IVR-T Sub-Study Protocol and IRB Modification

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1. **IRB Modification Number:** 005

2. **Sub-Study Title:** Optimizing the use of reminders to improve efficiency in GI endoscopy

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4. **Participating Clinics or Departments:** All KPCO Gastrointestinal Endoscopy Clinics

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6. **Clinic or Department Champions:** Jennifer A. Ziouras, MD, Wendolyn S. Gozansky, MD, MPH, Katie H. Cody (GI Clinical Services Director), Kelly S. Shuster (GI Nurse Manager), Louis Morris MD, Wesley Kasen MD, and Elizabeth Sofian-Conlan MD (CPMG)

7. **IHR Technical Staff:** Katherine Burniece, Jonah Langer, David Steffen

8. **Dates of Project:** November 1, 2018 through December 31, 2019

BACKGROUND AND RATIONALE

The Institute for Health Research (IHR) has conducted two randomized trials to reduce missed appointments in KPCO primary care clinics using interactive voice-response telephone and text message (IVR-T) technology. Both studies were commissioned by KPCO operational leaders. In the initial study, the IHR deployed an automated appointment reminder system for members with appointments at the Westminster and Aurora Centre Point Primary Care Clinics between June 2014 and April 2015. This study demonstrated that members who received outbound reminder IVR-T had a missed appointment rate that was 1.2% (absolute percentage) lower than those who did not receive a reminder. (Steiner) This IVR-T protocol was then implemented in all KPCO primary care sites.

Operational leaders then proposed refinements to the IVR-T approach. We designed a 3-armed randomized trial in all KPCO primary care clinics comparing a single IVR-T reminder one day prior to a primary care visit, a single reminder 3 days prior to the visit, and two reminders, delivered both 1 and 3 days prior to the visit. In addition, we assessed the effect of the intervention in all primary care sites on visit satisfaction. This trial was conducted between October and December 2016. In this study, reminders both 1 and 3 days prior to a visit reduced missed appointments by 1.4% (absolute percentage) compared to a 3-day reminder, and by 0.9% compared to a 1-day reminder alone ($p<0.001$ for both comparisons). The effectiveness of 2 reminders was particularly strong in individuals who were at predicted high risk of missing appointments. For these individuals, 2 reminders reduced missed appointments by 4.5% and 3.7%, respectively. Based on these findings, 3-day and 1-day IVR-T reminders are now standard for all primary care visits in KPCO.

Clinical and operational leaders have now requested the IHR develop IVR-T interventions to reduce missed GI endoscopy procedures in KPCO. GI endoscopies (both upper and lower endoscopy) are performed at Franklin, Rock Creek, and Lone Tree facilities. GI clinic managers have tracked "appointment loss," defined as prior-day cancellations, same-day cancellations, or missed visits since 2013. The trends over this period are shown in Table 1:

Table 1: Appointment Loss in GI Procedure Clinics, KPCO, 2013-2018

Site	2013	2014	2015	2016 (January-May)	2017	2018 (January- mid-October)
Franklin	8.7%	9.6%	8.8%	9.6%	x	Total = 9.2% No show – 2.5% Same-day cancel – 2.6% Prior day cancel – 4.1% N = 7612
Rock Creek	6,4%	6.4%	5.3%	5.9%	x	Total = 4.8% No show –1.2% Same-day cancel – 1.2% Prior day cancel – 2.4% N = 7592
Lone Tree	6.0%	7.4%	5.2%	6.5%	x	Total = 6.5% No show –1.2% Same-day cancel – 1.0% Prior day cancel – 3.2% N = 9283

These rates have been relatively constant over time. They represent substantial inefficiency for the KPCO system and prevent many members from receiving their procedure in a timely way. Each unfilled slot represents an estimated cost of about $1200 to KPCO.

This problem has persisted despite the use of IVR-T reminders and live calls from GI clinic nurses. In October 2018, the IVR-T protocol for GI procedures includes a single IVR-T reminder, 7 days prior to the appointment. If a text message cannot be sent due to a text-incapable phone number or a text failure, members receive an IVR telephone call. Both text and call provide the date, time and location of the appointment. The text includes a number to call to reschedule or cancel. The call allows the member to transfer into the GI scheduling line. If the appointment is for a colonoscopy, both the text and the IVR call contain additional information about the bowel preparation and the need to bring a driver to take the member home after the procedure. This automated reminder is supplemented by live phone calls 5 business days in advance from GI clinic nurses when their workflow allows it. These calls are most common at the Rock Creek clinic. The nurses do not use pre-defined criteria to decide who to call, they simply try to call any patients they can reach. The proportion of members currently receiving these calls is unknown.

