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A Chronic Obstructive Pulmonary Disease Pilot Using Risk Stratification to Improve Resource Allocation and Reduce Readmissions

Linda Gould
Boise State University

A Chronic Obstructive Pulmonary Disease Pilot Using Risk Stratification to Improve Resource Allocation and Reduce Readmissions

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By

Linda Gould

Committee Chair: Pamela Gehrke, EdD, RN, DNP in Leadership Program Director

Committee Member: Ron Ordona, DNP, FNP-BC, GS-C

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Abstract

***Background*:** Chronic Obstructive Pulmonary Disease (COPD) impacts 250 million people, is associated with high hospital readmission rates, and costs over $50 billion annually. ***Purpose*:** Apply risk stratification identifying higher risk patients to prioritize complex, time-consuming interventions and resources. ***Methods*:** Patients hospitalized with COPD were risk stratified using PEARL. Moderate-high risk patients were referred to specialty nurse practitioners, who used real-time interventions and motivational interviewing during intense weekly visits over 30 days targeting self-management, patient-specific risks, and resources. ***Results*:** No patients were readmitted or died during the pilot using risk stratification with patient-specific tertiary preventive care to communicate resource allocation. ***Impact*:** This process provided recommendations for expansion throughout the healthcare facility, other chronic health conditions, budgets and policy for value-based care, and further research.

Key words: COPD, risk stratification, transitional care, motivational interviewing, resource allocation

A Chronic Obstructive Pulmonary Disease Pilot Using Risk Stratification to Improve Resource Allocation and Reduce Readmissions

Adult patients with Chronic Obstructive Pulmonary Disease (COPD) have multiple, complex, and lifelong risk factors that contribute to significant symptoms and higher rates of hospital readmissions. Additionally, risk factors associated with readmissions are different for every patient and preventive care interventions may be unknown, not available, or not a priority for the patient to modify in their specific environment. Hence, it is challenging for healthcare facilities and providers to understand confidently how to focus care. This scholarly project (hereafter referred to as project) describes a quality improvement (QI) pilot for patients with COPD. The project implemented risk stratification during hospitalization and transitional care for moderate and high-risk patients to expedite referral to an outpatient pulmonary clinic. Interventions included intense visits to optimize Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2020) guideline-based therapy (GBT), target self-management, patient-specific risk factors, and barriers to care (hereafter referred to as patient-specific variables), and communicating necessary resources for improved patient outcomes.

Problem Background

Chronic obstructive pulmonary disease is a component of chronic lower respiratory diseases including emphysema and chronic bronchitis. It affects 250 million people worldwide and contributes to the 3rd leading cause of death globally, nationally, and locally (Heron, 2019; Idaho Department of Health and Welfare [IDHW], 2018; World Health Organization [WHO], 2019). Patients experiencing acute exacerbation COPD (AECOPD) suffer significant increase in symptoms of breathlessness, cough, wheezing, and chest tightness beyond normal day to day

variations thus requiring increased use of rescue medication, acute healthcare visits, and/or hospital admissions (GOLD, 2020).

The costs of COPD are near $50 billion annually in the U.S., exacerbations contribute to 70% of costs, and the highest prevalence is in the aging population (Centers for Disease Control and Preventions [CDC], 2020; Fuhrman et al., 2017; Press et al., 2018). The national COPD readmission rate is high at 19.5% (Medicare, 2019). Hospitals face risks of negative cultural and financial penalties up to 3% of reimbursements for readmissions within 30 days (Centers for Medicare and Medicaid Services, Hospital Readmissions Reduction Program [CMS, HRRP], 2012). Over 25% of COPD readmissions are due to AECOPD and over 50% are related to other conditions (Jencks et al., 2009; Shah et al., 2016). These patients have high co-morbidities as 80% reported at least one comorbidity, great than 60% reported two, and nearly 50% reported three or more (Dal Negro et al., 2015). Top comorbidities include heart failure, cardiac disease, respiratory infections, malignancy, diabetes, liver or renal disease, psychiatric problems, gastrointestinal ailments, and sleep apnea (Dal Negro et al., 2015; Jacobs et al., 2018; Jencks et al., 2009). Aging and multiple chronic conditions lead to frailty which is 58% higher in patients with COPD and frail patients have a higher rate of admissions and death (Park et al., 2013).

It is important to identify patients who are the top percent users of healthcare resources and how to support these patients to avoid hospitalization (Mitchell, 2019). High risk users consume 1-5% of resources due to multiple, complex chronic conditions, comorbidities, and hospitalizations, and an additional 30% of patients are moving towards high-risk use (Robert Woods Johnson Foundation [RWJF], 2017). Risk stratification helps identify and predict patients at highest risk for resource utilization to help prioritize patient-specific, highly complex, time-consuming interventions (Crane et al., 2010; Press et al., 2018; Scalable Health, 2018).

Identifying and managing high risk populations to track improvement in outcomes demonstrates value to payers known as value-based care (National Council Organization, 2017).

Local Problem

Locally, patients hospitalized for AECOPD are not risk stratified for readmission; therefore, it is unknown which patients require intensive evaluation and interventions for resource allocation. The local healthcare facility COPD readmission rate is high at 19% which is no different from the nation or other state acute care facilities (Medicare.gov, 2019). Age influences COPD incidence and those in the state under age 45 have 2.2% compared to those over age 75 having 12.7% (CDC, 2011; Community Health Rankings [CHR], 2020). Projections for the increased diagnosis of COPD and the state's rapid growth of retirement population will increase the disease burden, cost, and need for access to care (Dal Negro et al., 2015; U.S. Census Bureau, 2018).

Available Knowledge

Literature Review

The following electronic databases were used for the literature search for peer reviewed studies between 2014-2019 of English language: Academic Search Premier, CINAHL, Medline, Business Source, Cochrane Library, ERIC, Nexus Uni, PsycINFO, and Google Scholar. Search terms targeted COPD, hospital readmission, risk stratification, and outcomes. Hand searches for pertinent articles were completed. Titles were screened and excluded if unrelated to the topic. The articles were relevant to the problem and provided evidence for the project shown in the Literature Review Summary table (Appendix A). These were critically appraised using Johns Hopkins Evidence-Based Practice Synthesis and Evidence Tool (Dang & Dearholt, 2018; Appendix B).

Synthesis of the Evidence

Studies yield good to high level evidence from research and field experts reporting no single but rather variable and complex interventions deployed to reduce readmissions. Timely evidence-based practice (EBP) is imperative to improve outcomes. Recommendations include access to quality care to confirm obstruction on spirometry for appropriate guideline-based therapy, risk stratification, and identify patient-specific variables to strategically allocate resources in the outpatient community settings (Benzo et al., 2016; Bourbeau & Echevarria, 2019; Kalhan & Mutharason, 2018; Press et al., 2018; Zikos, et al., 2019).

Access to Care

Care team communication at the time of hospital discharge with transitional care management (TCM) for intense follow-up (generally home visits within 3-7 days and weekly visits thereafter in the first 30 days) engaging specialty registered and advanced care nurses, respiratory therapists, and pulmonologists coordinating with the primary care providers (PCP) (Benzo et al., 2016; Deniger et al., 2015; Naylor et al., 2004; Verhaegh et al., 2014). One study reported the highest rate of readmission within the first 72 hours of discharge and >50% within the first 15 days (Jacobs et al., 2018). Another study reported 26% of patients were readmitted within 30 days but expanded focus is recommended as 74% had an avoidable readmission after 30 days (Krishnan et al., 2015).

Risk Stratification

Risk stratification tools were evaluated for quality of study design, internal and external validation, and feasibility for use in context to the setting. The PEARL risk stratification tool (Echevarria et al., 2017; Appendix C) incorporates prior admission, age, severity of disease or

symptom burden and heart failure which are leading factors for COPD readmission, showed comparable c-statistics to CHADS, and outperformed LACE and BODE.

Patient-specific Variables

Identifying pertinent risk factors and comorbidities predicted 30-day readmissions (Jacobs et al., 2018; Krishnan, et al., 2019). Interventions identified patient motivation, clinical and patient risk factors (psychosocial disparities and comorbidities), self-management and reiterative patient education (Benzo et al., 2016; Blaha et al., 2018; Bourbeau & Echevarria, 2020; Mora et al., 2017). Two studies reduced readmission at 30 days: Benzo et al. (2016) incorporated motivational interviewing (MI) with health coaching and a hotline for urgent contact and Prieto-Centurion et al. (2014) provided frequent communication, a patient hotline, and reiterative patient education.

Rationale

Theoretical Model

The Stetler Model (2001) guided research utilization emphasizing critical thinking, decision making, and problem-solving through five phases: 1) Preparation, 2) Validation, 3) Comparative evaluation or Decision-making, 4) Translation or Application, and 5) Evaluation (Appendix D). This was a good fit for the project because the five phases relate to the process and workflow within the healthcare facility as follows:

1. Preparation: Preparatory meetings with stakeholders confirmed the project aligned with healthcare facility priorities. Developing stakeholder support and selecting quality, relevant, and contextual evidence were foundations for the pilot.

