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REVIEW ARTICLE

Understanding stakeholder awareness and communication strategies to inform implementation of precision medicine among minority populations: A systematic review

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ABSTRACT

Background and Aim: This systematic review aimed to (1) understand stakeholder awareness of benefits, risks, and likelihood of participating in precision medicine research and treatment and (2) identify effective communication strategies to increase awareness of precision medicine.
Relevance for patients: Our review identified a limited number of studies to inform stakeholder understanding and use of precision medicine, indicating that more evidence on how to communicate with stakeholders about precision medicine is warranted.

1. Introduction

The Transdisciplinary Collaborative Center (TCC) in Precision Medicine for Minority Men's Health was established at the Medical University of South Carolina in 2015 to address disparities in the translation of precision medicine (PM) approaches among racial minority groups.

This regional consortium focused on three aims: (1) The development of a consortium of regional and national partners, (2) the conduct of transdisciplinary research examining synergistic effects of biological, social, physiological, and clinical determinants of chronic disease risks and outcomes, and (3) the dissemination and implementation of PM approaches, with an emphasis on reducing disparities in health care and outcomes among minority men.

The third aim of the TCC focused on how to better translate and disseminate information and create awareness among a range of stakeholders of the potential and actual benefit of PM for minority men. Our plan included three approaches: (1) Working with our regional and national partners to understand their needs and preferences regarding information about PM, its components, and its potential benefit for them, (2) working with our researchers to assure that their study findings were translated into materials appropriate for our partners, and (3) exploring current best practices for communicating and disseminating PM approaches and research findings into materials and products for our target audiences of health-care providers and members, particularly male members, of minority communities.

This systematic review was designed as part of our third approach and sought to better understand stakeholder awareness of benefits, risks, and likelihood of participating in PM research and treatment and to identify effective communication strategies to increase awareness of PM and its components, particularly among minority populations.

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Throughout the work of our consortium and, including this review, we used the definition of PM from the National Institutes of Health [1]. PM is "an emerging approach for disease treatment and prevention that considers individual variability in genes, environment, and lifestyle for each person" [1]. We also acknowledge through our searches and analyses that PM may be described as "individualized medicine," "personalized health," or "individualized health" and that related approaches and disciplines include genetics, genetic testing, and pharmacogenomics.

PM contrasts with a one-size-fits-all approach to providing care, in which disease treatment, prevention, and pharmaceutical strategies are developed for the average person, with less consideration for the differences between individuals and/or groups. Although examples can be found in several areas of medicine, the current role of precision medicine in day-to-day health care is relatively limited and often not clearly understood by either health-care providers or patients [2]. Given recent advances in PM and the influx of data generated by PM, patients have access to more details about their health than ever before [3]. For patients to make informed decisions in the era of PM, it is imperative that they understand basic genetic principles; however, studies suggest that a substantial proportion of the general public lacks this understanding [4-7].

As the amount of genetic and other health data becomes available, consumer-focused resources will be needed to put this information into context [2,8]. Research into consumers' specific information needs and preferences related to PM could help guide the evolution of existing and development of new educational resources [9,10] to support implementation of precision medicine.

Similarly, many clinicians lack familiarity with genetics and the important role it plays in health care. Reports from the Secretary's Advisory Committee on Genetics, Health, and Society [11] raise concerns about the amount of medical genetics education health care workers receive. Health-care professionals need an understanding of genetic concepts to interpret PM data and explain them to patients.

To support implementation of patient engagement in PM and informed, shared decision-making about its use, clinicians, patients, health systems administrators, payers, and policy makers will need trusted online and other resources that provide easy-to-read information about genetic principles, genetic disorders, gene functions and their roles in disease, and pharmacogenomics [12]. Preliminary results from an ongoing survey of randomly selected website users indicate a strong interest in the relationship between genetic mutations and disease course, the role of genetics in treatment options, and the interaction of lifestyle and genetic factors in disease. Survey respondents want information that is applicable to their health situation [13].

