

ORIGINAL RESEARCH

How Team Science Is Documented and Described in Published Family Medicine Research

Julie S. Armin, PhD, Jeffrey L. Goodie, PhD, Melanie Steiner, PhD,
Dean A. Seebusen, MD, MPH, and Nathaniel E. Miller, MD

Purpose: Increasingly emphasized by leaders in family medicine and primary care research, team science is an approach to research that requires clear documentation for replicability. Here, we report the approach to documenting team science in 2 US family medicine research journals.

Methods: Our interdisciplinary team, composed of MDs and PhDs from family medicine and other disciplines, established a definition of the “team science” construct, which included the utilization of interdisciplinary partnerships and/or collaboration with community-based organizations. Two team members reviewed every original research article published in 2023 in the *Annals of Family Medicine* (AFM) and the *Journal of the American Board of Family Medicine* (JABFM). Data extraction identified the use of the term “team science” or the presence of elements of the construct as defined by the team, as well as the funding source(s).

Results: Of the 107 articles reviewed, none explicitly mentioned the term “team science.” However, 19 (17.8%) described interdisciplinary partnerships. Seventeen (15.9%) described the disciplines of the contributors, and 5 (4.7%) described community collaborators. Most articles (80.4%) were funded studies, with 70.9% supported by national governmental or nongovernmental entities.

Conclusions: In this sample of articles, team science was either not reported at all or it was described in a limited way. The authors recommend that editors encourage discussions of interdisciplinarity and team science research practices in manuscripts, including descriptions of the strengths each disciplinary representative brings to the team. (J Am Board Fam Med 2025;38:619–624.)

Keywords: Family Medicine, Interdisciplinary Research, Primary Health Care, Publishing, Qualitative Research, Research Ethics, Team Science

Introduction

Team science describes research conducted by multiple individuals or teams from different disciplines who work not only collaboratively but *interdependently* to address increasingly complex questions,^{1,2} such as health disparities or the impact of climate change on health. The need for team science reflects that many of the world’s problems are not “within-discipline” problems but require the expertise of

researchers from different fields.³ As a parallel development to the ever-further specialization within single disciplines, the impetus for team science is to design and conduct effective research by drawing on the methodologies, bodies of knowledge, and theoretical frameworks of several disciplines at once.^{4–7} The goal is not to turn all research into team science, but as a way to address complex problems. Evidence

This article was externally peer reviewed.

Submitted 1 October 2024; revised 18 November 2024, 23 December 2024; accepted 21 January 2025.

From the Department of Family & Community Medicine, The University of Arizona, Tucson, AZ, United States (JSA); Department of Family Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD (JLG); Department of Family Medicine, Indiana University School of Medicine, Indianapolis, IN (MS); Department of Family and Community Medicine, Medical College of Georgia, Augusta University, Augusta, GA (DAS); Department of Family Medicine, Mayo Clinic, Rochester, MI (NEM).

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sector.

Conflict of interest: Dr. Seebusen is the Deputy Editor of the *Journal of the American Board of Family Medicine*. The other authors have no conflicts of interest to report. The opinions and assertions expressed herein are those of the authors and do not reflect the official policy or position of the Uniformed Services University of the Health Sciences, the Defense Health Agency, or the Department of Defense.

Corresponding author: Nathaniel E. Miller, MD, Department of Family Medicine, Mayo Clinic, 200 First Street SW, Rochester, MN 55905 (E-mail: miller.nathaniel@mayo.edu).

suggests that team science may offer a way to address some complex challenges facing health and health care,^{8–11} which is why advocates and sponsors of biomedical research, including the National Institutes of Health and the National Academies, recognize team science as a National Library of Medicine (NLM) keyword, publish best practices in support of the widespread application of team science, and invest in ambitious, transformative programs such as the BRAIN Initiative.^{12–14}

