UPMC Center for High-Value Health Care

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Study Title: Leveraging Integrated Models of Care to Improve Patient-Centered Outcomes for Publicly-Insured Adults with Complex Health Care Needs

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Contents

List of Common Abbreviations in Protocol:

- **MCC**: Multiple chronic conditions
- **CT**: Community Team
- **UPMC ISD**: University of Pittsburgh Medical Center Insurance Services Division
- **HTE**: Heterogeneity of treatment effects
- **ODP**: Optimal Discharge Planning

Research Synopsis

Study Population: Medicaid or dual-eligible (Medicare-Medicaid) adults aged 21 years and older with multiple chronic conditions (MCC), including at least one physical health condition and at least one additional physical or behavioral health condition, beneficiaries/members of our partnering health care payer, and identified as having high and/or rising health care needs and at risk for unplanned health care use.

Study Design: A comparative effectiveness study using an individual-level, randomized design along with a pragmatic, mixed-methods approach to compare three strategies (e.g., in-person and telephonic supported care, technology-supported care, and optimal discharge planning care) all of which include evidence-based components of integrated care. Quantitative (e.g., self-report, claims, process) and qualitative (e.g., interviews) data will be collected across multiple timepoints during the study period.

Sample Size: We expect to enroll 1,400 individuals.

Study Duration: The contract period begins January 1, 2018 and concludes November 30, 2024.

Background and Significance

Chronic disease is widely recognized as the U.S. public health challenge of the 21st century.[1] Defined as "conditions that last a year or more and require ongoing medical attention and/or limit activities of daily living,"[2] these diseases comprise a wide range of physical illnesses, such as diabetes, arthritis, asthma, heart disease, chronic obstructive pulmonary disease, and hypertension, as well as mental health and substance use disorders. Among the Medicaid population, 80% of high-need beneficiaries have three or more chronic conditions, and 60% have five or more chronic conditions, including a high incidence of behavioral health issues.[3,4] Three in five of the 9 million individuals eligible for both Medicare and Medicaid (e.g. dual-eligible) services have multiple chronic physical conditions, 20% have more than one mental/cognitive condition, and almost two in five have comorbid physical/behavioral health conditions.[5,6]

Although numerous randomized controlled trials have shown that practice-based integrated chronic care models assisting patients and their caregivers in managing their health and health care can improve outcomes for various chronic conditions,[7-13] including comorbid medical and behavioral health issues,[14-17] implementation of these models has been limited due to the significant upfront financial and infrastructure investments that are typically required.[18,19] Related interventions, such as transitional care,[20,21] self-management education,[22-24] and coordinated care,[25] have also been proven effective in improving outcomes for adults with multiple chronic conditions (MCC), but there is still considerable uncertainty about how best to implement these practices to achieve widespread and significant impact.[19,26,27] The fact that different approaches may be required in order to optimally support specific patient subgroups adds a further layer of complexity.[28,29] For example, there is very little information available about how to effectively support Medicaid[29] and dual-eligible enrollees,[30] who are often sicker, report lower health and functional status, and are more likely to be disabled than their

Medicare-only counterparts.[31] Targeting intensive care management services to these high-need patients is an increasingly well-recognized best practice.[32]

Despite increased understanding of how to promote optimal care for individuals with MCC, widespread improvements in health outcomes have yet to be realized, especially for high-risk, high-need subgroups. There have been no head-to-head trials comparing the effectiveness of system-level interventions in supporting the delivery of evidence-based integrated care for adults with MCC in general or the Medicaid and dual-eligible populations to date. The proposed study will assess innovative approaches of integrated care that can be leveraged to address this gap.

To this end, we propose to compare the effectiveness of the two primary system-level features that drive these programs, namely personalized service design and innovative use of technology in delivering four evidence-based, patient-centered components of established integrated chronic care models: (1) interdisciplinary care team management;[33,34] (2) development and monitoring of individual care plans;[33,34] (3) patient education and chronic disease self-management/self-care support;[7,33,35-39] and (4) supporting member linkages with medical/behavioral health and social services.[33,40,41] The hybrid nature of the proposed interventions is both unique and compelling. No single, system-level intervention has yet to combine all four components of integrated care that have been proven effective in improving outcomes for patients with MCC.