Having sufficient, accurate, and timely information alone does not assure its comprehension and/or motivate its use to offer, participate in or support the implementation of precision medicine. As an example, a recent review summarized stakeholder views regarding barriers to implementing pharmacogenetic testing [11,14]. The most common topics in studies of providers related to clinical usefulness of genetic data and educational needs for themselves. Among the general public, the most common concerns were medical mistrust (in general and in among specific populations), insufficient education, and practicality [14]. Patients were concerned about ethical or legal and economic issues and payers about practicality and clinical usefulness [14]. Stakeholder views overlapped in some instances (e.g., lack of knowledge) and diverged in others (e.g., privacy, cost, and test result dissemination) [14].

Furthermore, stakeholders are also concerned that underrepresented minority populations are often not included in PM initiatives and/or biomedical research that seeks to improve human health and reduce the burdens of disease [15,16].

Findings from these studies illustrate the need to examine existing literature and evidence to support communication strategies using multilevel models such as the Multilevel Ecological Model of Health to accelerate the appropriate use of PM [17]. Systematic reviews of studies comparing the effectiveness of implementation strategies have identified a number of strategies known to be effective in increasing the adoption and use of evidence-based care among health-care providers: Educational outreach visits or academic detailing, decision-support systems and other systems reminders, interactive educational meetings, multicomponent interventions, audit and feedback, use of local or national experts, opinion leaders or champions, use of local consensus processes, computerized reminders, and patient-mediated interventions [18]. While each of these strategies was found to be effective under some circumstances, educational outreach visits, audit and feedback, educational meetings, and computerized reminders were found to have small to moderate effect.

Overall, multifaceted strategies were not necessarily better than single strategies but multifaceted strategies including organizational interventions (redefined role, enhanced multidisciplinary team work) appeared to be more effective in changing practice, especially if the guideline or intervention is complex [18]. Similar findings apply for dissemination research with a recent review finding that, compared with single dissemination strategies, multicomponent dissemination strategies are more effective at enhancing clinician behavior, particularly for guideline adherence [18].

2. Objectives

This systematic review was designed to examine the peer-reviewed literature to (1) understand stakeholder awareness about PM, including perceptions of benefits, risks, and the likelihood of participating in PM research and treatment (stakeholder awareness) and (2) to identify effective communication strategies to increase awareness of PM with specific audiences at different levels of the health-care system (communication strategies). Understanding gaps or misperceptions on the part of stakeholders along with the effectiveness of specific communication strategies related to precision medicine could inform efforts to increase stakeholder awareness and promote implementation of precision medicine into clinical practice.

3. Methods

3.1. Searches

A systematic search of electronic databases of peer-reviewed and gray literature was conducted by a trained information professional. The electronic databases included Scopus®, PubMed (Legacy version), and 35 databases within the EBSCOHost platform including CINAHL, Medline, Academic Search Premier, and PsychhINFO. Final search terms included (communication strategies OR engagement OR implementation OR Dissemination) AND (precision medicine OR Personalized health OR individualized medicine OR individualized health) AND (minority OR minorities OR underrepresented OR African-American OR black OR African-American OR Black American OR minority). Full search terms, exclusion and inclusion coding, a full list of search sources, and query translation are found in Appendix A.

3.2. Study inclusion and exclusion criteria

Articles, other than systematic reviews, were included if published in the United States and in the English language between January 1, 2015, and June 12, 2018. Table 1 provides details about inclusion and exclusion criteria regarding study design, setting, timeframe, language, country of publication, and age of population. Inclusion dates were based on our assessment of past reviews on the topics of stakeholder awareness of PM and on other reports related to communication strategies.

After reviewing the gray literature search results (n=595), the research team decided, given the lack of relevance of these citations, to exclude the findings of these searches in favor of original research citations (n=147).