This protocol and IRB modification describes a series of projects to optimize the use of reminders to improve efficiency in GI endoscopy. Collectively, their goal is to improve operational efficiency by reducing missed appointments and late cancellations.

LITERATURE REVIEW

The published literature addresses three general questions about missed appointments in GI endoscopy clinics:

a. What is the incidence of missed appointments and/or late cancellations?
b. What are the predictors of missed appointments and/or late cancellations?
c. Are interventions effective in reducing missed appointments or late cancellations?

These studies take place in three clinical contexts and settings: 1) Studies of appointment-keeping in endoscopy clinics; 2) Studies of appointment-keeping in GI consultation practices; and 3) Studies of colonoscopy completion after positive FOBT or FIT testing. The first studies are most relevant. The second group may identify risk factors and intervention strategies that also apply to endoscopy appointments. In the third group, endoscopy appointment-keeping is one step in a care continuum that begins with *referral* after a positive test for occult blood, then *scheduling* of an appointment for flexible sigmoidoscopy or colonoscopy, then evaluation of the *adequacy of the prep*, and finally completion of the procedure.

Key findings and references:

a. Most studies have been conducted in academic settings, the VA, or safety-net delivery systems. None have been conducted in integrated, private systems such as KPCO.

b. The incidence of non-attendance at endoscopic procedures varies widely, depending in part on whether late cancellations within a few days of the procedure are included in the definition. The incidence of no-shows on the day of the procedure ranges from 4% to 23%, with most studies reporting rates of 8-10%. (Lee, Gurudu, Griffin, Blumenthal, Childers, Partin) In a large VA study, the incidence of cancellations was 32%. (Partin) Several studies did not distinguish between no-shows and cancellations (Griffin, Childers) and reported aggregated rates of 16%-42% for all causes of non-attendance.

c. Most studies identified clinical and procedural predictors of non-attendance. Most conducted multivariable analyses, but only one study (Blumenthal) developed and validated a clinical prediction rule for missed endoscopy appointments. Patient-level predictors of missed or cancelled appointments in multiple studies included: minority race or ethnicity, unmarried/unpartnered, Medicaid or no health insurance, and presence of a mental health or substance abuse disorder. The clinical indication for the procedure was a predictor in some but not all studies. Clinic and system-level predictors included: longer wait time between scheduling and procedure; prior missed endoscopy appointments, and prior missed appointments in other settings. A large VA study also found substantial variation between VA facilities. (Partin) The one reported prediction rule incorporated patient-level and system-level variables and had a c-statistic of 0.75 in the development set, and 0.70 in the validation set, indicating moderate accuracy in discriminating individuals at high risk of missing endoscopy appointments from those at lower risk. (Blumenthal)

d. Some form of reminder (letter or phone call) was commonly provided as a baseline in these studies. One randomized trial compared a “live” nurse reminder call to IVR

outreach 3 days or 7 days prior to the endoscopy appointment – no differences were found between groups. (Griffin) A before-after study found that no-shows decreased from 16.5% to 12.8% after instituting a nurse call. This study also quoted the lost revenue from a missed appointment as approximately $1000 for colonoscopy and $780 for upper endoscopy. An RCT of a telephone call 1 day prior to colonoscopy to educate about bowel prep showed that adequate prep was greater in the intervention than control group (81.6% vs. 70.3%), as was polyp detection (38.0% vs. 24.7%).

e. In summary
    - The prevalence of missed endoscopy appointments or late cancellations is already lower in KPCO than in most published studies.
    - The most important clinical predictors used in other studies are available through KPCO electronic data sources.
    - The only reported prediction rule to identify high-risk patients for missing endoscopy appointments had only moderate accuracy.
    - A relevant randomized trial showed no difference between a single "live" reminder and a single IVR call 3 days or 7 days prior to the visit.
    - Another randomized trial suggests that a live call the day prior to the procedure can increase the adequacy of the bowel prep.

