

REVIEW ARTICLE

Around the EQUATOR with clinician-scientists transdisciplinary aging research (Clin-STAR) principles: implementation science challenges and opportunities

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Abstract

The Institute of Medicine and the National Institute on Aging increasingly understand that knowledge alone is necessary but insufficient to improve healthcare outcomes. Adapting the behaviors of clinicians, patients, and stakeholders to new standards of evidence-based clinical practice is often significantly delayed. In response, over the past twenty years, Implementation Science has developed as the study of methods and strategies that facilitate the uptake of evidence-based practice into regular use by practitioners and policy-makers. One important advance in Implementation Science research was the development of Standards for Reporting Implementation Studies (StaRI), which provided a 27-item checklist for researchers to consistently report essential elements of the implementation and intervention strategies. Using StaRI as a framework, this review discusses specific Implementation Science challenges for research with older adults, provides solutions for those obstacles, and opportunities to improve the value of this evolving approach to reduce the knowledge translation losses that exist between published research and clinical practice.

KEYWORDS

geriatrics, implementation science, knowledge translation, reporting standards

This is the first of a series of manuscripts for the Journal of the American Geriatrics Society supported by the Clinician-Scientists Transdisciplinary Aging Research Leadership Core. While multiple textbooks and review articles exist to support the design, conduct, and reporting of research methods for general populations, investigators in the field of geriatrics often encounter unique challenges related to the complexities of aging. The intent of this series will be to provide first-

hand insights for geriatric researchers on topics such as pragmatic randomized controlled trials, diagnostics, machine learning, and big data investigations.

INTRODUCTION

In 2001 the Institute of Medicine report *Crossing the Quality Chasm: A New Health System for the 21st Century* highlighted the concept of Knowledge Translation

in which “Making use of new knowledge requires health professionals...use new tools to access and apply the expanding knowledge base.”¹ Over the subsequent decades, Implementation Science arose as the study of methods and strategies that facilitate the uptake of evidence-based practice into regular use by practitioners and policymakers. A decade later, the National Institutes of Health created a framework depicting the components of and objectives of Implementation Science research (Figure 1).² Shortly thereafter, Standards for Reporting Implementation Studies (StaRI) provided a 27-item checklist for researchers to consistently report essential elements of the implementation and intervention strategies.^{3,4}

Journal of the American Geriatrics Society (JAGS) readers were introduced to StaRI in 2017 and implementation scientists were encouraged to use this new Enhancing the Quality and Transparency of Health Research (EQUATOR) Network reporting standard.⁵ The National Institute on Aging increasingly understands that knowledge alone is necessary but insufficient to improve healthcare outcomes since adapting the behaviors of clinicians, patients, and stakeholders to new standards of evidence-based clinical practice is complex, disjointed, and often significantly delayed.⁶ To improve the quality and relevance of clinical research outcomes for older adults, the National Institutes of Health recognized that the inclusion of participants across the lifespan, such as at the extremes of age, is an important factor to consider when assessing funding priority.⁷ Implementation Science research is appearing with increasing frequency in *JAGS* as we discover more about older adults, caregivers, and aging infrastructure.^{8–13} Implementation Science is needed to accelerate the uptake and sustainability of knowledge across healthcare settings in the team-based environment where contemporary older adult medical and surgical management exists. The objectives of this review are to highlight Implementation Science challenges for aging-focused researchers, provide solutions for those obstacles, and identify opportunities to improve the value of this evolving approach in order to reduce the knowledge translation decay that exists between published research and clinical practice.

IMPLEMENTATION SCIENCE BARRIERS FOR GERIATRICS RESEARCHERS

StaRI's 27-item checklist presents numerous challenges for transdisciplinary aging focused researchers with Implementation Science objectives. Table 1 is a condensed version of the StaRI checklist illustrating theoretical, operational, and logistical challenges likely to arise

Key points

- The EQUATOR Network provides a 27-item StaRI checklist to standardize the quality of Implementation Science research reporting, but older adults present unique challenges for researchers to adhere to these recommendations.
- Anticipated obstacles for geriatric researchers occur with each component of StaRI, including the selection of frameworks, contextual descriptors, meaningful subgroups, outcomes that matter, and comprehensive cost analyses.
- Early engagement of Implementation Science researchers and opportunities to overcome these barriers could accelerate knowledge translation.

