

12-1-2018

A learning community approach to identifying interventions in health systems to reduce colorectal cancer screening disparities.

Lillian C. Man
Thomas Jefferson University

Melissa DiCarlo
Thomas Jefferson University

Emily Lambert
Thomas Jefferson University

Randa Sifri
Thomas Jefferson University

Martha Romney
Follow this and additional works at: <https://jdc.jefferson.edu/medoncfp>
Thomas Jefferson University

 Part of the [Family Medicine Commons](#), and the [Oncology Commons](#)

[Let us know how access to this document benefits you](#)

See next page for additional authors

Recommended Citation

Man, Lillian C.; DiCarlo, Melissa; Lambert, Emily; Sifri, Randa; Romney, Martha; Fleisher, Linda; and Myers, Ronald, "A learning community approach to identifying interventions in health systems to reduce colorectal cancer screening disparities." (2018). *Department of Medical Oncology Faculty Papers*. Paper 90.

<https://jdc.jefferson.edu/medoncfp/90>

This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University's [Center for Teaching and Learning \(CTL\)](#). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in Department of Medical Oncology Faculty Papers by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: JeffersonDigitalCommons@jefferson.edu.

Authors

Lillian C. Man, Melissa DiCarlo, Emily Lambert, Randa Sifri, Martha Romney, Linda Fleisher, and Ronald Myers



Review Article

A learning community approach to identifying interventions in health systems to reduce colorectal cancer screening disparities

Lillian C. Man^{a,*}, Melissa DiCarlo^b, Emily Lambert^b, Randa Sifri^c, Martha Romney^d, Linda Fleisher^e, Ronald Myers^b

^a Department of Medical Oncology, Thomas Jefferson University Hospital, 834 Chestnut Street, Suite 320, Philadelphia, PA, 19107

^b Center for Health Decisions, Division of Population Science, Department of Medical Oncology, Thomas Jefferson University, 834 Chestnut Street, Suite 314, Philadelphia, PA 19017, United States of America

^c Department of Family and Community Medicine, Thomas Jefferson University, Curtis building, Suite 401, Philadelphia, PA 19107, United States of America

^d Jefferson College of Population Health, Thomas Jefferson University 901, Walnut, Street, 10th floor Philadelphia, PA 19107, United States of America

^e Center for Injury Research and Prevention, Children's Hospital of Philadelphia, 2711 South Street, Rm 13121, Philadelphia, PA 19146, United States

ARTICLE INFO

Keywords:

Colorectal cancer
Minorities
Health disparities

ABSTRACT

Although colorectal cancer (CRC) screening in the United States has been increasing, screening rates are not optimal, and there are persistent disparities in CRC screening and mortality, particularly among minority patients. As most CRC screening takes place in primary care, health systems are well-positioned to address this important population health problem. However, most health systems have not actively engaged in identifying and implementing effective evidence-based intervention strategies that can raise CRC screening rates and reduce disparities. Drawing on the Collective Impact Model and the Interactive Systems Framework for Dissemination and Implementation, our project team applied a learning community strategy to help two health systems in southeastern Pennsylvania identify evidence-based CRC screening interventions for primary care patients. Initially, this approach involved activating a coordinating team, steering committee (health system leadership and stakeholder organizations), and patient and stakeholder advisory committee to identify candidate CRC screening intervention strategies. The coordinating team guided the steering committee through a scoping review to identify seven randomized trials that identified interventions that addressed CRC screening disparities. Subsequently, the coordinating team and steering committee applied a screening intervention classification typology to select an intervention strategy that involved using an outreach strategy to provide minority patients with access to both stool blood test and colonoscopy screening. Finally, the coordinating team and steering committee engaged the health system patient and stakeholder advisory committee in planning for intervention implementation, thus taking up the challenge of reducing and important health disparity in patient populations served by the two health systems.