In October 2023, the North American Primary Care Research Group (NAPCRG) and the Association of Departments of Family Medicine (ADFM) announced their National Research Strategy for family medicine through 2030.^{15–17} Part of their vision includes the promotion of team science by seeking to “normalize a team science approach by developing cross-disciplinary partnerships with PhDs, interprofessional groups, and community-based organizations.”¹⁷

Family medicine and primary care have modified and incorporated the team science approach into interprofessional team-based care,¹⁹ without fully realizing its potential for research. NAPCRG and ADFM’s motivations for promoting team science in primary care research are clear. Newton et al. observe that total family medicine research funding falls short of some individual internal medicine departments research funding, and primary care received only 0.3% of funding from the National Institutes for Health (NIH).¹⁵ Science teams, compared with individuals, are more productive and generate more impactful research,^{20–22} which the NIH recognizes and encourages.²³

To improve its research capacity, family medicine must therefore more fully embrace—or normalize—team science and develop research that integrates interdisciplinary partnerships. Doing so may improve the academic credentials of family medicine faculty and the discipline, promote primary care partnerships with specialties, and build research capacity.^{1,22} Importantly, the NIH and other federal funders recently acknowledged the critical role of primary care in carrying out research that addresses the health of historically marginalized populations (eg, NIH initiatives such as Communities Advancing Research Equity for Health²⁴). The lack of federal funding for family medicine research, combined with NIH’s recognition of primary care’s potential to transform health care through research, explain the push for team

science articulated in NAPCRG and ADFM’s research strategy for 2030.

Normalizing team science for family medicine research requires a change in the culture of primary care to which the discipline’s research journals can and should contribute. Yet it is currently not known if and how team science is reported in published family medicine research. In this study, we aimed to determine the frequency and ways that original research reported a team science approach or described interdisciplinary collaboration in 2 leading family medicine journals; we also looked for partnerships with community-based organizations and whether, and how, these studies were funded.

Methods

A multidisciplinary team composed of MDs and PhDs from the disciplines of family medicine (NM, DS), medical anthropology (JA), psychology (JG), and the humanities (MS) participating in the NAPCRG Building Research Capacity (BRC) fellowship developed and implemented this project. Using the guidance from the 2030 NAPCRG and ADFM goal article, the team operationalized the concept “team science” and developed data extraction domains to structure our reviews of identified manuscripts (Table 1).

Primary and secondary reviewers were randomly assigned to assess research articles published in 2023 in the *Annals of Family Medicine* (AFM) and the *Journal of the American Board of Family Medicine* (JABFM). We included original research articles from AFM and JABFM while excluding systematic reviews, meta-analyses, and other nonresearch article categories.

After JG randomly assigned primary and secondary reviews for each article, JA, JG, MS, DS, and NM conducted data abstraction. Full manuscripts were reviewed for the term “team science,” descriptions of interdisciplinary partnerships, involvement of community-based organizations, and funding source. Each reviewer was responsible to serve as primary reviewer of approximately 20 articles and secondary reviewer of an additional 20. Primary and secondary reviewers communicated to resolve discrepancies. The full research team adjudicated any remaining differences. JG conducted descriptive analyses of the abstracted data. All authors participated in the interpretation of these data.

Table 1. Data Extraction Domains to Operationalize “Team Science”

	Domain	Variable(s)
1	Reviewer information	<ul style="list-style-type: none"> • primary reviewer’s initials • secondary reviewers’ initials
2	Article identification	<ul style="list-style-type: none"> • author last names • full article title • journal title • DOI
3	“Team science” appears in manuscript?	<ul style="list-style-type: none"> • yes • no
4	Article describes interdisciplinary partnerships? (e.g. this description describes interdependence between disciplines)	<ul style="list-style-type: none"> • yes • no
4a	If yes, location of the description?	<ul style="list-style-type: none"> • in manuscript • in appendix
4b	Description	Verbatim copy from manuscript
5	Article describes disciplines of contributors?	<ul style="list-style-type: none"> • yes • no
5a	If yes, description of disciplines?	List of disciplines
6	Article describes collaboration with community-based organizations (e.g. community organization contributes to the development of the project)?	<ul style="list-style-type: none"> • yes • no
6a	If yes, location of description of collaboration of community-based organizations?	<ul style="list-style-type: none"> • in manuscript • in appendix
6b	If yes, description of collaboration?	Verbatim copy from manuscript
7	Funding?	<ul style="list-style-type: none"> • funded • unfunded
7a	If funded, funding type?	<ul style="list-style-type: none"> • intramural • local foundation • national foundation • national government funding

Abbreviation: DOI, digital object identifier.