Remaining abstracts (n=147) were dual reviewed by three individual reviewers using stated inclusion and exclusion criteria (Table 1) resulting in the exclusion of 93 articles and retention of 54. A full-text dual review of 54 articles was completed by three PhD prepared or PhD level members of the research team, who had prior experience conducting reviews. Disparate reviews were adjudicated by the lead author. Six articles were determined to have met inclusion criteria with two addressing stakeholder awareness and four addressing communication strategies (Figure 1).

3.3. Literature synthesis

For the stakeholder awareness synthesis, any descriptive study design (e.g. surveys, focus groups, interviews, or some combination of these methods) was allowed if it assessed any one of the stakeholder awareness outcomes: Stakeholder awareness of precision medicine, perceptions of benefits and risks related to precision/personalized medicine, and participation and/or intention to participate in PM for African-American or minority populations.

The communication strategies synthesis was limited to evaluative studies and small trials that tested communication interventions aimed at improving knowledge and/or use of PM among African-American or minority populations.

3.4. Study quality assessment

Population, Intervention, Comparison, Outcome, and Study Type (PICOS) criteria were used to abstract included articles and to summarize the evidence. The lead author assessed risk of bias at the outcome level after synthesis of results using these indicators: Sample size, variation in use of behavioral constructs, variation in studied populations, intervention completion and fidelity of intervention content and process, variability in PICOS, and overall small number of studies. This information was presented to and discussed with all authors. Author consensus was reached on overall study quality and overall strength of evidence for each theme and for the themes combined.

Table 1. Inclusion and exclusion criteria by category

Category	Inclusion criteria	Exclusion criteria
Timeframe (X1, n=55)	Published between 2015 and 2018	Published before 2015 or after 2018
Language (X2)	Published in English language	Not published in English language
Wrong outcome (X3, n=47)	For stakeholder awareness theme: Stakeholder awareness of PM, including perception of benefits and risks related to precision/personalized medicine and/or participation and/or intention to participate in precision medicine for African-American or minority populations For communication strategies theme: Communication strategies to increase awareness of PM with specific audiences at different levels of the health-care system or within the community. Specifically, not communication or dissemination strategies for sharing information about precision medicine/not sharing information/implementing precision medicine research with minorities/and/or communities	Outcomes outside those specified for each theme
Study design (X4, n=30)	Original research: For stakeholder awareness theme: Any descriptive study design including observational, cross-sectional, qualitative (e.g., surveys, focus groups, interviews or some combination of these methods), or mixed methods For communication strategies theme: All trials including RCT, comparative effectiveness studies, or evaluative studies that tested communication interventions aimed at improving knowledge and/or use of PM among African-American or minority populations or subgroups	Systematic reviews, commentaries, books, book chapters, abstracts Study designs outside those specified for each theme
Country (X5, n=4)	Published in the U.S.	Not published in the U.S.

3.5. Data extraction strategies

Data collection spreadsheets tested in a prior review [19] were used to abstract information for the full-text dual review. The following data were, if available abstracted for each article included in the full-text review: Publication date, citation components, abstract of the article, link to the full article, DOI, study purpose,

