INtegrating Care After Exacerbation of COPD (InCasE)

Protocol

NCT02021955

12/18/2018

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1. Abbreviations

- (CCQ) – Clinical COPD Questionnaire
- (CDW) – VA Corporate Data Warehouse(ICD) - International Classification of Diseases
- (DC) - Discharge
- (EHR) – Electronic Health Record
- (GLMM) – Generalized Linear Mixed Model
- (IRB) – Institutional Review Board
- (MCS) – Mental Component Summary
- (PCP) – Primary Care Provider
- (PCS) – Physical Component Summary
- (SHEP) – Survey of Healthcare Experiences of Patients
- (VA) – Veterans Affairs
- (VISN) – Veterans Integrated Service Network
- (VR-12) – Veterans RAND 12 Item Health Survey

2. Funding/Regulatory

- Funding: Veterans Affairs (VA) Health Services Research and Development IIR 12-130-2
- IRB: VA Puget Sound Institutional Review Board (IRB) approved all study procedures.
- Trial registration: ClinicalTrials.gov as NCT02021955.

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4. Background/Rationale

Hospital admission and readmission have been an interest as an important driver of healthcare costs (AHRQ – Au-DH).[1] In 2014, CMS implemented a COPD readmission penalty with assumptions that 30-day hospital readmissions were in part related to quality of care received while in hospital. Interest has focused on interventions to reduce COPD readmission with systematic reviews expressing doubt about the effectiveness of such interventions.[2,3] From a patient perspective, exacerbations cause significant decrements in health-related quality-of-life.[4,5,6,7] Across health systems, exacerbations drive health care expenditures with as many as half of patients requiring readmission within 6 months. The time after discharge (DC) for hospital can be viewed as a sensitive period where the likelihood of relapse peaks within 8 to 12 weeks after the incident exacerbation. How to deliver guideline recommended services in a timely fashion is a challenge across most health systems.

Within North America, the Department of Veterans Affairs provides care to Veterans at more than 1000 primary care settings and 150 medical centers. To meet the needs of Veterans across all instances of health care settings, VA needs to redesign care delivery systems regardless of locale. VA's current specialty care system reflects a fee-for-service model where specialists wait for patient referrals and do not assume responsibility for the health of a population of patients. This approach does not take advantage of the VA integrated health system increasing risk of care fragmentation. Specialists also are geographically concentrated at major medical centers that are culturally and physically separated from the patient's medical home. Determining how to deploy existing specialties using a primary care and patient centric approach represents an important opportunity to improve access, timeliness, and quality-of-care.

5. Rationale and objectives

To be successful, health systems require a pragmatic health system-level solution. In this intervention, we propose to realign specialty care to collaborate with primary care teams and focus on patient needs and guideline concordance after discharge from hospital for COPD exacerbation. The intervention was designed to: 1) support primary care teams in the care of patients recently discharged for a COPD exacerbation, 2) utilize population health methods to identify patients at risk of readmission, 3) integrate proactive collaborative care

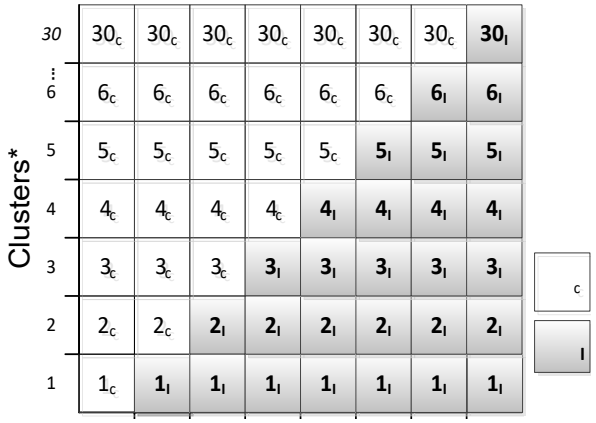
with specialty care and primary care teams 4) deliver care within the context of existing services and ongoing care, 5) leverage data systems and virtual care to facilitate improved delivery, and 6) respect the role of primary care while attempting to minimize their workload. Our goal is to improve 1) patient quality-of-life as measured by the Clinical COPD questionnaire and 2) reduce 180-day hospital readmission and mortality after hospital discharge.

6. Setting

We will conduct this trial at the VA Puget Sound Health Care System in Washington State, and the Boise VA Medical Center in Idaho. These are two academic medical facilities within VISN 20. We will include their accompanying 10 community-based outpatient clinics. These facilities cover a wide geographic range, including six that are designated as rural facilities.

7. Overall Design

Figure 2. Transition of primary care team clusters from control to intervention.



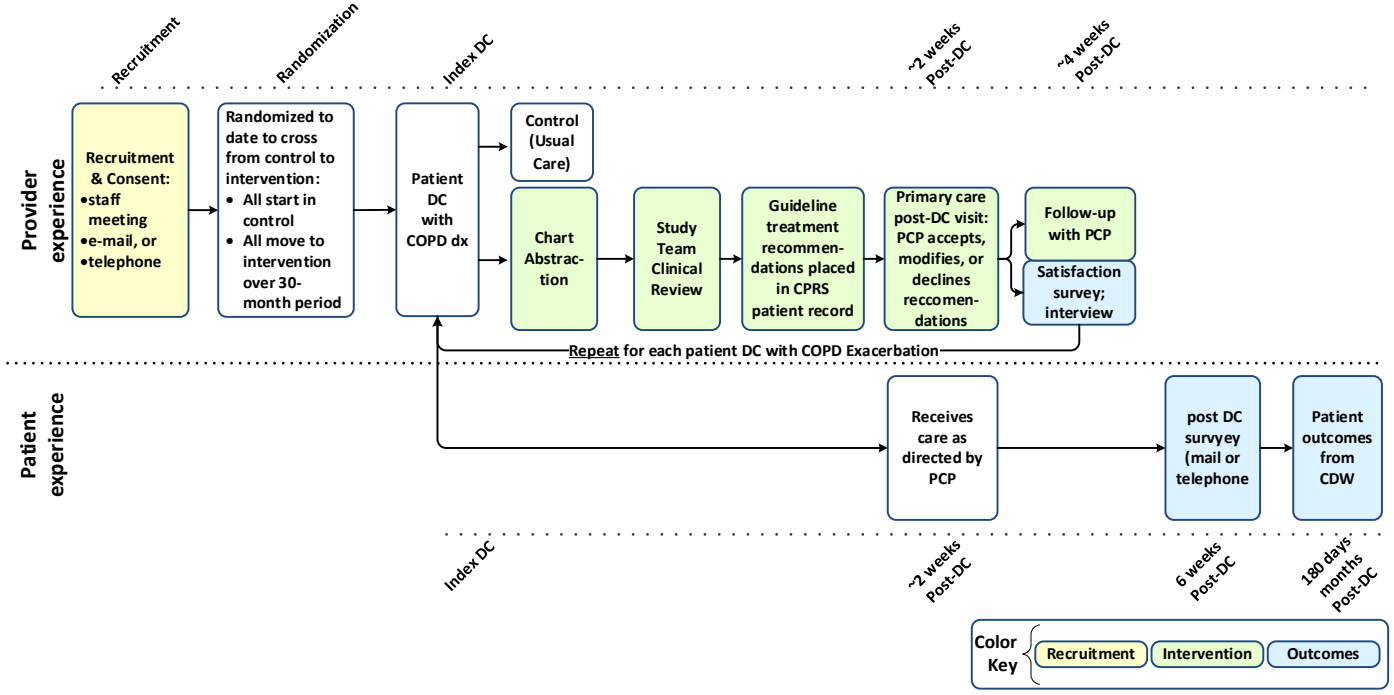
*1-4 providers/team and 2-13 teams/cluster such that each cluster had comparable number of COPD patients

We will perform a modified stepped wedge clinical trial which is a variant of a clustered randomized cross-over design.[8,9] Our focus will be to evaluate a multifaceted intervention designed to improve quality-of-life and decrease rate of hospital readmission and mortality among patients who were discharged from hospital with an exacerbation of COPD (Figure 2). We chose a modified stepped wedge design for several reasons: 1) resource constraints require a staggered roll out of the intervention; 2) timing is randomized, allowing all providers to eventually receive the intervention; 3) utilizes within and across provider comparisons maximizing efficiency and allowing the fewest number of providers to be enrolled because analyses utilize within provider and between provider comparisons increasing power.