Results

Table 2 shows summary results of the review. A total of 107 articles met inclusion criteria, 48 (44.9%) from AFM and 59 (55.1%) from JABFM. None explicitly mentioned the term “team science.” However, nineteen (17.8%) described interdisciplinary partnerships, which is a component of team science. Of those, nearly all (18) were found in the main body of the publication, and 1 was in the appendix. Seventeen articles (15.9%) described the disciplines of the contributors, and 5 (4.7%) described collaborators at community-based organizations. Most articles (80.4%) were funded studies, and 43 (50%) reported funding received from national governmental entities (eg, NIH, Centers for Disease Control, or Patient-Centered Outcomes Research Institute). There was no statistical difference in the studies describing interdisciplinary partnerships that were funded or unfunded.

Discussion

These results show that the term “team science” is not explicitly reported or routinely described in

family medicine literature. Interdisciplinary collaborations were mentioned or described in a minority of manuscripts which suggests team science is being performed despite not being named. Deliberately calling out team science and describing team composition in published research may advance NAPCRG and ADFM’s goal of normalizing team science as an important aspect of primary care research.

One challenge to discussing and investigating team science is deciding what qualifies as team science, given the lack of a unified definition.⁶ For example, Steer et al. describe it as “initiatives [that] are designed to promote collaborative and often cross-disciplinary (including multi-, inter-, and transdisciplinary) approaches to answering research questions about particular phenomena.”²⁵ This description denotes purpose to the collaboration rather than an incidental partnership, but does not emphasize the interdependency of disciplines characteristic of team science as understood by the National Academy of Sciences and the NIH.² In addition, within primary care, team science continues to be confused

Table 2. Summary of Article Characteristics Examined (n = 107)

Domain Examined	#	% of Total or Domain
Journal*		% of total
AFM	48	44.9
JABFM	59	55.1
<i>Total number of manuscripts</i>	107	
Number of manuscripts listing Team Science	0	0.0
Number of manuscripts describing Interdisciplinary Partnership	19	17.8
Location of description of Interdisciplinary Partnership		% manuscripts describing Interdisciplinary Partnership
in manuscript	18	94.7
in appendices	1	5.3
		% of total
Number of manuscripts describing Discipline of Contributors	17	15.9
Number of manuscripts describing Community Collaborators	5	4.7
Location of description of Community Collaborators		% manuscripts describing Community Collaborators
in manuscript	5	100.0
in appendices	0	0.0
		% of total
Number of manuscripts describing research as “funded”***	86	80.4
Funding type		% of funded
National Gov’t funding (e.g. NIH, CDC, PCORI)	43	50.0
National foundation (e.g. RWJF)	18	20.9
Local foundation	11	12.8
Intramural (e.g., university, department)	14	16.3

*Original research articles published in 2023 in the *Annals of Family Medicine* (AFM) and the *Journal of the American Board of Family Medicine* (JABFM) were included, while systematic reviews, meta-analyses, and other nonresearch article categories were excluded.

**We examined whether funding status was related to whether there was an interdisciplinary partnership using a Fisher’s Exact Test. There was no statistically significant relation between funding status and whether there was an interdisciplinary partnership ($P = .35$).

Abbreviations: NIH, National Institutes of Health; CDC, Center for Disease Control; PCORI, Patient-Centered Outcomes Research Institute; RWJF, Robert Wood Johnson Foundation.

with interprofessional team-based care, which shares similarities but is different from interdisciplinary research.

