

The Importance of Evidence in Digital Health

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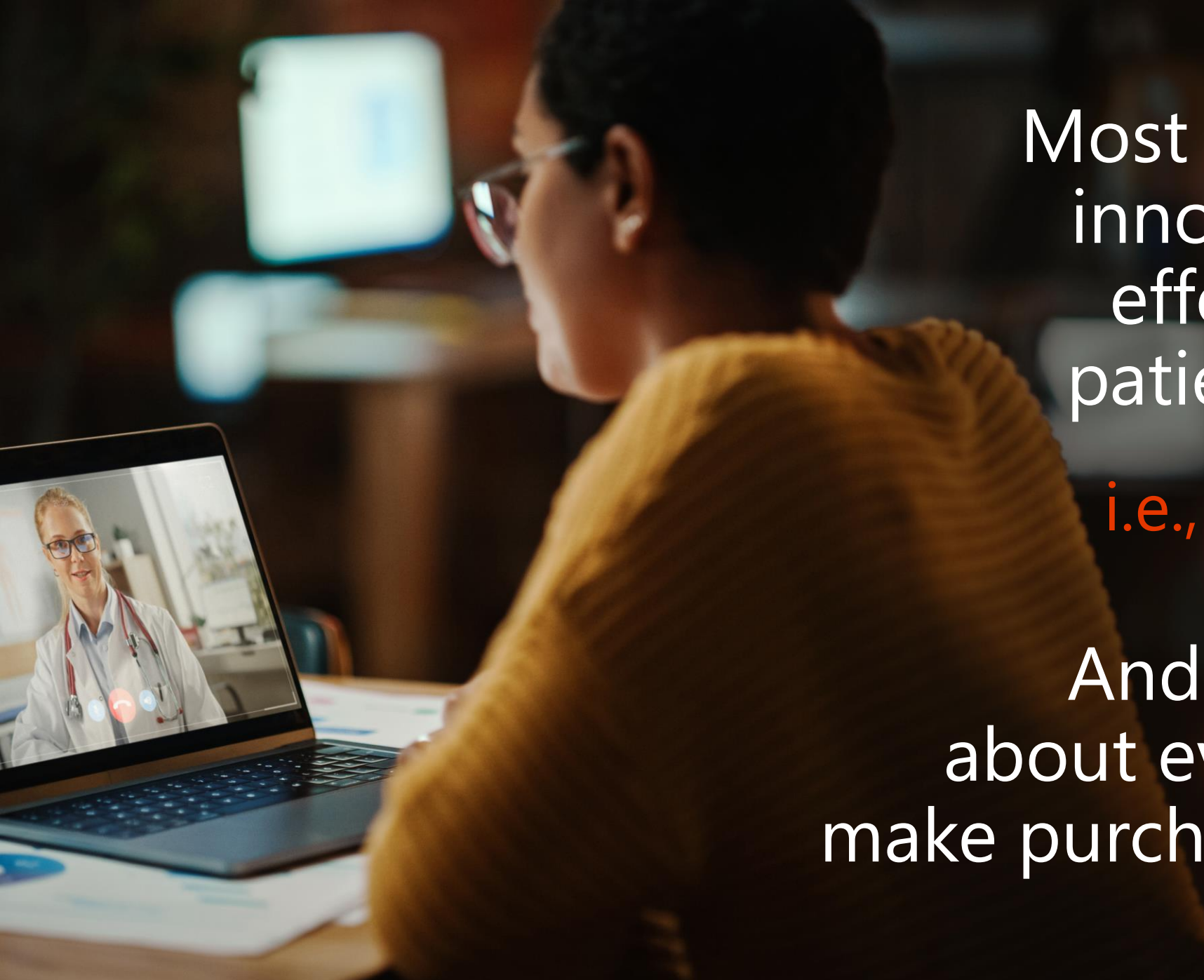


The fundamental challenge

Markets and science move at different speeds

Entrepreneurs are conflicted but most often want to move at the pace of the market

Quality Clinical Research is resource intensive.



