Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Editorial

COVID-19 Vaccination and Implementation Science: How One Can Benefit the Other

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As of September 16, 2021, more than 5.85 billion doses of the COVID-19 vaccine had been administered across the globe, 383 million of those in the United States.[1] Two-thirds of the US adult population have been fully vaccinated, as have almost 83% of persons aged ≥65 years.[2] These same numbers are reflected among nursing home staff and residents, 64% and 84% of who have been vaccinated, respectively.[3] Vaccination rates have increased in the wake of the Delta variant, but they remain suboptimal.

JAMDA has published numerous papers on COVID-19 vaccination in recent months, including reasons for vaccine hesitancy,[4,5] the importance of ease of access,[6] the potential utility of diversity/equity/inclusion committees to reduce racial disparities and improve vaccine uptake,[7] increased vaccination rates when requiring it as a condition of employment,[8] and the advocacy of AMDA—The Society for Post-Acute and Long-Term Care Medicine in that regard.[9] What is missing from the dialogue, however, is explicit recognition that COVID-19 vaccination—and in fact, all new recommended care practices—require an implementation science lens if they are to be fully adopted and sustained. Implementation science provides a framework to understand the uptake of research evidence into routine practice, with the ultimate goal of improving the quality and effectiveness of health services.[10] Employing this lens underscores why COVID-19 vaccination has been challenging in long-term care and sheds light on the broader context of striving to change any care practice.

Implementation science lays bare the complexity of "diffusion of innovations"[11]—in this case, the innovation being COVID-19 vaccination. The extent to which any new care practice is adopted relates to numerous considerations, all of which have been evident in the effort to vaccinate persons providing and receiving long-term care.

- The *innovation* itself, including its perceived benefits and risks; for COVID-19, the perceived risks have largely centered around safety, efficacy, and length of testing[12];
- *Communication and influence*, such as the extent to which potential adopters are similar to current adopters; in the case of COVID-19 vaccination, potential adopters tend to have lower education and income than adopters, suggesting a mismatch in communication and influence between the two[13];
- The *outer context*, a relevant example being less acceptance of vaccination among those holding certain political beliefs or of certain cultural backgrounds[12];
- *System antecedents* for the innovation; toward this end, decentralized decision making is known to promote adoption, but nursing homes tend to be centralized organizations[14];
- *Linkages*, such that if developers are linked to users early on, adoption is more likely—which of course was not the case in vaccine development;
- *System readiness* for the innovation, which is promoted by tension for change (certainly true of COVID-19) and also existing practices, policies, and resources; in many ways, efforts related to seasonal influenza vaccination in long-term care have promoted system readiness[15];
- The *adopter* himself or herself, such as the desire of long-term care staff to protect their patients and residents;
- System *assimilation*, which includes structural changes relating to the innovation, with a recent example being mandates for vaccination[16]; and
- The *implementation process*, such as whether frontline workers are involved in decision making, which is not typical of a centralized organization.

To simplify this complexity, some researchers have consolidated these areas into 5 domains (ie, the Consolidated Framework for Implementation Research): intervention characteristics, outer setting, inner setting, the process of implementation, and the characteristics of the individuals involved.[17]

Despite simplification, each component of implementation is itself complex. At the level of the individual adoptee, for example, the nursing home nursing assistant workforce ranges in age from younger than 20 years of age to older than 65, is almost equally white (42%) and black or African American (38%), and includes 13% who are Hispanic and 21% who are immigrants.[18] This variability is consequential, because cultural beliefs and norms influence perceptions of disease and also shape behavior[19,20]—take, for example, filial piety (familial allegiance) that is in part attributed to especially high vaccination rates of Native Americans.[21] Cultural adaptation and implementation science are in fact intertwined: implementation science offers the lens to identify what contextual factors influence adoption, and adaptation offers the tools to facilitate successful and equitable

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Table 1
Expert Recommendations for Implementing Change (ERIC)[30]

1. Use evaluative and iterative strategies
2. Provide interactive assistance
3. Adapt and tailor to context
4. Develop stakeholder interrelationships
5. Train and educate stakeholders
6. Support clinicians
7. Engage consumers
8. Utilize financial strategies
9. Change infrastructure

implementation.[22] Nonetheless, attempts to incorporate cultural adaptation into vaccine outreach and education are limited and could be bolstered by messaging that reflects differences in language and context to make it compatible with the cultural patterns, meanings, and values of a given population.[23,24] Toward that end, the Agency for Healthcare Research and Quality (AHRQ) has materials available under their "Spotlight on Vaccine Confidence" website that among other implementation components address individual differences in vaccine trust and diverse strategies to increase vaccination rates among nursing assistants.[25]

Thus, understanding the challenges of COVID-19 in the context of implementation science both underscores the complexity of changing care practices and provides a framework for the adoption of any new care practice. Such a framework can benefit adoption of innovations related to falls reduction,[26] deprescribing,[27] antibiotic stewardship,[28] palliative care,[29] and virtually any other practice, because in all instances, intervention characteristics, the outer setting, the inner setting, the process of implementation, and the characteristics of individuals are influential. It is for this reason that a major effort of implementation science is to consolidate the overwhelming number of strategies to better guide how innovations are implemented into various health care and clinical contexts. Implementation science has much to contribute in terms of understanding the often complex ecosystem in which many long-term care settings operate, and offers a number of strategies and evaluation insights that can help better inform and tailor effective adoption of innovation in nursing homes, assisted living communities, and similar environments. For example, consider the Expert Recommendations for Implementing Change (ERIC) shown in Table 1. The 9 ERIC categories include numerous specific strategies to guide implementation efforts (including quality improvement) to facilitate adoption of evidence-based innovations.[30]

In focusing on how implementation science elements could have been better harnessed to improve vaccination uptake in long-term care, it is important to recognize that the unprecedented nature of the COVID-19 pandemic and its catastrophic effects highlight structural and social challenges that no implementation approach could likely overcome—including the extreme political polarization contributing to individuals' decisions to remain unvaccinated, as well as media that actively traffic misinformation. In fact, it is for these and related reasons that it is essential to appreciate the complexity of changing care practices; in sum, COVID-19 vaccination is a global case study of implementation science.

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