In this stepped wedge design, clusters of teams transition from the control group to the intervention group over time. For this trial (Figure 2), we will assemble 30 clusters of primary care teams (see Section 8.4). Each primary care team consists of between 1-4 primary care clinicians. The number of primary care teams allocated to each cluster will be done to ensure a balanced number of patients with COPD in each cluster. All clusters of teams will start in the control group (first column of Figure 2). At the beginning of every 30-day period, a randomly selected cluster of primary care teams will transition to the intervention group such that all clusters will be in the intervention group in the 30th period (last column of Figure 2). The first control period (period 0) started on May 12, 2015.

We describe the trial flow in the following sections as illustrated in Figure 2.

Figure 2: Overll study flow



8. Provider Eligibility, Recruitment, and Consent

8.1. Eligibility:

We will obtain names and contact information for providers from the VA Corporate Data Warehouse (CDW).[10] We will invite all PCPs (physicians, physician residents, physician's assistants, and nurse practitioners) from the VA Puget Sound and the Boise VA Medical Center to participate. The only exception will be PCPs who agreed to be co-investigators on this trial.

8.2. Recruitment:

We will approach providers using the following methods:
Primary care team meetings: We will introduce the study at primary care team meetings and grand rounds. At the end of the presentation, we will ask providers to complete an enrollment sheet indicating their willingness, or not, to participate and a short demographic survey. Providers will either return the enrollment forms to trial staff after the meeting or mail it to us after the meeting. For providers who do not indicate their willingness, we will send an email inviting them to participate (see next section).

Email: We will invite providers via email if they do not return an enrollment sheet after a team meeting or if they are hired after the intervention launches. The email will contain an overview of the study, and a link to a detailed study description and the demographic survey, as well study contact information. The email will ask providers to review the material and reply if they wish to be excluded. The email explains that we will consider them enrolled in the study if they do not respond within one week (default opt-in), and that they could withdraw at any time.

8.3. Consent:

We will consider a provider consented once they return the enrollment sheet, respond to the invitation email indicating that they want to participate, or we receive no response to the email within one week.

8.4. Provider clustering/randomization:

We will group VA Primary care teams based on continuity and usual cross -coverage purposes. Primary care teams consist of 1-4 providers. We will group consented providers into 30 clusters. When assembling provider clusters, to the extent possible, we will group teams 1) that had shared staffing (e.g. nurses, medical support assistants), 2) are from the same site, and 3) when combined have relatively even distributions of empaneled clinic patients with a COPD diagnosis. By clustering this way, we minimize potential contamination of providers in the control arm by providers who had already crossed into the intervention.

The trial biostatistician will randomly assign each cluster to one of 30 30-day time periods. Each period the next cluster of PCP teams will transition from the control to the intervention period. When new providers join a primary care team, they assume their team's cluster and randomization time period. If providers change teams after randomization, they will retain their original cluster assignment. Any new teams created will be randomly assigned into one of the remaining intervention time periods such that they will have at least one time period in the control and intervention periods.

9. Index discharges

An index discharge is the date of a hospital discharge involving care for COPD for a patient under the care of an enrolled provider starting May 12, 2015. We will interrogate the CDW daily to identify all eligible discharges as described below.

9.1. International Classification of Diseases (ICD) discharge diagnosis codes:

We will define a COPD exacerbation as a primary ICD-9 primary discharge diagnosis of COPD (491%, 492%, 493.2%, or 496%), or a primary discharge diagnosis of respiratory failure (518.51, 518.53, 518.81, 518.83, 518.84) with any secondary diagnosis of COPD. In October 2015, VA will switch from the ICD-9 to the ICD-10 coding convention (J41.0, J41.1, J41.8, J42., J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, or J44.9 for COPD and J80., J96.00, J96.01, J96.02, J96.10, J96.11, J96.12, J96.20, J96.21, J96.22, J96.90, J96.91, J96.92 for respiratory failure).

We will exclude patients who were miscoded as having COPD discharge. Study coordinators will review the electronic health record (EHR) to confirm that the patient received care consistent with a COPD exacerbation. A single coordinator will review discharges where COPD is the primary discharge diagnosis. For cases of uncertainty, a second coordinator will review. If discordant, a study clinician will adjudicate and make the final decision.
Discharges for respiratory failure with a secondary COPD diagnosis are often more complicated. In this situation, two coordinators will independently review and adjudicate with a clinician when discordant.

9.2. Discharges with missing ICD codes:

For discharges with a missing ICD discharge code, we will employ a Natural Language Processing algorithm to identify potential index discharges. This algorithm identifies discharges with pre-defined keywords (%COPD%, %Bronchitis%, %Bronchiectasis%, %Bronchospasm%, %Emphysema%, %Acute% and %Bronc%, %SOB% and %Bronchitis%, %Chronic% and %Bronc%, %Chronic% and %Pulm%, %Chronic% and

%Obstruct%, Obstructive Pulmonary Disease, or Reactive Airway Disease) contained within the admission diagnosis or discharge summary text. Once identified, coordinators will review the EHR to confirm the hospitalization covered treatment for a COPD exacerbation.

9.3. Additional eligibility criteria.

- A patient may have more than one index discharge if the 180-day outcomes period for the prior index discharge is completed and was with a provider in the control group. Once a patient has a discharge with a provider in the intervention group, they cannot have additional index discharges. We will include each patient's first discharge only in primary analyses.
- We will exclude patients for whom we would not be able to provide recommendations including those discharged to a domiciliary unit, a nursing home, respite care, or to hospice.
- We considered patients discharged and readmitted within 12 hours to have a continuous hospital admission.

10. Intervention

10.1. Recommendations for COPD guideline care:

Each week, for patients with a new index discharge and under the care of a provider in the intervention group, we will perform the following:

Chart abstraction: A study coordinator will cut and paste pertinent sections of the EHR into an abstraction template (Appendix 1). These abstractions will include notations from emergency care, discharge summaries, primary care, pulmonary/sleep, social work, advanced directives, post-discharge telephone calls, and procedures and imaging studies.

Clinical review: The intervention team, consisting of pulmonary, primary care, and pharmacy providers, and study coordinators will convene to prepare recommendations for each patient with an abstraction as follows:

- Clinical lead:
    - A pulmonologist or PCP team member will be designated to lead the review each week
    - Reviews the abstractions, and/or EHR as needed, to draft a recommendations checklist (Appendix 2). The checklist will include:
        - Recommendations for diagnostic testing, medications, therapies/referrals, and/or follow-up, addressing any gaps in contemporary COPD guideline recommended care[4,11] and related co-morbidities.
        - Draft of the recommendations note that will be placed into the EHR for the PCP's review.
- Review meeting:
    - Moderator: clinical lead.
    - Attendees: a clinical team consisting of at least one pulmonologist and one PCP, with input by the pharmacist as needed, and coordinators.
    - Review: the clinical team will discuss each patient's history, consulting the abstraction and EHR as needed, and identify any gaps in guideline COPD/comorbidity care.
- Recommendations:
    - Final recommendations: modify draft recommendations checklist as appropriate per team review
    - Language/content: ensure that notations will be acceptable to primary care providers. For example, smoking cessation counseling:

        - Do not recommend if there have been notations reflecting previous discussions.
        - Do offer recommendations such as addition of pharmacotherapy for smoking cessation if none has been previously offered.
    - No recommendations: if a patient is receiving all guideline care, reinforce the excellent work.

Entering recommendations and/or orders into EHR: We will provide recommendations to the PCP timed to coincide with the patient's post-discharge clinic follow-up (usually within two weeks of discharge) as follows:

- EHR notation:
    - Enter note: a study coordinator will cut and paste the finalized recommendations note into the EHR as an E-Consult note for the lead clinician to sign.
    - Lead study clinician signs: once entered, the clinician will receive an EHR alert that they have a note ready for signature.
    - Additional signers: To ensure awareness, we will add the patient's PCP and pulmonologist, if any, as additional signers. If the PCP is a resident, we will add the attending physician as a signer.
    - Questions: The note will encourage the PCP to ask any questions about the recommendations, or any other elements of their OPD care, by responding with an addendum to the note, through encrypted email, or telephone.
- Enter unsigned orders:
    - A study coordinator will enter any recommended orders notated on the finalized. recommendations checklist as an unsigned order on behalf of the PCP to sign.
    - For any questions that arise, the coordinator will seek guidance from the lead clinician.
- PCP reviews recommendations:
    - View alert: once entered, the PCP will receive an EHR alert that an order is awaiting signature.
    - Signs, modifies, or cancels orders: the PCP may choose to sign the order as is, modify the order, or decline the order as appropriate given their personal knowledge of the patient's clinical condition.
    - Autonomy: this process ensures the PCP maintains autonomous care of the patient.
- Recommendations requiring more clinical context:
    - We will elaborate on recommendations that require more clinical context in the E-consult note but will not enter any related orders on behalf of the PCP.

10.2. In-services:

The study pharmacist will provide periodic training to residents on correct use of inhalers available in the VA formulary.