1. Introduction

In 2018, there will be an estimated 140,250 newly diagnosed cases and 50,630 deaths from colorectal cancer (CRC) in the United States (Society, 2017). Many of these deaths will be due to missed opportunities to undergo screening (Edwards et al., 2010; Zauber et al., 2012). Although CRC screening in the United States has been increasing, screening rates are not optimal, and there are persistent disparities in CRC screening and mortality among nonwhites, as compared to whites (US Preventive Services Task Force et al., 2016; Pennsylvania Cancer Registry, 2018). As most CRC screening takes place in primary care, health systems are well-positioned to address these population health

problems (Greene et al., 2012). However, most health systems have not taken steps to identify and implement effective evidence-based intervention strategies that can raise CRC screening rates and reduce disparities. A health system-based learning community approach may help to catalyze this process.

Typically, learning communities are formed in academic settings to provide a structure for people and organizations to align around a shared purpose and work cooperatively to achieve defined common goals (Key Concept: Learning Communities, 2018). The Agency for Healthcare Research and Quality defines learning communities in health care as a collection of stakeholders who organize to advance the implementation of evidence-based interventions in health care settings

* Corresponding author.

E-mail addresses: Lillian.Man@jefferson.edu (L.C. Man), Melissa.DiCarlo@jefferson.edu (M. DiCarlo), Ronald.Myers@jefferson.edu (R. Myers).

<https://doi.org/10.1016/j.pmedr.2018.10.009>

Received 12 February 2018; Received in revised form 2 October 2018; Accepted 14 October 2018

Available online 17 October 2018

2211-3355/ © 2018 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

to address important population health problems (Anon, 2018a). In addition, it is posited the formation of health system-based learning communities could not only help health systems address important health problems faced by the patient populations they serve, but could also set the stage for the transition of health systems to learning health care systems that can scale and implement effective strategies for improving population health (Kraft et al., 2017). To date, reports on the development of health system-based learning communities have been limited, and there is a dearth of information on the formation of such learning communities to address CRC screening.

In 2015, the Center for Health Decisions of the Sidney Kimmel Cancer Center, a National Cancer Institute (NCI)-designated cancer center, along with Jefferson Health (JH), and Lehigh Valley Health Network (LVHN), two large health systems in southeastern Pennsylvania, started the *Reducing Cancer Disparities by Engaging Stakeholders (RCaDES) Initiative*. This project, which was supported by the Patient Centered Outcomes Research Institute (EAIN 2471), operationalized a health system-based learning community dedicated to increasing cancer screening and reducing disparities. At that time, CRC screening rates in JH primary care practices among whites was 45%, while rates among AAs and Hispanic patients were 40% and 32%, respectively. In LVHN, the CRC screening rates among whites was 57%, while rates among AAs and Hispanic patients were 52% and 30%, respectively. The current paper describes how the RCaDES Initiative learning community identified an evidence-based intervention strategy for implementation in the health systems.

2. Methods

The RCaDES Initiative was based on an integrated model that draws from the Interactive Systems Framework (ISF) for Dissemination and Implementation (Greene et al., 2012; Wandersman et al., 2012; Nilsen, 2015) and the Collective Impact Model (Nilsen, 2015; Committee on the Learning Health Care System in America, Institute of Medicine, 2013; Anon, n.d.). The ISF posits that successful efforts to implement preventive health strategies in health systems begin with an intervention synthesis stage, wherein the need to address a population health problem is recognized, an evidence-based intervention strategy that addresses the need is identified, and there is an expression of readiness by the health system to translate/adapt an identified intervention to fit organizational features and preserve intervention fidelity. The ISF also includes a final stage in which the adapted intervention strategy is implemented/maintained as part of routine care. While the ISF describes stages of organizational change, the Collective Impact Model offers insight into how these stages can be operationalized.

The Collective Impact Model calls for establishment of a “backbone organization” as a basic component of a health system learning community. This component assumes responsibility for bringing health system leaders and other stakeholders (e.g., public and private payers and community organizations) together to address population health problems (Committee on the Learning Health Care System in America, Institute of Medicine, 2013; Anon, n.d.; Aragón and Garcia, 2015). This group can activate the health system to define important healthcare problems (e.g., the need to increase CRC screening adherence), identify an effective evidence-based intervention that can address the priority needs, and promote health system efforts to implement the intervention for patients served by primary care practices in the system.