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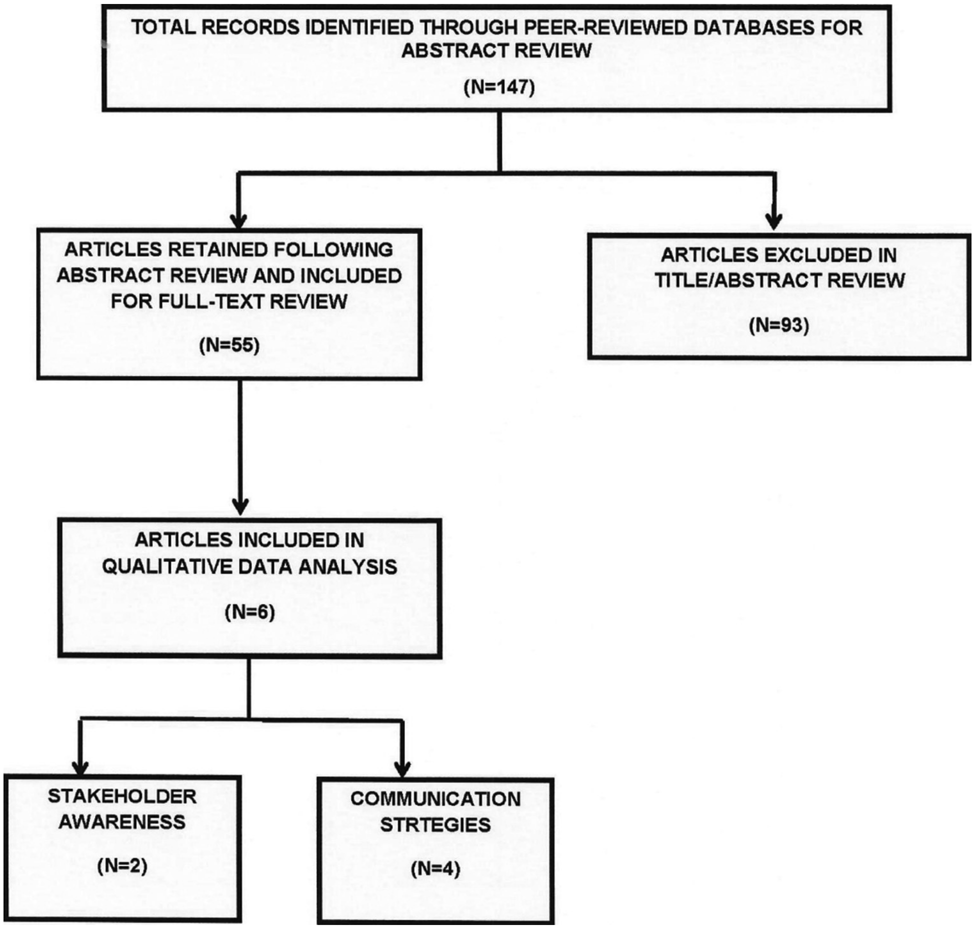

Figure 1. Peer-review article abstraction outcomes.

study design, setting and sample, statistical analysis used, and study outcomes including effect estimates and confidence intervals for individual studies were recorded, as available in each article.

3.6. Data synthesis and presentation

Findings from the included articles were organized by PICOS categories (population, intervention, comparisons, outcomes, and study type) and ecological model level (e.g. individual/patient, family and social support, providers/teams, organization and/or practice setting, local community environment, state health policy environment, and national health policy environment) for each topic: Stakeholder awareness and communication strategies. Themes related to each stakeholder awareness and communication strategy outcome were developed using the appropriate levels of the multilevel ecological model of health as a coding framework [16].

4. Results

4.1. Review statistics

The search was completed in July 2018 and 742 total records were identified through peer-reviewed databases for abstract review (Figure 1). Search databases with the highest hit count were MEDLINE (54 results), Academic Search Premier (28 results) CINALHL Complete (15 results), and PsycINFO (12 results).

Fifty-four articles were retained following title/abstract review and included for full-text review; 93 articles were excluded for the following reasons: Wrong time frame (X1: n=59), wrong outcome (X3: n=47), wrong study design (X5: n=30), and wrong country (not US): (X6: n=4). No non-English language (X2) articles were returned in the search. Six articles met inclusion criteria and were included in the qualitative analysis for this review [20-25].

4.2. Evidence of effectiveness

The heterogeneity of all PICOS criteria across studies for each topic precluded meta-analysis. Data were assessed qualitatively along with strength of evidence rated for each topic as high, moderate, low, or very low. For all studies, the overall risk of bias rating as well as the number of articles in each topic sample was used to determine overall strength of evidence.

4.3. Evidence summaries

4.3.1. Stakeholder awareness

4.3.1.1. Included studies

Two studies examined stakeholder awareness outcomes [21,22].

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4.3.1.2. Population

Populations included a predominantly female (60.8%), older (mean age of 55.0±14.0 years) inner city population [22], and a group of users of the mTurk human intelligence tasks landing page, identified as age 18 and over, having a United States (US)-based mTurk account, and indicating their race as either White or Black [21].