11. Blinding:

Because we will only review for recommendations patients whose PCP was in the intervention, it is not possible for anyone on the study team to be blinded for the intervention. Patient self-report outcomes collected over the telephone were collected by a coordinator blinded to the patient's intervention status.

12. Outcome and Baseline Assessments

We will assess the following using a combination of data extracted from CDW, EHR chart review, and self-report surveys (Table 1). For patient self-report, we will mail an invitation to complete surveys six weeks after their index discharge. The mailing will include a cover letter informing them that their provider is taking part in the study and asking for their input about their satisfaction with their COPD care and COPD-related health.

The mailing also will include an Information Statement with detailed information about the study. The letter will ask them to either return completed surveys by mail, or to return a postcard indicating they do not want to participate or that they want more information through a telephone call. For those who do not respond after two weeks, we will follow up with a telephone call. For those who prefer, we administered the surveys over the telephone. We describe provider self-report methods below.

12.1. Primary outcome measures

Hospital readmission and mortality: assess 180 days after the index discharge with a composite measure of any hospital readmission or death.

COPD specific health status: measured with the *Clinical COPD Questionnaire* (CCQ),[12-14] which consists of 10 items that encompass three domains (symptoms, functional state, mental state). Scores range from 0-to-6 with higher scores indicating better health. The minimally important difference (MID) is 0.39 with a standard error of 0.21.

12.2. Secondary measures

Secondary outcomes - patient-reported:

General health status: measure using the *Veterans RAND 12 Item Health Survey (VR-12)*,[15,16] which consists of 12 items yielding a Physical Component Summary (PCS) and Mental Component Summary (MCS) score of 0-100, with higher scores reflecting better health. Our outcome is the PCS score, which has a national mean of 27.0 (SD=8.4) among Veterans admitted for COPD.[17]

Patient satisfaction: assess patients' satisfaction with respect to the post-discharge primary care follow-up visit using sections of the *Patient Care Medical Home Survey of Healthcare Experiences of Patients (SHEP)* (Appendix 3). We will use the 6-item communication, 3-item medication decisions, and the 2-item self-management composite scores, as well as single-item questions covering coordination of care, information, and provider rating.

Secondary outcomes - provider experience and perception:

To assess providers' experience and perception of the intervention, we will use a convergent mixed methods[18] approach, concurrently using quantitative and qualitative measures.[18] For quantitative measures, we developed a brief 10-item survey (Appendix 4), based on our work with the VA Office of Specialty Care Transformation evaluation, that assessed topics directly relevant to our intervention including satisfaction with the consultation process, workload, patient access to specialty care, and quality of care delivered. Within two weeks of posting recommendations for their first intervention patient, we will email providers asking them to complete this survey on-line. For those who do not respond, we will mail the survey with a return inter-office envelope.

For the qualitative approach, coordinators will conduct semi-structured interviews using scripted, open-ended questions and semi-structured prompts (Appendix 5) to elicit thick descriptions that capture the depth and breadth of providers' experiences including: acceptability; fit with practice; feasibility and satisfaction with the intervention; and its perceived effectiveness. We will invite providers to participate in the interview after their first intervention patient is discharged. We anticipated needing to interview no more than 30 providers to reach thematic saturation, the point at which no new or novel insights are provided [19]

12.3. Other measures:

Uptake of care recommendations: A coordinator will use the finalized recommendations checklist to enter recommendations into the study database. A second coordinator, blinded to the first coordinator's entries, also will enter the recommendations. The coordinators will discuss any discrepancies, clarifying with that week's lead clinician as needed to resolve. Six weeks after an index discharge for a patient of an intervention provider, two study coordinators will independently conduct EHR chart reviews to determine which of the care recommendations have been endorsed and completed by the PCP. They will discuss any determination for which they did not agree and consult with a study investigator for resolution as appropriate.

Quality of COPD care:

Using a composite measure of quality metrics endorsed by the National Quality Forum[20], we will use a combination of data from CDW and EHR chart review to assess the overall quality of COPD care 180 days after discharge. Similar to the approach used by Lindenauer[21] et al., our measure will dichotomized those patients who achieved all of the recommended care processes for which they were eligible (score =1) versus those who did not (score =0). Individual measures may be assessed individually or grouped based on whether they are generic (tobacco use, vaccinations) or COPD specific (medications, spirometry). These recommended processes include:

- Assessment of smoking status
- Referral/counseling for smoking cessation, if current or recent quitter (within 1 year)
- Assessment of resting O2 saturation or PaO2
- Provision of O2 for long-term continuous therapy for patients with SpO2<88% or PaO2<55mhg
- Addition of at least one controller agent (LABA, LAMA, ICS, Roflumilast) when appropriate
- Confirmation of COPD by lung function assessment
- Offer, confirmation or administration of influenza vaccination during appropriate season
- Offer, confirmation or administration of pneumococcal vaccination
- Other inhaled therapy types--date filled
- Systemic corticosteroid therapy types--date filled
- Antibiotic therapy types--date filled
- Other therapy types--date filled

12.4. Baseline Characteristics:

- Sociodemographic: patient and provider characteristics at enrollment using a combination of CDW and self-report.

We will use CDW to identify/calculate the following:

- COPD and medications: results from patients' most recent pulmonary function tests and pulmonary medication prescriptions over the past 12 months.
- Days exposed to steroid: number of days a patient was prescribed an oral corticosteroid in the year prior to index admission.
- COPD exacerbations not requiring hospitalization: number of outpatient exacerbations over the year prior to the index discharge, defined by a primary outpatient ICD-9 or ICD-10 diagnosis associated with a clinical event and prescription for an antibiotic and systemic corticosteroid within 2 days of the diagnosis.

- Comorbidities and health status indicators: collected information on common comorbidities that comprised the health inventory checklist used in previous intervention studies[22,23] for the year prior to and through the index admission:
  - diagnoses for COPD and common co-morbidities such as diabetes, liver disease, chronic heart failure, vascular disease, and the like to include diagnoses that comprise the Charlson comorbidity index[24]
  - number of all-cause admissions
  - number of inpatient COPD exacerbations
  - number of COPD outpatient exacerbation
  - length of admission
  - Intensive care unit hours during index admission

Table 1. Summary and timing of data elements.

	Data element	**Source**	**Timing**
Primary Outcomes	Hospital readmission	Record review, CDW, patient self-report, CMS (on early participants)	180 days post index discharge
	Mortality	Record review, CDW	
	Clinical COPD Questionnaire	Patient self-report	6 weeks post index discharge
Secondary Outcomes and other measures	VR-12		
	Patient satisfaction / smoking status		
	Care recommendations	EHR chart review	
	Quality of COPD care	EHR chart review, CDW, patient self-report	180 days post index discharge
	Provider satisfaction	Provider self-report survey	2 weeks after receiving recommendations for intervention discharge
		Interview	After receiving recommendations for intervention patient
Key Characteristics	Patient sociodemographic	Patient self-report and CDW	6-weeks post index discharge
	Provider sociodemographic	Provider self-report and CDW	Enrollment
	Comorbid diagnoses	CDW	1 year prior to index discharge
	All cause hospital admissions		
	Inpatient and outpatient exacerbations -Days exposed to steroid		
	Additional COPD treatments -Oral corticosteroid use prior to admission -Oral corticosteroid dosage at admission -Inhaled medications -LTE inhibitors -PDE-4 inhibitor		

12.5. Remuneration:

We remunerated participant $20 for survey completion. We did not pay providers.

13. Analytic Approach

Our modified stepped wedge design, through its randomized intervention allocation, offers several advantages to interval validity compared to observational approaches. However, our clustered design also requires additional analytic evaluation compared to a simple two-arm randomized trial.[9] The primary outcome measure is COPD hospital readmission/mortality within 180 days as assessed through the CDW. Time zero for intervention patients is the start of the period when the provider cluster is randomized to receive the intervention. Time zero for control patients is the start of each 30-day period (wedge) while the provider cluster remained unexposed to the intervention. Provider clusters randomized to receive the intervention at later time periods will accrue fewer patients than clusters randomized to earlier periods. We will present the analysis for hospital readmission as the example for the analytic approach that would also apply for our secondary outcome measures.