In accordance with the integrated ISF and Collective Impact Model, the project team organized a coordinating team (CT), a steering committee (SC), and a patient and stakeholder advisory committee (PASAC) in each health system. This process is described in greater detail elsewhere (Myers et al., 2018). The CT included experts in cancer prevention and control research and cancer screening in primary care. This component was charged with the tasks of organizing the learning community, facilitating communication, and providing technical assistance. The SC, which included representatives of the two health

systems, major commercial insurers and employers in southeastern Pennsylvania, state and local public health departments, and community health organizations, was responsible for identifying effective, evidence-based strategies that could be adapted for use in these two health systems. Each PASAC included primary care patients from racially and ethnically diverse populations, community organization leaders, primary and specialty care providers, and health system administrators who oversaw preventive health care activities. This component of the learning community was ultimately responsible for adapting intervention strategies for implementation.

CT staff met with the SC in regularly-scheduled meetings to discuss health system screening disparities and how to identify effective evidence-based CRC screening interventions that could raise screening rates in populations experiencing disparities. Discussion in these meetings led to the decision that the CT should conduct a scoping review of evidence-based CRC screening interventions and characterize identified intervention strategies to allow for comparison.

Specifically, it was decided that the review should include randomized controlled trials of CRC screening interventions that were conducted in the United States and were reported in PubMed and Scopus between January 1, 2005 and December 31, 2016. Furthermore, the SC decided to focus the review on trials that involved the delivery of a screening intervention to patients of multiple health system primary care practices; included > 400 participants, at least 50% of whom were from minority populations (i.e., African Americans, Hispanics, Asian-Americans and other Pacific Islanders, and American Indians or Alaska Natives); and achieved a statistically significant intervention effect size of a > 10% increase versus a comparator. Specific search terms and strategies used in the review are reported in the Appendix.

CT members (LM, EL) conducted the review, removing duplicate citations identified in the initial search by using reference management software (Mendeley). They also manually reviewed citation titles and abstracts to eliminate trials that included persons at above-average risk of developing CRC (Society, 2017) (i.e., participants with a personal or family history of colorectal cancer or adenomatous polyps; a personal history of inflammatory bowel disease; family history of hereditary colorectal cancer syndrome; personal history of radiation to the abdominal or pelvic area to treat a prior cancer). Finally, a manual bibliography search was conducted to ensure that no relevant studies were overlooked. Any questions related to the application of study selection criteria during the review were adjudicated by CT leadership (RM, MD).

CT members (LM, MD, RM) then used a typology developed by Ritvo et al. (Ritvo et al., 2017) to characterize CRC screening interventions reported in the literature. The typology defines intervention strategies in terms of intervention sponsorship, populations targeted for intervention, alternative screening tests made available to patients, test delivery methods, and support for test performance. Intervention sponsorship refers to the entity (e.g. health system or government agency) that sponsors the invitation to screen. The population targeted criterion refers to the background characteristics of study participants who received the intervention. Alternative screening tests refers to the different screening modalities (e.g. stool blood test [SBT] or colonoscopy) offered to the target population(s). Delivery methods refers to the ways in which the different screening modalities were offered (e.g., mail, office visit). The last category, support for performance, refers to assistance provided to facilitate participant test performance (e.g., automated telephone reminders, navigation calls, and mailed reminders). Table 1 summarizes each of the seven studies using the Ritvo et al. typology.

Finally, results of the scoping review and intervention assessment were presented to the SC. Discussions in these meetings focused on identifying a strategy that fit health system needs. The SC, which included health system leaders, reached consensus that both health systems wanted to implement an intervention strategy that 1) involved centralized “outreach” strategy to nonadherent patients, especially those in populations experiencing screening disparities, 2) offered

Table 1
Characteristics of identified CRC screening trials.