We further encountered difficulties identifying discipline-specific contributions of individual authors or members of research teams in our study, to the point of determining if and how to count collaborations as team science. Descriptions of collaborations varied in quality, with little explicit discussion of how the interdisciplinary partnership contributed to the development and/or implementation of the project. Further questions arose about the applicability of people who may have been involved in project activities such as implementation and dissemination but not study design; this was particularly true for clinical studies that engaged site investigators. In some cases, articles discussed contributors’ training (eg, “trained in qualitative methodology”) but not their disciplines and how they contributed to the study. Notably,

several articles had PhD and MD contributors, which implies team science. Yet lack of explicit discussion of the authors’ disciplines, or how team science contributed to the research, precludes firm conclusions.

NAPCRG and ADFM’s team science definition includes collaborations with community-based organizations. However, descriptions of partnerships with community-based organizations were limited. Authors typically did not describe how community engagement affected the research approach, implementation, or outcome. More specific information about how community organization engagement contributed to a project would be helpful to appraise its use in future similar studies and promote replicability.

Recommendations

The lack of descriptions about research team members’ expertise and discipline-specific contributions limits the ability to analyze how family medicine

currently engages in and promotes team science. An intentional description of interdisciplinarity in published research articles may translate to increased research practices that capitalize on team science.²⁶ We suggest that journal editors encourage authors to report if and how interdisciplinary collaborations contributed to the research. Likewise, a description of community partnerships, if applicable, and their contributions to study design and implementation may provide important insights. Ideally this description would fit in the methods section, or it could be provided as supplementary material. The creation of a standardized approach to reporting team science across the discipline's journals might further promote interdisciplinarity collaborations.

Limitations

We reviewed the original research articles published in only 2 family medicine journals in one year. It is possible that published work in other journals or different years might result in more relevant descriptions of team science. It is also possible that team science approaches are being used more often than our data suggest, but are not explicitly documented. Future studies should be directed at contacting authors directly to further explore how team science is used in family medicine research. Of note, most of the studies reviewed were funded, which may not be typical for family medicine research. Nonetheless, we believe that (if anything) funding would increase the possibility of interdisciplinary partnerships and engagement with community-based organizations. Finally, given the lack of standardization around team science, it was difficult to interpret categories uniformly, which was ultimately resolved through team discussion. Further evaluation should examine study purpose, design, and methods to determine its effect on the description of interdisciplinary work.

Conclusion

Documenting and explicitly describing team science approaches in published family medicine research could advance normalizing team science in primary care research—one of the objectives of the NAPCRG and ADFM research strategy—yet published studies in 2 prominent family medicine journals currently do not routinely document team science or describe interdisciplinary work or collaborations with community-based organizations. We encourage journal editors to develop a standard for reporting team science;

reviewers to request descriptions of interdisciplinary collaborations; and authors to describe the scientific composition of their teams.

The authors would like to acknowledge the North American Primary Care Research Group (NAPCRG) yearlong Building Research Capacity (BRC) fellowship, which facilitated this project.

To see this article online, please go to: <http://jabfm.org/content/38/3/619.full>.