Why does this paper matter?

Implementation Science is an emerging research method across healthcare fields and is being applied with increasing frequency in geriatrics, yet the unique obstacles in older adults remain undefined.

as Implementation Science researchers strive to adhere to these reporting recommendations.

StaRI introduction

Standards for Reporting Implementation Studies (StaRI) recommends explicit and evidence-based justification for the intervention implemented as well as the theory or framework employed as the Implementation Science foundation. Over 100 theoretical models for dissemination and/or implementation research exist with the intent to bridge research and practice.¹⁴ Several of these models, including the RE-AIM Framework, Promoting Action on Research Implementation in Health Services, Precede-Proceed Model, Practical Robust Implementation and Sustainability Model (PRISM), and the Consolidated Framework for Implementation Research (CFIR), have been deployed in implementation studies. While some of these models have been used in geriatric research, many others remain theoretical and untested. None of these models has demonstrable superiority over another, so older adult researchers have employed different frameworks across studies. For example, a

Framework for Enhancing the Value of Research for Dissemination & Implementation

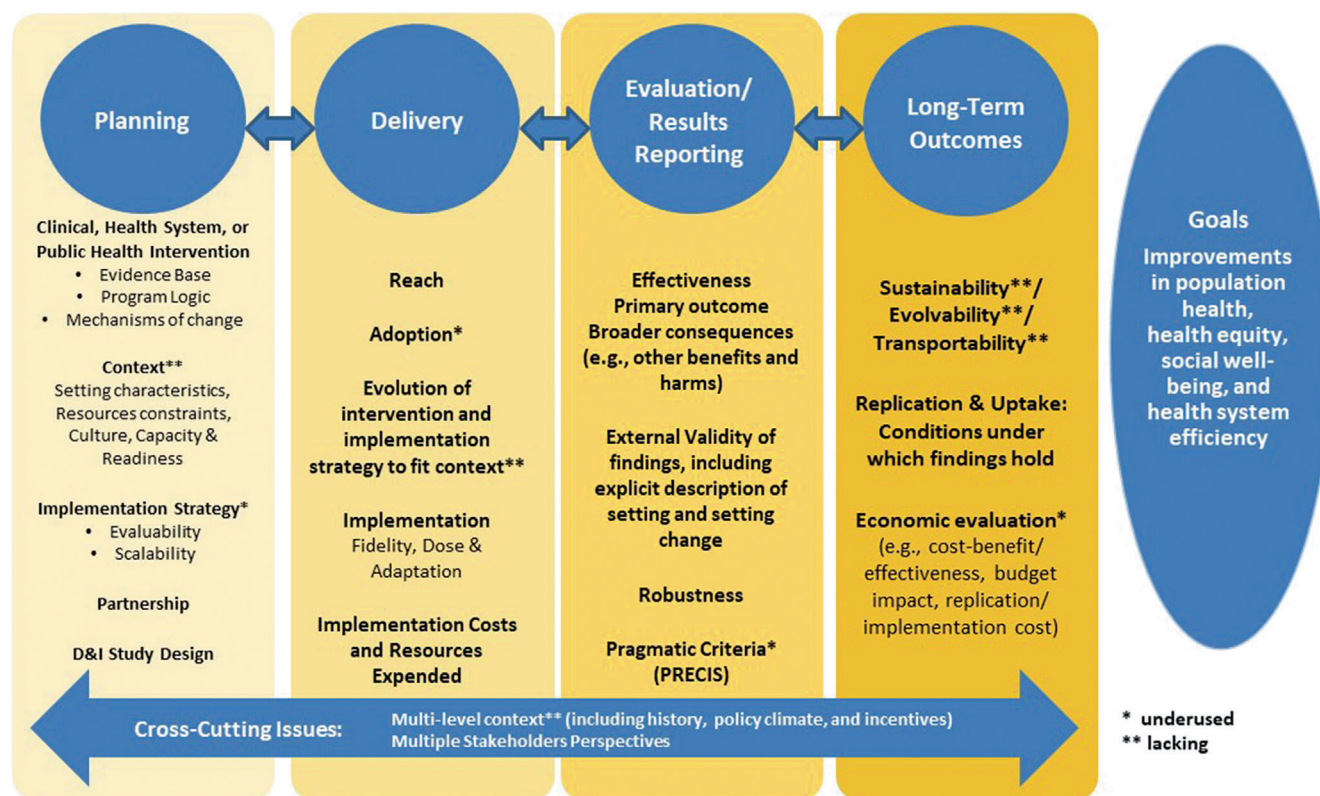


FIGURE 1 Framework for enhancing the value of dissemination and implementation research developed by national institute of health work group

systematic review of older adult physical activity programs that included 137 studies found that only 11 utilized any framework, and those used six different frameworks.¹⁵ Others have used the Complex Adaptive Systems model to create collaborative dementia care healthcare systems.⁸ Clinical informatics researchers using clinical decision support as knowledge translation tools have used PRISM as an integrative framework.