Author	Screening intervention sponsor	Population targeted for screening intervention and % minority	Alternative screening modalities	Screening modality delivery methods	Contacts to support screening test performance
Greiner et al.	9 safety-net clinics in Midwest metropolitan area	N = 470/42% African American and 27% Hispanic	Stool blood test and colonoscopy screening	Stool blood test kit (in-office); Colonoscopy referral (in-office)	Telephone contact: Follow-up regarding screening completion. In-office contact: Screening invitation and information; colonoscopy scheduling instructions; assessment of preferred screening test; bowel preparation materials; materials provided in alternative languages; race and ethnic-concordant staff
Lasser et al.	4 community health centers and 2 public hospital-based clinics in Massachusetts	N = 465/55.5% African American	Stool blood test and colonoscopy screening	Stool blood test kit (mailed); colonoscopy referral (telephone)	Mailed contact: Screening invitation and information; motivational interviewing calls; materials in multiple languages. Telephone contact: Screening invitation and information; follow-up regarding screening completion; assessment of preferred screening test; race and ethnic-concordant staff contact. In-office contact: Race and ethnic-concordant staff
Myers et al.	13 primary care practices in Philadelphia	(n = 764) 100% African Americans	Stool blood test and colonoscopy screening	Stool blood test kit (mailed); Colonoscopy referral (mailed)	Mailed contact: Screening invitation and information; follow-up regarding screening completion; colonoscopy scheduling instructions. Telephone contact: Screening invitation and information; assessment of preferred screening test; race and ethnic-concordant staff contact.
Gupta et al.	System of 13 community- and hospital-based primary care clinics and tertiary care hospital) in Texas	N = 5970/24% African American and 29% Hispanic	Stool blood test and Colonoscopy Screening	Stool blood test kit (mailed); Colonoscopy referral (telephone)	Mailed contact: Screening invitation and information; colonoscopy scheduling instructions; bowel preparation materials; materials provided in multiple languages. Telephone contact: Screening invitation and information; follow-up regarding screening completion; In office contact: Bowel preparation materials; materials provided in alternative languages
Inadomi et al.	Public health system in San Francisco	N = 997/18% African American, 34% Hispanic, and 30% Asian	Stool blood test and colonoscopy screening	Stool blood test kit (in-office); colonoscopy referral (in-office)	Mailed contact: Education materials in multiple languages. In-office contact: Colonoscopy scheduling instructions; assessment of preferred screening test; bowel preparation materials; materials provided in alternative languages
Menon et al.	3 different sites: One Midwest VA, one Midwest academic center, one Southeast medical center	N = 515/72.4% African American	Stool blood test, flexible sigmoidoscopy, and colonoscopy screening	Stool blood test, flexible sigmoidoscopy, and colonoscopy information (telephone)	Telephone contact: screening invitation and motivational interviewing calls
Singal et al.	Safety-net helath system in Dallas County, Texas	N = 5999/49% Hispanic and 24% African American	Stool blood test and colonoscopy screening	Stool blood test kit (mailed); colonoscopy referral (mailed)	Mailed contact: Screening invitation and information; colonoscopy scheduling instructions; bowel preparation materials; materials provided in multiple languages. Telephone contact: Screening invitation and information; follow-up regarding screening completion; race- and ethnic-concordant staff callers