2. Validation: The healthcare facility has a strong physician-administration focus for change that uses credible evidence. The risk stratification tool, PEARL (Echevarria et al., 2017), was presented at a journal club for physician input.
3. Decision-making: Evidence synthesis and critical interpretation showed logical decision-making to respect the healthcare facility physician-administration dyad and honor nursing using risk stratification and transitional care to improve outcomes.
4. Translation/Application: The process showed how risk stratification research can be applied to identify higher risk patients needing timely and intense clinic follow up using evidence-based resources and activities to achieve outcome measures.
5. Evaluation: Data analysis measured formative data (the project found what was intended) and summative data (goals were achieve), findings were disseminated, and a final report was prepared and presented to stakeholders and faculty. Outcomes were analyzed for the project to be accepted, modified, or rejected for sustainability.

Project Framework

The Logic Model developed by the WK Kellogg Foundation (2004) showed goals and measurable outcomes linked to resources, activities, and outcomes for evaluation (Appendix E). Evaluation was an important aspect of the project to answer what difference was made from effective and efficient interventions based on evidence (Moran, et al, 2020).

Specific Aims

The specific aims of this QI project were to: 1) reduce COPD readmissions, 2) apply risk stratification to identify higher risk patients, 3) identify and advocate for patient-specific variables and 4) communicate recommendations for patient-specific resource allocation, budgets, and policy development for this population.

Methods

Contextual Elements for the Project Intervention

Factors specifically considered for reducing COPD readmissions include expedited access to pulmonary specialty care, risk stratification using the PEARL (Echevarria et al., 2017), and interventions targeting patient-specific variables. A Risk Factors and/or SDoH table was adapted to identify health disparities (Appendix F). These require dedicated resources and activities to manage complex conditions specific to the project process and outcomes for the healthcare facility and coordinated with the timeframe and requirements of the academic institution.

Population

The state population is >30% rural, persons age 65 and older are 16%, approximately 50% are female, greater than 80% White race, Hispanics 12%, American Indian/Alaskan Native (AI/AN) and Asians are both less than 2%, and Blacks less than 1% of the population, the graduation rate is 90%, a poverty rate of 15%, and the state reports higher rates of COPD in adults over the age of 45, women, AI/AN, less than a high school education, income less than $25,000, smokers and areas with higher air pollution, more poor mental health days, and lower vaccination rates than the nation despite having access to a PCP (CDC, 2011, County Health Rankings [CHR], 2020; U.S Census Bureau, 2010; Rural Health Information Hub, 2002-2019).

Pilot inclusions were adult patients age of 45 or older, obstruction confirmed on spirometry, admitted with a primary or secondary diagnoses with COPD or AECOPD with/without acute respiratory failure between June and July 2021, local residence served by the healthcare facility in the intermountain west. Exclusions included malignancy, discharge to hospice, skilled nursing or long-term care facility, and patients who declined to participate.

Setting and Resources

The pulmonary clinic is owned and operated by the healthcare facility providing pulmonary, critical care, and sleep medicine services by 22 pulmonologists and 12 nurse practitioners (NPs) and physician assistants referred to as Advanced Practice Providers (APPs). The flagship healthcare facility is a non-profit Accountable Care Organization (ACO) with 8 medical centers, 1,005 hospital beds, over 200 clinics, 1.7 million clinic visits and over 56,600 hospital admissions. It is the second healthiest county in the state and performs better in health factors, health outcomes, and life expectancy compared to neighboring counties (CHR, 2019).

Congruence of the Project with the Healthcare Facility Readiness for Change

Efforts to reduce COPD readmissions strategically align with the healthcare facility 2020 mission and vision to improve community health and be a trusted partner for exceptional, patient-centered care. A recent community needs assessment by the healthcare facility recognized the need for improved chronic disease prevention and management programs. It created an interprofessional COPD workgroup to address this population's healthcare needs. The healthcare facility is positioned to optimize community care and shared value-based concepts as a leader in one of the healthiest counties in the state.

Strengths and Weaknesses

The project strengths were 1) the impact on a local, national, and global healthcare problem using EBP, 2) aligned with system thinking, 3) available experts and specialists, and 4) technology with a robust EHR and telehealth services for access to quality care.

Weaknesses included 1) workforce shortages, 2) work silos, 3) limited contact with leadership and challenges navigating services, 4) delayed expansion of telehealth if patients decline or do not have access to internet, technology, or integrated medical devices, 5) cultural

hierarchies with gaps in modernizing practices due to traditional styles, 6) delayed communications and workflow, and 7) urgent unforeseen situations such as the COVID-19 pandemic.

Memorandum of Understanding

A Memorandum of Understanding (MOU) outlined an agreement between the project lead and the healthcare facility (Appendix G). The Senior Director of Nursing & Patient Care Center of Excellence and the project lead signed the MOU prior to beginning the project. This included a brief project description as a readmission pilot project implementing patient risk stratification and facilitating resource allocation. It included the background, purpose, intended outcomes, and duration of the project. Reporting and agency preference for anonymity were included.

Interventions

Correlation of Interventions with the Theoretical Model

Five phases of the Stetler Model correlated with the project as follows:

1. Preparation: Outcomes 3 and 9 prepared providers and staff for the EBP initiative reiterating evidence and communicating interventions.
2. Validation: Outcome 4 was selected based on validity of the PEARL and context to the patient population (Echevarria et al., 2017).
3. Decision-making: Outcome 4 showed the patient risk score for readmission that provided guidance for which patients required intense clinic visits and outcomes 5, 6, and 7 identified patient-specific variables for resource allocation recommendations.

4. Translation/Application: The evidence was applied, and data was collected and monitored for modifications or adverse effects. Outcomes 4, 5, 6, and 7 communicated unique patient circumstances to care teams to understand how to apply resources.
5. Evaluation: Outcomes 1 and 2 evaluated the pulmonary clinic's ability to provide patient access to care, outcome 8 communicated the patient care experience, and outcome 10 communicated the process and outcomes to stakeholders to determine sustainability.

Correlation of Interventions with Project Framework

The LM showed the direct relationship of resources, activities, and outputs implemented to achieve outcomes and meet project aims. Ten of the eighteen outcomes were short-term process outcomes (PO) or change outcomes (CO), as follows:

1. 50% of COPD participants referred to the outpatient pulmonary clinic were seen within 7-14 days of discharge (PO).
2. 50% of COPD participants on the healthcare facility pulmonary service line accessed 3 out of 4 outpatient pulmonary clinic visits within 30 days s/p discharge (PO).
3. At least one pulmonary provider(s) and staff (1-2 MAs) in the organization's pulmonary clinic received training by the project lead to use the EHR COPD template (Appendix H) by the end of May 2021 (CO/PO).
4. 80% of COPD participants in the healthcare facility pulmonary clinic have the PEARL (Echevarria et al., 2017) risk stratification documented in the EHR by the 2nd pulmonary clinic visit or between June and August 2021(CO).
5. 80% of COPD participants in the healthcare facility healthcare facility pulmonary clinic identified patient-specific motivation impacting care as documented in the EHR by the 2nd pulmonary clinic visit between June and August 2021 (CO).

6. 80% of COPD participants in the healthcare facility pulmonary clinic identified at least one patient-specific risk factor(s) or social determinant for AECOPD documented in the EHR by the 2nd pulmonary clinic visit between June and August 2021 (CO).

7. 80% of COPD participants in the healthcare facility pulmonary clinic identified at least one patient-specific perceived barrier(s) impacting patient care documented in the EHR by the 2nd pulmonary clinic visit between June and August 2021 as measured by EHR audit (CO).

8. 80% of COPD participants in the healthcare facility pulmonary clinic reported the patient care experience by the end of August 2021 (CO).

9. 80% of COPD participants in the healthcare facility pulmonary clinic had their care plan communicated to the PCP and/or care team between June and August 2021 (CO/PO).

10. Recommendation's report for COPD patients in the healthcare facility pulmonary clinic includes readmissions, risk stratification, patient-specific variable for resources needed for value-based care communicated to stakeholders by the end of May 2022 (PO).

Description of the Intervention

The project lead received daily communications of patients admitted with COPD from hospitalists using a medical communication app, Voalte Me. In-patient APPs and the project lead screened patients just prior to discharge for appropriateness of inclusion and exclusion (Appendix I), completed risk stratification, and presented the participant letter (Appendix J) in tandem with describing the program to the patient. An urgent referral was generated for moderate and high-risk patients from the hospitalist to the pulmonary clinic. Low-risk patients were advised to follow up with a PCP as usual. Interpreters were available if needed.

The pulmonary clinic scheduler monitored for incoming urgent referrals daily and initiated a TCM encounter, scheduled appointment simultaneously for all four weekly visits (in-

person, telehealth, or coordinated with home base services), and forwarded the communication to designated MAs. Subsequently, MAs addended the TCM encounter with information from the patient and/or caregiver that reviewed discharge follow-up, medication reconciliation, and forwarded the communication to the pulmonary NP and PCP (Appendix K). Visit 1 with the pulmonary clinic NP was within 7 - 14 days of discharge as a 60-minute pulmonary clinic or home visit preferred over telehealth. Subsequent visits 2-4 were 30-minutes with telehealth option within 30 days of discharge. The COPD template documented visits. Follow-up with pulmonologists and transfer back to the PCP was arranged at visit 4 by the NP and was beyond the scope of this pilot.