PROJECT QUESTIONS AND HYPOTHESES

This project will address the following question:

Does an "enhanced" IVR-T protocol differ in effectiveness from the standard IVR-T protocol in reducing missed appointments and late cancellations for GI endoscopy?

Hypothesis 1: The enhanced IVR-T protocol will be more effective.

RESEARCH DESIGN AND METHODS

We will conduct a randomized trial over a 6-month period (March through September 2019) in the 3 GI endoscopy clinics (Franklin, Rock Creek, and Lone Tree). All members currently receive a text reminder 7 days prior to their procedure, which rolls over to a telephone reminder if the text cannot be delivered or the member's phone is not text-enabled. Members will be randomized either to receive this standard IVR-T protocol or to receive an enhanced reminder protocol.

Inclusion criteria:

a. Members scheduled for any GI procedure (upper endoscopy, colonoscopy, or both), with or without anesthesia, at all three clinical sites (Franklin, Rock Creek, Lone Tree) will be included if their procedure is scheduled ≥ 2 days prior to the procedure. The IVR-T protocol will be adapted based on the wait time between appointment scheduling and the date of the procedure.

b. Members with all clinical indications (screening, diagnosis, or surveillance), will be included.

Exclusion criteria:

a. KPCO members who request not to participate in research or not to receive IVR-T or email outreach

b. KPCO members in the "break the glass" or "code pink" protocols.

c. Members whose procedure is scheduled < 2 days prior to the procedure.

Randomization: Beginning in March 2019 (or on completion of all necessary design steps), we will use the randomization algorithm in the Structured Query Language program that manages the IVR relational database to assign each visit for a procedure at all three sites to one of the two interventions. Since members with multiple procedures on different days during the study period could receive different interventions for different visits, we will limit the statistical analysis to the first randomized appointment during the project period. Randomization will be stratified by clinic site.

Intervention content

a. **Standard reminder protocol (usual care):** Members randomized to this arm of the study will receive a single text message that "rolls over" to an IVR automated phone call if the text cannot be delivered. This message will be delivered 7 business days prior to

the appointment. This replicates the current protocol for GI procedures. Of note, members who schedule appointments within 7 days of the procedure currently receive no reminders.

b. **Enhanced reminder protocol:** The enhanced reminder protocol will include multiple reminders, multiple reminder modalities, and motivational messages. The timing of reminders will depend on the wait time between the date the appointment is made and the date of the appointment, as shown in Table 2.

Table 2. Timing of reminders for intervention group

Wait time between date appointment made and date of visit	Email †	IVR-1	IVR-2	IVR – Prep (colon only)
≥ 15 calendar days	14 calendar days	7 business days	5 business days	1 calendar day
8-14 calendar days	6-12 calendar days	5 business days	3 business days	1 calendar day
7 calendar days	5 calendar days	5 business days	3 business days	1 calendar day
6 calendar days	4 calendar days	2-3 business days (2 days if appt on Monday)	1 business day	1 calendar day
5 calendar days	3 calendar days	1 business day	x	1 calendar day
4 calendar days	2 calendar days	1 business day	x	1 calendar day
3 calendar days	1 calendar day	0-1 business day (No IVR if appt on Monday)	x	1 calendar day
2	x	x	x	1 calendar day
0-1 days	x	x	x	X

- An email reminder will be sent to all members who have provided their personal email information according to the schedule in Table 2.
- For IVR-T reminders, the rationale for choosing business days (Monday through Friday) rather than calendar days is that the GI appointment desk is only open on business days to cancel or reschedule procedures.
- Members scheduled for colonoscopy will also receive a single IVR-T reminder to begin their bowel prep the morning of the calendar day prior to the procedure.
- Brief motivational messages will be added to email, text and telephone messages. These messages will be "generic" rather than tailored for the clinical indication or type of procedure.
- For the duration of this intervention, the GI clinic will discontinue all live pre-procedure reminders so that we can assess the effectiveness of a purely automated intervention. Staff will continue post-procedure calls to assess service quality. Selective live reminders for members at high risk of missed appointments will be assessed in Step 3 of this project.

Intervention delivery: All interventions by email, text and telephone will be delivered by secure messages from the Automated Communication Technology (ACT) team in the KPCO

Institute for Health Research. At present, GI clinic nurses or staff make live reminder calls to some members as time allows; these calls will be stopped for the duration of the Step 1 trial.