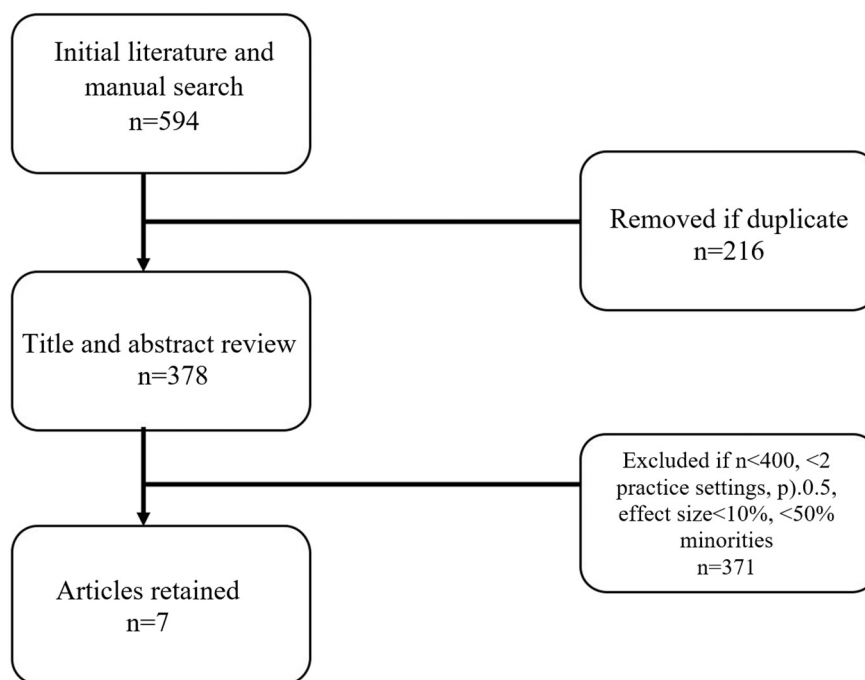


Fig. 1. Identification of trials.

patients both SBT and colonoscopy screening modalities, and 3) could achieve high levels of screening adherence. The SC also recommended that the PASACs in each health system be engaged in adapting the selected intervention strategy for future implementation.

3. Results

As shown in Fig. 1, the scoping literature review yielded a total of 594 citations in PubMed and Scopus (283 and 311 citations, respectively). 216 duplicate citations were removed, leaving 378 candidate articles. Application of additional inclusion and exclusion criteria as detailed in the Appendix resulted in the identification and retention of seven trials (Greiner et al., 2014; Gupta et al., 2013; Inadomi et al., 2012; Lasser et al., 2011; Menon et al., 2011; Myers et al., 2014; Singal et al., 2016). Table 1 summarizes each of the seven studies using the Ritvo et al. typology.

In each of the studies, participant engagement in screening was explicitly sponsored by the participant's health systems and/or primary care practice, in conjunction with the study investigators. In terms of the race/ethnicity of study participants, each of the studies had > 50% African American and/or Hispanic participants. The Inadomi, et al. (Wandersman et al., 2012) study also included a substantial proportion (30%) of Asian participants in the study population. In terms of screening tests made available to study participants, each trial offered both SBT and colonoscopy as screening modalities. The Menon et al. (Myers et al., 2018) trial was the only study in which flexible sigmoidoscopy screening was also explicitly offered as a screening option.

Regarding CRC screening test delivery, the studies either delivered SBT kits by mail to participants or in person at the time of primary care office visits. Alternatively, colonoscopy referrals were provided via telephone or at office visits. Specific support for performance methods were carried out in the form of mailed, telephone, or in-office contacts. Support methods included a personalized invitation to participate in CRC screening and provision of basic information about CRC; follow-up regarding completion of screening; colonoscopy scheduling instructions (for mailed contact); bowel preparations (for mailed or in-office contacts); use of information in multiple languages (for mailed or in-office contacts); directly scheduling the colonoscopy (for telephone or in-

office contacts); assessment of one's preference for modality of screening; and race- and ethnic-concordant staff.

Three of the trials reported relatively high screening rates for in-office and outreach trials. Among the trials that offered CRC screening to patients at the time of an office visit, the Inadomi et al. trial (Inadomi et al., 2012) reported a CRC screening rate of 69% in the intervention group that was provided access to both SBT and colonoscopy. Of those trials that used a centralized process to make CRC screening available to patients outside of a primary care practice visit, Singal et al. (Singal et al., 2016) and Myers et al. (Myers et al., 2014) reported the highest screening rates (59% and 43%, respectively).

Following SC member consideration of the scoping review findings and results from the process of categorizing intervention strategies, it was decided that the health systems favored a centralized "outreach" strategy that would reach nonadherent patients, included both SBT and colonoscopy screening modalities, and achieved the highest levels of screening adherence in populations that had experienced CRC screening disparities. The Myers et al. (Myers et al., 2014) and Singal et al. (Singal et al., 2016) trials satisfied these criteria.