References

- Hall KL, Vogel AL, Huang GC, et al. The science of team science: a review of the empirical evidence and research gaps on collaboration in science. *Am Psychol* 2018;73:532–48.
- Cooke NJ, Hilton ML. Committee on the Science of Team Science, Board on Behavioral, Cognitive, and Sensory Sciences, Division of Behavioral and Social Sciences and Education, National Research Council. Team composition and assembly. Enhancing the effectiveness of team science 2015.
- Ledford H. How to solve the world's biggest problems. *Nature* 2015;525:308–11.
- Börner K, Contractor N, Falk-Krzesinski HJ, et al. A multi-level systems perspective for the science of team science. *Sci Transl Med* 2010;2:49cm24.
- Ghamgosar A, Nemati-Anaraki L, Panahi S. Barriers and facilitators of conducting research with team science approach: a systematic review. *BMC Med Educ* 2023;23:638.
- Pelfrey CM, Goldman AS, DiazGranados DJ. What does team science look like across the CTSA consortium? A qualitative analysis of the Great CTSA Team Science Contest submissions. *J Clin Transl Sci* 2021;5:e154.
- Sullivan C. Team science and building a team. *Translational Sports Medicine*. Elsevier, 2023, pp. 551–5.
- Little MM, St Hill CA, Ware KB, et al. Team science as interprofessional collaborative research practice: a systematic review of the science of team science literature. *J Investig Med* 2017;65:15–22.
- Pitzen JH, Dieter HL, Gronseth DL, et al. Transforming the practice of medicine through team science. *Health Res Policy Syst* 2020;18:104–8.
- Luncheon A, Contractor NS. The effects of diversity and network ties on innovations: the emergence of a new scientific field. *Am Behav Sci* 2015;59:548–64.
- Stokols D. Mapping the impact of transdisciplinary research: a visual comparison of investigator-initiated and team-based tobacco use research publications. *Journal of Translational Medicine & Epidemiology* 2014;2.
- Team Science Toolkit, Available at: <https://cancercontrol.cancer.gov/brp/research/team-science-toolkit> (accessed November 14, 2024).

13. The BRAIN Initiative, Available at: <https://braininitiative.nih.gov/about/overview> (accessed November 14, 2024).
14. Bennett LM, Gadlin H, Levine-Findley S. Collaboration and team science: a field guide. (accessed November 14, 2024).
15. Newton W, Asif I, Weidner A. A milestone for promoting research in family medicine. *Ann Fam Med* 2023;21:564–6.
16. Schneider FD, Weidner A, Elwood S. Reconnecting to “Vision, Voice, Leadership”: ADFM’s New Strategic Plan. *Ann Fam Med* 2024;22.
17. Weidner A, Asif I. Shaping the future of family medicine research: the 2023 National Family Medicine Research Summit. *Ann Fam Med* 2024;22:72–4.
18. Medical Subject Headings 2024, Available at: https://meshb.nlm.nih.gov/?_gl=1*1fxiofo*_ga*MzE2NjcxMzIzLjE3MjYxNzMwNjE.*_ga_7147EPK006*MTczMDMyMTI0OC4xLjEuMTczMDMyMTM4OS4wLjAuMA.*_ga_P1FPTH9PL4*MTczMDMyMTI0OC4xLjEuMTczMDMyMTM4OS4wLjAuMA. (accessed October 30, 2024).
19. Fiscella K, Mauksch L, Bodenheimer T, et al. Improving care teams’ functioning: recommendations from team science. *Jt Comm J Qual Patient Saf* 2017;43:361–8.
20. Aarons GA, Reeder K, Miller CJ, et al. Identifying strategies to promote team science in dissemination and implementation research. *J Clin Transl Sci* 2019;4:180–7.
21. Singh J, Fleming L. Lone inventors as sources of breakthroughs: myth or reality? *Management science* 2010;56:41–56.
22. Wuchty S, Jones BF, Uzzi B. The increasing dominance of teams in production of knowledge. *Science* 2007;316:1036–9.
23. NIH. NIH-wide strategic plan fiscal years 2021–2025, Available at: <https://www.nih.gov/sites/default/files/about-nih/strategic-plan-fy2021-2025-508.pdf> (accessed October 31, 2024).
24. Communities Advancing Research Equity for Health™ (CARE for Health™), Available at: <https://commonfund.nih.gov/clinical-research-primary-care> (accessed July 25, 2024).
25. Steer CJ, Jackson PR, Hornbeak H, et al. Team science and the physician–scientist in the age of grand health challenges. *Ann NY Acad Sci* 2017;1404:3–16.
26. Smye SW, Frangi AF. Interdisciplinary research: shaping the healthcare of the future. *Future Healthc J* 2021;8:e218–e223.