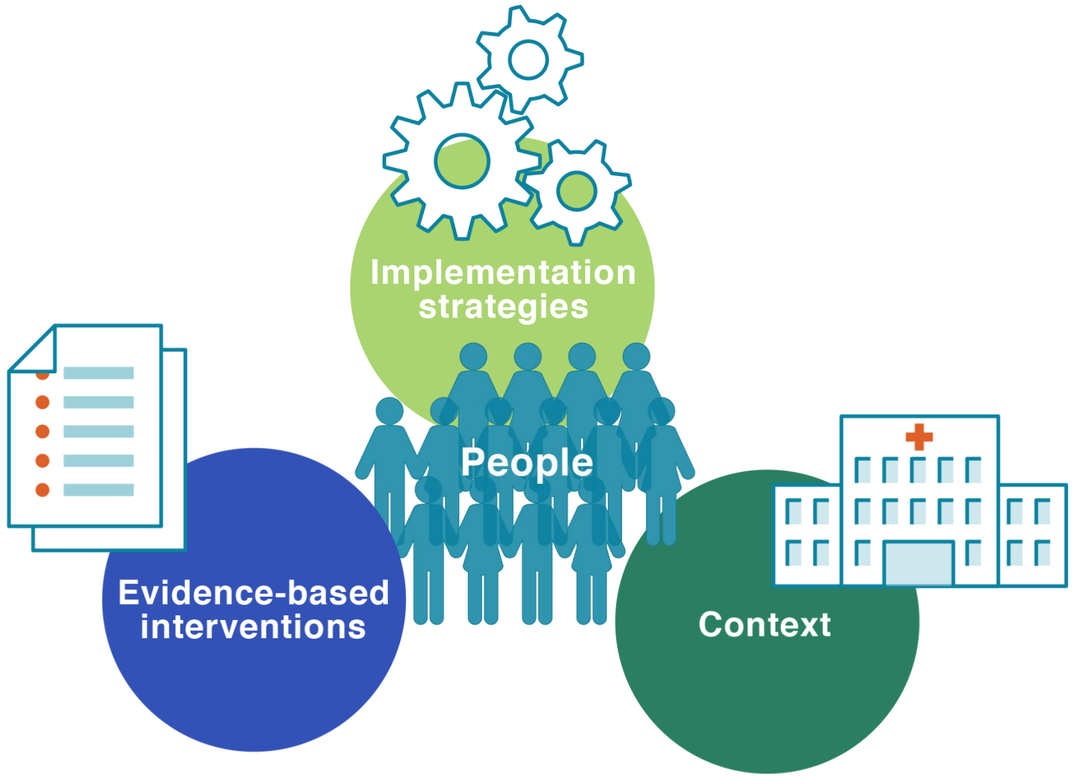
[1]Division of Infectious Diseases and Hospital Epidemiology, University and University Hospital of Zurich, Zurich, Switzerland and [2]Swissnoso, National Center for Infection Control, Bern, Switzerland

infections (CAUTIs), central-line–associated bloodstream infections (CLABSIs), surgical site infections (SSIs), ventilator-associated pneumonia (VAP), and hospital-acquired pneumonia not associated with mechanical ventilation (HAP) in acute-care or long-term care settings. For studies reporting raw rates, we extracted data and calculated the natural log of the risk ratio and variance to obtain pooled risk