In the Myers et al. (Myers et al., 2014) randomized trial, participants included 764 African American patients in 13 different health system primary care practices who were 50–75 years old and were not up-to-date with CRC screening. Screening test preference was assessed at baseline. Study participants were randomized either to a mailed intervention group or a navigation group. The mailed intervention group received a mailed CRC screening information booklet, a personalized letter that included a telephone number to schedule a colonoscopy appointment, and an SBT kit. All navigation group participants were sent the CRC screening informational booklet. Those who expressed a preference for SBT were also sent an SBT kit; while those who did not express a preference for SBT screening were sent both instructions for scheduling a colonoscopy and an SBT kit. After the initial mailing, a trained navigator attempted to contact participants to help with screening. Lastly, a reminder was sent 45 days to all participants post randomization. The screening rate in the navigation group was 43%, compared to 32% in the mailed intervention group ($p < 0.001$).

The Singal et al. study (Singal et al., 2016) was a randomized trial that included 5999 patients from 12 safety-net primary care practices

who were 50–64 years old and were not up-to-date with CRC screening. Seventy-three percent of study participant were from minority populations (49% Hispanic, 24% African American). Eligible patients were randomized to receive mailed SBT intervention, a mailed colonoscopy intervention, or usual care. Patients in the SBT group were mailed an informational letter, along with an SBT kit with a paid-postage return envelope, and were contacted by telephone to encourage screening. Patients in the colonoscopy group were also mailed an informational letter, were contacted by telephone to offer assistance with colonoscopy scheduling, and were mailed a bowel preparation kit and procedure instructions. Bilingual research staff also placed a reminder to participants in this intervention group. In addition, participants in this group who had scheduled a screening colonoscopy received two appointment reminder calls. At 12 months, screening completion rates were 59% in the SBT outreach arm, 42% in the colonoscopy outreach arm, and 30% in the usual care arm ($p < 0.001$ for both comparisons).

Careful review of these trials led the SC to conclude that the most effective intervention strategy for implementation in the health systems would include the following components: Mailing patients CRC screening information materials; providing patients with access to both SBT and colonoscopy screening; and contacting patients by telephone to navigate them through the process of completing their preferred screening test. The SC recommended that the PASAC take up the task of adapting this intervention strategy for implementation in the health systems.

4. Discussion

The RCaDES Initiative was a health system-based learning community developed to address CRC screening disparities among minority patients in primary care. This effort is consistent with recent calls for health systems to take a leadership role in improving population health (Greene et al., 2012). Ideally, such a process would involve determining population health problems; identifying evidence-based intervention strategies that could be used to address the problems; and, using a multi-level approach to promote the implementation of selected strategies. The RCaDES Initiative was intended to address these challenges by forming a health-systems based learning community.

Kraft et al. (Kraft et al., 2017) have argued that intervention implementation in health systems can be facilitated by locating responsibility for change in a group that can guide the transformational process and by forming partnerships of patient and health care providers and other stakeholders. The learning community described above served to operationalize these aspects of the learning community. Specifically, members of the learning community conducted a scoping review of the literature to search criteria led to identify randomized trials that helped to identify evidence-based intervention strategies that could substantially raise CRC screening rates and reduce screening disparities. The learning community also examined intervention strategies that fit health system plans to extend their CRC screening efforts to reach those patients who may not make frequent primary care practice visits; and to make more than one screening modality available to primary care patients who were eligible for CRC screening.

Initially, the Center for Health Decisions formed the CT, a learning community component that was committed to ensuring that patients from populations targeted for screening, primary care providers, health system leaders, and other stakeholders were represented in the learning community. In addition, CT members embraced the challenge of guiding health system representatives through the process of learning about CRC screening rates, identifying evidence-based intervention strategies that could be used to address screening disparities, and learning how to obtain feedback from the community related to those strategies that could be used to improve current screening rates.

The SC, another core component of the learning community that represented health system leadership and stakeholders from other healthcare organizations, worked with the CT to review CRC screening

data on health system CRC screening rates, to determine the existence of screening disparities among primary care patients, and to identify evidence-based practices in CRC screening that could be adapted for implementation. Importantly, the SC chose to focus attention on randomized trials of CRC screening interventions, especially those that showed a robust increase in CRC screening rates among populations experiencing disparities. We view this decision as reasonable, given the defined mission of the RCaDES Initiative, and our belief that RCTs on CRC screening reported in the literature have been informed by extensive work done historically on interventions designed to increase preventive health behaviors and systematic reviews that have identified successful intervention strategies.