Objectives

The goal of this collaborative study is to provide much needed information for adults living with MCC and other key stakeholders working to support the health of these adults through health care system improvements. The three care strategies, High-Touch (in-person and telephonic supported), High-Tech (technology-supported) and Optimal Discharge Planning (ODP) will be implemented and evaluated to determine their potential to serve as best practice for effectively managing chronic conditions.

To ensure our study's focus was patient-centered, the study team worked closely with the Patient Partner Co-Investigator and patient, provider, and system-level stakeholders to develop all aspects of this study protocol, including the early development efforts of in-person and technology-supported care approaches, the research questions, the study outcomes, the evaluation procedures, and the dissemination strategies included in this protocol.

Aims

This study aims to compare the effectiveness of the approaches on patient-centered outcomes and determine which care strategy works best for whom and under what circumstances. By observing comparisons on key outcomes with ODP, our findings will enable patients and health care systems to understand the relative effectiveness of the care strategies vis-à-vis current practice and provide much-needed information for patients with MCC as well as health systems striving to support them more effectively and efficiently.

Primary Aim 1: Compare the effectiveness of High-Touch, High-Tech, and ODP on primary outcomes including hospital readmission, health status, and patient activation, and on several

secondary outcomes including functional status, quality of life, care satisfaction, emergent care use, engagement in primary, specialty, and mental health care, and gaps in care.

Hypothesis 1a: High-Touch will result in lower readmission rates at 12 months compared to High-Tech & ODP.

Hypothesis 1b: High-Touch will result in higher health status at 12 months compared to High-Tech & ODP.

Hypothesis 1c: High-Tech will result in higher patient activation at 12 months compared to High-Touch & ODP.

Primary Aim 2: Examine the differential effects of the interventions for patient subgroups, based on age, race, illness complexity, and comorbid behavioral health conditions to evaluate heterogeneity of treatment effects (HTE) and determine for whom and under what circumstances the interventions are most effective.

Hypothesis 2a: For all primary outcomes, High-Touch will have greater positive impact than High-Tech & ODP for older participants (60 years or more) and for participants with comorbid behavioral health conditions.

Primary Aim 3: Examine perceived barriers and facilitators to efficient and effective implementation of High-Touch and High-Tech interventions for delivering evidence-based integrated care.

Interventions Compared

High-Touch. This approach leverages a personalized service design that includes payer-employed registered nurses and social workers to provide intensive, in-person/telephonic support and resources for eligible participants in their homes and/or communities for a minimum of four months following initial engagement. The health plan-based CT will focus on addressing the full range of health determinants that can impact an individual's health and health care and support information sharing with patients and providers through intervention that do not require access to mobile devices or the Internet.

High-Tech. By leveraging telehealth and remote monitoring technology to support self-directed care management in real time, this approach uses less in-person resources. CT will focus on addressing the full range of health determinants that can impact an individual's health and health care through innovative approaches including virtual visits and access to mobile communications/applications for managing individual health and health care. [42,43] [42,43] [42,43]

Optimal Discharge Planning (ODP). Prior to the use of High-Touch and High-Tech interventions within our payer environment, all members with MCC who were hospitalized and at risk for rehospitalization were supported through the UPMC Health Plan's optimal discharge planning program, considered to be ODP for this study's purposes. After initial engagement via a phone call to the member, a Care Manager from the CT will have an in-home or telephonic visit with each individual to provide evidence-based support, including: detailed disease management and medication education; confirmation of and connection to family/caregiver support and resources; scheduling an ambulatory follow-up appointment; and a hand-off to a health plan-based telephonic care manager, as needed.