13.1. Models

We will use mixed-effects linear regression or logistic regression as appropriate for the outcome of interest[25] (180-day readmission or death, CCQ Total Score, VR-12 PCS) with clustering by provider: $g\left(\mathrm{E}\left(y_i|\mathbf{X}_i, \alpha_{j[i]}\right)\right) = \mathbf{X}_i\boldsymbol{\beta} + \alpha_{j[i]}$, where y_i is the outcome for patient i and $\alpha_{j[i]}$ is a random effect for provider j seen by patient i such that, across providers, the $\alpha_{j[i]}$'s are assumed independently and identically distributed (i.i.d.) Normal$(0, \sigma_\alpha^2)$. $\boldsymbol{\beta}$ is a 7×1 vector of fixed effects regression coefficients, and $\mathbf{X}_i$ is a 1×7 vector containing the following fixed effects terms for patient i: a constant term (identical across patients), an indicator for patient i's receipt of the intervention ($\mathrm{X}_i^{intervention} = 1$ if patient i received the intervention, $\mathrm{X}_i^{intervention} = 0$ otherwise), three time-based restricted cubic spline terms for patient i, the number of days in the past year that patient i was exposed to systemic corticosteroids, and the number of COPD exacerbations not requiring admission experienced by patient i in the past year. The logistic link function was used for the 180-day readmission or death GLMM such that $\mathrm{E}\left(y_i|\mathbf{X}_i, \alpha_{j[i]}\right) = \pi_i = \left(e^{\mathbf{X}_i\boldsymbol{\beta}+\alpha_{j[i]}}\right)/\left(1 + e^{\mathbf{X}_i\boldsymbol{\beta}+\alpha_{j[i]}}\right)$. The identity link function was used for the CCQ Total Score and VR-12 PCS GLMMs such that $\mathrm{E}\left(y_i|\mathbf{X}_i, \alpha_{j[i]}\right) = \mu_i = \mathbf{X}_i\boldsymbol{\beta} + \alpha_{j[i]}$.

13.2. Sampling and non-response bias and missing data

We will perform an intention-to-treat analysis. The analysis will include all patients in the groups and time period which they were randomly assigned to begin receiving treatment, regardless of their adherence with the treatment and/or subsequent participation. An adjusted odds ratio will be estimated to compare control and intervention group odds of 180-day readmission or death, and adjustment mean differences will be estimated to compare control and intervention group means for CCQ Total Score and VR-12 PCS. In the event of missing outcome data, the primary analysis of the respective outcome will be based on outcome data imputed under a multiple imputation using chained equations procedure, with inference from 70 models of imputed data combined using Rubin's Rules. Sensitivity complete-case analyses will be performed for outcomes with missing values to assess whether direction of association or statistical significance is impacted by a change in missing data approach.

13.3. Sample size and study power

For the sample size calculation,[9] let the design have *I* clusters, *T* time points, and *N* individuals sampled per cluster per time interval. Assume the model, $Y_{ij} = \mu + \alpha_i + \beta_j + X_{ij}\theta + e_{ij}$, where α_i is a random effect for cluster *i* such that $\alpha_i \sim N(0, \tau^2)$, β_j is a fixed effect corresponding to time interval *j*, X_{ij} is an indicator of the treatment mode in cluster *i* at time *j* (1=intervention; 0=control), θ is treatment effect and $e_{ij} = \sum_k e_{ij}/N$ are independent and identically distributed $N(0, \sigma^2)$ and ${\sigma^2}_e/N$. Let Y_{ij} be the mean for cluster *i* at time *j*. Assume testing the hypothesis $H_0: \theta = 0$ versus $H_A: \theta = \theta_A$, where θ_A is the treatment effect size. The approximate power for conducting a two-tailed test of size alpha is $power = \Phi\left(\left(\theta_A/\sqrt{Var(\hat{\theta})}\right) - Z_{1-\alpha/2}\right)$ where Φ is the cumulative standard normal distribution function, $Z_{1-\alpha/2}$ is the $(1-\alpha/2)th$ quantile of the standard normal distribution function and $\hat{\theta}$ is the estimated treatment effect size. Let $X_{ij} = 0$ if cluster *i* receives the control at time *j* and let $X_{ij} = 1$ if cluster *i* receives the intervention at time *j*. Thus with this matrix $\boldsymbol{X}$ and assuming equal *N* per cluster per time interval, then assume $Var(\hat{\theta}) = [I\sigma^2(\sigma^2 + T\tau^2)]/[(IU - W)\sigma^2 + (U^2 + ITU - TW - IV)\tau^2]$ where $U = \sum_{ij} X_{ij}$, $W = \sum_j \left(\sum_i X_{ij}\right)^2$ and $V = \sum_i \left(\sum_j X_{ij}\right)^2$. This variance equation is used in the power calculation. We have approached the power estimates conservatively allowing for a lower proportion of subjects who may experience hospital readmissions, allowing for regression to the mean.

We assume 30 unidirectional movements from control to intervention among 30 clusters (clinics) and 15 individuals sampled per cluster per time interval. We assume a significance level of alpha = 0.05. We assume baseline hospital readmission of 0.40 with a 10% relative reduction to 0.36, baseline CCQ of 0.40 with a 10% relative reduction to 0.36, and baseline SF-12 of 0.35 with an 11% relative increase to 0.39. We assume each outcome to have a coefficient of variation equal to 0.1. Under these assumptions, our power is estimated for hospital readmission, CCQ, and SF-12 analyses to be 0.874, 0.874, and 0.889, respectively.

13.4. Qualitative analyses

We will conduct qualitative data collection and analysis concurrently. We will conduct data analysis using simultaneous deductive and inductive content analysis[26]. We will upload transcripts to ATLAS.ti.17 13 for coding and data management. Coding will use audio recordings and transcriptions simultaneously to ensure transcription fidelity, and capture participant inflection not contained in written transcripts. We will conduct deductive content analysis through the identification of quotes and phrases that fit within pre-identified and defined a-priori categories. A-priori categories to be included: acceptability, feasibility, provider satisfaction, sustainability, barriers, facilitators, intrusions, collaboration, engagement and perceived patient outcomes. Inductive content analysis will be conducted through open/unstructured coding, allowing for the identification of emergent, previously unidentified or unexpected themes. This will allow us to capture data that did not fit into a-priori categories. Coding will continue until thematic saturation: the point at which subsequent data failed to produce new findings [19].

An important component of mixed methods is the ability to compare and contrast the findings from each data source.[27] "Triangulation" describes a process by which data collected from multiple data sources are used comparatively, broadening and validating the definition and understanding of complex constructs. We will compare the survey derived satisfaction ratings from the full sample with the coded constructs that we have identified from the qualitative data. We will assess if there is concordance or discordance between these scores/constructs with a particular focus on whether the qualitative constructs offer some mechanism for understanding sources or satisfaction or dissatisfaction.

14. Protection of Human Subjects

14.1. Minimal risk

Since the intervention will be at the provider level and represents an encouragement of a variant of standard of care, the IRB determined that the study intervention presents minimal risks.

14.2. Consent

Using methods described above we will consent PCPs to receive guideline care recommendations (Section 8) for their patients discharged with COPD and to complete self-report surveys and interviews (Section 12.2) under a Waiver of Documentation of Informed Consent. The IRB does not require informed consent for activities that do not directly engage the patient by the study team; therefore, we will collect information about patients under Waiver of Informed Consent. For patient reported outcomes, we will provide an information sheet and opportunity to address questions. We will invite patients to complete self-report surveys (Section 12) approximately six weeks after their index discharge under a Waiver of Documentation of Informed Consent.

14.3. Data and safety monitoring

Adverse events:

Although all clinical decisions will be left with the patient's primary care clinician, there is an unlikely, but small chance for unanticipated adverse events. For example, recommendations may not consider a unique patient circumstance that is not well documented in the chart, yet the provider accepts the recommendations without review, resulting in worse outcomes. As such, our monitoring entity consists of Dr. David Au, the study Principal Investigator, and a clinical researcher with expertise in pulmonary medicine and not part of the study team, Dr. Kristina Crothers. We will not have a formal data and safety monitoring committee or board.

Based on previous work with a cohort of 3764 patients hospitalized for COPD, we identified diagnoses affecting at least 1% of patients during their initial hospital admission and subsequent admissions and outpatient visits over the year following their initial hospitalization. We will consider any occurrence of these events to be expected. All deaths and all-cause re-admissions will be considered expected.

Systematic adverse event review will occur after a patient's 180-day outcomes period when a coordinator will review the EHR for urgent care notes, hospital admissions, and PCP visits. A coordinator will prepare reports summarizing events involving urgent care, admissions, or respiratory symptoms, along with event outcomes and any study recommendations. A member of the monitoring entity will review for expectedness, relatedness, and severity. We will reported serious, unexpected events to the IRB within five days, and other events at annual review. We will process ad hoc events discovered during the six-week review of which study intervention recommendations were adopted in the same way.

Given that the intervention is a variant of normal care and that the likelihood for unanticipated adverse events is low, we will not have formal stopping rules for safety, efficacy, and futility are not proposed.