4.3.1.3. Intervention

The stakeholder awareness articles did not test interventions.

4.3.1.4. Comparison

Each included study evaluated statistical significance among various groups of survey participants [21,22].

4.3.1.5. Outcomes

Individual level outcomes included participant beliefs about uses for PM [21,22], participants identified barriers and facilitators affecting implementation of PM [22], and participant likelihood of participating in research that uses a participant's DNA, shares personal DNA with a private company, or allows personal DNA to be used to create cell lines [21]. At the health systems level, outcomes included barriers and facilitators to implementing PM [22].

4.3.1.6. Study type

Both studies were descriptive and used survey methods.

4.3.2. Stakeholder awareness findings by outcome

4.3.2.1. Participant interest in testing

Individual Level: In a survey of a diverse population of smokers in an inner city, female gender was a predictor of interest toward pharmacogenetic testing with women having 4.2 times higher adjusted odds of being interested in pharmacogenetic testing [22] than men. Almost half (44.4%) of the patients with high interest in being tested were willing to pay $20 or more for a test, whereas 76.2% of patients with low interest wanted testing at no cost [22].

In a survey of Black and White online respondents from across the US, African-American respondents were significantly less likely, after controlling for confounders, than White respondents to (a) indicate that use of genetic testing should be promoted and available for those who want to use them (3.18 vs. 2.51 P=0.125), (b) want to receive the results of genetic testing (3.51 vs. 3.85, P=0.0039), and (c) want to learn the test results if their providers knew them (3.73 vs. 4.10, P=0.003) [21].

4.3.2.2. Participant perception of benefits/facilitators

Individual Level: A survey of predominantly African-American, female, and older inner city residents identified a number of facilitators for improving participation in pharmacogenomic testing at the individual level: Providing information about pharmacogenetic testing; elaborating on benefits of testing to predict treatment efficacy; building patients' trust in their providers to make correct genotype-guided prescribing decisions; and assuring insurance coverage and test affordability [22].

4.3.2.3. Participant interest in participation in genetic research

Individual Level: Regarding participation in genetic research, African-American respondents responding to an online survey were, after controlling for confounding, significantly less likely than White respondents to participate in research that used their DNA, have their DNA shared with a private company, or allow their DNA to be used to create cell lines for future research [21].

4.3.3. Communication strategies

4.3.3.1. Included studies

Four studies examined communication strategy outcomes [20, 23-25].

4.3.3.2. Population

Populations represented in four studies testing or evaluating communication strategies included outpatient adult daily smokers with medical comorbidity [25], cardiologists [23], women with a history of gestational diabetes [20], and low income, minority patients due for colorectal cancer screening (CRC) [24].

Two studies did not identify a specific setting [23,24]. Studies reporting a setting were conducted in an outpatient facility [22] and an unspecified integrated health-care delivery system [20].

4.3.3.3. Interventions and comparisons

Evaluative studies and small trials developed and tested communication interventions including (1) metabolism informed care (MIC) compared to guideline-based care (GBC) [25], (2) the propensity of cardiologists to select antiplatelet therapy based on CYP2C19 loss-of-function variants in stented patients when exposed to an EHR prompt was compared to not receiving a prompt [23], (3) web-based training [20], and (4) storytelling (e.g. a video created from personal stories composited into a drama about "Papa" receiving CRC screening) + health-care provider referral for CRC screening + follow-up at 3 months to assess compliance with screening recommendation (a two-group randomized controlled trial) compared to usual care [24].

4.3.3.4. Outcomes

Outcomes included propensity of clinicians to select antiplatelet therapy based on CYP2C19 loss-of-function variants in stented patients [23], smoking cessation and nicotine metabolism rate (NMR)-medication match rates [25], patient trust, perceived risk for diabetes, and personal control using relevant tests [20], and participation in colorectal cancer screening [24].

4.3.3.5. Study type

Study types included a feasibility randomized controlled trial [25], a prospective study [23], a two-group comparison through survey and focus groups [20], and a two-group parallel randomized controlled trial [24].