¹⁶ More frequently, older adult researchers have used CFIR in nursing homes and acute care settings.^{10,13} Ongoing efforts to adapt CFIR for frail older adult primary care populations are underway, as is the work to conceptualize inner and outer settings that affect community-based innovations for those with more severe injury or illness in complex healthcare settings.^{17–19}

StaRI context

The population and healthcare setting in which innovations are implemented are essential for researchers to describe and often extend beyond the hospital or medical office into homes and communities. The Equity-focused

Implementation Research for health programs (EquIR) framework identifies challenges in the pre-intervention, implementation, and post-implementation phases of community-based participatory research.²⁰ These challenges include the identification of key partners while understanding community perceptions and values, obtaining and maintaining ethical oversight, aligning budgetary concerns with intellectual property rights, and sustainability. Failure to contemplate each of these components limits future investigators' ability to adapt the intervention or implementation strategy for their population and resources. In addition, understanding the context in which specific interventions fail to demonstrate anticipated benefits provides decision-makers opportunities to distinguish *unsuccessful intervention strategies* from *ineffective interventions*. For example, the Strategies To Reduce Injuries and Develop confidence in Elders' fall prevention trial did not reduce injurious falls despite a robust and evidence-based, individually targeted, multi-factorial intervention. This may not be an ineffective intervention, as post-hoc interviews guided by CFIR identified multiple potential contextual barriers resulting in unsuccessful implementation.¹² By understanding

