

Starry Aims to Overcome Knowledge Translation Inertia: The Standards for Reporting Implementation Studies (StaRI) Guidelines

In 2007, *Academic Emergency Medicine* hosted a consensus conference on “Knowledge Translation in Emergency Medicine” with the objective of identifying high-yield research priorities for the concept of moving from evidence to action.¹ Patients often fail to receive care that aligns with quality indicators, and the Institute of Medicine has estimated that on average 17 years pass before just 14% of effective interventions reach the bedside.^{2–4} Equally important is the concept that de-implementing wasteful, inefficient, or outdated clinical approaches frequently require more time and effort than is available, so the trajectory of bedside decision making often yields to the status quo.⁵

Changing the habits of a professional lifetime to incorporate research into clinical practice requires more than publishing a manuscript or highlighting contemporary studies in lectures. Awareness of new information is challenging with over 3,500 biomedical manuscripts appearing on PubMed daily, including increasing numbers of emergency medicine manuscripts every year. Clinicians must first accept research or guideline recommendations, which is far from guaranteed as some opinion leaders claim that most published findings are inaccurate or misguided.⁶ Once clinicians accept new findings as valid and worth considering, the diagnostic test or therapeutic intervention must be applicable to the real-world patients they are treating and easily accessible in the round-the-clock emergency department (ED). The multiple inclusion and exclusion criteria inherent to hypothesis-testing research often limit external validity,⁷ while new tests, devices, or procedures may

be unavailable.⁸ Changing practice also requires motivation to do things differently, acquisition of the necessary skills and resources to adapt, and an organizational ethos that promotes and values the implementation of change. These theoretical concepts underpin behavior change in individuals⁹ and need to be addressed within the existing routines of an organization.¹⁰

Adding to the complexity of translating appropriate research into clinical practice is incomplete reporting of implementation studies¹¹ in part due to the lack of acceptable standardization for the design, conduct, and reporting of implementation science. A multidisciplinary group of North American clinical researchers developed a framework describing the attributes of “dissemination and implementation” science in 2014 at the National Institutes of Health.¹² One priority identified was to develop an implementation science reporting guideline, as the 359 existing guidelines promoted by the Enhancing the Quality and Transparency of Health Research (EQUATOR, see <http://www.equator-network.org/>) were deemed inadequate for the high-quality reporting standards necessary to reproduce complex implementation strategies.¹² In response, an international collaboration of implementation scientists have now published the Standards for Reporting Implementation Studies (StaRI) guidelines to facilitate a uniform structure for the methods, results, and interpretation of implementation research (freely available online at <http://www.equator-network.org/reporting-guidelines/stari-statement/>).^{13,14} The foundations of StaRI are rooted in two key concepts.

The authors have no relevant financial information or potential conflicts of interest to disclose.

- Dual reporting strands for 1) implementation strategy and 2) intervention. The intervention is the evidence-based novel technology, process, or resource being introduced into practice; the implementation strategy concentrates on healthcare delivery components such as promotion by opinion leaders, staff resources, infrastructure, and the theoretical model used to promote change in practice.^{15,16}
- Explicit and contextual explanation of the environment in which the implementation approach is employed, including concurrent regional and national policy scenarios that prompted institutional investment in evidence uptake and diffusion of innovation.

The value of prior implementation studies in emergency medicine could have been improved by adherence to StaRI reporting guidelines. For example, to reduce inappropriate indwelling urinary catheters in older ED patients, Mulcare et al.¹⁷ described an implementation effort consisting of multiple slide presentations, prominent posters, and distribution of pocket cards. Each of these strategies disseminates knowledge of protocols and quality indicators, but does not consistently align clinician values with contemporary behavior adaptation models,¹⁵ prevailing opinion leaders,¹⁸ or concurrent funding or policy imperatives that either propel or impede implementation.

StaRI is also relevant to deimplementation. Self et al.¹⁹ aimed to reduce blood culture contamination rates at two community hospitals by eliminating the use of nonsterile gloves during phlebotomy. Their deimplementation strategy included local leaders, training videos, and workshops, but no formal behavioral or system-level change model and the results do not evaluate potential costs, unintended consequences, or sustainability. This project did not reference or follow any reporting standards; adherence to the existing Standards for Quality Improvement Reporting Excellence (SQUIRE) reporting guidelines²⁰ or StaRI could have improved the transparency of research.¹²

The details required by StaRI necessitate space in an era when publishers are increasingly imposing word limits. In comparison with an observational study exploring diagnostic accuracy of a new test or a randomized trial evaluating therapies, implementation studies are a complex mix of timing, environment, personnel, patient fit, momentum, and resources. Journal editorial boards may be able to be more flexible with the word limits for implementation science manuscripts adhering to StaRI,

but other solutions will be needed such as concise descriptions using timelines or tables¹⁴ or innovative approaches to online supplements. A related tension for authors may be the long-standing academic paradigm that rewards publishing quantity over quality typically emphasizing the raw numbers of publications and citation counts rather than the overall clarity and measurable impact of individual manuscripts.²¹ While the StaRI reporting guidelines encourage investigators to report in one manuscript the longitudinal details that are essential to reproduce successful implementation of a concept into practice (or deimplementation out of practice)—other options will include publishing protocols or detailed descriptions of developmental phases.