Care recommendation fidelity:

Prior to study launch, the study team will conduct mock reviews using actual patients discharged with a COPD diagnosis. We will continue reviews until the team has reached consensus about types of recommendations, orders, and standardized language we will use for providers in the intervention.

We will prepare a detailed "how-to" guide to entering notes and orders in the EHR for coordinators to follow. Using the guide, coordinators will enter orders into the EHR for a test patient until they have demonstrated 100% accuracy as assessed by a study clinician. For intervention patients, we will require coordinators to consult with a study clinician before entering any information in the EHR about which they have any questions.

14.4. Data management and confidentiality

This project requires the creation, maintenance, and analysis of a large, multivariate, database that includes a variety of measures from multiple sources. Recognizing that the success of this study critically depends on the quality of the data collected, systematic data collection, quality control, and data management procedures, we will implement: 1) specification and use of concise protocols; 2) rigorous training, certification, and periodic re-training of study personnel, with on-going monitoring of adherence to data collection and handling protocol; 3) regular review of questionnaire response rates, reported respondent burden, and missing items to identify and correct problem areas; 4) validation and verification of all data, and 5) regular meetings and progress reports to provide specific, well-documented feedback to project personnel concerning potential difficulties as well as follow-up to ensure that problems are resolved quickly.

We will assign all participants a unique study ID. The master list will be stored separately from the data and accessible only by IRB approved study staff. For clinical note abstractions, we will not remove identifiers because that material is copied verbatim, making it difficult to ensure that any reference to names, location, and dates were removed. We believe it is safer to acknowledge that identifiers will be present, and to carefully adhere to our strict protocol to store the abstracted notes on a secure server accessible only by study staff. Chart abstracted notations will not be entered into the study database.

We will store data in strong password protected SQL and ACCESS relational databases that reside on a secure VA network server. To reduce errors in data entry with participant self-report data elements, we will use double data entry and field valuation checks wherever possible.

For provider on-line surveys, we will e-mail a link that populates data on the VA secure server. Data will be secured at the database level, using a role-based and record-level security model. Providers will belong to a Windows group, which allows access to the database. Roles and the provider's login credentials restrict them to records associated only with themselves. They will not be able to see any other provider's records, regardless of the application used to connect to the database.

We will store data on paper in secure, locked file cabinets within secure offices. Any communications between study staff and provider participants regarding patient care will occur via encrypted e-mail.

15. Summary of Changes from original protocol

- 2/12/2014: VA CDW:
    - Used instead of Veterans Integrates Service Network (VISN) 20 data warehouse because of changes in VA policy.
- 2/12/2014: Remuneration
    - Patient participants were remunerated $20 instead of $25 based on budget and IRB application.

- 3/5/2015: Provider enrollment
    - Modified to passively consent providers who had not responded to invitation after one week.
- 4/2/2014: Outcomes
    - Used VR-12 instead of the SF-12 because VR-12 is the SF-12 modified for a Veteran population.
- 2/12/2014: Wedge interval length/outcomes period:
    - Wedges consisted of 30-day wedge intervals instead of 1 month to maintain standard interval length.
    - 30-day intervals resulted in 180-day outcomes period instead of six months.
- 5/6/2014: Number of wedges
    - Used 30 wedges over 30 months instead of 36 wedges over 36 months;
    - Recalculated power estimates based on actual numbers of consented providers and COPD exacerbation discharge data. To maintain 0.90 power assuming an alpha of 0.95 and coefficient of variation of 0.1, we would require 30 clusters in lieu of 36.
- 5/21/2015: Smoking status self-report
    - Added short smoking status questionnaire with patient outcomes, as smoking status around the time of discharge is an indicator of quality of COPD care.
- 8/4/2016: COPD Training for inpatient discharge and primary care teams
    - After several attempts to coordinate in-services to inpatient and primary care teams, we were unable to develop a practical and mutually agreeable schedule because of logistical and scheduling constraints.
- 7/23/2015: Mailed patient outcomes
    - Added option for patient participant to complete surveys via mail instead of telephone.
- 3/22/2016: E-cigarettes and vaping
    - Included a question about e-cigarette and vaping use, as these devices' popularity increased and many Veterans had adopted these practices over cigarette smoking.
- 7/27/2017: Qualitative interviews
    - Initially targeted providers after three intervention discharge; because of low response rate we reduced to one in attempt to include more providers.
- 1/12/18: Correlation of measures within patient/used participants first DC only
    - We did not correlate measures within patient, because we used only the first index discharge per patient. Given the small number of patients with > 1 index discharge, the additional complexity of modeling within-patient correlation would not be cost-effective with respect to degrees of freedom.
- 7/27/18: VR-12 PCS
    - demoted from primary to secondary because COPD intervention studies have not shown effects on QoL so no good rationale that there will be any significant effect– we will not adjust for it.
- 12/28/18: Analyses
    - Modeling time: we originally wanted to model (k – 1) fixed effects for the k wedges in the stepped-wedge design. However, each wedge only had ~10 discharges, on average, and it would be expensive (and likely not very informative) to model all of the wedges individually. Therefore, we modeled time using a 3-knot restricted (or natural) cubic spline for flexibility and lower degrees of freedom cost.
    - Medicare data: not used because of insufficient time/resources to pull and merge with current data.

16. References

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Appendix 1: Chart abstraction template
(back to intervention)

Date of abstraction: Click for date. **Abstractor:** Click here. **Links:**				
Patient Information	**DC Summary and/or H&P Template**			
Advanced Directive	Dates/Diagnoses	HPI	Hospital Course	Disposition
Smoking History	Prior Admissions	PMH	Condition On DC	Follow-up/Post DC call
Home CPAP/BIPAP/O2	Prior ER Visits	Social History	Activity Restrictions	Instr. and Education
Prior Primary Care Visit	Consultations	Review of Systems	Diet	Competency
Prior Pulmonary Visit	Procedures	Physical Exam	Medications/Allergies	Code Status
Social Work Notes				
Immunizations				
Sleep Study				

Patient:		**Station:** Choose an item.		
Age:	**Sex:** Click here.	**Ht (in):**	**Wt (lb):**	**BMI:**

Discharge Summary: Back to top

Current DC DATES/DIAGNOSES: (from Clinical Reports/Visits/Admissions/Discharge Diagnoses):

DC summary DC diagnoses text:

PRIOR ADMISSIONS (click for details) Back to top

PRIOR ER Visits (click for details) Back to top

CONSULTATIONS (click for details of consults up to 1 year prior) Back to top
DC summary text:

PROCEDURES/IMAGING (during or most recent to this hospitalization): Back to top
Click here for copy of most recent report: **PFT; CXR; CT; ECHO**
DC summary text:

HISTORY OF PRESENT ILLNESS: Back to top

HOSPITAL COURSE: Back to top

PAST MEDICAL HISTORY: Back to top

SOCIAL HISTORY (incl smoking): Back to top

REVIEW OF SYSTEMS: Back to top

PHYSICAL EXAM (click for details) Back to top

CONDITION ON DISCHARGE: Back to top
Choose an item.

ACTIVITY RESTRICTIONS: Back to top
Choose an item.

DIET: Back to top
Choose an item.

DISCHARGE MEDICATIONS (click for details) Back to top

DISPOSITION: Back to top
Choose an item.

FOLLOW UP/Post DC Follow-up call: Back to top

DISCHARGE INSTRUCTIONS AND EDUCATION: Back to top

COMPETENCY: Back to top
Choose an item.

CODE STATUS: Back to top
Choose an item.

Prior Hospital Discharges: Back to top Back to DC Summary

Prior ER Visits past year (not resulting in hospital admission): Back to top Back to DC Summary

Allergies: Back to top

Medications: Back to top

Back DC Summary

Active medication list at discharge:

Meds filled over last year (from Pharmacy Outpatient Medications) **, now not on Active list** (above)**:**

MEDICATION CHANGES:
From DC summary**:**

From Pharmacy Discharge Note**:**

PFT:
Back to top
Back to DC Summary

CXR:
Back to top
Back to DC Summary

CT Scan:
Back to top
Back to DC Summary

Echo:
Back to top
Back to DC Summary

Physical Exam/labs:
Back to top
Back to DC Summary

Consultations/findings (through 1 yr prior to DC):
Back to top
Back to DC Summary

Prior Primary Care Visit :
Back to top

Prior Outpatient Pulmonary Visit:
Back to top

Social Work Notes
Back to top

Home CPAP/BIPAP/O2:
Back to top

Date: Settings (inpt/outpt)

O2: **BiPap:** **CPAP:**

Sleep Study: Back to top

Advanced Directive: Back to top

Immunizations Back to top

Appendix 2: Recommendations checklist template

(back to intervention)

RECOMMENDATIONS CHECKLIST: InCasE
Patient ID: «Patient_ID»/«PatientLastName»/«PatientSSN»/«DischargeStation»
PCP: «Provider_Name»**Institution**: «InstitutionCode» «InstitutionName»
Attending Physician: **Pulmonologist:**
Completed by: Clinician's name **Meeting Date:** Click here to enter a date.