35%-55% of healthcare-associated infections are preventable

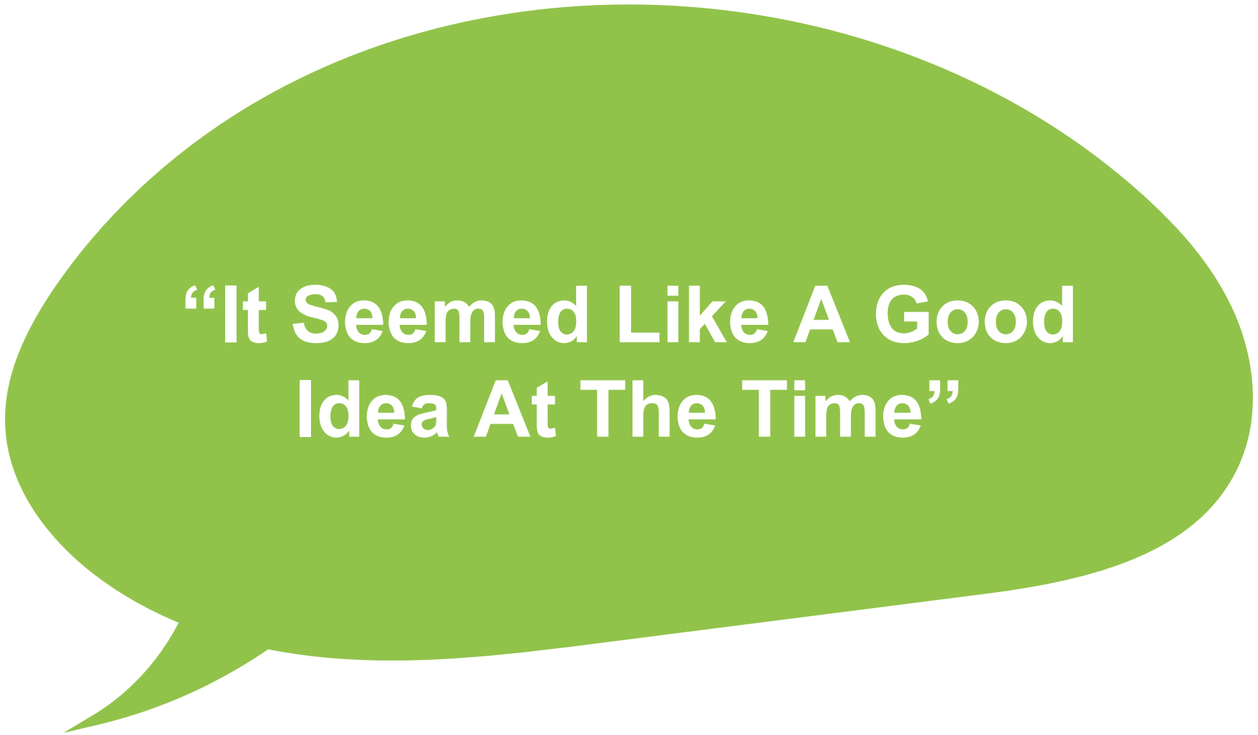
The know-do gap, or evidence-to-practice gap

Understanding leaks in the research pipeline



ISLAGIATT approach to implementation

Prof. Martin Eccles, Implementation Researcher



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What is implementation science?

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Implementation science definition

Implementation science is defined as the **scientific study of methods** to promote the **systematic integration** of **research findings and evidence based practices** into care delivery and the **de-implementation of low value care**.

- Involves early and active engagement of practice partners and end users
- Draws from rich theoretical foundation for understanding, designing, and evaluating complex implementation processes and their multilevel contextual interactions

https://edition.cnn.com/travel/article/shibuya-crossing-tokyo-japan/index.html

Intersection

research : practice

The bidirectional aims of implementation science are:

- to improve the quality and effectiveness of health care, and
- to shape future research priorities.

Typical implementation science questions

Stakeholder involvement

How can **stakeholders** be involved in designing/adapting an intervention to improve implementability?

Considering context

How can I design an **implementation approach (strategies)** to be successful in my context?

Evaluation

How and why was the implementation successful, or not?

Implementation science made (too) simple

- Evidence-based practice / innovation / clinical measures == **THE THING**
- Implementation strategies == the stuff we do to try to help people/places **DO THE THING**

Curran, G.M. Implementation science made too simple: a teaching tool. Implement Sci Commun 1, 27 (2020).