The clinic APPs incorporated MI for self-management and the emergency action plan (rescue inhaler or nebulizer, pursed lip breathing, acute prednisone burst x5 day, antibiotic, and call to the office or seen in ED) and identifying risk factors and barriers to care. Additionally, care included real time interventions for GBT, deteriorating conditions, and comorbidity management with health partners and the care team by phone or EHR notes.

Measures

Due to the timeframe of the project, only the ten short-term outcomes were measured (Appendix L). Quantitative and qualitative outcome measures in the EHR were tracked by the project lead and data analytics using a re-created and modified Data Collection Spreadsheet (Verhaegh, et al., 2014; Appendix M).

Outcomes 1 and 2 were quantitative measures of pulmonary clinic visits 1-4 in the EHR. Access to care within 7-14 days of discharge and intense weekly follow up in clinic visits over 30 days was a key strategy for risk assessment, early communication of participant decline, re-

iterative education, GBT, and communicating patient-specific variable. The strategic and recurrent appointments facilitated trust and rapport.

Outcome 3 were quantitative measures of the COPD template created and housed in the EHR and provider(s) were asked to complete a Likert scale after visit 4 for feedback on the COPD template. Additionally, meetings trained staff and providers on template use to decrease variances and promote communication about the patient and their unique environment.

Outcome 4 used quantitative measures of the PEARL (Echevarria et al., 2017) score risk for readmission during participant interview in the hospital and imbedded in the COPD template. The PEARL (Echevarria et al., 2017) has an overall c-statistic of 0.68 -0.73 using five variables (Prior Admission, eMRCD, Age, Right and Left ventricular function). If participants did not have an echocardiogram within the past 1 year, then screening questions for heart failure prompted a BNP level and if elevated then echocardiogram was performed; otherwise, there was no scoring for left ventricular function (S. Bourke, personal communication, June 26, 2020). The provider(s) were asked to complete a Likert scale after the pilot for feedback about the PEARL.

Outcome 5 used quantitative measures with a Likert scale in the COPD template, to assess patient motivation at pre-test (visit 1) and post-test (visit 4) asking two interview questions, “How important is it to you to manage your COPD” and “How confident are you that you can help manage your COPD”. Patient engagement in self-management using motivational interviewing was a successful approach for connecting and communicating with patients to reduce readmissions (Benzos et al., 2016).

Outcomes 6 and 7 used quantitative measures in a multiple-choice drop-down checklist and qualitative measures using triangulation of participant quotes using the COPD template, monitoring and clarifying expressions or communications, and offering opportunities to verify

information during clinic interviews. This rigor ultimately helped communicate participant risk factors, challenges and perceptions of care needed for resource allocation and budgets.

Outcome 8 was a quantitative measure with a Likert scale in the COPD template, to assess the participant care experience at the end of visit 4 as a post-project rating. The MA asked the patient, “How helpful was this project to your understanding of your medical condition?”

Outcome 9 was a quantitative measure obtained by review of EHR clinic visits 1 and 4 communicated to the PCP by forwarded chart notes.

Outcome 10 was a quantitative measure of a created report for readmissions, risk stratification, patient-specific variables and resources needed. The report provided a list of recommendations.

Data Analysis

A variety of tools and techniques were used to analyze and report the quantitative and qualitative data that represented the pilot participants. Small participant numbers enabled the project lead to collect and analyze the data. This was important to facilitate the project aims during times of limited provider and staff availability. Data analytics ultimately was able to pull most data from the EHR, COPD template, and coding/billing. In areas where data was not supplied, the director of nursing research provided oversight of the data analysis process.

Outcomes 1 and 2 were primary numerical data analyzing access to care using descriptive statistics from the EHR.

Outcome 3 had two parts: Part 1 answered if the COPD template was created, and Part 2 answered if the in-person training meeting was completed. Both parts used yes/no dichotomous nominal variables that were expressed as completed counts in the Data Collection Spreadsheet.

Outcome 4 was analysis of quantitative data using descriptive statistics of two parts: Part 1 was the PEARL risk stratification score (Echevarria et al., 2017) retrieved from the EHR and displayed as a pie chart, Part 2 was provider satisfaction with PEARL retrieved from Forms.

Outcome 5 analyzed quantitative data of participant motivation pre-test (visit 1) and post-test (visit 4) scores with descriptive statistics from the EHR and presented as a bar graph.

Outcomes 6 was descriptive statistics analysis of quantitative data for patient-specific risk factors/SDoH from the EHR presented as a pie chart and qualitative data was analyzed for themes and categories as reported by patients.

Outcome 7 used analysis of qualitative data retrieved from patient EHR who stated barriers to care and this was communicated as themes or categories to the PCP and administration.

Outcome 8 used analysis of quantitative data reported as descriptive statistics for the participant care experience after visit 4 as documented in the EHR.

Outcome 9 was analyzed by descriptive statistics that captured communication forwarded the PCP as documented in the EHR for visits 1 and 4 using counts of yes/no dichotomous nominal variables.

Outcome 10 was analyzed using descriptive statistics in a final report using a count of yes/no dichotomous nominal variables.

Ethical Considerations

Ethical Considerations and Protection of Participants

The obligation to serve and respect human life are ethical essentials in research and non-research projects (Moran et al., 2017). The Academic institution's internal review board (IRB) and healthcare facility's research department for formal research determination was completed

along with social, behavioral, and educational disciplines of human subject research for CITI certification (Appendix N). Health Insurance Portability and Accountability Act [HIPPA] (1996) and all healthcare facility policies and procedures protecting patients in research and evidence-based QI programs were followed to protect participants' identities and rights during the pilot project. Participants had pulmonary clinic visit notes documented in the EHR that were secure and protected for privacy using authorized and encrypted procedures. An Excel spreadsheet was created for data storage. This data consisted of only de-identified information extracted from the EHR. The spreadsheet was password protected and stored on OneDrive. A code sheet matching patient identification to project data was kept separate in a data file and destroyed when no longer needed. The healthcare facility facilitated usual signed consent to treat and financial disclosure for treatment.

Conflicts of Interest

The project lead is a NP in the pulmonary clinic with a long-standing relationship with the healthcare facility and patient care population. There were no other conflicts of interest or financial interests to report.

Biases

The project was carefully designed to improve practice outcomes. It was not designed to contribute to generalizable knowledge. Even so, the data collection procedures aligned with the patient population, evaluation methods of the project, outcomes and aims of the project that were founded on high quality research to mitigate bias. There was communication with stakeholders and champions to assure the project measured what was intended. The methods were relevant to the pilot and fit within the healthcare facility. The plan incorporated a working relationship with data and research experts to identify data as available, accurate, and reliable for credible use.

Primary and discrete data was used, when possible, to reduce the impact on bias. Additionally, validated measures, tools and appropriate analysis techniques were selected to reduce bias. A team of members, including a second reader from outside the pulmonary clinic and healthcare facility, was assembled to mitigate biases, threats to quality, and/or patient harm. Staff and the provider(s) were trained and retrained for the implementation process and data evaluated throughout the project timeline to quickly address any missing and outlying data.

Questions posed to enrolled participants during an interview by healthcare professionals may have had a halo effect contributing to bias if the patient felt the need to be a "good" patient. Efforts were made to decrease variability in provider questions through use of the COPD template, use of support staff when appropriate during interviews, and use of Microsoft Form surveys as opposed to interviews for providers when appropriate.

Threats to Quality

The potential threats to project quality were keeping the project prioritized within a large healthcare facility amongst other program and project priorities, varying service locations that risk work silos and communication delays, unforeseen circumstances such as the COVID-19 pandemic, delays and/or limitations in expanding telehealth for pulmonary clinic visits, manpower and budget constraints.

The plan to handle the potential threats included reinforcing the scope of the project that aligned with the healthcare facility mission and vision. These patients continue to require healthcare services once discharged from the hospital and providers need to be available in their communities. The pandemic has impacted patient contact in clinics and further risk of deteriorating health. Telehealth and domicile care helped to address the problem and connect

patients in their homes to providers however, this type of care must be carefully considered and strategically applied (Mahtta et al., 2021).

Internal Review Board Application and Project Determination

A letter of Research Determination was received from the healthcare facility's research department indicating the project does not meet criteria for human subject research. This information was communicated to the university Office of Research Compliance and faculty for approval prior to initiating the project. The university IRB confirmed the project was a QI pilot and did not meet criteria for human subject research (Appendix O).

Results

Timeline

A timeline kept the project on track (Appendix P). The planning phase began June of 2020 through May of 2021 with the literature review and synthesis of evidence, defined scope of the project with stakeholders and faculty, selection of data collection and analytical strategies, and projected budget. Formal research determination was completed from the healthcare facility that satisfied the academic institution's IRB process. A coding/billing specialist approved the TCM and COPD templates for documentation and billing requirements. Implementation phases consisted of training staff, patient pulmonary visits, collecting defined data, and monitoring for unforeseen changes communicated with stakeholders and faculty May through August 2021. The data analysis phase continued through March 2022 with interpretation and evaluation of outcome measures with updates to stakeholders and faculty. The project culminated in May 2022 with dissemination and report of findings to the healthcare facility, faculty, and Scholarworks.