TABLE 1 Older adult research related StaRI challenges

StaRI checklist	Implementation barriers	Intervention barriers
Introduction	<ul style="list-style-type: none"> Underlying theory/framework/model employed as Implementation Strategy often untested in complex older adult healthcare 	<ul style="list-style-type: none"> Few unequivocal interventions exist in geriatrics that consistently exhibit benefits that outweigh risks in pre-implementation research settings Medical complexity of older adult healthcare leads to challenges in implementing interventions uniformly across populations.
Methods: Description context	<ul style="list-style-type: none"> Acceptability of new knowledge varies across sites and is challenging to measure objectively Wide divide in socioeconomic status among older adults. 	<ul style="list-style-type: none"> Healthcare may be fractured among multiple providers. Services may not be reimbursed by Medicare. Local social services and access to transportation differ greatly between counties. Rural areas are underserved in research.
Methods: Description targeted “sites”	<ul style="list-style-type: none"> Age cutoffs may be less helpful than frailty levels, but are commonly used for services, clinics, and other interventions. Access to geriatricians varies significantly across hospitals Older adults in the community who are homebound or vulnerable are often functionally excluded from study recruitment due to lack of access to internet or healthcare. 	<ul style="list-style-type: none"> Eligibility criteria can become overly restrictive, excluding those with cognitive impairment or multiple comorbidities. Caregiver burden and availability are often not considered.
Methods: Evaluation outcomes	<ul style="list-style-type: none"> Pre-determined target outcomes are often not aligned with what matters most to older adults. 	<ul style="list-style-type: none"> Common outcomes are often not patient-centered. Acceptability of intervention to patient (and caregiver) should be reported. Outcome assessment scales/tools may not be validated in older adults or those with cognitive impairment.
Methods: Evaluation economic evaluation	<ul style="list-style-type: none"> Effective interventions may not be cost-effective unless all aspects of older adult care are considered CMS costs are frequently used as a stand-alone for healthcare costs. This does not include the 21% of people on Medicare who buy Medigap insurance and another 18% dual covered by employee-sponsored insurance. 	<ul style="list-style-type: none"> Healthcare costs often do not include out-of-pocket costs to patients or unpaid caregiver time needed for the intervention.
Methods: Subgroups	<ul style="list-style-type: none"> Pertinent subgroups rarely considered or analyzed distinctly for implementation or intervention approaches (frail, persons living with dementia, socially isolated) 	
Results: Fidelity	<ul style="list-style-type: none"> Geriatric-focused adaptation of implementation approach (who, what, where, when, how) rarely contemplated Healthcare crises from other comorbidities not addressed by the intervention can interrupt adherence to intervention. 	<ul style="list-style-type: none"> Core components of intervention for older patients and/or care partners and intensity with which those components delivered uncommonly reported
Discussion: Policy or clinical practice guideline implications	<ul style="list-style-type: none"> Investigators often miss opportunities to promote incorporation of effective implementation strategies into clinical practice guidelines 	<ul style="list-style-type: none"> Healthcare reimbursement structures do not adapt quickly to promote effective interventions. Clinical Practice Guidelines often miss opportunity to filter recommendations through geriatric perspective

individual patient's financial resources and mobility, as well as the connectedness of their healthcare setting and ability to navigate between various professional clinics and home health resources across rural and urban settings, aging-focused researchers can more accurately interpret the applicability of Implementation Science research for their environment.^{21,22}

StaRI targeted populations and sites

Older adults, particularly frail subsets of the population, have traditionally been underrepresented in pre-implementation efficacy trials which leave the potential benefits and harms largely undefined.²³ For example, the majority of cancer diagnoses and deaths are adults over

age 65, yet less than a decade ago a significant knowledge void existed for oncology therapeutics in this population.²⁴ At the patient level, implementation researchers need to evaluate and report constructs such as frailty and physiological resilience for external stakeholders to assess applicability to their populations.²⁵ Different frailty tools are used in various clinical settings with limited knowledge around how to harmonize measures of frailty between instruments. Whereas brevity must be weighed against accuracy in time-limited settings like the emergency department, primary care settings have the opportunity for serial assessments and longer frailty assessments like the Frailty Index.^{26,27} Similarly, the assessment of physical resilience is an emerging construct without transdisciplinary acceptance of a uniform measure of resilience across medical, surgical, and mental health settings.²⁸ Measurement approaches for physical resilience will need to incorporate frail phenotype, biological, and chronological age, and anticipated disease trajectory within the context of the acute stressor and therapeutic alternatives. Geriatric implementation scientists should carefully contemplate acceptable and reproducible measures of frailty and physical resilience.

Health literacy and socioeconomic constraints often limit patient participation in efficacy research and dissemination into real-world populations.²⁹ The Centers for Medicare & Medicaid Services Accountable Needs Communities Health-Related Social Needs Screening Tool is an established and commonly used instrument for a broad assessment of social determinants of health.³⁰ In addition, complex interventions often require care partner availability and engagement, so objectively reporting their involvement will be an essential component of reproducibility and scale-up.³¹ The Caregiving Health Engagement Scale is one measure of a care partner's capacity to participate in another patient's care.³² At the healthcare system level, describing the interconnectedness of insurance status and equitable access to services is a component of adapting interventions locally to accommodate resource constraints, yet is often unreported or provided only in general demographic tables.³³