Effectiveness vs. Implementation Research

	Effectiveness research	Implementation research
Study aim: to evaluate a…	Clinical intervention	Implementation strategy
Typical intervention	Drug, procedure, therapy, product, evidence-based practice, guidelines	Techniques used to enhance use of a clinical practice: involving clinician behavior or organizational practice change
Primary outcomes	Symptoms, health outcomes	Adoption, Appropriateness, Costs, Feasibility, Fidelity, Penetration, Sustainability
Typical unit of analysis, randomization	Patient	Clinician, team, organization

Hybrid effectiveness-implementation trials

effectiveness > implementation

Type I

effectiveness = implementation

Type II

effectiveness < implementation

Type III

Curran, Geoffrey M., et al. "Effectiveness-implementation hybrid designs: combining elements of clinical effectiveness and implementation research to enhance public health impact." *Medical care* 50.3 (2012): 217.

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Examples from Zurich (and beyond)

Example 1: prevention of non-ventilator-associated healthcare acquired pneumonia (nvHAP)

Setting

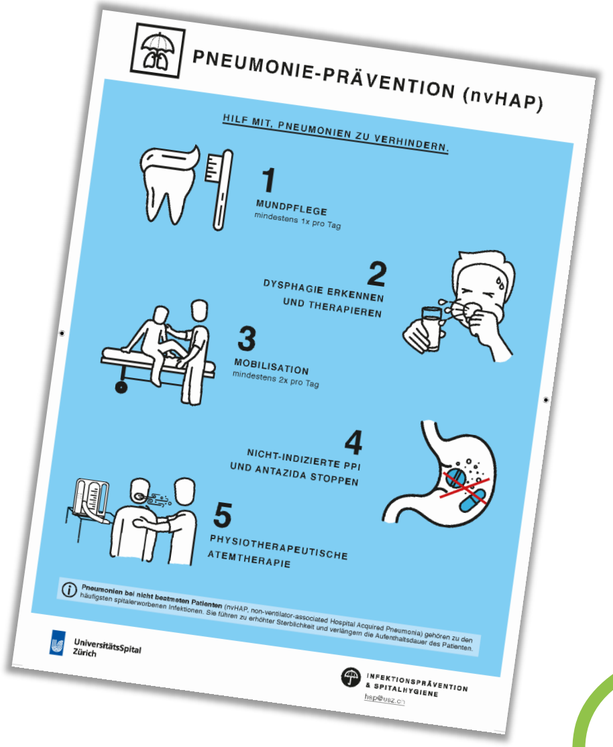
- University-affiliated, tertiary care hospital
- 10 medical and surgical departments

We aim to simultaneously test:

- A clinical intervention (USZ nvHAP Bundle) → *Effectiveness*
- A multifaceted tailored implementation strategy → *Implementation*

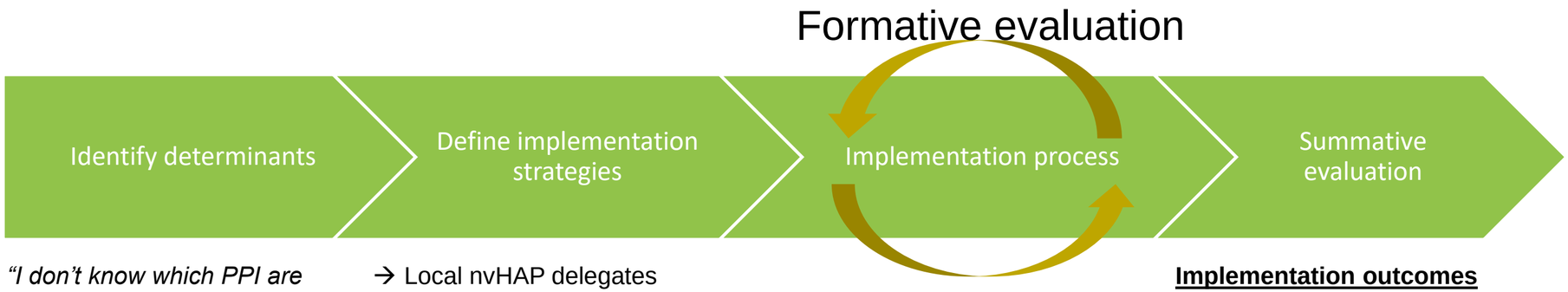
Mixed-methods, type 2 hybrid trial

- Quantitative stepped-wedge quasi-experimental trial → *Effectiveness*
- Longitudinal qualitative study and formative evaluation based on interviews, focus groups, and observations → *Implementation*