Over the 6-month period of the project, we estimate that approximately 2300 visits per month will be scheduled across the 3 participating sites. After anticipated exclusions (10% of total cases), we estimate that there will be approximately 2100 eligible appointments per month. We project that the study will run from March 8, 2019 through September 7, 2019 to achieve the proposed sample size of approximately 13,000 appointments. The duration of the study will be dictated by the number of appointments necessary to detect an operationally significant reduction in the rate of appointment loss, as described in the sample size calculations below. We will monitor recruitment during the study and adjust the duration of the randomization period as necessary to achieve the projected sample size.

9. Study Measures

Outcome variable: The primary outcome for the study will be "appointment loss", defined by GI leaders as the combined rate of prior day cancellations, same-day cancellations, and missed clinic appointments ("no shows"). The rationale for this outcome definition is that it is difficult to schedule new procedures within this time frame. As a secondary outcome, we will assess the adequacy of the bowel preparation for colonoscopy only.

Covariates: To describe the project participants and identify clinically and operationally relevant subgroups, we will measure patient covariates that we have used in prior IVR-T evaluations in primary care clinics, as well as variables specific to the GI clinic setting. These variables are listed in Appendix 1. All variables will be drawn from the IHR Virtual Data Warehouse (VDW), KPCO appointment scheduling system, or endoscopy data from Clarity.

10. Sample size and statistical analysis

Sample size calculation: As shown in Table 1, "appointment loss" in the 3 GI clinics has been 6.8% from January – mid-October 2018. Across sites, approximately 2580 procedures/month were scheduled, and 175 were missed. Using standard parameters for Type 1 error (0.05, two-sided) and Type 2 error (0.20), the necessary sample to detect differences between standard and enhanced IVR-T protocols is:

Table 3. Sample Size Estimates

Detectable difference in appointment loss	N total (per group)	Duration of project (months)
3% absolute difference (6.8% vs. 3.8%)	2654 (1327)	1.3
2% absolute difference (6.8% vs. 4.8%)	5644 (2822)	2.7
1% absolute difference (6.8% vs. 5.8%)	21244 (10622)	10.1
20% relative difference*	11112 (5556)	5.3

(6.8% vs. 5.4%)		

*Effect consistent with prior KPCO trials and systematic reviews of missed appointment interventions

Based on these calculations, a 6-month study will provide statistical power to detect a 20% relative difference in appointment loss.

Analytic plan Statistical analyses will be consistent with approaches used in prior IVR-T interventions. Patient demographic and clinical characteristics will be compared between the 2 groups using *t*-tests for normally distributed continuous variables, Wilcoxon rank tests for non-normally distributed continuous variables, and chi-square tests for discrete variables. We will assess the effectiveness of the intervention across the 3 participating clinics, after adjusting for predictors of missed appointments/late cancellations. To estimate the number of additional kept visits and available appointments per week that would result if the most effective intervention were implemented for all visits that met inclusion criteria, we will multiply the average number of visits at each clinic by the sum of the rate reduction in missed appointments and the rate increase in cancelled appointments at that clinic.

We will conduct three planned subgroup analyses:

1. We will develop a multivariable logistic regression model to predict appointment loss using approaches similar to prior IVR-T interventions. Clinic site will be included as a fixed effect. We will include linear and quadratic terms for continuous predictors and include both terms in the final model if statistically significant. Missing values for each predictor will be included as a separate category. Backward selection with Wald chi-square tests will guide the selection of predictors. The final prediction model will include an indicator variable for treatment group and all covariates with p-values <0.05. The discrimination of the model will be assessed with the c-statistic. We will use this prediction rule to stratify participants into risk quartiles and will assess the effectiveness of the intervention in each quartile.
2. We will assess the effectiveness of the intervention in each of the 3 participating clinics, after adjusting for predictors of missed appointments/late cancellations, to provide preliminary information on site-level factors that may modify intervention effectiveness.
3. We will analyze the effectiveness of the intervention in the subgroup of individuals who schedule their endoscopies ≤ 7 days prior to the procedure, since these individuals will receive no reminders under the standard protocol.

Human subjects

The standard reminder protocol includes a text message that "rolls over" to an IVR automated phone if the text cannot be delivered. The GI Clinic has received permission from the KPCO Compliance Office to send emails to the private email addresses of KPCO members.