StaRI outcomes

Person-centered care requires a collaborative approach to align individual values with attainable outcomes that often require an understanding of a patient's decisional conflict, health literacy, and preparedness for decision-making.³⁴ Patient and physician priorities require time and expertise to align in older adults with complex co-morbidities, yet investigators often neglect these factors in reporting the application of an intervention and implementation strategy in research.³⁵ Memory and communication impairments associated with Alzheimer's dementia and related disorders

also create obstacles to both research consent and patient-reported outcomes, so implementation researchers need to accommodate those challenges.³⁶ Successful and ethically acceptable approaches to recruiting and retaining vulnerable older adults in health outcomes research have been described elsewhere and should be applicable to Implementation Science investigations.^{37,38}

The costs and cost-effectiveness of implementing interventions is the most frequently omitted element of StaRI in non-geriatric research and is likely more complicated in older adults. An intervention resulting in the best outcomes for older adults may not be economically feasible unless all healthcare costs are considered. For instance, cognitive behavioral therapy for insomnia is generally not well-reimbursed but is preferred over hypnotic medications due to concerns over falls and other adverse events.^{39,40} Investigators should include a health economist on the research team to ensure reasonable assumptions and cost-analysis approaches are reported.^{41,42}

StaRI subgroups

Aging populations are hardly monolithic. Instead, older adults represent a heterogeneous patient group ranging from functionally and cognitively intact individuals who are fully and independently engaged in the community to frail and dependent persons (18%–60%, depending on the reporting community and frailty score used).^{43–45} Implementation Science seeking to ramp up effective interventions across real-world settings must contemplate prevalent subsets in whom distinct strategies may be required to attain similar outcomes. Geriatric subsets might include persons living with dementia, frail individuals, and care partner dependency. Also, caregivers of older adults are frequently older adults themselves, who can also suffer from cognitive dysfunction and multiple comorbidities. Interventions relying on caregivers or dyads need to ensure that the caregivers as well have the support and cognition necessary for the intervention. Implementation researchers can remain attuned to these subgroups by utilizing some of the recommendations discussed in the Target Populations section, such as measuring and reporting frailty and describing the interconnectedness of health systems and social determinants of health with patient-oriented outcomes.

StaRI results

Fidelity represents the extent to which an intervention was delivered in terms of content and quality as conceived by the developers.⁴⁶ Improving older adult outcomes often necessitates the delivery of education, communication, or interventions that require a sustained effort from multiple

stakeholders. For example, one fall prevention exercise trial required instructors to review home exercises and Tai Chi over the course of a 24-week program, but observers noted the omission of 25% of this content.⁴⁷ The concept of fidelity is challenging to capture in a reportable manner, particularly when the key components of an implementation intervention require the meaningful engagement of multiple individuals across time and locations. Nonetheless, complex implementation trials must pre-plan assessments of fidelity for key stakeholders and specify the unit of analysis.^{48,49} Tele-observation (video conference or recording sessions for asynchronous review), direct observation, or asking participants to rate the elements of an intervention by how compliant they were to each one may be ways to assess intervention fidelity. One study of a palliative care nurse intervention used a 5-point Likert “helpfulness” scale, to assess participants’ ability to use the intervention tools.⁵⁰

Fidelity assessments can greatly inform future trials, and often yield interesting new barriers or motivations. A study of a Coach2Move intervention led by physical therapists for older adults assessed fidelity through a scale and follow-up qualitative interviews. They found fundamental differences in the theoretical approach to physical therapy in therapists who were high fidelity to the intervention and those who were low fidelity.⁵¹

StaRI discussion

Clinical practice guidelines represent medicine’s effort to synthesize research evidence into actionable recommendations based on factors including the consistency of effect, potential harms, health equity, resources, and feasibility. The Grading of Recommendations Assessment Development and Evaluation approach recommends an implementation component to accompany guideline recommendations to reduce knowledge translation obstacles and facilitate uptake in clinical practice.⁵² Unfortunately, geriatric clinical practice guidelines are rare and those that exist often neglect implementation resources.⁵³ More frequently, efforts to integrate clinical practice guidelines are a local effort that requires the investment of time and innovation repeatedly across healthcare systems.⁵⁴ Future geriatric clinical practice guideline development should incorporate implementation science by providing an implementation toolkit that could be operationalized at the local level.⁵⁵