Most health-focused innovations involve efforts to improve patients' well being

i.e., lives are at stake

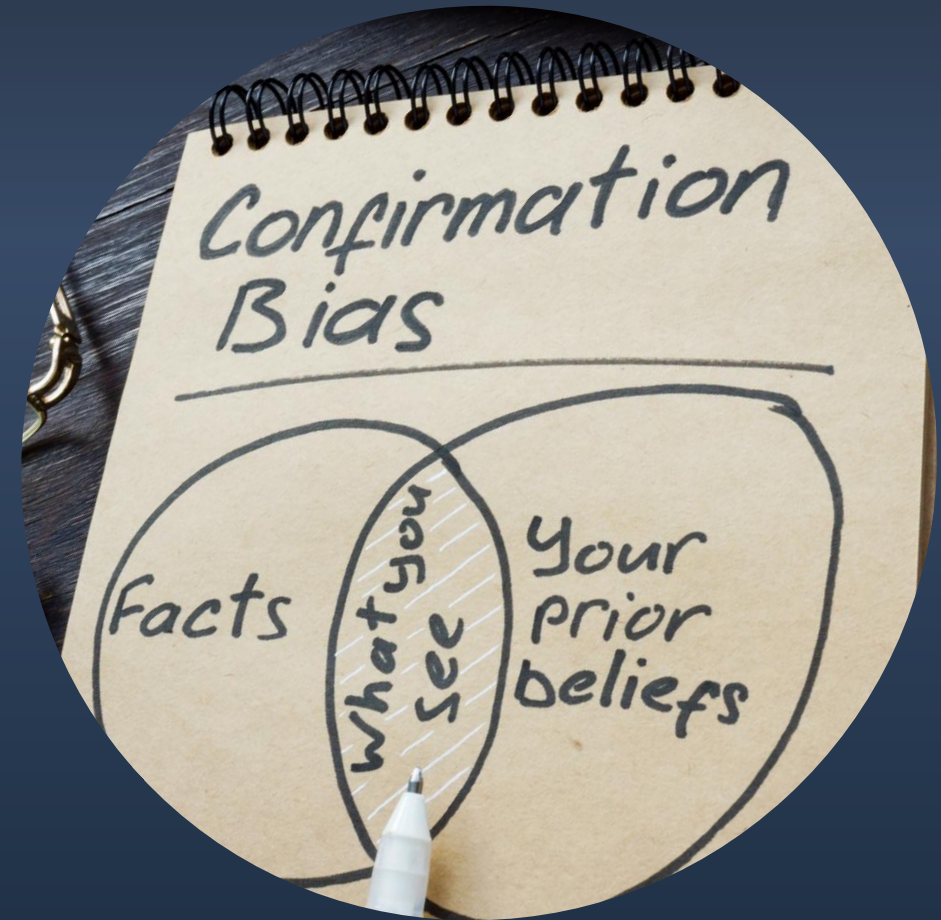
And...clinicians care about evidence as they make purchasing decisions

Why can't **common sense** guide us?

Cognitive biases – 162 of them!