Study Design/Methodology

We have chosen an individual-level randomized design along with a pragmatic, mixed-methods approach to compare three integrated care approaches, High-Touch (in-person/telephonic supported), High-Tech (technology-supported) and ODP for Medicaid or dual-eligible adult members with MCC who reside in in Western, Central, or Eastern Pennsylvania (PA) and are at high risk for high utilization, including rehospitalization.

Quantitative data will be collected from several sources. Self-report data will be gathered at baseline and three additional timepoints (3-, 6-, 12-months) using REDCap Cloud, a secure data collection platform. Claims/administrative data will be collected from UPMC Insurance Services Division (UPMC ISD) to inform several outcomes and covariates. Claims data will be extracted at six months and 12 months to characterize participant service use through each participant's enrollment period, allowing for one full year of service-use observation.

Qualitative telephonic interviews will be conducted with a sample of participants and CT staff to examine perceived barriers and facilitators to efficient and effective implementation of the High-Touch and High-Tech approaches for delivering evidence-based integrated care at three timepoints (Participants: baseline, 3-, and 12-months; CT Staff: baseline, mid- and end-implementation period).

Randomization Procedure

The study will use web-based randomization to one of the three care strategies for those individuals who consent to participate in the study. The consent process may take place face-to-face with an eligible individual, or over the phone, providing that the individual consenting has received a paper or electronic copy of the consent form and enrollment materials to review. Once a member of the CT staff determines the individual's eligibility, they will enter in key identification information, independently or with support of the research team, and the system will then generate a Study ID (numeric identification number). A research team member will verify eligibility and the accuracy of the information entered with the CT staff and enrollee, and then the REDCap Cloud system will provide an assignment to an intervention arm. Randomization will be stratified by gender, type of insurance (Medicaid or Medicare-Medicaid), and technology/digital literacy, which will be assessed at time of enrollment and before randomization, to ensure that intervention arms are balanced with respect to these important variables. Within each stratum, random block sizes of 5 and 10 will be used to maximize balance between intervention groups while minimizing the ability to unmask investigators to the next treatment assignment, triggering an automated alert to CT staff regarding which intervention (care strategy) to implement for each participant and documented accordingly in HealthPlaNET, UPMC ISD's integrated health management software program. If a participant is unwilling to be randomized, they will be excluded from the study.

Measures

Process Measures

Participant and payer care team staff perceptions/experience will be assessed via telephonic qualitative interviews with a sample of participants and CT staff to examine perceived barriers

and facilitators to efficient and effective implementation of High-Touch and High-Tech and to identify strategies for intervention improvement/tailoring and dissemination.

Primary Outcome Measures

Patient activation will be assessed using the Patient Activation Measure (PAM), a 13-item scale that gauges individual knowledge, skills, and confidence essential to managing one's own health.[44] In consideration of "straight-lined" answers in the PAM measure, (i.e., all 13 questions answered with "strongly disagree"), we plan to include all participant responses and conduct a sensitivity analysis. This is recommended by our study investigative team, including our Patient Partner Co-investigator.

Health status will be measured using the Health Survey (SF-36), a 36-item scale measuring functional health and well-being within eight domains, including physical functioning, physical ability to complete tasks, bodily pain, general health, vitality, social functioning, emotional ability to complete tasks, and mental health.[45]

Subsequent 90-day rehospitalization will be measured using an all-cause readmission rate existing in UPMC ISD inpatient claims for physical and behavioral health service use within 90 days of the last hospital discharge prior to study enrollment. All-cause readmission does not include observation visits.

Secondary Outcome Measures

Subsequent rehospitalization will be measured using an all-cause readmission rate existing in UPMC ISD inpatient claims for physical and behavioral health service use within 30 days and again at 12 months, following the index inpatient admission. Inpatient and ED visits that were adjudicated and reclassified as Observation visits will be separately explored at 12 months.