Study Risks: This study utilizes current standard protocols for contacting KPCO members and data collected during the course of routine clinical care to improve efficiencies in the delivery and quality of care for patients. Therefore, the primary risk of this study is the potential for loss of confidentiality and privacy of a member, through a loss or inappropriate disclosure of study data. There are no known risks to investigators or staff.

Protection against Risks: The primary protection against a breach of privacy and confidentiality is in the structure of the data itself. The data extracted will include the minimum necessary to conduct the described research. Additional procedures will be in place to further protect members from a breach of confidentiality: 1) all data in study datasets will be identified only by a study-assigned unique ID number and will not include the name or medical record number of the subject; 2) a crosswalk table linking the study ID to a patient medical record number will be separately maintained on password-protected computers only accessible to project staff; 3) all members of the project team have completed mandated training procedures and certifications, including special compliance training; new research team members (if any) will complete currently mandated training procedures and certifications prior to working on the study; and 4) the written study protocol will be reviewed, approved, and monitored by the IRB. Furthermore, only aggregate data will be released in any public forum or publication.

Study Benefits: Members may receive improved quality of their overall care with Kaiser through this study. The results could promote increased health and wellness.

Risk-Benefit Justification: This investigation involves minimal risks to any member. The benefits outweigh the minimal risks to members.

Informed Consent: This study will request a waiver of individual informed consent as in prior projects because it is low risk, has a large number of members and is a comparison of standard practices. This is a study of improving efficiencies and therefore the risks to subjects are minimal. It is estimated that up to 15,000 members will be eligible for the study, which is not feasible to contact to obtain written informed consent. This study is intended to enhance the quality of care for patients and standard practices.

HIPAA Authorization: This study will request a waiver of patient authorization to obtain private information, also known as a waiver of HIPAA authorization. This waiver is requested because the study involves no more than a minimal risk to the privacy of individuals.

Dissemination and implementation

Operational leaders (Cody, Stauffer) have actively participated in intervention design and can lead implementation efforts to sustain the intervention in KPCO if it is effective, as has been the case for prior missed appointment interventions in KPCO. The findings of this evaluation will be shared with KPCO organizational sponsors. We will also prepare a paper for publication based on these findings.

Appendix 1. Study Variables

Variable	Use, comments, questions
Age	*
Sex	*
Race/ethnicity (white, Asian, black, Latino, Native American, unknown/other)	*
Marital status	
Employment	
Comorbidities	Quan index *
Mental health diagnoses	From MHRN list
Substance use diagnoses	From MHRN list
Number of address changes in last 12 months	New variable – created for Claudia Nau's project
Number of telephone contact # changes in last 12 months	New variable – created for Claudia Nau's project
Number of insurance plan changes in last 12 months	New variable – used by Claudia Nau
Clinic site	*Franklin, Lone Tree, Rock Creek
Day of week of appointment	
Exact time of day of appointment	
Health insurance type	*
Duration of enrollment in KPCO	
New member in KPCO	Individuals enrolled < 12 months will be defined as "new enrollees." May conduct separate subgroup analysis for these individuals. Alan Kroll notes that several "segments" of new members have been defined for onboarding interventions.
Appointment lead time	* Exclude if <10 days
Number and rate of ED visits in prior 12 months	*
Number and rate of hospitalizations in prior 12 months	*
Number and rate of missed primary care appointments in prior 12 months	* We will consider various way of analyzing prior missed appointments: a) one or more b) relative risk for each additional missed visit

Number and rate of missed specialty care appointments in prior 12 months	*
Number and rate of missed GI endoscopy appointments in prior 12 months	
Appointment outcome (missed, kept, cancelled)	*
Bowel prep adequacy	Boston Bowel Prep scale (0-9 scale from GI smart set
Applied for or received medical-financial assistance in last year	New variable – any IHR experience with this? Nicole Friedman has a contact in KPNW who has extracted this variable UCDA also says that this is accessible.
Unpaid account balance	New variable – how to define?
Geo-located residence	**We will use census tract as the primary unit of analysis**
Distance from residence to clinic	
Picked up prep kit from KP Pharmacy	Prep kits provided by prescription only; may be picked up from non-KP pharmacies.

Notes:

1. include missing as a category for each variable
2. *= significant variable in prior predictive model(s) in primary care
3. For members with <12 months of enrollment, we will assess utilization from the beginning of enrollment to the date of the first scheduled primary care appointment.

Refs:

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