The most common example
is the placebo effect

Conflicts of interest

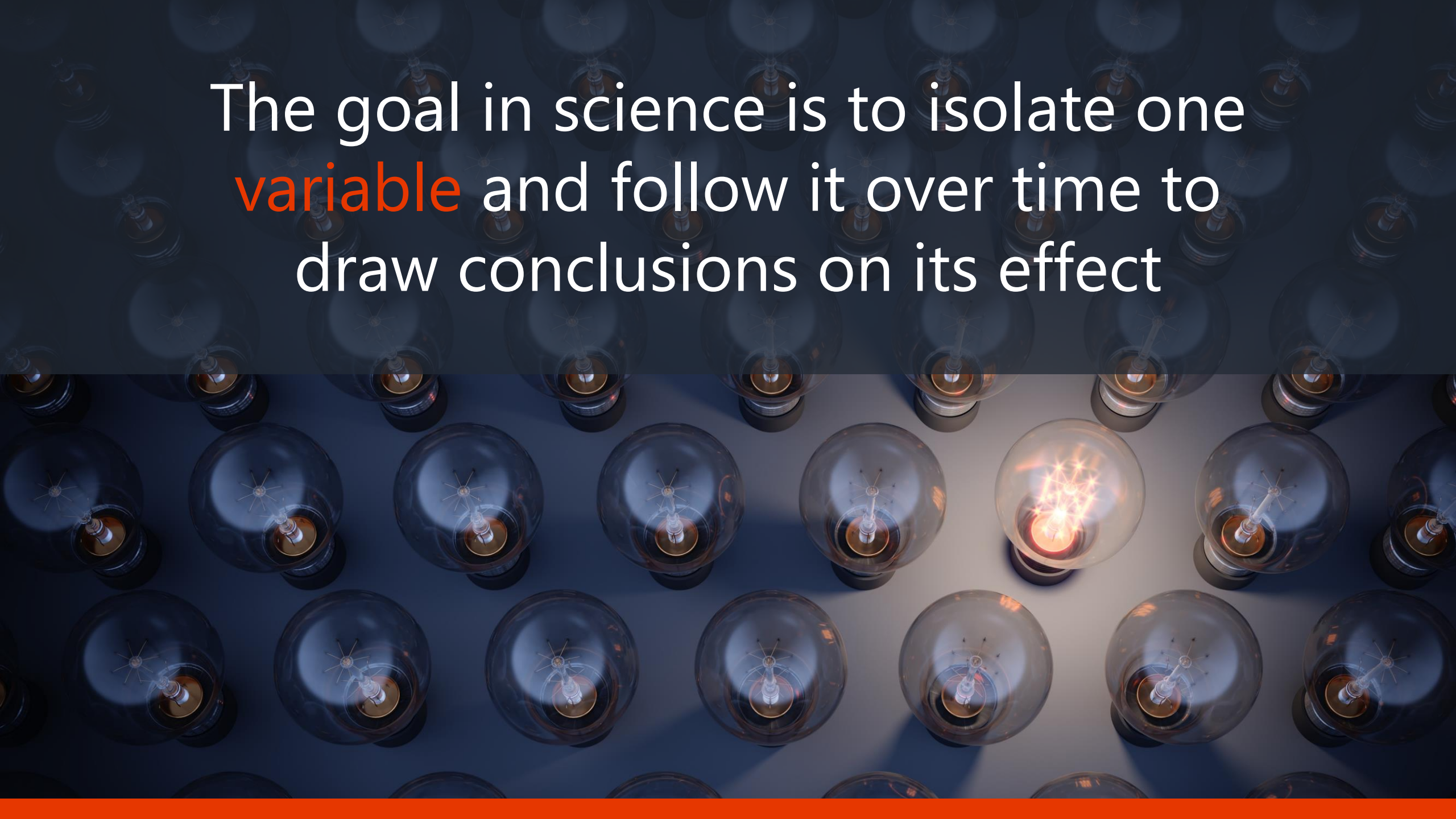


The background is a dark blue night sky filled with numerous stars of varying sizes and colors, including white, yellow, and blue. A grid of thin, light blue lines is overlaid on the sky, creating a celestial map or star chart appearance. At the bottom of the image, there is a solid, horizontal orange bar.

The **dog days** of summer



The **Fever** Tree

A top-down view of a grid of light bulbs. Most are unlit, but one in the middle-right area is glowing brightly, casting a warm light on the surrounding bulbs. The background is dark blue.