4.4. Communication strategies findings by ecological level

4.4.1. Individual level

One study supported the importance of building trust in the medical system and avoiding words and images that have strong negative associations among low-income minority community members [24]. The study also found that the use of storytelling (a video created from personal stories composited into a drama about “Papa” receiving CRC screening) versus an instrument estimating level of personal cancer risk + healthcare provider advice did not indicate significant differences (37% and 42%) in seeking CRC screening [24]. Factors positively associated with CRC screening included being female, Hispanic, married or living with a partner, speaking Spanish, having a primary care provider, lower income, and no health insurance. Engagement with providers to work through positive attitudes toward the behavior also predicted CRC screening participation [24].

A study of MIC, a NMR-based precision approach to smoking cessation, found that treatment-seeking daily smokers with medical comorbidity viewed MIC favorably (90% of smokers) and were willing to accept MIC-guided medication [25].

4.4.2. Provider level

Having genomic information (e.g., CYP2C19 variant status) present in the electronic health record (EHR) was sufficient to prompt its use by cardiologists as it was the most influential factor impacting the prescribing decision in poor metabolizers followed by patient age and type of stent implanted [23].

One study showed significant differences in receipt of NMR-matched medication (i.e. normal metabolizers received varenicline; slow metabolizers received NRT patch) by MIC participants compared to participants receiving GBC (84% vs. 58%) [23].

4.4.3. Health systems levels

MIC increased the odds of optimized matching between NMR and medication more than 3-fold over GBC [25]. Because the number needed to treat to help one normal metabolizer quit smoking is only 4.9 for varenicline versus 26 for patch, broad implementation of MIC will improve drug efficacy in normal metabolizers as well as minimize side effects in slow metabolizers [25].

5. Discussion

Our review identified a small number of studies related to stakeholder awareness and communication strategies to facilitate the understanding and use of PM among African-American and minority populations. This scant evidence is in keeping with the relatively new field of PM and limited body of work related to how to communicate with patients and others about health issues, including PM. Patient/individual, provider, and health systems themes were consistent with the multi-level ecological framework and reflected awareness, preferences, barriers, and facilitators at various levels.

Our findings were limited by several factors including the lack of specificity about what to call precision medicine. Terms such as precision medicine, personalized health, individualized medicine, and/or individualized health are used in the literature, sometimes as synonyms for each other. While our search criteria were designed to include these terms and/or various combinations of them, it is likely that we missed some relevant articles.

We chose to include search terms related to genetics, genetic testing and pharmacogenomics given our understanding that stakeholders may have differing awareness of PM and its components. If stakeholders do not know how genetic testing is done or its role in PM, they may be less likely to indicate a willingness to participate in PM research and/or treatment. In recognition of this linkage, we searched for studies that provided information on stakeholder insight into this relationship and/or tested interventions to improve communications about these topics.

The generalizability of our findings was also limited by the great variability across studies on all PICOS characteristics. Outcomes and interventions varied widely, were based on different behavioral constructs, were often complex, and/or focused on only one population. Assessments of intervention completion and fidelity of intervention content and process were not presented in any of the included studies. We rated the strength of evidence for these findings as low based on the small number of studies and variability in PICOS. We acknowledge the possibility that our findings are affected by selection and publication bias and the potential for reviewer misclassification of study characteristics.

Stakeholder awareness findings at the individual level that aligned with previous work included greater participant interest in pharmacogenomic testing among women compared to men [22], participant identified barriers to implementation of precision/personalized medicine that includes concerns about the negative consequences associated with test results, the burden of the testing itself, perceived lack of test utility among specific groups, privacy issues, and lack of insurance coverage [22].

Participant perceptions of facilitators of PM awareness and use also aligned with prior work. Specific facilitators included providing more information about pharmacogenetic testing, including its benefits and potential to predict treatment efficacy; building patient trust in providers to make correct genotype-guided prescribing decisions, and assuring insurance coverage and test affordability [22].