Per IRB approval, save this document only in the InCasE secure network folder.
\\VHAPUGFPC30.v20.med.va.gov\Projects$\InCasE-MIRB\InCasE_Clinical_Reviews

1. PCP VISIT SCHEDULED PRIOR TO THIS MEETING?

No	Yes	
☐	☐	Follow up scheduled for :

2. DIAGNOSIS AND ASSESSMENT RECOMMENDATIONS:

ADD	Consider	PFT
☐$_1$	☐$_3$	☐ spirometry before and after bronchodilator
	☐$_3$	☐ lung volumes
	☐$_3$	☐ DLCO
	☐$_3$	☐ MIP/MEP
☐$_1$	☐$_3$	6-minute walk
☐$_1$	☐$_3$	Ambulatory/Exercise Oximetry
☐$_1$	☐$_3$	Chest X-ray
☐$_1$	☐$_3$	Chest CT
☐$_1$	☐$_3$	ECHO
☐$_1$	☐$_3$	ABG
☐$_1$	☐$_3$	PSG/sleep study
☐$_1$	☐$_3$	Serologies
☐$_1$	☐$_3$	IGE levels

3. PHARMACOLOGIC TREATMENT RECOMMENDATIONS:

Add	Remove	Consi-Sider*	Cont.	*check this box if the add or remove is not definitive, but we want the PCP to consider the change and we did not enter a consult for this
3.a. Short-acting beta-agonist (SABA)				
3.a.1. by Metered Dose Inhaler (MDI)				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Albuterol
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Levalbuterol (non-formulary at VA, second line to Albuterol)
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Metaproternol (no longer manufactured, only available as tablet and syrup, non-formulary at VA)
3.a.2 by Nebulization				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Albuterol
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Levalbuterol
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Metaproternol (no longer manufactured, only available as tablet and syrup, non-formulary at VA)
3.b. Short-acting antimuscarinic agents (SAMA)				
3.b.1. by Metered Dose Inhaler (MDI)				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Ipratropium
3.b.2. by Nebulization				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Ipratropium, Inhl 0.02%
3.c. Combo				
3.c.1. by Respimat				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Ipratropium /Albuterol (Combivent)
3.c.2. by Nebulization				
☐$_1$	☐$_0$	☐$_{3/4}$	☐$_2$	Ipratropium /Albuterol (DuoNeb)

3.d. Long-acting beta-agonist (LABA)

☐1	☐0	☐3/4	☐2	Olodaterol
☐1	☐0	☐3/4	☐2	Salmeterol

3.e. Long-acting antimuscarinic (LAMA)

☐1	☐0	☐3/4	☐2	TIOTROPIUM

3.f. Long-acting antimuscarinic (LAMA)/ Long-acting beta-agonist (LABA) (combination)

☐1	☐0	☐3/4	☐2	Olodaterol/Tiotropium (Stiolto Respimat)

3.g. Inhaled corticosteroid (ICS)

☐1	☐0	☐3/4	☐2	Beclomethasone Dipropionate Inhl (non-formulary at VA after mometasone and symbicort)
☐1	☐0	☐3/4	☐2	Budesonide (not available at VA)
☐1	☐0	☐3/4	☐2	Flunisolide (not available at VA)
☐1	☐0	☐3/4	☐2	Fluticasone (non-formulary at VA, after mometasone, symbicort, and beclomethasone)
☐1	☐0	☐3/4	☐2	Mometasone
☐1	☐0	☐3/4	☐2	Triamcinolone no longer manufactured

3.h. Inhaled corticosteroid (ICS)/ Long-acting bronchodilator (LABA) (combination)

☐1	☐0	☐3/4	☐2	Budesonide /Formoterol (Symbicort)
☐1	☐0	☐3/4	☐2	FLUTICASONE/Salmeterol (non-formulary at VA)
☐1	☐0	☐3/4	☐2	Formoterol / Mometasone (non-formulary at VA)
☐1	☐0	☐3/4	☐2	Modified Titration of inhaled glucocorticoid (mometasone)

3.i. Phosphodiesterase-4 inhibitor

☐1	☐0	☐3/4	☐2	Roflumilast (non-formulary at VA)

3.j. Methylxanthine

☐1	☐0	☐3/4	☐2	Theophylline

3.k. Mucolytic

☐1	☐0	☐3/4	☐2	Acetylcysteine

3.l. Oral Corticosteroid

☐1	☐0	☐3/4	☐2	Methylprednisolone
☐1	☐0	☐3/4	☐2	Dexamethasone
☐1	☐0	☐3/4	☐2	Hydrocortisone
☐1	☐0	☐3/4	☐2	Prednisolone (not available at VA)
☐1	☐0	☐3/4	☐2	Prednsone
☐1	☐0	☐3/4	☐2	Prednisone, burst taper prn home use

3.m. Antibiotics

☐1	☐0	☐3/4	☐2	Antibiotics
☐1	☐0	☐3/4	☐2	Antibiotics, prn home use

3.n. Leukotriene modifier

☐1	☐0	☐3/4	☐2	Montelukast

3.o. Smoking Cessation

☐1	☐0	☐3/4	☐2	Nicotine replacement patch, gum, lozenge, (nasal spray non-formulary at VA)
☐1	☐0	☐3/4	☐2	Varenicline
☐1	☐0	☐3/4	☐2	Buproprion

3.p. Other

☐1	☐0	☐3/4	☐2	

4. PHARMACY EDUCATION:

Add	Consi-sider*	*check this box if the add is not definitive and we did not enter a consult for this
☐1	☐3	Inhaler technique
☐1	☐3	Spacer
☐1	☐3	Pharmacy Other (ie med review, peak flow meter):

5. THERAPIES/REFERRALS:

Add	Consi-Sider*	*check this box if the add is not definitive and we did not enter a consult for this
☐1	☐3	Pulmonary rehabilitation
☐1	☐3	Respiratory Therapy
		☐Oxygen titration evaluations
		☐ Nocturnal oximetry
		☐ home oxygen evaluation
		Smoking cessation
☐1	☐3	☐ 1-800 quit line
		☐Behavioral Health/Pharmacy Counseling
☐1	☐3	Pulmonary specialty care evaluation
☐1	☐3	Palliative care
☐1	☐3	Weight loss: ☐ MOVE! ☐ TELE-MOVE!
☐1	☐3	Nutritional eval
☐1	☐3	PT/OT
☐1	☐3	Social Services
☐1	☐3	Dental
☐1	☐3	Vaccinations:
☐1	☐3	OTHER Recommendations:

6. DIFFERENTIAL DIAGNOSIS:

This hospitalization was due to COPD exacerbation:	**Yes** ☐	**Probably Yes** ☐	**Probably No** ☐	**No** ☐
If COPD Dx is questionable, list probable differential diagnosis:				

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CPRS RECOMMENDATIONS TEMPLATE

DRAFT completed by lead reviewer PRIOR to team meeting, then finalized and copied into CPRS after team discussion

****

✂---

This patient's medical record was reviewed by the INtegrating Care After Exacerbation of COPD (InCasE) collaborative review team on [date]. Team members include the following primary care physicians and pulmonary specialists:
Seattle: Rosemary Adamson, David Au, Douglas Berger, Richard Goodman, Karin Nelson, Lynn Reinke, Deborah Woo.
Boise: Paula Carvalho, William Weppner, Theodore Lange

For your convenience, we have entered unsigned orders for you to review and accept, modify, or discontinue based on your clinical judgment and personal knowledge of this patient.

SUMMMARY:

DIAGNOSTICS:
Recommended:
-
-
Consider:
-
-

MEDICATION(S):
Recommended:
-
-
Consider:
-
-

PHARMACY USE/EDUCATION:
Recommended:
-
-
Consider:
-
-

THERAPY(S)/REFERRALS(S):
Recommended:
- <<Per DAU, discuss Pulm Rehab for all pts>>
-
Consider:
-
-

FOLLOW-UP:
Recommended:
-
-
Consider:
-
-

We are happy to address any of these recommendations with you based on your preference by encrypted e-mail (InCasEStudy@va.gov), CPRS, Pulmonary SCAN-ECHO, E-Consult, and/or phone.