(Study protocol: Wolfensberger* Clack* et al. BMC Infectious Diseases, 2020)

Example 1: prevention of non-ventilator-associated healthcare acquired pneumonia (nvHAP)



"I don't know which PPI are really necessary" (knowledge)

"My patients would prefer not to be mobilized or have to brush their teeth" (outcome expectancy)

"We already have 100 things we have to think about when admitting patients" (memory)

"I don't have experience screening for dysphagia" (skills)

→ Local nvHAP delegates
→ Implementation blueprints during "Action Plan" meetings
  → Information dissemination (education)
  → Practical skills training (how to use swallowing assessment)
  → Environmental restructuring (reminders, standardization, provision of toothbrushes)

Continue identifying determinants

Housekeeping! Patients!

Recurring education for wards with high-turnover!

Implementation outcomes
- Acceptability
- Appropriateness
- Fidelity
- Sustainability

(Study protocol: Wolfensberger* Clack* et al. BMC Infectious Diseases, 2020)

Example 1: prevention of non-ventilator-associated healthcare acquired pneumonia (nvHAP)

- Implementation success scores correlated with lower nvHAP rate ratios!

Prevention of non-ventilator-associated hospital-acquired pneumonia in Switzerland: a type 2 hybrid effectiveness–implementation trial

Aline Wolfensberger*, Lauren Clack*, Stefanie von Felten, Mirjam Faes Hesse, Dirk Saleschus, Marie-Theres Meier, Katharina Kusejko, Roger Kouyos, Leonhard Held, Hugo Sax

Summary

Background Non-ventilator-associated hospital-acquired pneumonia (nvHAP) is a frequent, but under-researched infection. We aimed to simultaneously test an nvHAP prevention intervention and a multifaceted implementation strategy.

Methods In this single-centre, type 2 hybrid effectiveness–implementation study, all patients of nine surgical and medical departments at the University Hospital Zurich, Switzerland, were included and surveyed over three study periods: baseline (14–33 months, depending on department), implementation (2 months), and intervention (3–22 months, depending on department). The five-measure nvHAP prevention bundle consisted of oral care, dysphagia screening and management, mobilisation, discontinuation of non-indicated proton-pump inhibitors, and respiratory therapy. The implementation strategy comprised department-level implementation teams who conducted and locally adapted the core strategies of education, training, and changing infrastructure. Intervention effectiveness on the primary outcome measure of nvHAP incidence rate was quantified using a generalised estimating equation method in a Poisson regression model, with hospital departments as clusters. Implementation success scores and determinants were derived longitudinally through semistructured interviews with health-care workers. This trial is registered with ClinicalTrials.gov (NCT03361085).

Findings Between Jan 1, 2017, and Feb 29, 2020, 451 nvHAP cases occurred during 361 947 patient-days. nvHAP incidence rate was 1·42 (95% CI 1·27–1·58) per 1000 patient-days in the baseline period and 0·90 (95% CI 0·73–1·10) cases per 1000 patient-days in the intervention period. The intervention-to-baseline nvHAP incidence rate ratio, adjusted for department and seasonality, was 0·69 (95% CI 0·52–0·91; p=0·0084). Implementation success scores correlated with fewer nvHAP rate ratios (Pearson correlation −0·71, p=0·034). Determinants of implementation success were positive core business alignment, high perceived nvHAP risk, architectural characteristics promoting physical proximity of health-care staff, and favourable key individual traits.