Functional status will be measured using the PROMIS Physical Functional Form – Short For 6b which is a brief self-report tool that assesses functional impairment in everyday tasks, household chores, and walking using a 5 point Likert scale.[46]

Quality of life will be measured using the Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q-18), which is an 18-item, self-administered questionnaire monitoring enjoyment in several domains (physical health, subjective feelings, leisure time activities, social relationships).[47]

Care satisfaction will be measured using the Patient Assessment of Chronic Illness Care (PACIC), a 20-item survey designed to provide an assessment of important aspects of care for chronic illness patients, including specific actions or qualities of care that patients report experiencing in the service delivery system and their satisfaction level.[48]

Emergent care use will be measured using existing behavioral and physical health claims data from the UPMC ISD data warehouse determining participant frequency of emergent service use over 12 months.

Engagement in primary, specialty, mental health care will be measured using existing behavioral and physical health claims data from the UPMC ISD data warehouse determining participant frequency of non-acute visits for participants over 12 months.

Gaps in care will be assessed using Healthcare Effectiveness Data and Information Set (HEDIS) quality metrics that will be compiled using existing behavioral and physical health claims data from the UPMC ISD data warehouse. Gaps in care will be assessed for six of the most common chronic diseases present among our target population, including: asthma, chronic obstructive pulmonary disease, congestive heart failure, coronary artery disease, diabetes, and depression.[49]

Covariates

Engagement in interventions will be assessed using the automatically generated usage statistics and administrative/ utilization data routinely collected for non-research purposes as part of insurance claims processing and existing payer-provider service delivery.

Patient characteristics will be obtained through self-report data and existing secondary administrative data on age, gender, race/ethnicity, and insurance type.

Technology/digital literacy will be measured using a series of questions from the Health Information National Trends Survey (HINTS) to assess comfort and experience with use of different. communication channels, including the Internet, to obtain vital health information for themselves and their loved ones.

Social support will be measured using the Interpersonal Support Evaluation List (ISEL), a 12-item measure designed to assess the perceived availability of three types of social support (appraisal, belonging, and tangible).[50]

Health literacy will be measured using the first ten items of the All Aspects of Health Literacy Scale (AAHLS), a 13-item survey designed to assess functional, communicative, and critical health literacy.[51] The final three items on the AAHLS are part of an 'empowerment scale' that is not related to the outcomes of this study.

Illness complexity will be measured using the age-adjusted Charlson Comorbidity Index (CCI) which was developed as a prognostic burden of comorbid disease and is currently used by the UPMC ISD.[52] A score will be computed at baseline based on the previous 12 months of claims, adding assigned weights for specific diseases as classified by using International Classification of Diseases (ICD) diagnoses on claims records, and age adjusting by adding 1 point for every decade over 40 to the CCI score.[52]

Socioeconomic status will be measured using the Area Deprivation Index (ADI), which uses 17 different socioeconomic indicators to determine a deprivation score for a given neighborhood. Scores are reported in the form of quintiles, with a higher quintile indicating a higher degree of deprivation.[53-55]

Study Population

Medicaid or dual-eligible adults aged 21 years and older with MCC, including at least one physical health condition and at least one additional physical or behavioral health condition and are beneficiaries/members of our partnering health care payer. In addition, these individuals are identified as high risk for unplanned care use including rehospitalization. Our study population is representative of the majority of Medicaid and dual-eligible beneficiaries and accords with a national sample.[56]

Inclusion/Exclusion Criteria

Inclusion Criteria

Individuals who are (1) Medicaid or dual-eligible; (2) age 21 years and older; (3) insured through physical and/or behavioral health payers within the UPMC ISD; (4) identified as members high risk for high utilization including rehospitalization and have had an inpatient hospital stay within the last 30 days; (5) who have at least one physical health condition (e.g. cardiovascular disease, hypertension, COPD, diabetes) and at least one additional physical or behavioral health condition (e.g. depression, serious mental illness, substance abuse disorder); and (6) who reside in Pennsylvania.

Exclusion Criteria

Individuals who are (1) pregnant; (2) in skilled nursing facilities; (3) on hemodialysis for kidney disease; (4) in active cancer treatment; and/or (5) unable to speak, read, or understand English or Spanish at the minimum-required level.