OPPORTUNITIES TO IMPROVE THE VALUE OF IMPLEMENTATION SCIENCE FOR GERIATRICS

StaRI must be considered at the initial planning stage of an implementation study, and even better during the

intervention development. We suggest even further consideration for interventions with older adults which we label “StaRI-65” (Table 2). Obvious targets exist to accelerate the uptake of research into practice for older adults as illustrated in Figure 2. One immediate priority is to include a representative spectrum of older adults in ongoing research across specialties and healthcare settings rather than the historical approach of excluding complex older adults from efficacy trials. The 21st Century Cures Act and the National Institutes of Health Inclusion Across the Lifespan initiative target populations at the extremes of age and provides funding priorities to promote this paradigm shift.⁷ The American Geriatrics Society advocates the 5Ts (Target Population, Team, Tools, Time, and Tips to Accommodate) to increase the inclusivity of health outcomes research for aging populations.⁵⁶ Inclusion of older adults into health outcomes research from rural populations and chaotic acute care settings is also necessary and quite challenging.^{37,57} Increasing the inclusion of older adults will provide a more compelling rationale for the intervention component of implementation research.

Concurrently, subtypes of Implementation Science such as de-implementation are emerging as essential precursors to both reduce practices overused by health care providers and to promote uptake of new research in older populations.⁵⁸ De-implementing outdated or non-evidence-based health interventions mandates an understanding of the comparative efficacy of alternatives, the values of the patient currently receiving the inferior intervention, and the rationale of the healthcare team delivering the outdated alternative.⁵⁹ De-adoption may simply require trial evidence of preventable harms or lack of efficacy, but will often mandate a more proactive approach to facilitate practice change with a transparent understanding of the context in which healthcare teams and service leaders conceptualize de-implementation of the status quo.⁶⁰ In geriatric research StaRI principles are being leveraged to increase the deprescribing of potentially harmful medications, but de-implementation likely requires an approach that differs from Implementation Science and older adult patient populations will probably present unique challenges in removing suboptimal interventions from routine practice.⁶¹

Another priority is to learn to think in terms of Implementation Science across the spectrum of research. Designing for dissemination and implementation as early as the basic science phase of discovery provides a novel pathway to accelerate knowledge translation from the bench to the bedside.⁶² The National Center for Advancing Translational Science created the Integrative Framework of Dissemination, Implementation, and Translation to provide a rationale for basic researchers to engage with clinical implementation investigators and vice versa.⁶³