Our review contributes one new stakeholder awareness finding that African-American respondents to an online survey in the US, after controlling for confounding, were significantly less likely than White respondents to participate in research that used their DNA, have their DNA shared with a private company, or allow their DNA to be used to create cell lines for future research [21].

Barriers at the community level echoed prior work by mentioning lack of trust, ethical issues, privacy, and skepticism about medical research in general [21,22,26].

Communication strategies found to be effective at the health systems level for building trust in the medical system included avoiding words and images with negative connotations, especially for low-income minority community members and using personal stories presented in video format among individuals who were female, Hispanic, married/living with a partner, Spanish speaking, lower income, with no health insurance, and with a primary care provider. Among providers, having genomic information present in the EHR was sufficient to prompt its use by cardiologists making prescribing decisions [23]. Similarly, the availability of metabolism-informed care information led to improved medication match rates for smoking cessation among adult daily smokers with medical comorbidity [25].

6. Conclusions

Although our findings were insufficient to recommend approaches for communication strategies to facilitate use of precision medicine, several areas of promising research were identified at the individual/patient, provider, and health systems levels. The identification of barriers and enablers at each level could inform multilevel intervention design and testing. Our findings regarding patient/individual preferences for various types of communication channels, materials, and content could inform more robust testing among specific population groups and the public. Provider response to EHR and other technology prompts could also be further tested as well as similar prompts for patients and caregivers. Since we found that system supports were important at all levels of the ecological model, further study of the types of supports needed and the coordination and/or combination of these supports across levels and within organizations could also be studied further to inform implementation of precision medicine trust.

With regard to improving awareness of and participation in PM activities, recently developed resources, such as the All of Us Research Program could be evaluated and improved through the active engagement of both those individuals choosing to participate and those declining participation [27]. Our review indirectly addressed the mission of the All of Us Research Program to speed up research and medical breakthroughs by "*people to lead the way to provide the types of information that can help us create individualized prevention, treatment, and care for all of us*" [24]. Perhaps, our most important over-riding conclusion is that more rigorous research is needed to inform the engagement of a wide range of stakeholders, to identify and overcome their barriers to participation and use of precision medicine, and to identify the most effective ways to reach them with information tailored to their specific preferences, situations, and settings.

Conflicts of interest

The authors declare that they have no competing interest.

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Appendix - A

Appendix: Search Databases, Final Search Terms, and Query Translations

Please note that the retirement of Legacy PubMed means that our search terms and query translations are not replicable in the current version of PubMed.

Final Search Terms: (Communication strategies OR engagement OR implementation OR Dissemination) AND (precision medicine or personalized medicine OR Personalized health or individualized medicine or individualized health) AND (minority OR minorities OR underrepresented OR African-American or Black or African-American or Black American or minority)

EBSCOhost Final Search Terms: (communication strategies OR engagement OR implementation OR Dissemination) AND (precision medicine OR personalized medicine OR Personalized health OR individualized medicine OR individualized health) AND (minority OR minorities OR underrepresented OR African-American OR Black OR African-American OR Black American OR minority)

EBSCOhost Research Databases: Search Screen - Advanced Search Database - CINAHL Complete; Academic Search Premier; Agricola; Alt HealthWatch; Newswires; Applied Science & Technology Full Text (H.W. Wilson);Business Source Premier; Computer Source; Criminal Justice Abstracts with Full Text; eBook Collection (EBSCOhost);Education Full Text (H.W. Wilson);ERIC; European Views of the Americas: 1493 to 1750;Fuente Académica; Funk & Wagnalls New World Encyclopedia; GreenFILE; Health Source - Consumer Edition; Health Source: Nursing/Academic Edition; History Reference Center; Library Literature & Information Science Index (H.W. Wilson);Library, Information Science and Technology Abstracts; MAS Ultra - School Edition; MasterFILE Premier; MEDLINE; Middle Search Plus; Military & Government Collection; Newspaper Source Plus; Primary Search; Professional Development Collection; PsycARTICLES; Psychology and Behavioral Sciences Collection; PsycINFO; Regional Business News; Religion and Philosophy Collection; Science Reference Center; Teacher Reference Center; TOPICsearch; Vocational and Career Collection; Literary Reference Center; Small Business Reference Center; Web News; AHFS Consumer Medication Information; eBook Academic Collection (EBSCOhost);Consumer Health Complete.