Finally, to be successful in moving evidence-based interventions into routine care, Psek et al. (Psek et al., 2015) have highlighted the need for health systems to actively engage patients, providers, health system leaders, and other stakeholders in adapting intervention strategies to fit the needs of target populations and of the health system itself. The JH PASAC and the LVHN PASAC included primary care patients from racially and ethnically diverse populations served by health system primary care practices, primary care physicians from participating practices, and administrators who are responsible for managing cancer prevention and control services.

Going forward, PASAC members plan to identify challenges to intervention implementation from the patient and provider perspectives. Furthermore, the PASACs will develop recommendations on how the intervention may be adapted to facilitate intervention reach, fidelity, and effectiveness in primary care patient populations experiencing disparities, as recommended by Chambers and Norton (Chambers and Norton, 2016). Particular attention will be devoted to addressing needs of diverse patients without disrupting functional workflows of primary care practices. Following the Plan, Study, Do, and Act (PSDA) model described by Langley et al. (Anon, 2018b), the learning community has encouraged health system leaders to engage the PACACs in planning PSDA quality improvement projects aimed at overcoming barriers to intervention implementation.

To our knowledge, the RCaDES Initiative represents the first instance in which an NCI-designated cancer center has helped to organize a health system learning community to catalyze the translation of evidence-based CRC screening interventions into practice to reduce screening disparities in minority populations. It is reasonable to believe that the strategy described here may also be applied to other important targets for preventive health intervention in primary care populations (e.g., screening for breast, cervical, and lung cancer). Research is needed to explore the broader utility of the learning community approach to moving evidence-based interventions into routine care in health systems.

Acknowledgements

Paul Hunter, DMD, MLIS. Clinical informatics librarian, Center for Learning and Teaching, Jefferson University Hospital.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2018.10.009>.

References

- Anon, 2018a. Developing and Implementing Learning Communities: Findings and Lessons From the AHRQ Health Care Innovations Exchange|AHRQ Health Care Innovations Exchange [Internet]. Available from: <https://innovations.ahrq.gov/learning-communities/reports/developing-and-implementing-learning-communities-findings-and-lessons>.
- Anon, 2018b. The Improvement Guide: A Practical Approach to Enhancing Organizational Performance, 2nd ed. AHRQ Patient Safety Network Available from: <https://psnet.ahrq.gov/resources/resource/1580/the-improvement-guide-a>