Interpretation The prevention bundle led to a reduction of nvHAP. Knowledge of the determinants of implementation success might help in upscaling nvHAP prevention.

Funding Swiss Federal Office of Public Health.

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Introduction

Hospital-acquired pneumonia contributes the highest number of disability-adjusted life-years among the six major health-care-associated infections,[1] with non-ventilator-associated hospital-acquired pneumonia (nvHAP) representing 60–70% of cases.[2,3] As a consequence, around half of patients with nvHAP require intensive care unit admission,[3] many have a long hospital stay,[4] 20% need mechanical ventilation,[4] and up to 30% have a fatal in-hospital outcome.[3] However, previous research has focused almost exclusively on ventilator-associated pneumonia. In recent years, prevention initiatives have started to consider nvHAP.[5] Notably, in 2022, the Society of Healthcare Epidemiology of America guideline for the first time included a section on nvHAP prevention, although little robust data existed on intervention strategies.[2]

Traditionally, effectiveness studies have been used to evaluate interventions and implementation studies to test strategies for delivering the intervention. Combining both study types in a hybrid approach produces simultaneous results on the effectiveness of the intervention and its implementation.[6] This approach helps to provide understanding and to facilitate replication and scale-up of a new intervention more broadly and rapidly. We aimed to conduct a type 2 hybrid effectiveness–implementation study to evaluate the effect of a prevention intervention and multifaceted implementation strategy on nvHAP incidence rates and implementation outcomes.

Methods

Study design and participants

This type 2 hybrid effectiveness–implementation trial with a quasi-experimental, non-randomised,

Lancet Infect Dis 2023

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See Online/Comment https://doi.org/10.1016/S1473-3099(22)00865-2

*Contributed equally

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Correspondence to: Dr Aline Wolfensberger, Department of Infectious Diseases and Hospital Epidemiology, University Hospital Zurich, University of Zurich, 8091 Zurich, Switzerland aline.wolfensberger@usz.ch

(Results: Wolfensberger* Clack* et al. Lancet Infectious Diseases, 2023)

Example 2: European implementation of infection prevention and antimicrobial stewardship (REVERSE)

Setting
- 24 acute care hospitals in 4 European countries

We aim to simultaneously test:
- Clinical interventions (Infection prevention & antimicrobial stewardship) → *Effectiveness*
- Enhanced vs. basic implementation support → *Implementation*

Mixed-methods, type 2 hybrid trial
- Quantitative stepped-wedge cohort study→ *Effectiveness & Implementation*
- Longitudinal qualitative study → *Implementation*
- Health economic evaluation → *costs related to Effectiveness & Implementation*

www.reverseproject.eu

REVERSE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 965265.

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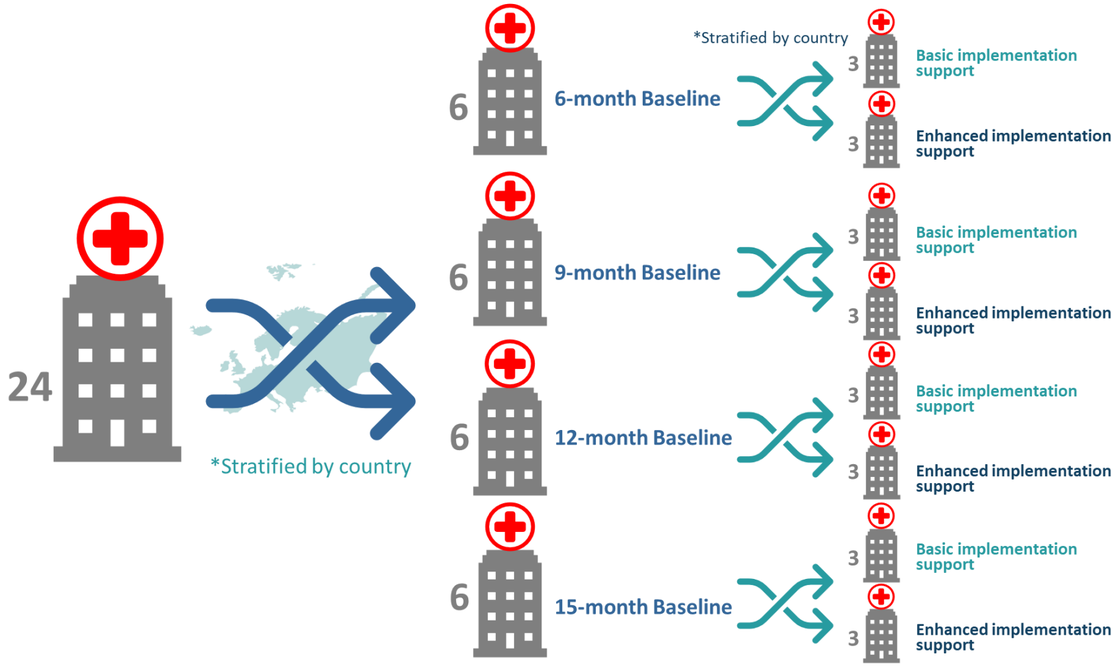