Steps of the Intervention

The project intervention initiated with the planned implementation activities of training staff and providers on workflows for patient appropriateness for inclusion/exclusion, PEARL (Echevarria et al., 2017) risk stratification, screening and enrolling patients, TCM requirements, and COPD template use. A PowerPoint presentation provided an overview to pulmonary providers and administration using Microsoft Teams. Emails were used to coordinate the topic and logistics with hospitalists and PCPs who identified and referred patients to the project lead. The pilot was implemented in the summer, as planned (see description of the process in Methods). Hospitalist referrals and screening were completed by the end of July to allow for final pulmonary clinic visits to be completed four weeks later to meet the projected end date.

Process Measures and Outcomes

Over the eight-week course of the initiative, 36 patients were referred and screened for participation. Eighteen were excluded per criteria. The remaining eighteen were assessed for risk of readmission and of those, eleven (61%) were further excluded due to low risk. Seven were enrolled and completed the program: six (33%) were moderate risk and one (6%) was high risk. 57% were women. The age range was 62-84 with an average age 76. No participants were readmitted or died at 30 days which was a specific aim of this pilot. Data was pulled from the EHR and COPD template as planned (Outcomes 1-9).

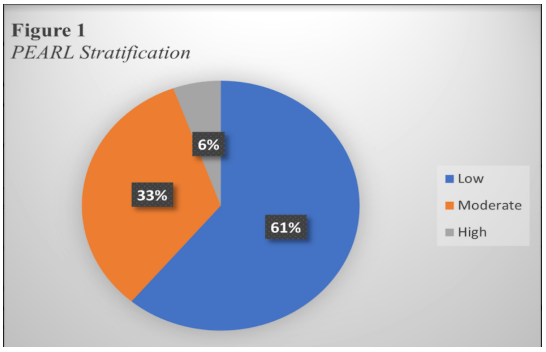
Outcomes 1 and 2: Met. All participants were contacted by medical staff within two days of discharge. The average number of days from hospital discharge to visit 1 was five days. One hundred percent of participants were seen in clinic within 7-14 days of hospital discharge and accessed three out of four pulmonary clinic visits within 30 days of discharge meeting TCM criteria. The Data Collection Spreadsheet was created and modified for efficiency and useful

information, coding and billing compliance, and data collection and analysis measures for the D&A team.

Outcome 3: Met. A total of three clinic staff (medical assistants [MAs]), two administrative staff (schedulers), six APPs (four in-patient and two out-patient for the multiple sites) received training for use of the COPD and TCM templates. Coding updates included a telehealth clause to the COPD template and TCM details were re-iterated. A post-project survey using Microsoft Forms was created to measure APP feedback which was rated 4/5 on a Likert scale (1, not easy to use and 5, easy to use). Comments included an informative and inclusive template but busy and needed to be streamlined to guide the comprehensive process.

Outcome 4: Met. 100% of participants interviewed had their readmission risk score documented in the EHR by visit 2 using the PEARL tool (Echevarria et al., 2017). Patients' levels of risk are shown in Figure 1: low (61%), moderate (33%), and high (6%) risk.

Figure 1
PEARL Stratification

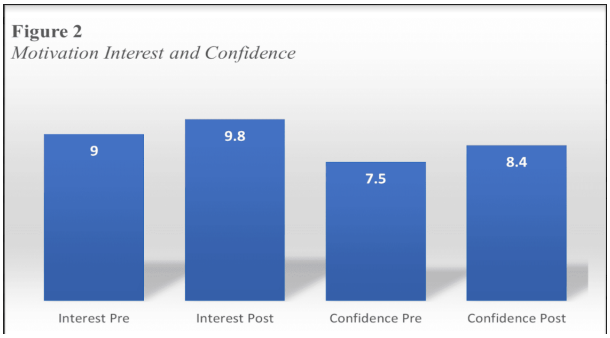


Note. Reference PEARL (Echevarria et al., 2017)

A post-project survey using Microsoft Forms was created to measure APP feedback for using PEARL (Echevarria et al., 2017) which was rated 2-5/5 on a Likert scale (1, not easy to use and 5, easy to use). Sixty-six percent of providers completed the survey and comments included easy to use but there was the need for re-iteration on how to score (specifically for prior

admissions and eMRC rating) and the tool was a way to infer risk stratification for hospital personnel and educate patients about why they are being referred to pulmonology.

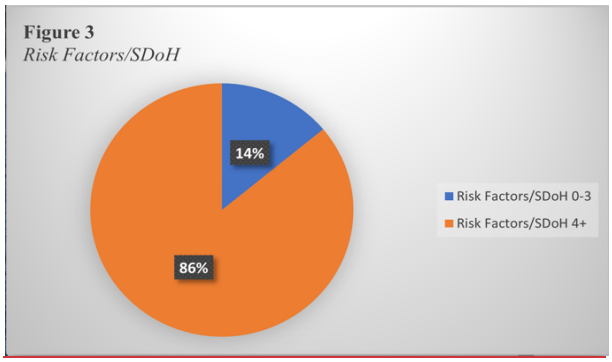
Outcome 5: Met. 100 % of participants interviewed had their motivation score documented in the EHR by visit 2. Participants were interviewed to identify their motivation for importance of and confidence in managing their COPD using a Likert scale (1, not important/not confident and 10 extremely important/extremely confident). The scores for pretest at visit 1 and post-test at visit 4 are displayed in Figure 2. Participants' scores for importance of managing their COPD were high with pretest scores ranging 8 - 10 (average 9) and post-test was 9 – 10 (average 9.8). The level of participants' confidence for managing their COPD varied low to high with pretest scores ranging 2 - 10 (average 7.5) and post-test was 7 - 10 (average 8.4). The majority of participants (86%) participants scored seven or greater for high importance and confidence in managing their COPD.



Note. Bar graph shows participants' average Likert scores (1, low and 10, high) for motivational interest (at visit 1 is 9 then increases by visit 4 to 9.8) and confidence in managing their COPD (at visit 1 is 7.5 then increases by visit 4 to 8.4).

Outcome 6: Met. 100 % of participants interviewed had a patient-specific risk factor and/or SDoH using a checklist documented in the COPD template by the visit 2. Participants' risk factors/SDoH scores associated with readmissions included 86% with high (4 or more) risk factors and 14% with moderate (0-3) risk factors which is displayed in Figure 3. All participants (100%) noted comorbidities and most (86%) noted aging as a risk factor for exacerbations. Five

(71%) of participants reported difficulties adhering to care plan recommendations, including two (29%) who continued smoking.



Note. Pie chart shows percent of participants' Risk Factors/SDoH scores 0-3 (12%) associated with moderate risk for readmission and 4 or more (88%) associated with high risk for readmission.

Outcome 7: Met. 100% of participants were interviewed to describe barriers to care that impact their care by visit 2. Six (86%) of participants reported no barriers to care, and one (14%) reported the lack of ability or desire to change as a barrier to care.

Outcome 8: Met. 100% of participants were asked to score their patient care experience at visit 4 which averaged 4.8/5 (1, not helpful and 5, most helpful) helpfulness to understand their medical condition.

Outcome 9: Met. 100% of participant office visits notes were sent to their PCP and/or care team to communicate patient updates and care plans. Due to a trusted professional relationship between the PCP and specialist in our healthcare facility, and the high volume of un-related messages providers receive, the PCPs requested to have only visits 1 and 4, and/or visits with a specific concern or need to act, forwarded to them.

Outcome 10: Met. A scholarly report of project outcomes communicated findings and patient-specific risk factor with recommended resource allocation to support value-based care (Appendix Q). The resource allocation smart data element was not created in the EHR as no tech support was available.

Missing Data

The human fatigue factor during COVID and coding variations in admitting diagnoses could have played a role in potentially missed participants. Repetitive, daily reminders using the communication app were sent soliciting hospitalists for AECOPD admissions. Hand searches for AECOPD hospital admissions supplemented requests from hospitalists. Two sets of data were excluded since one patient did not show up for visit 1 as scheduled and the second was incorrectly diagnosed. Follow-up data was requested from data and analytics for visit 3 to assure TCM was met, and hand pulled to review for accuracy for motivational interview scores, participants' care experience, and communicating with the PCP when computer data was not identified.

Unexpected Findings

Sixty-one percent of patients risk stratified with the PEARL tool (Echevarria et al., 2017) during hospital screening, were low risk for readmissions or death and therefore did not meet enrollment criteria. The tool adds scoring for hospital admissions in the past year, and so the scoring may have yielded different results during a non-pandemic timeframe.

The motivational interest and confidence were overall higher than expected as measured in pre-test and post-test and the halo affect may have been a factor. Alternatively, patients who are overly confident may not realize the incongruence with negative lifestyle or non-adherence to treatments, or they may lack education on the complexity of the disease. High scores may be an opportunity harness motivation to support change.

There were anecdotal reports of fewer AECOPD related hospitalizations during the summer months of this pilot during COVID-19 pandemic which may be due to the following: decreased community contact between people, masking, handwashing lessening usual infections,

less activity and therefor fewer symptoms, and decreased commuters with subsequent decreased air pollution and fewer symptoms. The latter is of interest as predictions for this area report an increase in commuting population which worsens air pollution. Additionally, the increasing retirement population and more people expected to be diagnosed with COPD should trigger an uptick in readmissions.