****
We have made COPD-specific recommendations based on the:
*Global Strategy for the Diagnosis, Management and Prevention of COPD, Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2014, available from:
http://www.goldcopd.org/uploads/users/files/GOLD_AtAGlance_2014_Jun11.pdf, and

*VA/DOD Clinical Practice Guideline for the Management of Outpatient Chronic Obstructive Pulmomary Disease, Version 3.0, 2014, available from:
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDCPG.pdf (full).
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDClinicianSummary.pdf (summary).
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDPocketCard.pdf (pocket card).

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****
STANDARD PHRASES
****

DIAGNOSTICS:

CXR

-Follow up 2-view chest x-ray in 6-8 weeks to evaluate...

- Follow-up 2-view chest X-ray in approximately one month to evaluate areas of infiltrate/atelectasis evident on admission films.

PFT

-Pulmonary function testing – spirometry before and after bronchodilator, lung volumes and DLCO. Needs updating.

- Pulmonary function testing with bronchodilator response, volumes, DLCO, 6-MWT, exercise oximetry with titration. Functional assessment should be performed when the patient is at or approximating his respiratory baseline.

-Minimum of spirometry with and without bronchodilator. If no airflow obstruction is found by spirometry, focus evaluation of <dyspnea> on <list other diagnoses> issues as he is not likely to have COPD.

MIP and MEP

- Although the admitting diagnosis was Acute Respiratory failure related to COPD exacerbation we do not think this is COPD. To verify diagnosis, we suggest obtaining an updated pulmonary function test including MIP and MEP to evaluate for neuromuscular dysfunction.

MRI

-Follow-up on previously ordered MRI.

Obesity

-The team is unclear if the symptoms are driving by weight vs copd.

MEDICATIONS:

COPD

-Agree with current medication management. However, if pt. does not stabilize, would consider addition of Symbicort 160/4.5 mcg q12 and discontinuation of mometasone.

-If he has COPD, consider adding as needed albuterol by nebulization as rescue therapy.

-Agree with albuterol mdi and neb, and tiotroprium

-Discontinue duoneb because patient is already on tiotroprium

-Consider discontinue symbicort because of potential side effect of PNA from steroid component

-Consider replacing with combination of mometosone and formoterol with plan to titrate off mometasone as described (we have arranged pulmonary follow up for patient)

-LABA/ICS or LAMA/LABA:

- simplify regimen with LABA/ICS (budensonide/formoterol) or LAMA/LABA (tiotropium/oldaterol) if he becomes willing. As you are aware, tiotropium and ipratropium should not be used together - ipra outcompetes tio for binding sites

LABA

- Starting Olodaterol 2 actuations daily. Long-acting bronchodilator (in this case a Long-acting beta-agonist) is the preferred controller therapy approach for symptomatic patients with COPD.

Opiate titration for dyspnea

- We also recommend consideration of an opioid to help with the sensation of dyspnea. The Canadian Thoracic Society guidelines on the management of dyspnea in COPD are extremely useful and include a regimen for the initiation of morphine for dyspnea. This guideline provides very clear recommendations for how to initiate opioids for the management of

dyspnea in COPD using morphine solution. This allows you to start at an extremely low dose, such as 1mg and then titrating extremely slowly. Such low doses are unlikely to cause respiratory depression. Marciniuk et al. Managaing dyspnea in patients with advanced COPD: A Canadian Thoracic Society clinical practice guideline. Can Respir J 2011;18(2):69-78

Suggested protocol for managing dyspnea with opioid therapy in advanced chronic obstructive pulmonary disease patients:
• Initiate opioid therapy with oral immediate-release morphine syrup – titrate slowly at weekly intervals over a 4- to 6-week period
• Start therapy with morphine 0.5 mg orally twice daily for 2 days, and then increase to 0.5 mg orally every 4 h while awake for remainder of week 1
• If tolerated and indicated, increase to morphine 1.0 mg orally every 4 h while awake in week 2, increasing by 1.0 mg/week or 25% dosage increments/week until the lowest effective dose that appropriately manages the dyspnea is achieved
• Once a stable dosage is achieved (ie, no significant dose change for 2 weeks and dyspnea managed), a sustained-release preparation at a comparable daily dose could be considered for substitution
• If patients experience significant opioid-related side effects such as nausea or confusion, substitution of an equipotent dose of oral hydromorphine could be considered (1 mg hydromorphine = 5 mg morphine)
• Stool softeners and laxatives should be routinely offered to prevent opioid-associated constipation

Titrate methadone/opiates:
-Titrate methadone and opiates: from a pulmonary standpoint based on pharmakinitics and risk these can repress breathing. Please discuss with patient the need to reduce these medications.
Step down on inhaled corticosteroids once resolved.

Titrate glucocorticoid:
- Modified Titration of glucocorticoid medications based on the NEJM article found here: http://www.nejm.org/doi/full/10.1056/NEJMoa1407154 to comply with medications available at VA. At least eight (8) weeks after the patient started the high potency high dose regimene they are currently on reduce the dose by half. Six(6) weeks later cut the dose in half again and six (6) weeks after that discontinue the medication completely.

For Mometasone: Beginning at highest dose than the patient is currently on usually
Begin at 220 mgm BID 2 puff
after 8 weeks reduce it to 110mgm bid,
after 6 weeks reduce it to 110 mgm QD 1 puff OD,
after 6 weeks off
For steroid: beginning at the high dose that the patient is currently on
Begin flovent at 500 BID
After 8 weeks cut flovent in half (flovent 250 BID)
After 6 weeks cut in half again (flovent 125 BID)
After 6 weeks off

Smoking Cessation
Nicotine lozenges:
-Consider prescribing nicotine lozenges as use for replacement of cigarettes, which is effective even among precontemplators..

Bupropion
Bupropion is recommended along with a tobacco cessation program to provide the patient with additional support and educational materials.
http://www.publichealth.va.gov/smoking/professionals/treatment/pharmacotherapy.asp

GERD:

- GERD controlling medication (H2 blocker or PPI) and GERD education

PHARMACY USE/EDUCATION:
- To maximize inhaler teaching we are entering a return to clinic order for PCC pharmacy teaching. This can be done on a day he is already at VA.

THERAPIES/REFERRALS

Smoking Cessation
- Refer to behavioral health for assistance with smoking cessation
- Consider a warm hand-off to behavioral health at next visit to address smoking cessation and oxygen compliance.
- Consider behavioral health referral for assistance in smoking cessation, as it is evident that prior attempts to offer assistance with smoking cessation has been declined.
- Continue to encourage smoking cessation, consider referral to behavioral medicine or home telemonitoring if patient willing.

Smoking Cessation-inconsistent pt report of status
- In reviewing chart, we noticed patient inconsistent in reporting of smoking status (told PCP none x3 mo, reported 2 cigs/day to admitting resident). Encourage continued attention to smoking, as you are doing.

Co-Smoking Cessation and Mental Health
-Dr. Saxon and colleagues have demonstrated that co-treatment of mental health and tobacco concomitantly is effective for smoking cessation.

Marijuana
-Encourage patient to not smoke marijuana

Palliative Care
-Consider focusing on palliation of symptoms and clarifying goals of care.
-Consider a Palliative care consult to address goals of care and symptomatic treatment of dyspnea.

Pulmonary Rehab
-Pulmonary rehabilitation: Demonstrated to reduce readmission and improve quality of life by improving functional ability and improving dyspnea management.

-Pulmonary rehabilitation – we will enter a non-VA care consult given patient lives > 40 miles from the Seattle VA

- Pulmonary rehabilitation: randomized evidence reduces readmission and improves functional status.

Rule out DVT-BLE venous duplex exam
- Consider ruling out DVT- BLE venous duplex exam. Patient has sufficiently elevated pulmonary arterial pressures thus increasing the morbidity factor of PE if he does have DVT. Further diagnostics for PTE would depend on results of duplex.
-If clinically indicated at this time, further assessment for cardiac ischemia with cardiac stress test could be considered.

*O2****
-Needs reevaluation for use of long-term oxygen therapy.
- Consider a warm hand-off to behavioral health at next visit to address oxygen compliance.
- Respiratory therapy for 6 minute walk test, exercise oximetry, o2 titration evaluation, and home oxygen evaluation (order entered)

***Seattle Reevaluation does not have the staff for us to be able to do the evaluations routinely. Alice Hansen may complete some on Thursdays if the Provider requests her, otherwise it is up to the PCP to re-assess. When Norco does

the every 90 day concentrator check, she will write a progress note and have the PCP co-sign when a discrepancy is noted. Per A. Hanson 4/2016

MOVE!
Lung specialists agree that obesity is likely the driving factor in this patient's disease process, and weight reduction may be the most beneficial therapy; therefore encouragement to participate in MOVE! or TeleMOVE! is recommended.