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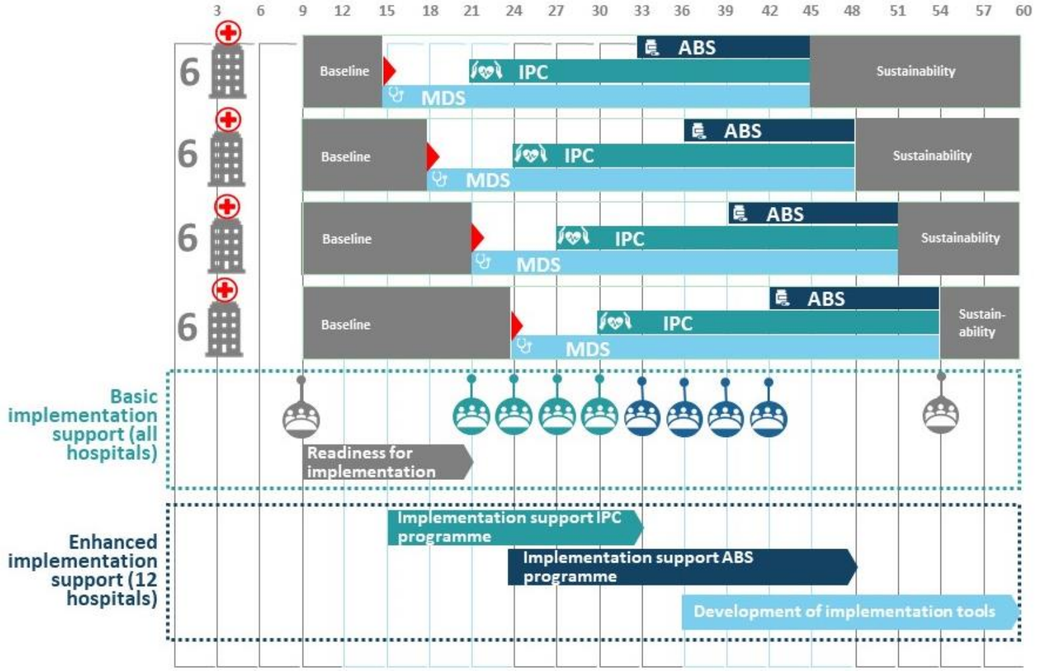

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Key messages

Why is implementation science important?

- Offers rigorous research methods, theories, models and frameworks to accelerate and improve research translation
- Implementation science is a growing field with an extensive methodological toolbox

Opportunities for implementation science & public health

- Stakeholder engagement
- Considering context (& selecting implementation strategies)
- Hybrid effectiveness-implementation designs → study what works, why, and how

Clinical research is not complete without implementation!

- Strengthen both health care research and practice
- Implementation science thrives on collaboration
- Ultimate goal of optimizing care & improving public health

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Thank you!

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