Study Duration/Study Timeline

January 1, 2018 – April 14, 2018: Pre-Implementation Period
April 15, 2018 – December 31, 2022: Implementation Period
January 1, 2023 – November 30, 2024: Post-Implementation Period

Statistical Analysis Plan

Sample Size and Power Calculations

We will evaluate, based on a 20% attrition rate, a total of 1,120 participants at 12-month post-enrollment data collection time point, which will be the main time point for the comparison of primary outcomes. We will use a randomization ratio of 2:2:1 (High-Touch; High-Tech; ODP, respectively) and, as such, estimate final sample sizes of n=448 for each active care strategy and n=224 for the ODP strategy. All calculations for the power estimates were done in PASS version 13. For the primary test for the trial, the power calculation is based on the comparison of the two primary care strategies (High-Touch and High-Tech) for the main outcome of hospital readmissions between the strategies, using a two-sample test of proportions; specifically we have 80% power to detect a difference between a readmission rate of 20% in the High-Touch care strategy versus 28% in the High-Tech care strategy.[21,57,58] Additionally, for the overall differences between the three care strategies the given sample sizes yield 95% power; based on a chi-squared test.

For the additional primary outcomes of health status (SF-36)[45] and patient activation (PAM)[59], power estimates are based on a two-sample t-test for comparing High-Touch and High-Tech and using an Analysis of Variance (ANOVA) for an overall difference across the three arms. For SF-36 scores, we hypothesized mean increases of 11, 5 and 0 points in High-Touch, High-Tech and ODP, respectively, with a standard deviation of 10 in each arm or care strategy.[60-63] This yielded over 99% power for the test between the two active interventions (e.g. High-Touch and High-Tech), assuming a 5-point increase for the High-Tech group would yield 80% power for detecting a difference as small as 1.7, which is a small effect size of 0.17. The hypothesized mean increases also yield >99% power for the overall test of mean differences across interventions and yield >90% for means as close as 5.6, 5.0 and 4.4. For PAM scores, we hypothesized mean increases of 4, 8 and 0.5 points in High-Touch, High-Tech and ODP, respectively, with a standard deviation of 20.9 in each arm.[44,64] This difference, which corresponds to a small effect size of 0.19 yielded 82% power for the test between the two active intervention groups (e.g. High-Touch and High-Tech). The hypothesized mean increases also yield >99% power for the overall test of mean differences across the groups and yield >80% for means as close as 6.5, 8 and 6.

For the tests of interactions, we have identified, a priori, eight subgroups of interest: those aged 60 years and above, constituting 23% of the sample, and those aged below 60; race with non-white participants constituting 38% of the sample (n=203 High-Touch/High-Tech, n=100 ODP), and white participants; Charlson Comorbidity Index Score of five or above, indicating higher illness complexity includes 54% of the sample versus lower illness complexity; and positive (opposed to negative) for comorbid behavioral health conditions for 60% of the sample. We are only presenting power analysis results for the treatment by age interactions since we do not have any a-priori hypotheses about the direction of differential effects for treatment by race, treatment by illness complexity, or treatment by comorbid behavioral health condition. All such interactions will therefore be labeled as purely exploratory in subsequent findings and publications. Power estimates for interactions were calculated based on a 2-way factorial design and the average sample size across groups. For readmission rates, we used a normal approximation to estimate the standard deviation and applied a 2-way ANOVA as similar procedures are not available for dichotomous outcomes without approximating as normal.