Recommended guideline-based therapies varied such as limited or no use of recommended pulmonary rehabilitation, PDE-4, NIPPV, palliative care, and health coaches and included concerning uses of chronic oral glucocorticoids (GOLD, 2020; Celli & Wedzicha, 2019; Mandru et al., 2021).

Unintended Consequences

An unintended consequence was furthering group fatigue and sense of project lead isolation within the pulmonary group which was likely multifactorial with an evolving NP-led initiative, pre-pandemic HR problems, followed by the COVID pandemic, that added to already heavy workloads. These crises delayed contact and limited communications between healthcare professionals unless there were very specific and intentional needs to be met, and/or high acuity problems.

Project Budget

The expenses necessary to pilot the project were $19,795.00 with generated revenue including in-kind donations totaling $26,995.00. The budget categories included expenses, revenue, and operating income. A full financial analysis for Year 1, Years 2-3 budget and the Statement of Operation can be found in appendices, R, S, and T, respectively.

Year 1 projected expenses ($19,795.00) includes personnel, office space, office system, office supplies, office equipment and travel. Year one to year two predicted expenses are

adjusted for increase in patient volume and Year 3 projections included a 3% salary increase. Revenue ($26,995.00) included primarily in-kind donations of DNP student hours, healthcare facility personnel, space, equipment and materials, diagnostics if necessary and pulmonary clinic visits. The resulting operating income is $7,200.00.

The primary changes in expenses anticipated the sustainable project growth through and beyond years 2 & 3. Revenue would also include cost savings from avoiding 3% financial penalties for COPD readmissions estimated at $10,000 (Elixhauser & Podulka, 2006), avoiding medical errors occurring during hospitalizations which is estimated annually at $17 billion and 210,000-400,000 deaths per year nationally (James, 2013), avoiding lack of productivity from deteriorating physical and socioeconomic conditions from hospitalizations estimated at more than $6,000 per patient per year (Press et al., 2018), and poorer outcomes if greater than three hospitalizations /year (Soler-Cataluna, et al., 2005).

Discussion

Summary of Key Findings

Data demonstrated no patients were readmitted which was a specific aim of the pilot. Applying risk stratification facilitated effective use of TCM from hospital discharge to pulmonary clinic for intense real-time management of patient-specific conditions as reported by Echevarria et al. (2017) and Mora et al. (2017). Motivational interviewing facilitated self-management topics (Benzos et al., 2013 & 2016). Identifying and communicating patient-specific variables was accomplished to allocate meaningful resources for value-based care which were specific aims and strengths of the pilot. It successfully aligned with the healthcare facility mission and priorities which was a strength of the project. The Stetler model was an appropriate foundation for the project.

Interpretation

Association Between Interventions and Outcomes

The LM shows the strategic use of resources (hospital and clinic personnel, APPs, and technology) and activities (timely and highly intense visits, communication, and technical support) during clinic visits to identify, plan for, and deliver timely, coordinated patient-centered care (Kellogg Foundation, 2004). This demonstrates the difference we can make as a collective team of healthcare professionals to improve patient and healthcare facility outcomes.

Impact of Project on People and System

This pilot included intentional communications with multiple disciplines and programs: discharge coordinators with health partners, transitional care coordinators, rehabilitation, and technology with EHR, telehealth, and remote monitoring. The project increased demands on IT and data analytics teams which were unable to fully support developing smart data elements. Critical thinking provided guidance to strategic resource allocation within an ACO, reflecting commitment to healthcare facility mission and values.

Contextual Elements Influencing the Logic Model

There were three important influences on the project: 1) the DNP role was new to the acute care service line, 2) the pulmonary clinic was in a pre-pandemic human resource (HR) crisis, and 3) the COVID-19 pandemic crisis started after the proposal was initiated. The DNP in leadership role was introduced to the pulmonary clinic and acute care service line. The healthcare facility initially recognized the project lead under the DNP student umbrella which would have required regulatory co-signatures; as such, healthcare facility leadership additionally recognized the project lead under the employed NP umbrella implementing a QI project. This allowed full participation in the pilot as a licensed provider working within the scope of practice

in the state. The purpose and size of the pilot was explained to the pulmonary clinic and administration to assure: 1) safety for implementing evidence-based initiative, 2) fit for the culture, and 3) feasibility for the healthcare facility (Stetler Model, 2001).

The pre-pandemic HR crisis shifted focus for pulmonary clinic operations and patient access as clinic providers (physicians and APPs), clinical staff (MAs and respiratory therapists), managers, and leaders left the clinic. APPs had limited support and tension during this time and during COVID. While research studies used NPs, RNs, and RTs trained in MI (Benzo et al., 2016, Mora et al., 2017), the pulmonary clinic does not have a RN and the RT are not trained in MI. Additionally, not all APPs had MI skills and hospital work, part-time status, and/or paid time off decreased the number of APPs available for the continuity of intense weekly clinic visits. The project lead as a pulmonary NP was unable to be credentialled for home visits due to time constraints and prioritized pulmonary clinic needs; therefore, a partnership was established with a home base NP to be used when home health criteria was not met.

The original proposal included hospital patient referrals from multiple disciplines of respiratory therapy, nursing, and admitting; however, these staff became fatigued and/or were new or travelers unfamiliar to the service line during the COVID pandemic. Therefore, the administrative leadership requested only hospitalists or providers from the acute care service line refer patients to the pilot for screening inclusion. Initial patient screening within 1-2 days of hospital discharge was temporarily modified to try accommodating inpatient APP requests for screening at any time during hospitalization to avoid short-notice referral demands on already heavy workloads and tensions from the pre-pandemic and pandemic crises. However, if the screening was started too early, it was difficult to complete the enrollment process due to pending diagnostics, evolving care plans, and unknown discharge location such as rehabilitation

or hospice which would be exclusions. Zikos (2019) identified a mismatch between admitting and discharging diagnosis up to 60% of the time. Screening patients closer to the time of discharge allows time for stabilization and diagnostics to confirm the discharging diagnosis matches the presumed admitting diagnosis and discharge location.

Baseline data for the healthcare facility was limited to Medicare/Medicaid reporting (Medicare, 2019). Knowledge and sharing of information about the population surfaced at the time of implementation including the limited involvement of pulmonologists, care coordinators, TCM, health partner programs, and variations in telehealth and remote services. Due to the pandemic and shifting priorities, the COPD workgroup was placed on hold, and technology and data analytics team were not provided hours to develop a patient-specific resource table to assist in connecting patients to resources supporting value-based care. Telehealth services were developing which facilitated patient visits during COVID.

Reasons for differences between Anticipated and Observed Outcomes

The specific aims and outcomes were met so there are no differences between anticipated and observed outcomes. However, more patients admitted with AECOPD were anticipated during the pilot which was likely associated with COVID-19. Unlike Echevarria (2017), there was a high percentage of patients with low risk for readmission in this pilot either due to local population, care outcomes, or the COVID-19 pandemic.

Costs and Strategic Trade-offs

The stakeholders agreed ten or fewer participants for the pilot seemed manageable while offering information on project fit, feasibility, safety for participants. Additionally, only moderate, or high-risk patients were offered pulmonary specialty care due to the complex nature

of these patients and lower risk patients continued to follow with their PCP to help reduce the volume of patients referred to the pilot.

Frequent contact and MI skills help identify, communicate, and treat deteriorating conditions, reiterate self-management, and reinforce behavioral changes as reported by Benzo et al. (2016). There is increased cost associated with frequent visits, technology, and training; however, as previously mentioned, these costs offset more expensive costs and risks associated with 30-day readmissions, poorer productivity, and poorer prognosis for patients with more than three AECOPD/year (Press et al., 2018; Soler-Cataluña et al., 2005).

Limitations

This project was specific to the site and healthcare facility and thus is not generalizable. Systems layers, cultural hierarchies, and financial constraints often become barriers to the scope of work that can be collaboratively accomplished. The number of pulmonary providers and respiratory therapists trained in motivational interviewing, changing and limited clinic personnel, lack of a registered nurse, volume of patients requiring access to care, and system priorities limited the scope of this pilot. It was important to stay objective and focused on patient improvement and lifelong learning.

The PEARL risk stratification tool was new to the acute care service line, and although reviewed in journal club, practice with use is important to confirm scoring is done consistently.

As mentioned, COVID-19 may have impacted hospitalizations which may have skewed patient risk stratification results. The COPD readmission rate remains high for the healthcare facility at the time of this report (Medicare.gov, 2022). The actual hospitalization rate for AECOPD pre and during COVID-19 is unknown to the project lead which represents siloed information and limited contact with healthcare facility leadership.

The health care facility and physician leaders recently developed an EHR SDoH dashboard, but this was not available for use. Therefore, the project lead adapted a table for use that incorporated known risk factors associated with readmissions based on face validity (Deniger, 2015; Kansagara, 2011; Magnan, 2017; Shah, et al. 2016).

Conclusions

Usefulness of Work

The pilot demonstrates the role of the DNP in Leadership to translate evidence into practice which is important when considering the delay of >10-15 years of getting research into practice (WHO, n.d.). It also offers interprofessional support to physicians, administration, and the healthcare facility system. There is plenty of work to coordinate in a learning community. The resources, activities, and interventions of the pilot have the potential to impact local and regional care to decrease COPD readmissions.