Legacy PubMed User Query: (((((communication AND strategies) OR “communication strategies” OR engagement OR implementation OR dissemination))) AND (((precision AND medicine) OR “Precision medicine” OR (personalized AND medicine) OR “Personalized Medicine” OR (personalized AND health) OR “Personalized Health” OR “individualized medicine”)))) AND (((African AND American) OR “African American’ OR Black OR African-American OR (Black AND American) OR “Black American” OR minority OR minorities OR underrepresented)))

Legacy PubMed Query Translation: ((((“communication”[MeSH Terms] OR “communication”[All Fields]) AND strategies[All Fields]) OR “communication strategies”[All Fields] OR engagement[All Fields] OR implementation[All Fields] OR dissemination[All Fields]) AND ((precision[All Fields] AND (“medicine”[MeSH Terms] OR “medicine”[All Fields])) OR “Precision medicine”[All Fields] OR (personalized[All Fields] AND (“medicine”[MeSH Terms] OR “medicine”[All Fields])) OR “Personalized Medicine”[All Fields] OR (personalized[All Fields] AND (“health”[MeSH Terms] OR “health”[All Fields])) OR “Personalized Health”[All Fields] OR “individualized medicine”[All Fields])) AND (((“African continental ancestry group”[MeSH Terms] OR (“African”[All Fields] AND “continental”[All Fields] AND “ancestry”[All Fields] AND “group”[All Fields]) OR “African continental ancestry group”[All Fields] OR “African”[All Fields]) AND American[All Fields]) OR “African American”[All Fields] OR (“African continental ancestry group”[MeSH Terms] OR (“African”[All Fields] AND “continental”[All Fields] AND “ancestry”[All Fields] AND “group”[All Fields]) OR “African continental ancestry group”[All Fields] OR “Black”[All Fields] OR “African-Americans”[MeSH Terms] OR (“African”[All Fields] AND “Americans”[All Fields]) Or “African-Americans”[All Fields]) OR (“African-Americans”[MeSH Terms] OR (“African”[All Fields] AND “Americans”[All Fields]) OR “African-Americans”[All Fields] OR (“African”[All Fields] AND “American”[All Fields]) OR “African-American”[All Fields]) OR ((“African continental ancestry group”[MeSH Terms] OR (“African”[All Fields] AND “continental”[All Fields] AND “ancestry”[All Fields] AND “group”[All Fields]) OR “African continental ancestry group”[All Fields] OR “Black”[All Fields] OR “African-Americans”[MeSH Terms] OR (“African”[All Fields] AND “Americans”[All Fields]) OR “African-Americans”[All Fields]) AND American[All Fields]) OR “Black American”[All Fields] OR (“minority groups”[MeSH Terms] OR (“minority”[All Fields] AND “groups”[All Fields]) OR “minority groups”[All Fields] OR “minority”[All Fields]) OR (“minority groups”[MeSH Terms] OR (“minority”[All Fields] AND “groups”[All Fields]) OR “minority groups”[All Fields] OR “minorities”[All Fields]) OR underrepresented[All Fields]) Final

Scopus Search: (TITLE-ABS-KEY ((communication AND strategies) OR “communication strategies” OR engagement OR implementation OR dissemination) AND TITLEABS-KEY ((precision AND medicine) OR “Precision medicine” OR (personalized AND medicine) OR “Personalized Medicine” OR (personalized AND health) OR “Personalized Health” OR “individualized medicine”) AND TITLE-ABS-KEY ((African AND American) OR “African American” OR Black OR African-American OR (Black AND American) OR “Black American” OR minority OR minorities OR underrepresented))