TABLE 2 StaRI-65 recommendations

StaRI checklist	Barriers	StaRI-65 recommendations
Introduction	<ul style="list-style-type: none"> Underlying theory/framework/model employed as Implementation Strategy often untested in complex older adult healthcare Few unequivocal interventions exist in geriatrics that consistently exhibit benefits that outweigh risks in pre-implementation research settings 	<ul style="list-style-type: none"> Acknowledge the limitations of frameworks and implementation strategies and how they are adapted to the population in question. Include a representative spectrum of older adults in ongoing research across specialties and healthcare settings rather than the historical approach of excluding complex older adults from efficacy trials.
Methods: Description context	<ul style="list-style-type: none"> Acceptability of new knowledge and readiness to change varies across sites and is challenging to measure objectively Wide divide in socioeconomic status among older adults. Healthcare may be fractured among multiple providers. Services may not be reimbursed by Medicare. Local social services and access to transportation differ greatly between counties. Rural areas are underserved in research. 	<ul style="list-style-type: none"> Contemplate key components such as identification of key partners, community perceptions, and values, obtaining and maintaining ethical oversight, aligning budgetary concerns with intellectual property rights, and sustainability. Understand the context in which specific interventions fail to demonstrate anticipated benefits Consider patient characteristics such as financial resources, mobility, their connectedness to the healthcare setting, and ability to navigate between various professional clinics and home health resources.
Methods: Description targeted sites and populations	<ul style="list-style-type: none"> Age cutoffs may be less helpful than frailty levels, but are commonly used for services, clinics, and other interventions. Access to Geriatrics varies significantly across hospitals Eligibility criteria can become overly restrictive, excluding those with cognitive impairment or multiple comorbidities. Caregiver burden and availability are often not considered. 	<ul style="list-style-type: none"> Evaluate and report patient-level constructs such as frailty, physiological resilience, health literacy, and socioeconomic status. Describe the interconnectedness of insurance status and equitable access to services. Justify inclusion/exclusion of those with frailty or cognitive impairment.
Methods: Evaluation outcomes	<ul style="list-style-type: none"> Pre-determined target outcomes are often not aligned with what matters most to older adults. Common outcomes are often not patient-centered. Acceptability of intervention to patient (and caregiver) should be reported. Assessing effectiveness outcomes qualitatively may be limited due to cognitive impairment. 	<ul style="list-style-type: none"> Understand a patient's decisional conflict, health literacy, and preparedness for decision-making. Contemplate how memory and communication impairments, such as those associated with Alzheimer's dementia and related disorders, have an impact on outcomes. Include caregiver outcomes.
Methods: Evaluation economic evaluation	<ul style="list-style-type: none"> Healthcare costs often do not include out-of-pocket costs to patients or unpaid caregiver time needed for the intervention. CMS costs are frequently used as a stand-alone for healthcare costs. This does not include the 21% of people on Medicare who buy Medigap insurance and another 18% dual covered by employee-sponsored insurance. 	<ul style="list-style-type: none"> Report insurance status. Report out-of-pocket costs. Report non-reimbursable costs to health systems or clinics.
Methods: Subgroups	<ul style="list-style-type: none"> Pertinent subgroups rarely considered or analyzed distinctly for implementation or intervention approaches (frail, dementia, socially isolated) 	<ul style="list-style-type: none"> Contemplate prevalent subsets of older adults, such as persons living with dementia, frail individuals, and care partner dependency, in whom distinct strategies may be required to attain similar outcomes.
Results: Fidelity	<ul style="list-style-type: none"> Geriatric-focused adaptation of implementation approach (who, what, where, when, how) rarely contemplated 	<ul style="list-style-type: none"> Pre-plan assessments of fidelity, understanding that this will be challenging to capture in a reportable manner, particularly when the key components of an implementation intervention require meaningful

(Continues)

TABLE 2 (Continued)

StaRI checklist	Barriers	StaRI-65 recommendations
	<ul style="list-style-type: none">Core components of intervention for older patients and/or care partners and intensity with which those components delivered uncommonly reported	<ul style="list-style-type: none">engagement of multiple individuals across time and locations.Report any differences between high fidelity and low fidelity users.
Discussion: Policy or clinical practice guideline implications	<ul style="list-style-type: none">Investigators often miss opportunities to promote incorporation of effective implementation strategies into clinical practice guidelinesHealthcare reimbursement structures do not adapt quickly to promote effective interventions.Clinical Practice Guidelines often miss opportunity to filter recommendations through geriatric perspective	<ul style="list-style-type: none">Report how the study evidence may affect the strength of recommendations for existing guidelines.

