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VIEWPOINTS

Where Is the Implementation Science? An Opportunity to Apply Principles During the COVID-19 Pandemic

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The coronavirus disease 2019 pandemic represents a global crisis that has received extraordinary response from healthcare workers and scientists. One critical but potentially overlooked field in a pandemic is implementation science—the study of methods to reduce the research-to-practice gap. In this Viewpoint, we discuss the important role of implementation science during this and future pandemics and highlight considerations to maximize the utility of implementation research.

Keywords. implementation science; pandemic; COVID-19.

The coronavirus disease 2019 (COVID-19) pandemic represents a global crisis that will require Herculean responses from healthcare workers and scientists. Providing high-quality care during an unprecedented, rapidly evolving pandemic presents a steep learning curve for all. Many fields of science have mobilized to address this global crisis including infectious disease, epidemiology, virology, economics, and bioethics. One underutilized but highly salient field is implementation science—the study of methods to reduce the research-to-practice gap [1].

National health policy leaders have affirmed the critical role of research before, during, and after a pandemic [2]. The scientific community has nimbly mobilized trials testing the efficacy and effectiveness of interventions for patients with COVID-19. Indeed, rapid acquisition of rigorous trial data to support or quell potential interventions for COVID-19 is imperative. However, medicine suffers from a historical failure to translate research findings into practice, with 30%–40% of patients not receiving effective treatments and 20%–25% of patients receiving care that is unnecessary or potentially harmful [3]. Therefore, it is insufficient to identify efficacious interventions for COVID-19; we must also ensure that these interventions are delivered in such a way that optimizes population health impact and equity. Implementation science offers a set of frameworks, outcomes, strategies, and evaluation approaches for this purpose. In this article, we discuss the important role of implementation science during this and future pandemics and highlight considerations to maximize the utility of implementation research.

APPLICATIONS OF IMPLEMENTATION SCIENCE

Implementation science focuses on how best to deploy evidence or evidence-based practices (EBPs) in the real world. Other key foci include learning from natural experiments via observational studies about how best to scale or sustain evidence, as well as the comparative evaluation of strategies to implement EBPs into practice (see Table 1 for insights from implementation science relevant to the COVID-19 pandemic). To accomplish these objectives, implementation scientists evaluate intermediary outcomes including perceptual outcomes such as acceptability (how palatable people find the EBP), appropriateness (how well the EBP fits the context), feasibility (how possible it is to deploy the EBP) and behavioral outcomes such as reach (how many people receive the EBP), adoption (how many people choose to use the EBP), fidelity (how closely the EBP is followed), cost, and sustainability in real-world settings.

WHAT IS THE PRACTICE OF INTEREST AND EVIDENCE SUPPORTING IT?

When determining how to apply implementation science to COVID-19 research, we offer the "subway-line metaphor." [4] First, researchers should identify the "practice of interest" to be implemented. For COVID-19 research, practices of interest could include candidate vaccine or drug therapies, supportive care such as ventilator management or prone positioning, healthcare delivery approaches such as telemedicine platforms or cohorting patients in dedicated respiratory units, or population health prevention strategies such as physical distancing

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Table 1. Applications of Implementation Science to the Coronavirus Disease 2019 Global Pandemic

Applications	Examples
1. Identify the practice of interest and the evidence that exists for this practice	Practices of interest could include candidate vaccine or drug therapies, supportive care approaches such as ventilator management or prone positioning, healthcare delivery approaches such as using telehealth platforms or cohorting patients in dedicated respiratory units, or population health strategies such as physical distancing and widespread testing
2. Design for implementation in the earliest stage of scientific discovery	Include implementation scientists as core members of discovery teams with regard to identifying interventions for COVID-19
3. Conduct hybrid effectiveness-implementation trials	For newly identified potentially effective interventions (eg, prone positioning in ARDS patients), include both effectiveness (eg, mortality) and implementation (how well prone positioning was used) outcomes in RCTs
4. Attend to context such as patient, clinician, unit, organizational, regional, and country factors that might affect implementation success	When implementing a newly identified evidence-based practice such as prone positioning in ARDS patients, understand key factors at multiple levels such as clinician attitudes and knowledge, and organizational endorsement
5. Include an emphasis on implementation evaluations to understand population health impact	Study personal protective equipment donning/doffing technique and/or use of low tidal volume ventilation strategy for COVID-19 patients with ARDS

Abbreviations: ARDS, acute respiratory distress syndrome; COVID-19, coronavirus disease 2019; RCT, randomized controlled trial.

and widespread testing, or mental health prevention and intervention.

DESIGN FOR IMPLEMENTATION DURING DISCOVERY RESEARCH

Because COVID-19 is a novel disease, many of the relevant practices of interest have not yet shown efficacy or effectiveness. Examples of these practices are vaccines, pharmacotherapy, and convalescent plasma, which need to be tested in nimble but rigorous clinical trials. In this case, implementation principles should be considered in the development and test conditions of the intervention where possible.