For age by treatment interactions, readmission rates are hypothesized to increase in older age groups, with greater differences in the treatment effects. We also hypothesized that the intervention groups will yield similar rates in the younger group while High-Tech will be closer to ODP in the older group.[65] More specifically, we have 79.8% power to detect a significant interaction with readmission rates of 22%, 40%, and 42% in the older group (for High-Touch, High-Tech, and ODP, respectively) and rates of 18%, 16% and 28% in the younger group. For PAM scores, we hypothesized that, in the older group, the interventions will work equally well and much more effectively than ODP, whereas, in the younger group, High-Tech will be most effective, with High-Touch and ODP showing no effect on PAM scores.[66] More specifically, we have 72.2% power to detect a significant interaction with mean increases in PAM of 8, 8, and 1 in the older group for High-Touch, High-Tech, and ODP, respectively, and mean increases of 0, 8 and 0 in the younger group. For SF-36 scores, we assumed a greater overall effect for High-Touch and a greater effect in younger ages and a slightly larger difference between ages for the

High-Touch group.[67] Specifically, we have 99.5% power to detect a significant interaction with mean increases in SF-36 of 7, 2, and 0 in the older group for High-Touch, High-Tech, and ODP, respectively, and mean increases of 15, 8, and 1 in the younger group.

Quantitative Analysis

We will conduct descriptive analyses and multivariate modeling of patient self-report and administrative data to examine changes in outcomes over time and explore moderating variables. If any additional analyses are identified during the study, they will clearly be labeled as post-hoc comparisons and interpreted as such.

Primary outcomes will be analyzed using both self-report and claims data. As such, loss to follow-up for a participant will be calculated at the point which they no longer complete their self- report questionnaires for a given timepoint and they are no longer Medicaid/Medicare-Medicaid eligible, as determined by the proxy of 9 months of Medicaid/Medicaid-Medicare coverage in the 12-month period prior to the data collection timepoint. Whichever comes last is the point at which the participant is lost to follow-up. No surveys are collected during Timepoint 2, and as such, loss to follow-up will be calculated at the point which they are no longer Medicaid/Medicare-Medicaid eligible, as determined by our proxy described above.

All inferential modeling will be preceded by descriptive analyses of baseline and outcome measures. Summary statistics will include the mean and standard deviation, and the median and range for continuous variables, and the frequency and percentage for each categorical variable. Results will be presented for the entire sample and stratified by intervention arm. We will also statistically assess the balance of key covariates across the interventions via analysis of variance for continuous measures and chi-squared tests for categorical measures. For continuous variables which are assumed to be normal, we will visually assess the univariate distribution via a normal probability plot to determine departure from normality and the bivariate correlations between pairs of covariates to assess collinearity; appropriate diagnostics for collinearity and model fit of the regression models described below will also be checked in each analysis. Transformations will be implemented if required, although slight to moderate departures from normality will not be problematic with the large sample sizes.

Our models will be based on an intent-to-treat principle as we do not expect large drop out or non-adherence. We will employ linear regression models for continuous outcomes, logistic regression for dichotomous outcomes, and Poisson regression or negative binomial models (in the case of over-inflated variance) for count outcomes. We will fit multivariate models with the key independent variable of interest being the main effect of treatment with main effects for additional covariates included to produce an adjusted estimate of the treatment effect. These covariates will be defined a priori and will be divided into two subgroups. The first set of clinically-important covariates will be included in all models including age, race, gender, insurance type, illness complexity, and socio-economic status. The second set of covariates will be defined as engagement in interventions, social support, health literacy, and technology literacy. To address Aim 2, separate models will be fit for each a priori defined heterogeneity of treatment group (HTE) subgroup of interest. As listed below, we will test the interaction of treatment with the covariate defining the HTE subgroup.

The objective of Aim 2 is to determine whether the intervention works better for some than for others. Our pre-specified analysis plan will examine differences in main outcomes for

several subgroups. These subgroups are determined by our stakeholders to be most relevant so that end results can meaningfully inform patients about what works best for whom, and in turn, better supports individuals with MCC as they navigate the health care system and make decisions about their care. Furthermore, in examining differential impact of the interventions based on these subgroups, providers, payers, and other decision makers can target resources in a manner that best meets the needs of those in services, reduces variations in practice, and improves health outcomes.