The goal in science is to isolate one **variable** and follow it over time to draw conclusions on its effect

Ways to gather evidence (**study design**)

Observational studies

- regression to the mean

- learning bias

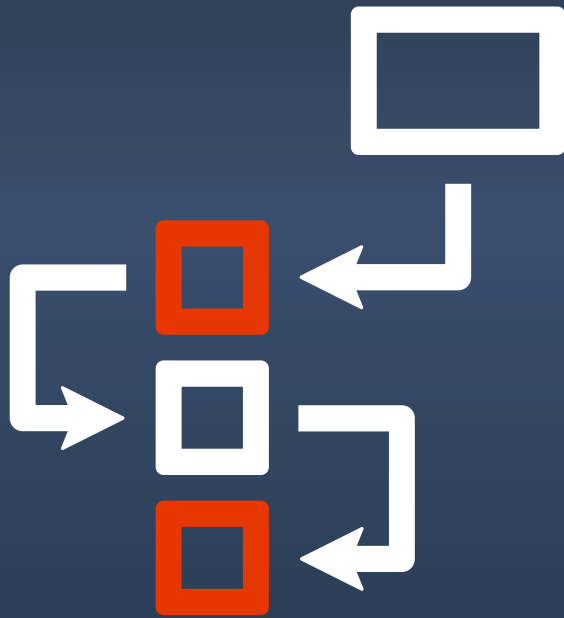
Before and after studies

Case-control studies – imperfect matching

Single-blind trials – possible study staff bias

Double-blind trials – difficult with digital interventions

Common logic traps



Correlation is not causation

Digital health interventions
change subjects in multiple ways
(before-after studies)

Null hypothesis, Type I (false +)
and type II (false -) errors



Where are you on the **evidence** journey?

1. Keen observation leads to hypothesis generation
2. Hypothesis testing in small samples
3. Large-scale, randomized, controlled trials
4. Multiple studies point to same conclusion

Is video telehealth of **diagnostic quality**?



Original Investigation | Health Informatics

Assessment of Clinician Diagnostic Concordance With Video Telemedicine in the Integrated Multispecialty Practice at Mayo Clinic During the Beginning of COVID-19 Pandemic From March to June 2020

Bart M. Demaerschalk, MD, MSc; Andrew Pines, MD; Richard Butterfield, BS, MA; Jack M. Haglin, MD; Tufia C. Haddad, MD; James Yiannias, MD; Christopher E. Colby, MD; Sarvam P. Terkonda, MD; Steve R. Ommen, MD; Matthew S. Bushman, BSc; Troy G. Lokken, MBA; Rebecca N. Blegen, MBA; Mckenzie D. Hoff, MSW; Jordan D. Coffey, MBA, MHA, MA; Greg S. Anthony, MBA, MSPH; Nan Zhang, MSc; for the Diagnostic Accuracy of Telemedicine Utilized at Mayo Clinic Alix School of Medicine Study Group Investigators

Is telehealth additive or substitutive?




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www.nature.com/npjdigitalmed

BRIEF COMMUNICATION **OPEN**



The impact of expanded telehealth availability on primary care utilization

Ram A. Dixit¹, Raj M. Ratwani¹  , Jasmine A. Bishop², Kevin Schulman³, Christopher Sharp³, Kerry Palakanis⁴ and Ethan Booker 

Barriers to high-quality clinical research in LMIC

Lack of financial and human capacity

Ethical and regulatory system obstacles

Lack of a research environment

Operational barriers

Competing demands

Source: Alemayehu et al. <https://equityhealthj.biomedcentral.com/articles/10.1186/s12939-018-0748-6>

Possible Solutions

Capacity development

Links between research policy and practice

Emphasis on a systems approach

Source: Franzen et al. doi:10.1136/bmjopen-2016-012332

Digital Twins



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www.nature.com/npjdigitalmed

EDITORIAL **OPEN**

Health digital twins as tools for precision medicine:
Considerations for computation, implementation, and
regulation

 Check for updates

Wrapping up

Evidence gathering takes **time, costs money,** and **requires open-mindedness and patience**

Most other ways of looking at the world are **fraught with bias**

Industry and academia should do more **collaboratively** to bring the two worlds together

It is critical that **LMIC strengthen their capacity** to do high-quality biomedical research



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