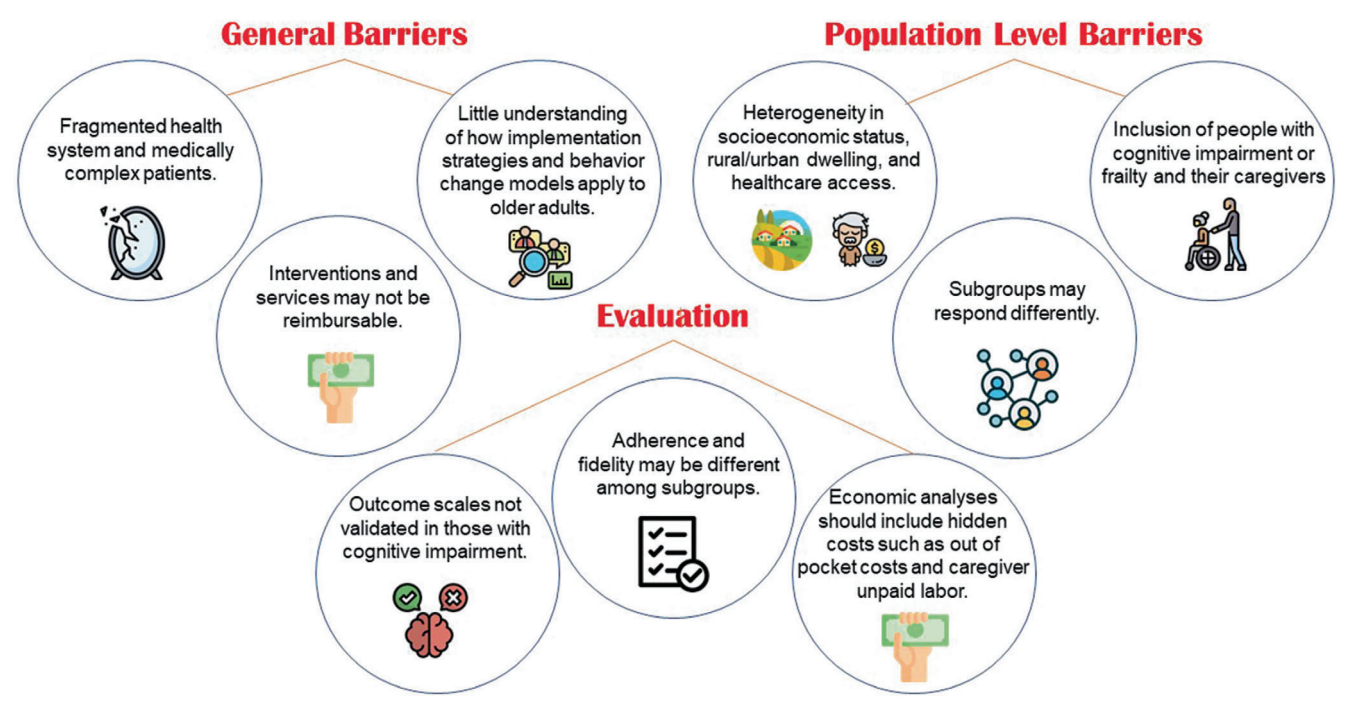


FIGURE 2 Investigators utilizing implementation science in older adults with complex disease co-morbidities frequently encounter barriers at multiple levels which require attention during the design, conduct, interpretation, and reporting of research

Pragmatically, research networks like the Latin America and Caribbean Consortium on Dementia are concurrently planning multidisciplinary research platforms spanning basic science to translational research that harmonizes approaches to diagnosis and interventional strategies with the vision to accelerate post-discovery implementation into patient care.⁶⁴ Health outcomes investigators will likely benefit from increased exposure to Implementation Science during their research training.⁶⁵ In the meantime, Implementation Science experts can collaborate with aging-focused investigators during the early stages of research planning and beyond to provide a foundation upon which to build for widespread dissemination,

incorporation into clinical practice, and sustainability across healthcare settings and aging populations.⁶⁶ Implementation Science experts can help guide researchers' exploration of an intervention's efficacy and effectiveness as a roadmap to readiness for a StaRI-guided approach along the spectrum of translational research.⁶⁷

CONCLUSIONS

StaRI will need to adapt to encompass the unique complexities of older adult Implementation Science. Few Implementation Science studies in this population

currently cite StARI as a reporting standard and the issues described in this article may be one reason for that omission. Subtypes of Implementation Science such as de-implementation may emerge as essential precursors to promote the uptake of new research in older populations. Early exposure to Implementation Science principles and structured collaboration with Implementation Science experts may catalyze more expeditious incorporation of geriatric clinical research evidence into widespread healthcare delivery while StARI is adapted to the unique complexities of older adult interventional investigations.

AUTHOR CONTRIBUTIONS

Christopher Carpenter conceived the concept for this series. Christopher Carpenter, Lauren Southerland, Brendan Lucey, and Beth Prusaczyk designed and prepared this manuscript. Lauren Southerland designed Figure 2.

CONFLICT OF INTEREST

CRC is on the Clinician-Scientists Transdisciplinary Aging Research Leadership Core. CRC also co-authored the EQUATOR Network StARI reporting guidelines.

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