Journals have an important role in promoting use of reporting standards. In emergency medicine, 41% of journals do not mention any reporting guidelines in their author instructions and as a result researchers often fail to adhere to recommendations.^{22,23} Adherence to reporting guidelines improves the transparency and comparability of research across journals and specialties.²⁴ Journal instructions should refer potential authors to appropriate EQUATOR guidelines and reminding reviewers of relevant reporting standards may improve the quality of reviews. Therefore, *Academic Emergency Medicine's* author instructions will now refer investigators to the StaRI reporting guidelines for implementation research.

Generations of researchers have transformed medicine into a societal resource with the potential to prolong the quality and quantity of life via disease and injury prevention, patient education, and the alleviation of psychological and physical suffering. Shortening the delay between practice-ready knowledge and routine bedside use of that knowledge is the next frontier of medicine. Adherence to StaRI reporting guidelines will provide a template to enhance communication and understanding of effective and ineffective efforts to bridge the gap between knowledge and practice. We may need to change, but challenge and opportunity lie ahead.

Christopher R. Carpenter, MD, MSc

(carpenterc@wustl.edu)

Twitter: @SAEMEBM

*Division of Emergency Medicine and Emergency Care
Research Core, Washington University in St. Louis School
of Medicine, St. Louis, MO.*

Hilary Pinnock, MD

*University of Edinburgh Medical School, Edinburgh,
Scotland, UK*

Supervising Editor: John H. Burton, MD

References

- Lang ES, Wyer PC, Eskin B. Executive summary: knowledge translation in emergency medicine: establishing a research agenda and guide map for evidence uptake. *Acad Emerg Med* 2007;14:915–8.
- McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med* 2003;348:2635–45.
- Mangione-Smith R, DeCristofaro AH, Setodji CM, et al. The quality of ambulatory care delivered to children in the United States. *N Engl J Med* 2007;357:1515–23.
- Balas EA, Boren SA. Managing clinical knowledge for health care improvement. *Yearbook of Medical Informatics 2000: Patient-Centered Systems*. Stuttgart: Schattauer, 2000. p. 65–70.
- Niven DJ, Mrklas KJ, Holosinsky JK, et al. Towards understanding the de-adoption of low-value clinical practices: a scoping review. *BMC Med* 2015;13:255.
- Ioannidis JP. Why most published research findings are false. *PLoS Med* 2005;2:e124.
- Godwin M, Ruhland L, Casson I, et al. Pragmatic controlled clinical trials in primary care: the struggle between external and internal validity. *BMC Med Res Methodol* 2003;3:28.
- Langhan ML, Riera A, Kurtz JC, Schaeffer P, Asnes AG. Implementation of newly adopted technology in acute care settings: a qualitative analysis of clinical staff. *J Med Eng Technol* 2014;39:44–53.
- Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci* 2011;6:42.
- Greenhalgh T. Role of routines in collaborative work in healthcare organisations. *BMJ* 2008;337:a2448.
- Pinnock H, Epiphaniou E, Sheikh A, et al. Developing standards for reporting implementation studies of complex interventions (StaRI): a systematic review and e-Delphi. *Implement Sci* 2015;10:42.
- Neta G, Glasgow RE, Carpenter CR, et al. A framework for enhancing the value of research for dissemination and implementation. *Am J Public Health* 2015;105:49–57.
- Pinnock H, Barwick M, Carpenter CR, et al. Standards for reporting implementation studies (StaRI) statement. *BMJ* 2017;356:i6795.
- Pinnock H, Barwick M, Carpenter CR, et al. Standards for reporting implementation studies (StaRI): explanation and elaboration document. *BMJ Open* 2017;7:e013318.
- Tabak RG, Khoong EC, Chambers DA, Brownson RC. Bridging research and practice: models for dissemination and implementation research. *Am J Prev Med* 2012;43:337–50.
- Rabin BA, Lewis CC, Norton WE, et al. Measurement resources for dissemination and implementation research in health. *Implement Sci* 2016;11:42.
- Mulcare MR, Rosen T, Clark S, et al. A novel clinical protocol for placement and management of indwelling urinary catheters in older adults in the emergency department. *Acad Emerg Med* 2015;22:1056–66.
- Carpenter CR, Sherbino J. How does an ‘opinion leader’ influence my practice? *CJEM* 2010;12:431–4.
- Self WH, Mickanin J, Grijalva CG, et al. Reducing blood culture contamination in community hospital emergency departments: a multicenter evaluation of a quality improvement intervention. *Acad Emerg Med* 2014;21:274–82.
- Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. *BMJ Qual Saf* 2015;25:986–92.
- Carpenter CR, Cone DC, Sarli CC. Using publication metrics to highlight academic productivity and research impact. *Acad Emerg Med* 2014;21:1160–72.
- Sims MT, Henning NM, Wayant CC, Vasar M. Do emergency medicine journals promote trial registration and adherence to reporting guidelines? A survey of “Instructions for Authors”. *Scand J Trauma Resusc Emerg Med* 2016;24:137.
- Gallo L, Hua N, Mercuri M, Silveira A, Worster A. Adherence to standards for reporting diagnostic accuracy in emergency medicine research. *Acad Emerg Med* 2017;24:914–919.
- Simera I, Moher D, Hirst A, Hoey J, Schulz KF, Altman DG. Transparent and accurate reporting increases reliability, utility, and impact of your research: reporting guidelines and the EQUATOR Network. *BMC Med* 2010;8:24.