It is important to take the time to discover patient-specific variables and promote connections to reduce patient burden of multiple, complex issues placing patients at risk for readmissions. Recall, Press et al. (2018) reported the need to help prioritize complex, time-consuming interventions. Administration, IT, pulmonary and primary care physicians, APPs, respiratory therapists, transitional care registered nurses, and medical assistants reported appreciation and willingness to be involved with a new initiative to improve outcomes. This provides a sense of unity, helpfulness, and responsiveness to make a difference in patient care.

Patient engagement within the clinic and community is necessary to shift focus from inpatient to outpatient preventive levels of care. This shift allows the identification of patients' specific needs to create realistic budgets and policies for the clinic and community arenas. This

outpatient work further aligns with the healthcare system mission and vision of being a trusted partner in all communities served.

Sustainability

This pilot demonstrated the ability to reduce hospitalizations and/or survival at 30 days but what happens after that? Press et al. (2018) recommended moving beyond 30 days. Several well-designed studies identified the need to follow patients closely initially and continue to follow over one year (Benzo et al., 2016; Hernandez et al., 2015; Ko et al., 2017; Mora et al., 2017). Extending care plans have implications to meet intermediate and long-term outcomes presented in the logic model.

This is a relevant project to replicate due to the projected rapid population and retirement growth that will increase the volume and cost of patients needing COPD care. Recall, RWJF (2018) reported thirty percent of healthcare patients have a trajectory towards high resource utilization and these patients need to be identified. The project lead is dedicated to this work with a pertinent background working as a NP, commitment to lifelong learning, and experiences with rural healthcare.

Potential for Spread

The interventions are appropriate to spread to other chronic conditions and underserved areas. The work transforms healthcare, reduces costs, improves patient care outcomes, and demonstrates value in quality patient and provider care, supporting efforts of The Quadruple Aim (Bodenheimer & Sinsky, 2014). The pilot demonstrated the contributions of nurse leaders and a healthcare team when identifying and managing gaps in care and supporting EBP. Nurse leadership is a strong and valuable workforce and now is the time for nurse-led initiatives

(RWJF, 2017). Collaboration and coordination of care to keep patients out of the hospital, managed in the clinic, and supported in the community is a project well-suited for nurse leaders.

Future Research.

- Research is needed comparing disease specific risk stratification tools to SDoH tools as patients living in underserved areas may all have high SDoH; predictive tools must account for multiple patient factors.
- Explore provider perceptions for following versus not following GBT.
- Explore complementary and alternative care with this population.
- Policy should explore community shared savings and cost center partnerships, care coordination with health partners, referrals, e-consults and communication to demonstrate value-based care.
- Future studies are important for nurse-led initiatives' impact on patient, system, and community outcomes.

Implications for Policy and Practice

This pilot may not have the same outcomes if the evidence-based processes that were implemented are not followed. The healthcare facility must be engaged and prepared to connect patients with meaningful, useful, and reimbursable community resources and activities outside of the hospital setting (Hernandez et al., 2015; Shah et al., 2016; Zhong et al., 2019). Patients then receive care and support required in their environment versus risk further deterioration in health, and poorer productivity (Ben-Assuli et al., 2020; Press et al, 2014; Shah et al., 2016; Bourbeau & Echevarria, 2020). Care must extend beyond the 30 days risk of financial penalty because while patients are in the hospital, they avoid negative environmental factors and have access to multiple professionals with supportive care; but, once discharged, patients risk re-engaging in

negative lifestyles and fail adherence to quality treatment care plans. One of the most challenging tasks may be how to address lifelong behaviors specific to community cultures. Providers must have scheduled time for a deep dive into patient-specific variables. It is important to recognize and understand each patient's uniquely different circumstances to support them in their living environment. What works in one area may not work in another due to lack of access, culture of care, and/or limited resources. These factors are important to communicate to patients, care givers, system leadership and policy makers to help with the decision-making process of resource allocation (Deniger et al., 2015; Hernandez et al., 2015; Ko et al., 2017; Mora et al., 2017; Naylor et al., 2004; Verhaegh, et al., 2014). Recommendations include the following:

Access to Care.

- Professionals need to be hired and/or trained for knowledge, skills, and abilities in motivational interviewing as reflected in research recommendations (Benzo et al., 2016).
- Hospital discharge to clinic follow up with TCM including pulmonary specialists, PCPs, care teams, and health partners (Mora et al., 2017).
- Policy makers must incentivize and reimburse all guideline-based therapies for example access to health coaches with low confidence and portable home equipment when there is no rehabilitation.
- Palliative care services are needed to support for, example, top resource users, patients with a poor trajectory, and patients with low or no motivation for changing lifestyle.
- Healthcare providers living in neighborhoods with higher risk populations of chronic disease are instrumental in creating new pathways to care for individual or family lifestyle change (U.S. Department of Health and Human Services, 2010; Halfon, 2012).

- Commuting must be judiciously applied as it increases air pollution and risks of diagnoses, exacerbations, and readmissions of residents thus worsening outcomes (Li et al., 2017).

Risk Stratification.

- Primary care providers and pulmonary specialists must leverage risk stratification work.
- Patients with poor trajectories and higher risks must be identified using risk stratification and predictive models even prior to hospitalization (Ben-Assuli & Padman, 2020; Echevarria, 2017; Press et al., 2018; Zhong et al., 2017).
- Risk stratification must be applied at the time of hospitalization for follow up care decision-making and communication that is important between care teams (Echevarria et al., 2017).

Patient-specific Variables.

- Patient accountability and system financial reimbursements must be incorporated into public health policy and reimbursements for costs when patients have low motivation or incongruent actions in knowing versus applying quality care recommendations (Shah, et al., 2016; Zhong, et al., 2017).
- Insurance coverage must expand to meet patient-specific needs, incentivize health living and de-incentivize an unhealthy lifestyle.
- Reliable lines of communication must connect leadership and front-line workers to advocate and coordinate critical interprofessional care, especially for patients with higher vulnerability and diminished health equity (Blaha et al., 2018; Bourbeau & Echevarria, 2020; Press, 2018; Prieto-Centurion, 2014; Mora et al., 2017).

Technology.

- Technology (telehealth and remote patient monitoring) must be strategically applied to help access care and education for patients and providers with inequitable or inaccessible care services (Mahtta et al., 2021; WHO, n.d.).
- Care teams should take advantage of, but strategically use, technology according to patient ability to hear, understand, and degree of illness as the highest risk benefit from in person visits.
- Updated templates and tables are needed in the EHR to 1) know quickly where to look for information, recommendations, referrals, and re-iterations and 2) link patient specific needs to the correct resources.
- COPD education must be provided and re-iterated with respect to the patient's best learning style to support care experiences (Bourbeau, 2019; Jiang, 2013; Press, 2018; Stone, 2012).

Next Steps

The next steps for this pilot includes dissemination of the findings and advocating to continue work toward the intermediate and long-term goals per the LM. Reinstating the COPD workgroup is one avenue to support recommendations and policy development, breakdown siloed information and care, and integrate work with PCPs, home base services, mobile units, IT, transitional care, health partners, and pulmonary clinics while developing community partnerships and population health programs for patient-centered care. Additionally, advance practice nurse leaders added to boards facilitate communication and compassionate patient-centered care in these complex scenarios (Institute of Medicine [IOM], 2011).

In conclusion, the participants in the pilot were not readmitted. They reported a very good patient care experience. The PEARL tool (Echevarria et al., 2017) was useful for risk

stratification to help predict and prioritize resource allocation which demonstrates value-based care (Scalable Health, 2018; National Council Organization, 2017). Providers made timely interventions for deteriorating conditions and strategically assessed patient-specific variables using intense visits and motivational interviewing skills. Self-management targeted patient-specific needs. The information was communicated in real-time to their care team and as a report to stakeholders of the healthcare facility. Recommendations were included for sustainability, policy and budgets, and additional research. The pilot demonstrated the role of NP leaders in EBP and QI initiatives in conjunction with physicians, administration, and care team members to improve value-based care in the community.

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Appendix A Literature Review Summary

Searchable Statement and Question: The PICO format was used to develop the question, In the population of adult patients age 45 and older with COPD referred to a pulmonary specialty clinic (P), will identifying high risk patients for admission/readmission due to acute exacerbation COPD (AECOPD) by using an evidence-based risk stratification tool facilitate preventive care management and resource allocation (I) thus affect AECOPD and/or hospital readmissions (O)?

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
AECOPD READMISSIONS AND RISK FACTORS:							
Psychosocial Risk Factors for Hospital Readmission in COPD Patients on Early Discharge Services: A Cohort Study	Coventry, P., Gemmell, I., & Todd, C. (2011)	Evaluate whether psychosocial risk factors independently predict readmission for AECOPD in patients referred to early discharge services Search Terms COPD readmissions Risk stratification Risk factors Outcomes Database Cochrane NURS620 Searched 2/2020 Fit - Yes	Prospective cohort study Nonexperimental Quantitative Level III B Predictor variables (SGRQ, HADS, ESSI, Carstairs) were continuous scores Covariates (age, Charlson Index, FEV_1) were continuous T-tests to compare group means for normally distributed variables Mann-Whitney U test for those variables not normally distributed. Multiple logistic (readmissions),	3 acute care hospitals in the UK 79 of 1153 patients recruited by specialty nurses followed over 12 months 5/2007-8/2008 Intervention: Nurse-led early discharge, patients called within 1 week of discharge for home visit Eligibility: COPD (ICD-10 codes J40-J44, J47), and/or clinical history, reduced spiro ratio, normal mini mental state, labs, GP, social support Exclusion: malignancy, pneumothorax, uncontrolled afib, CP	Primary outcome: Readmission for AECOPD within 365 days of index admission Secondary outcomes: time to first event (readmission or death), frequency and number of readmissions, and change in psychosocial status over 365 days Data on lung function, comorbidity, hospital admissions, medications, social demographics,	Design and evaluation of interventions aimed at optimizing the psychosocial care	Cited x 114 Reported: Age, lung function, and previous hospital admission are the most powerful predictors of readmission for AECOPD.