We are only powering for the interactions with age, since we do not have any a-priori hypotheses about subgroup effects for the other variables. Those additional subgroups will clearly be labeled as exploratory and will only be examined further if the overall analysis is significant. We will conduct modeling as defined above to examine the HTE and will utilize contrasts from these regression models to make inferences about the heterogeneity. We will present both the treatment effect estimates, in terms of estimated odds or risk ratios for dichotomous or rate outcomes or the model coefficients for the continuous outcomes and measures of their variability in the form of confidence intervals. Two-sided tests of level 0.05 of the interactions between intervention and HTE subgroup will allow us to test the Aim 2 hypotheses.

For all the described models, we will focus on the 12-month outcome. Each of the above analyses will also be repeated using all follow-up outcomes collected as a secondary analysis using a mixed model with a random intercept to account for within-subject repeated measures and associated correlation. Significance tests from all regression models will all be assessed using likelihood ratio tests for logistic, Poisson, or, if applicable, negative binomial models or partial F-tests for linear regression.

Additionally, exploratory data analyses will include comparison of the following variables in the pre- versus post-COVID-19 time periods: a) demographics and primary outcomes at baseline, b) the primary outcomes over time, and c) patterns in missing data. If significant differences result, we will repeat the primary analysis by: a) adjusting for the demographic variables that can describe pre- and post-COVID-19 participants, b) include indicator variables for post-COVID-19 enrollment with and without interactions with time variables, and c) statistically account for missing patterns.

Qualitative Analysis

Codebook construction will follow standard editing methods.[68] Separate codebooks for patients and staff interviews will be constructed after completion of the first set of interviews. A system of audit trails will be employed to document creation of codes during the iterative process of codebook development. Two trained independent analysts from the Qualitative, Evaluation and Stakeholder Engagement (Qual EASE) Research Core will code the interviews in Atlas.ti, qualitative analysis software. A manual will be created to outline information about each code in the codebook. After each transcript is coded, coders will meet to process and adjudicate differences until agreement is achieved. Codes determined through this process will be recorded in a master file to be used in final analysis. Once all transcripts are coded, Cohen's Kappa scores will be calculated to assess inter-coder reliability with the goal of achieving reliability of >0.75 which exceeds substantial coder agreement.[69]

For each qualitative cohort and for each wave of data collection, a final report will be created. We will examine key topics in the interview guides to better understand barriers and facilitators to intervention implementation and success and how interventions impact patients' ability to manage their chronic conditions. In addition, for each subsequent wave of data collection, we will examine changes and consistency across the waves. Final reports will be shared with stakeholder teams to ensure ongoing intervention improvements and aid in interpretation of findings.

Informed Consent Process

Informed consent can be obtained either telephonically or obtained during the first in-home visit using a web-based platform, at the participant's home or a preferred location within the community. For telephonic consents, the care manager will provide the participant with a copy of the consent form and study FAQs to review prior to enrollment. CT staff, who have completed the University of Pittsburgh Human Research Protection Office (HRPO) human subjects research training through the Collaborative Institutional Training Institute (CITI), will assist the participant in navigating the web-based consent process, with support provided by the research team. The web-based consent process will provide subjects with a clear explanation of the objectives, procedures, risks and benefits of the study, a frequently asked questions page and their rights as study participants. Research Team members will be available via the telephone to answer all questions related to the informed consent process and the study prior to the member consenting to participation. Consent will be obtained only from the participant. Consent will also be required for participation in the qualitative interviews.

Participants will retain their right to have their questions answered by the Principal Investigator or a member of the Research Team via telephone or an appointment for an in-home visit. The Research Team believes that informed consent is an ongoing process in any study and so will continue to educate participants about the nature of the research and will address any questions that arise throughout the course of the study. These efforts will comply fully with the Health Insurance Portability and Accountability Act (HIPAA) and the informed consent guidelines of the University of Pittsburgh's HRPO.