Dental
-Agree with dental and nutrition consult

Nutrition
-Agree with dental and nutrition consult

Non-compliant patient
Based on this review, patient has received excellent care in the hospital and in follow-up. He is receiving guideline concordant care for COPD and any co-morbidities; therefore, we have only minor suggestions to consider adding to your management of this patient. We understand the difficulties providing care in this apparently reluctant participant with recommend Rx.

Other:
- If the patient completes smoking cessation for 6 months and pulmonary rehabilitation, he may be considered for lung transplantation.

Question of if patient actually has COPD:
This patient has a number of complex comorbid issues of which respiratory problems are prominent. The etiology of his symptoms includes both potential cardiac and pulmonary etiologies. Although the pretest probability is reasonable that the patient has COPD, we were unable to find records of PFT to confirm the diagnosis. Some of the below recommendations are based on whether he actually has COPD.

Good job-minor suggestions:
Based on this review, patient has received excellent care in the hospital and in follow-up. He is receiving guideline concordant care for COPD and any co-morbidities; therefore, we have only minor suggestions to consider adding to your management of this patient.

We agree thus far with excellent inpatient and outpatient management, with the following recommendations to further the plan that has been initiated.

This patient with typical COPD exacerbation is receiving guideline concordant care in primary care and through his hospitalization. His disease is obviously very severe COPD. Appreciate attention to his goals of care/discussion with DPOA.

****

GOOD Job - NO RECOMMENDATIONS:

Based on this review, your patient is receiving guideline concordant care for COPD and any co-morbidities; therefore, we do not have additional recommendations. We agree with your excellent management of this patient.

If you have any questions about COPD treatments for this patient, please feel free to contact us via e-mail (InCasEStudy@va.gov), CPRS, Pulmonary SCAN-ECHO, E-Consult, and/or phone [insert study number], whichever is easiest for you.

COPD guideline recommendations may be found here:
*Global Strategy for the Diagnosis, Management and Prevention of COPD, Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2014, available from: http://www.goldcopd.org/uploads/users/files/GOLD_AtAGlance_2014_Jun11.pdf, and

*VA/DOD Clinical Practice Guideline for the Management of Outpatient Chronic Obstructive Pulmomary Disease, Version 3.0, 2014, available from:
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDCPG.pdf (full).
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDClinicianSummary.pdf (summary).
http://www.healthquality.va.gov/guidelines/CD/copd/VADoDCOPDPocketCard.pdf (pocket card).

Appendix 3: Modified SHEP

(Back to Secondary Measures)

Our records show that you received care from *[insert name of post DC PCP]* after your hospital discharge on *[insert discharge date].*

The questions in this survey will refer to *[insert name of post DC PCP]* as "this provider." Please think of that person as you answer the survey.

1. Did this provider explain things in a way that was easy to understand?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
2. Did this provider listen carefully to you?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
3. Did this provider give you easy to understand information about your health questions or concerns?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
4. Did this provider seem to know the important information about your medical history?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
5. Did this provider show respect for what you had to say?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
6. Did this provider seem informed and up-to-date about the care you got from specialists?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
7. When you talked about starting or stopping a prescription medicine, how much did this provider talk about the reasons you might want to take a medicine?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
8. When you talked about starting or stopping a prescription medicine, how much did this provider talk about the reasons you might not want to take a medicine?	☐ Not at all (0)	☐ A little (1)	☐ Some (2)	☐ A lot (3)
9. When you talked about starting or stopping a prescription medicine, did this provider ask you what you thought was best for you?	☐ Yes (1)	☐ No (1)		
10. Did you and anyone in this provider's office talk about all the prescription medicines you were taking?	☐ Yes (1)	☐ No (1)		
11. Did anyone in this provider's office talk with you about your specific goals for your health?	☐ Yes (1)	☐ No (1)		
12. Did anyone in this provider's office ask you if there are things that make it hard for you to take care of your health?	☐ Yes (1)	☐ No (1)		
13. Did this provider's office give you information about what to do if you needed care during evenings, weekends, or holidays?	☐ Yes (1)	☐ No (1)		

14. Did this provider spend enough time with you?	☐ Yes (1)	☐ No (1)	
15. Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate this provider? (please only mark one box)	☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10 Worst		Best

Appendix 4: Provider Satisfaction Survey
(Back to Secondary Measures)

Provider Survey **Study ID:**

This survey is intended for primary care providers involved in the INtegrating Care After Exacerbation of COPD (InCasE) intervention. The purpose of this survey is to evaluate how the intervention is working for patients discharged from your facility for a COPD exacerbation. For each item below, please rate the strength of your agreement or disagreement with the statement. If you intentionally do not answer a question, please indicate the question number in #10 so that we will not contact you for a missing answer.

	strongly disagree	disagree	neither agree nor disagree	agree	strongly agree	not applicable
1. Training for the InCasE intervention has been adequate.						
2. The InCasE intervention has increased my workload.						
3. The intervention was helpful to me.						
4. I feel that the InCasE intervention process respects the role of the primary care provider in patient management.						
5. InCasE clinicians respond to my questions about their recommendations in constructive ways.						
6. The InCasE intervention has improved patient access to specialty care.						
7. The InCasE intervention has improved coordination of care between primary and specialty care providers.						
8. The InCasE intervention has improved the quality of care for our patients.						
9. As a provider, I find participating in InCasE to be a satisfying component of my role in patient care.						

10. Please provide any additional comments or insights into the InCasE intervention below:

Appendix 5: Provider Interview Guide

(Back to Secondary Measures)

Interview Guide

Interviewer Name:

Date: 8/21/17
#301

Time Start:
Time End:

Hello [Dr./Mr./Ms. interview participant name],

My name is [interviewer name]. We are interviewing providers of patients who have participated in the InCaseE intervention in order to get your perspective on the program.

We won't identify you as a participant, nor will we identify your site in any of our reports.

The call will take approximately 30 minutes.

Your participation in this interview is voluntary. You can stop the interview at any time, and let me know if you'd rather not answer a particular question.

Do you have any questions?

In order to make sure we capture all of the information you give us, we would like to record this call. The audio-file for the recording will be stored directly to a restricted access file on the VA secure network. Is this okay with you? Since we are recording, please do not refer to specific patients by name. **[Hit record button.]** Okay, to confirm, I'm starting the recording. Is this ok with you?

[Generic prompts: If responses are limited or require clarification, probes may be used to elicit more detailed responses. Probes should use words or phrases presented by the participant using one of the following formats:
1. What do you mean by _____ ?
2. Can you tell me more about _____ ?
3. Can you give me an example of _____ ?
4. Can you tell me about a time when _____ ?]

1. Are you familiar with the INCasE Program?

   IF YES: Please describe the program for me.

   IF NO: The InCasE study began in May 2015. The intervention was developed by a team of primary care, pulmonary, pharmacy, and palliative care providers to decrease rates of hospital readmissions and mortality among Veterans discharged for COPD exacerbations.

   After patients are discharged for a COPD exacerbation, the study team reviews the patient's CPRS record and provides a summary of recommended COPD treatments, medication, and follow-up through a CPRS note. They also enter any recommended orders for the provider to review, and then sign, modify, or decline.

   a. Are you familiar with this program?

*Note: if still not familiar with this program, **PAUSE RECORDER** and list patients seen as part of the intervention.*

Our records indicate that you have received InCasE recommendations for some of your patients. Do you recall this?

IF NO Provide patient full name & last 4.

1.
2. _____
3. _____

I am now going to turn the recorder back on, remember that because we are recording, please do not refer to any patients by name. ***RESUME RECORDER***

If provider is still not familiar with the program, skip to question 8.

2. Please tell me about your experience with the InCasE.
3. [As needed] How well does the InCase intervention fit with your practice? [Acceptability]
    a. [If needed] What, if anything, about the InCasE intervention fit with your work flow?
    b. [If needed] Was there anything about the InCasE intervention that did not fit with your work flow?
4. [As needed] How easy or difficult was it to implement the InCasE recommendations? [Feasibility]
    a. [If needed] Were there any challenges to implementing the InCasE recommendations?
    b. [If needed] What, if anything, helped to implement the InCasE recommendations?
5. [As needed] How satisfied have you been with InCasE? [Satisfaction]
    a. [If needed] Was there anything about InCasE that you found satisfying?
    b. [If needed] Was there anything about InCasE that you were dis-satisfied with?
6. [If needed] Can you tell me about InCasE's effect on patient care. [Effectiveness]
7. [If needed] What future do you see for InCasE? [Feasibility & Sustainability]
8. Would you like to see the approach used in InCasE extended to other disciplines?
9. Do you have any questions for us, or is there anything else you would like to add?

Thank you for participating in this interview.