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
			Cox (time to first event) and Univariate logistic regression (psychosocial factors (SGRQ, HADS anxiety, HADS depression, ESSI, Carstairs), Exploratory multivariate models for psychosocial Poisson link for number of admissions in 365 days Calculated the score using a Microsoft Excel Macro SPSS 15.0 Limitations: Inadequate power, Under-recruitment	and/or acute ECG findings; required full time nursing or intravenous, insulin dependent DM, pneumonia, CXR changes, PE, falls Assessed variables at baseline, 3 and 6 months	St George's Respiratory Questionnaire, Hospital Anxiety and Depression Scale and Social support Results: Depression, FEV1, Socioeconomic home ownership were leading factors for readmission Readmitted patients had worse SGRQ and HADS scores at 12 months		
Prognostic Factors After Hospitalization for COPD Exacerbation	Fuhrman et al. (2017)	Indications reported increased hospitalizations for AECOPD in France. AECOPD is	Descriptive study Full text not available for methods and limitations	Adults hospitalized for AECOPD in 2013 in France Data from the French national health insurance information system	Mortality, readmissions and lung function testing after discharge for adult men and women Results:		Cited x5 Trust - Yes

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
		associated with impaired health status and increased healthcare cost Topic: Risk factors Age Prior admit Co-morbidity Disease severity Female Disadvantaged Database Medline Social Determinant		Full text not available for Inclusion/Exclusion not identified	The survival was better among women, even after considering the other risk factors (age, previous hospitalization for AECOPD, comorbidities, exacerbation severity) Female gender, advanced age, comorbidities and living in a disadvantaged area were associated with a lower frequency of lung function testing Women had better prognosis than men after AECOPD h ospitalization. The frequency of lung function testing after discharge remained low, particularly		

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
					among women and people living in disadvantaged area		
Early Hospital Readmissions After an AECOPD in the Nationwide Readmissions Database	Jacobs et al. (2018)	Determine rates, causes, and predictors for early (3-, 7- and 30-d) readmissions using U.S. Nationwide Readmission Database after the initiation of the HRRP, prior to expansion to COPD COPD Readmission Risk stratification AECOPD Incidence CINAHL, Medline, Database, Nexis Uni NURS620 Search 2/2020 Fit - Yes	Descriptive Nonexperimental Quantitative Level III B Coding differences impact reliability Unvalidated algorithm Chi-square tests and Student's *t* tests were used to compare proportions and continuous variables Limitations: Data from after the implementation of HRRP for CHF, AMI, and pneumonia, but before COPD; Sensitivities of ICD-9-CM algorithms were low and varied (12–25%), with positive predictive	1,055,830 patients with AECOPD Nationwide Readmission Database from 2013 to 2014 19.2% readmission rate Inclusion: Primary diagnosis COPD, acute resp failure Secondary diagnosis AECOPD codes Exclusion: death during the index hospitalization, elective readmission, discharged AMA, missing LOS variable, residents of a different state	Readmission timing Readmission diagnosis Predictors of hospital readmission Results: Highest rates of readmission were seen within the first 72 hours of discharge (4.2 to 5.5 percent); more than half of readmissions (58 percent) were within the first 15 days The most common reason for readmission was respiratory-based diseases (52.4 percent), with COPD the most common diagnosis (28.4	Development of a COPD-specific risk stratification algorithm based on patient and clinical factors may be necessary to better predict patients	Cited x 23 Trust - Yes Look at non-inpatient data

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
		Topic: Significance of problem	values as low as 81%, based on administrative claims, analysis of Medicare claims data showed a 1.9% increase in COPD-specific readmission rates when patients were followed across states Hierarchical two-level logistic model		percent) Correlations for early readmission were: Patient factors (Medicaid payer status, lower household income, higher comorbidity, and alcohol abuse, Clinical factors (LOS <2 or >5, discharge to SNF or HH) AECOPD is characterized by a similar spectrum of readmission diagnoses		
Comprehension and Recognition of Acute Exacerbation Among COPD Patients	Jiang, M. & Ma, J. (2013)	Gain insight of patient comprehension and recognition on the exacerbations and related factors of COPD, so as to provide evidence for treatment of	Cross-sectional, interview-based survey **Check: Descriptive study** **Answer: Qualitative Study** Unable to obtain full text for methods and limitations	911 COPD patients including 738 men (81.0%) and 173 women (19.0%), with mean age as 69.2 years old (± 9.1 years), smoking was 45.6 pack/year Unable to obtain full text for inclusion/exclusion	Reported AECOPD characterized as: increasing short of breath, increasing amount on sputum, purulent sputum or coughing, disease stability, duration of exacerbation,		

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
		acute (AECOPD) Topic: Risk factors Poor awareness Low edu Low income Database Medline Social Determinant			belief of health severity Results: Patients with COPD were poor on the awareness of AECOPD, particularly among patients with low income, low education levels, low COPD stage		
An Overview of Acute Exacerbations of COPD	Kelly (2009)	Provide overview using nursing report Database: Nexis Uni Search: Significance of problem	Literature Review Level V B c-stat n/a Limitations not discussed	General AECOPD population Inclusion Patients with AECOPD in UK Exclusion not addressed	AECOPD definition, causes, effects on patient Results: AECOPD is complex with significant impact on morbidity, mortality, cost, not fully understood	Recommend follow-up ideally to address psychosocial well-being, optimal treatment and management	Cited x 3 Study is older but the information from nursing perspective is applicable in a database outside of healthcare
Impact of Air Pollution and Outdoor Temperature on the Rate of AECOPD	Krachunov et al. (2012)	Study the relationship between air pollution, outdoor	Descriptive, retrospective study of AECOPD and air quality Level III B c-stat n/a	309 AECOPD were recorded in the analysis Inclusion FEV1/ FVC<0.70 Exclusion	Air pollution level (PM) and temperature, Daily AECOPD rate Results:	Recommend multi-center study	Cited x2 Reported: Almagro et al. who found that the decrease of temperature by

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
		temperature and AECOPD Topic: Risk factors Air Pollution Database: Medline Google Scholar Search: Social Determinant	Limitations Small n, Frequency of mild AECOPD unknown but leads to decline. These factors could lead to underestimation	Residence outside of study area	Lower daily mean temperatures were associated with the levels of air pollutants. The level of PM10 correlated with the levels of the other air pollutants. The daily number of AECOPD was found to correlate weakly, but significantly with the mean level of PM10 in the previous six days		1 degree resulted in 4.7% increase in the mean number of hospitalizations
Impact of Air Pollutants on Outpatient Visits for Acute Respiratory Outcomes	Li et al. (2017)	Investigate the impact of air pollutants on acute respiratory outcomes in outpatients Topic: Risk factors Air pollution Database Medline Social Determinant	Descriptive retrospective study of AECOPD and air quality Case-crossover design Spearman rank correlation analysis Multiple and Conditional regression between acute respiratory outcomes and air pollution	57,144 patients Outpatient data from December 2, 2013, to December 1, 2014 Inclusions: respiratory department with acute symptoms and fever clinic including URTI, acute bronchitis, CAP, AECOPD or AE-asthma or AE-Bronchiectasis	Air pollutant data including ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), and particulate matter (PM2.5 and PM10) upper respiratory tract infection, acute bronchitis, community-		Cited x 46 Trust - Yes

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
			Limitations: Outpatient data One hospital	Exclusions: Outpatient visits for chronic diseases without an acute exacerbation, non-infectious diseases, and diseases without a definite diagnosis were excluded	acquired pneumonia, AECOPD, AE bronchiectasis Air pollutants had acute effects on outpatient visits for acute respiratory outcomes, with specific outcomes associated with specific pollutants PM2.5, PM10, NO_2, SO_2, and CO exposures were positively associated with outpatient visits for acute infectious and non-infectious exacerbations of underlying lung diseases PM10, SO_2, and CO exposures were positively associated with outpatient visits for AECOPD		