Privacy and Confidentiality

Self-report and qualitative data collected for this study will be used for research purposes only. Access to the data will be restricted to the Principal Investigator, Co-Investigators, and other Research Team members trained in UPMC and University of Pittsburgh HRPO Human Subject Research Training requirements. Research staff will sign confidentiality agreements as required. Identifying links to all data will be maintained at baseline and other data collection time points using a secure password-protected server, accessible only by authorized members of the study team. Once the data is collected, the file containing the link between identifying information and the participant's data will be destroyed.

Qualitative data will be audio recorded using digital recording devices, transferred to a secure server immediately following recording and deleted as soon as it is fully transcribed. Interviews will be audio recorded, transcribed, and scrubbed of identifying information.

Participants will be asked not to include any identifying information in their responses, and coders will not code any identifying information that may be provided inadvertently.

All data obtained over the course of the study will be confidential and secure. Paper study records will be secured using the "double-lock" method (i.e., in a locked cabinet within a locked office). Data stored on computers will be password protected and stored on a secure server behind the organization's firewall. Each Research Team member has a unique network account and a secure password that complies with existing UPMC policies and procedures. Only members of the team who are authorized by the Principal Investigator will have access to the secured files. Identities of participants will not be revealed in the publication or presentation of any results from this study.

Risk/Benefit

Risk to Participants

There is no known serious health or psychological risk of participating in this study. Some of the items in the self-report measures that ask respondents about their health, attitudes, and experiences could be considered sensitive. However, participants can refuse to answer questions at any time, which will be made clear during the consenting procedures and at the time of administration of all research measures and interviews. Minimal risks of study participation may still apply, such as participants feeling inconvenienced by the assessment requirements and/or uncomfortable when responding to surveys or interviews. As with all research involving personal health information (PHI), there is also a potential risk of a breach of confidentiality for all study participants. However, safeguards will be in place to fully decrease this risk. Currently, there are no known risks associated with involvement in the study interventions, other than possible emotional discomfort associated with the discussion of issues related to complex health conditions. In instances where participants appear to be unduly distressed about health or other issues in their interactions during the interventions, they will be advised to speak directly with Dr. Dan Swayze, Principal Investigator.

Benefits to Participants

There is a high likelihood that all study participants will benefit from the evidence-based components of integrated care delivered through study interventions. Moreover, greater knowledge about the comparative effectiveness of the interventions or care strategies and their impact on patient-centered outcomes will eventually benefit all patients with MCC. For these reasons, the Research Team notes that the potential benefits of the knowledge to be gained from the proposed study outweigh the minimal risks posed to participants.

Compensation for Participation

Total possible compensation for the entire study: $190

Timepoint 1: $20 for baseline self-report measures
Timepoint 2: $20 for 3-month self-report measures
Timepoint 3: $20 for 6-month self-report measures

Timepoint 4: $40 for 12-month self-report measures

Timepoint 1: $30 for baseline interview
Timepoint 2: $30 for 3-month interview
Timepoint 3: $30 for 12-month interview

Data Safety Monitoring

Dr. Dan Swayze (Principal Investigator) and Dr. Kevin Kraemer (Co-Investigator) will be responsible for data and safety monitoring. They will meet with the Research Team to review all data protocols and policies, including informed consent and data confidentiality procedures. All key personnel will adhere to the National Institutes of Health policy on education in the protection of human subject participants in the conduct of research. Additionally, we will convene biannual Data Safety and Monitoring Board meetings to ensure any issues related to participant or data safety are fully vetted and addressed. The Data Safety and Monitoring Board will sunset in Spring 2022, after all enrollment goals are met. This decision follows the recommendation of the board chair and approval of the PCORI program officer, given the limited time remaining in the study implementation phase and the low-risk nature of the intervention.

Conflict of Interest

The study investigators report having no conflicts of interest or financial interests related to the research conducted under this contract.

Publication and Presentation Plans

We will form a Stakeholder Dissemination Committee in Year 2 of the study. The committee will include members from the Stakeholder Advisory Board and the Patient Partners Work Group, and the committee will meet biannually to aid in the development and execution of novel dissemination practices. Committee members will provide a diversity of perspectives in terms of organizational, geographic, and system backgrounds.

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