USE HYBRID EFFECTIVENESS-IMPLEMENTATION DESIGNS

In some cases, practice recommendations are supported by effectiveness studies for other populations, but there is uncertainty whether the study setting or population is generalizable to the context of the COVID-19 pandemic. For example, although robust literature supports prone positioning for patients with acute respiratory distress syndrome (ARDS) [5], questions about the applicability of this finding to patients with COVID-19 ARDS remain. In this scenario, testing both effectiveness and implementation research questions using an effectiveness-implementation hybrid trial design has advantages [6]. In the example of prone positioning, a hybrid study could pair a traditional effectiveness outcome (eg, mortality) with contextual inquiry such as acceptability and feasibility of prone positioning under isolation precautions, and drivers of nonadherence to prone positioning protocols. Another application of hybrid effectiveness-implementation approach is when a practice of interest has not shown efficacy but is supported by strong face validity or already has implementation momentum. For example, cohorting patients in specialized respiratory units has considerable face validity for reducing transmission of the severe acute respiratory syndrome coronavirus 2. However, there is no evidence that this strategy is effective in improving outcomes. A hybrid effectiveness-implementation design could combine a pragmatic randomized controlled trial or high-quality observational design with rigorous implementation science methodology to simultaneously study (1) effectiveness of cohorting patients to improve health outcomes, (2) contextual factors relevant to implementation of dedicated respiratory units, and (3) comparative effectiveness of different implementation strategies for cohorting.

ATTEND CAREFULLY TO CONTEXT

A hallmark of implementation science is its focus on contextual factors. In perhaps no other setting is context more important than in an unprecedented global crisis such as COVID-19. Healthcare systems operate under markedly adapted organizational rubrics, social structures are disrupted, and patients and providers bring myriad new beliefs and attitudes into the setting. Determining these contextual factors is essential in informing clinicians and policymakers whether an intervention fails because it is not effective or because it was not implemented appropriately for the given context. Moreover, identifying the essential contextual factors for successful interventions allows broadly generalizable learning about successful strategies to enhance implementation of future interventions.

INCLUDE AN EMPHASIS ON IMPLEMENTATION EVALUATIONS TO UNDERSTAND POPULATION HEALTH IMPACT

Finally, practices that have shown efficacy and effectiveness should undergo robust implementation evaluations to ensure these practices are achieving maximum population health impact. Examples of these practices relevant to the COVID-19 pandemic include proper personal protective equipment technique

and the use of low tidal volume ventilation for COVID-19 patients with ARDS. Another area of COVID-19 research where the role of implementation science is increasingly appreciated is the study of digital health innovations. Funding agencies have recognized the importance of evaluating challenges encountered in the rapid expansion of telemedicine during COVID-19, including effects on quality, safety, and value of health system response to COVID-19 [7]. Here, implementation science studies might focus on contextual factors (ie, barriers and facilitators to the implementation of digital health innovations such as telemedicine), design or refinement of implementation strategies to support implementation, or comparative effectiveness of different implementation strategies. Concordantly, de-implementation of non-evidence-based practices, such as prophylactic hydroxychloroquine, may be needed.

CHALLENGES TO THE APPLICATION OF IMPLEMENTATION SCIENCE TO THE PANDEMIC

There are surmountable challenges when applying implementation science to pandemic research. Within the context of a global pandemic, questions about the level of evidence needed to change practice are paramount. Second, traditional approaches to data collection in implementation science may not match the timeline of this crisis. Often, rich contextual data are gained through in-person data collection such as longitudinal interviews or ethnography. These data collection techniques are ill-advised during a pandemic when public health experts recommend social distancing and when critical information is needed quickly. Instead, high-quality virtual interfaces can be substituted, although these types of interviews must be undertaken by experienced qualitative scientists with expertise in maximizing connection and information gain under suboptimal interview conditions. The importance of gaining knowledge efficiently may require rapid assessment methods for qualitative data analysis [8]. This may be compounded by the availability and attention of stakeholders, particularly front-line healthcare workers. During a pandemic, the healthcare workforce is highly stressed, which can limit time for stakeholder data collection or even seem distracting from front-line patient care. In response, implementation scientists should strive to streamline instruments and keep data collection minimally intrusive to front-line stakeholders, utilizing electronic health record data and/or observational data whenever possible.

CONCLUSIONS

The scientific community plays a critical role in mitigating the extraordinary impact of COVID-19 and future infectious disease outbreaks. Implementation science offers a valuable set of tools to ensure that best practices are optimally delivered, and thus must assert a nimble presence before, during, and after a pandemic.

Note

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