- practical-approach-to-enhancing-organizational-performance-2nd-ed.
Anon Sense of Community: A Definition and Theory - McMillan - 1986 - *Journal of Community Psychology* - Wiley Online Library. [cited 2018 Jul 4]. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/1520-6629%28198601%2914%3A1%3C6%3A%3AAID-JCOP2290140103%3E3.0.CO%3B2-I>.
- Aragón, T.J., Garcia, B.A., 2015. Population Health Division Leadership Team. Designing a learning health organization for collective impact. *J. Publ. Health Manag. Pract.* (Suppl. 1), S24–S33.
- Chambers, D.A., Norton, W.E., 2016 Oct. The Adaptome: advancing the science of intervention adaptation. *Am. J. Prev. Med.* 51 (4 Suppl 2), S124–S131.
- Committee on the Learning Health Care System in America, Institute of Medicine, 2013. In: Smith, M., Saunders, R., Stuckhardt, L., JM, McGinnis (Eds.), *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America* [Internet]. National Academies Press (US), Washington (DC) [cited 2018 Jul 3]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK207225/>.
- Edwards, B.K., Ward, E., Kohler, B.A., et al., 2010 Feb 1. Annual report to the nation on the status of Cancer, 1975–2006, featuring colorectal trends and impact of interventions (risk factors, screening, and treatment) to reduce future rates. *Cancer* 116 (3), 544–573.
- Greene, S.M., Reid, R.J., Larson, E.B., 2012 Aug 7. Implementing the learning health system: from concept to action. *Ann. Intern. Med.* 157 (3), 207.
- Greiner, K.A., Daley, C.M., Epp, A., et al., 2014 Dec. Implementation intentions and colorectal screening: a randomized trial in safety-net clinics. *Am. J. Prev. Med.* 47 (6), 703–714.
- Gupta, S., Halm, E.A., Rockey, D.C., et al., 2013 Oct 14. Comparative effectiveness of fecal immunochemical test outreach, colonoscopy outreach, and usual care for boosting colorectal cancer screening among the underserved: a randomized clinical trial. *JAMA Intern. Med.* 173 (18), 1725–1732.
- Inadomi, J.M., Vijan, S., Janz, N.K., et al., 2012 Apr 9. Adherence to colorectal cancer screening: a randomized clinical trial of competing strategies. *Arch. Intern. Med.* 172 (7), 575–582.
- Key Concept: Learning Communities**, 2018. Center on the Developing Child at Harvard University. Available from: <https://developingchild.harvard.edu/collective-change/key-concepts/learning-communities/>.
- Kraft, S., Caplan, W., Trowbridge, E., et al., 2017 Oct. Building the learning health system: describing an organizational infrastructure to support continuous learning. *Learn Health Syst.* 1 (4), e10034.
- Lasser, K.E., Murillo, J., Lisboa, S., et al., 2011 May 23. Colorectal cancer screening among ethnically diverse, low-income patients: a randomized controlled trial. *Arch. Intern. Med.* 171 (10), 906–912.
- Menon, U., Belue, R., Wahab, S., et al., 2011. A randomized trial comparing the effect of two phone-based interventions on colorectal cancer screening adherence. *Ann. Behav. Med. Publ. Soc. Behav. Med.* 42 (3), 294–303.
- Myers, R.E., Sifri, R., Daskalakis, C., et al., 2014. Increasing colon cancer screening in primary care among African Americans. *J. Natl. Cancer Inst.* 106 (12).
- Myers, R.E., DiCarlo, M., Romney, M., et al., 2018 Sep. Using a health system learning community strategy to address cancer disparities. *Learn Health Syst.* 18, e10067.
- Nilsen, P., 2015. Making sense of implementation theories, models and frameworks. *Implement Sci.* 10, 53.
- Pennsylvania Cancer Registry, 2018. *Pennsylvania Cancer Incidence and Mortality: Executive Summary* [Internet]. Pennsylvania Health Statistics Available from: http://www.statistics.health.pa.gov/HealthStatistics/CancerStatistics/AnnualCancerReport/Documents/Executive_Summary_PA_Cancer_Incidence_and_Mortality_2012.pdf.
- Psek, W.A., Stametz, R.A., Bailey-Davis, L.D., et al., 2015 Mar 10. Operationalizing the learning health care system in an integrated delivery system. In: *EGEMs Gener Evid Methods Improve Patient Outcomes.* 3(1). pp. 6.
- Ritvo, P., Myers, R.E., Serenity, M., et al., 2017 Aug. Taxonomy for colorectal cancer screening promotion: lessons from recent randomized controlled trials. *Prev. Med.* 101, 229–234.
- Singal, A.G., Gupta, S., Tiro, J.A., et al., 2016 Feb 1. Outreach invitations for FIT and colonoscopy improve colorectal cancer screening rates: a randomized controlled trial in a safety-net health system. *Cancer* 122 (3), 456–463.
- Society, American Cancer**, 2017. *Colorectal Cancer Facts & Figures 2017–2019*. Available from: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/colorectal-cancer-facts-and-figures/colorectal-cancer-facts-and-figures-2017-2019.pdf>.
- US Preventive Services Task Force, Bibbins-Domingo, K., Grossman, D.C., et al., 2016 Jun 21. Screening for colorectal Cancer: US preventive services task force recommendation statement. *JAMA* 315 (23), 2564–2575.
- Wandersman, A., Duffy, J., Flaspohler, P., et al., 2012. Bridging the gap between prevention research and practice: the interactive systems framework for dissemination and implementation. *Am. J. Community Psychol.* 41 (3–4), 171–181.
- Zauber, A.G., Winawer, S.J., O'Brien, M.J., et al., 2012 Feb 23. Colonoscopic polypectomy and long-term prevention of colorectal-cancer deaths. *N. Engl. J. Med.* 366 (8), 687–696.