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
Considerations for and Mechanisms of Adjunct Therapy in COPD	Mandru et al. (2021).	Review of adjunct therapies as part of approach to managing COPD	Expert Review V A	COPD	Provided brief but information considerations for past and present therapies in advanced COPD	Selection of adjunct therapies must be weighed carefully	Yes
Managing Patients with COPD Exacerbatio: Does Age Matter	Stone et al. (2012)	Gain insight into the relationship between age and management of AECOPD, as older persons are known to be at a greater risk of hospital admission Topic: Risk factors Age Poor Awareness Database Medline Google Scholar Social Determinant	Clinical and Patient questionnaire **Check:** **Descriptive correlation or Cohort Study** **Answer:** **Qualitative Study** Level III B Chi-squared test for age decile group Mann–Whitney/Kruskal–Wallis test for age in years SPSS V18 Limitations: Did not audit for dementia Not all elderly patients captured	2,842 Adult patients with COPD Age ranged from 27 to 102 2008 UK COPD audit Inclusion Hospital units admitting unselected emergency admissions prospectively up to 60 consecutive cases of COPD exacerbation between March and May 2008, Exclusion Not id'd	Patient-reported data: knowledge base and self-care data Clinician-reported data: disease severity, comorbidity, mortality Results: Older patients had inferior knowledge of COPD, less self-care and were less likely to recognize symptoms of exacerbation prior to hospitalization Although older patients had severe disease and symptoms, greater co-	Clinicians should consider increasing age as a specific risk factor (particularly >80) in the management of COPD	Cited x 19 How patients selected: Hospital units admitting unselected emergency admissions identified prospectively up to 60 consecutive cases of COPD exacerbation between March and May 2008, and audited retrospectively their in-hospital care and outcomes 90 days following the index admission

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					morbidity at presentation and higher mortality, fewer were seen in hospital or followed up subsequently by respiratory specialist		Patients surveyed prior to discharge about COPD management and if help needed after discharge
Acute Exacerbation of COPD: Influence of Social Factors in Determining Length of Hospital Stay and Readmission Rates	Wong et al. (2008)	Determine the factors that influence length of stay in the hospital and Readmission for patients with AECOPD Topic: Risk factors Disease severity Comorbidity Database: Medline Search: Social Determinant	Non-experimental/quantitative Retrospective Study Level III B Logistic regression analysis using readmission (positive or negative) Multiple logistic regression analysis was conducted using age and sex as covariates possibly related to readmissions Stepwise logistic regression on other variables Data for each patient were coded	109 admissions reviewed Canadian hospital Inclusion diagnosis of AECOPD Exclusion Not id'd	Global Initiative for Obstructive Lung Disease (GOLD) status, Comorbidity, Marital status, Length of Stay (LOS) Results: Disease severity (GOLD status) and number of comorbidities are associated with readmission rates of patients with AECOPD. Social factors such as marital status and the need for social work intervention are also linked to	Prospective studies using social factors and socioeconomic status with optimal therapy Pulmonary rehab Opportunities for policies for targeted public health and health service interventions	Cited x 92 Study supported socioeconomic factors

TITLE OF ARTICLE	AUTHOR YEAR	RESEARCH AIM Search Terms Database Dates Fit (PICOT)	Study Design Type of Evidence Level /Quality Statistical Analysis c-stat Limitations	Population Inclusion/Exclusion	OUTCOME MEASURES/ RESULTS	RECOMMENDATIONS/IMPLICATIONS	Times cited Trust Notes
			with a unique identifier using iCAPTURE Centre database system Two-tailed tests SAS version 9.1 Limitations Single-centre retrospective study, not designed or powered to address specific treatment		readmission rates and LOS		
Estimation of the Mismatch between Admission and Discharge Diagnosis for Respiratory Patients, and Implications on the Length of Stay and Hospital Charges	Zikos, D., Shrestha, A., & Fegaras, L. (2019)	Measure discrepancy between admit and discharge diagnosis, and create a real time program to raise awareness of the need for differentials diagnosis considerations,	Quasi-experimental II B	Medical claims data for respiratory conditions	Admitting and discharge diagnoses are often mistaken – up to 60% leading to increase LOS and costs	Robust differentials must be considered at the time of admit for appropriate careYes	Yes

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
RISK PREDICTION MODELS (Optimal: algorithms with low-high stratification, real-time data, coding, concrete data available in HER, shared data IP/OP)							
Multimorbidity in Risk Stratification Tools to Predict Negative Outcomes in Adult Population	Alonso-Morán et al. (2015)	Summarize validated risk stratification tools for predicting negative outcomes, with a specific focus on multimorbidity COPD readmissions Risk stratification Outcomes Cochrane NURS620 Search 2/2020 Fit – Yes, Tied to readmission PM with variables	Systematic review Level III B c-statistics 0.5-0.85 (highest with disability) Statistical Analysis: Data too heterogeneous to allow meta-analysis so used qualitative synthesis (see notes section) Weakness: limitations in generalizability due to variety of risk factors	Review of 3,674 citations 36 articles met inclusion criteria Metanalysis with both derivation and validation cohorts 29 had as outcome hospital admission/readmission. Exclusions: Psych, Post- surgical, Peds and Developing countries	Primary aim multimorbidity (primarily using Charlson tool) and validated tools for risk prediction of readmission Results: Risk PM with multimorbidity (HF, DM, Stroke, age and disability) as predictor variable are more accurate		Cited - 20 Trust – Yes Table of risk stratification tools "ACG-PM" heath care cost, Use of SQLape Logistic Regression, Probability of Repeat Admissions (PRA) Older study, Did not analyze newer tools
Trajectories of Repeated Readmissions of Chronic Disease Patients: Risk Stratification, Profiling, and Prediction	Ben-Assuli, O. & Padman, R. (2020)	Investigate unplanned readmission risk within 30 days for patients seen in ED with multiple chronic conditions over time as a heterogeneous population and as	**? Level III A** New Research/ Modeling framework Logistic Regression and Boosted Decision Tree using Microsoft AZURE ML	HMOs serving >4 million customers De-identified data extraction from EHRs/ HIE from 471,192 topics covering ED visits from 2005-2008 Final models clustered 16,117	Recommended statistical methods using STATA SAS GBTM over CLCM and HMM models with dual statistical and machine learning Successful prediction of group and individual	Important to follow patients over time to re-stratify risk due to complexity Information is generalizable to many scenarios where repeated information is collected on	Trust – Yes Finite mixture models such as GBTM, GMM, CLCM aim to identify and profile small volume latent trajectories grouping individuals into

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		individuals with specific risks Investigate impact over time of risk factors Explore PM for trajectories on future readmission Readmission, Risk stratification Risk prediction Business Management Hand Search 2/2020 Fit – Yes, Readmission, Risk stratification and Prediction	Limitations: Israel HMO	patients into three trajectory categories 100,286 ED visits and 34,651 readmissions Inclusion/Exclusion Multiple comorbidity Chronic patients followed over years	readmission trajectories	individual behaviors Need studies on non-chronic and/or all inpatient admissions, Software to adapt to digitization of healthcare using varying home monitoring, covariates, social determinants Future to include factors from ED, inpatient, ambulatory, and community	clusters to match patient's evolving characteristics Used CCI and LACE, age Insurance (HMOs), LOS, Readmissions and ED visits Creat level Persons living with multiple chronic disease increasing (HHS, 2010) Risk stratification at group level and Risk prediction at individual level to assess risk of future readmission
Big Data for the Stratification of Readmission Risk After Hospital Discharge of Older Adults with Complex Conditions	He et al. (4/2019)	Develop a method to stratify the risk of readmission in an older, frail and high comorbid population Reference hand search 3/202 Fit – Yes	Predictive Prospective Study Level III C Statistics analysis with machine learning models including Logistic	Consecutive admissions to subacute care unit Jan 2015 – April 2016 Inclusions/Exclusions not identified	Trained different machine learning models: Logistic regression, Support vector machines, Decision trees and Random Forest Results: Random Forest gave best stratification	Data supports "cost-effective action plans"/focused preventive measures on high-risk patients	Cited – none found Trust -Yes Define "cost" effective plans

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		PMs for risk of readmission for focused preventive care intervention	regression, Support Vector, Decision Trees, Random Forests c-stat 0.63 Increased c-stat to 0.8 adding prior hospital admits, LOS, distinct diagnostics Limitations: pending original study/requested				
Risk Prediction Models for Hospital Readmission: A Systematic Review	Kansagara et al. (2011)	Summary validated readmission risk prediction models, described their performance, and assess suitability for clinical or administrative use COPD readmissions Risk stratification Outcomes Cochrane NURS620 Search	Systematic Review Qualitative Synthesis Level III B Limitations: Cannot use findings to generalize. Biases present Studies too heterogenous to permit meta-analysis Results qualitatively	Review of 7,843 citations 30 studies of 26 unique models met Inclusion criteria: English, Stat models to predict hospital readmission risk, Dual cohorts - derivation and validation, All cause readmission Exclusions: Psych, Surgical, Developing nations	Primary outcome: 30-day readmission but only 1 model addressed preventable readmission 14 models could be potentially used to risk adjust for readmissions including comorbidity, prior medical service 2 studies found functional and social	Innovations needed to collect broader variables: psychosocial factors Risk stratification effect on "clinic' workflow and resource prioritization should be assessed	Cited -960 Trust – Yes Found deficiencies in risk prediction models 2 studies used social and functional variables Define difference prediction model vs risk stratification tool

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		2/2020 Fit – Yes, Risk PMs with defined risk factor variables and recommendations for intervention/resources	synthesized with focus on model discrimination Poor discrimination c-stats .68-.83. (improved w/ functional and social variables)		variables improved discrimination Results: Measures of poor health risk: comorbidity, prior use of medical service and increasing age		
Predictors of 30-day Readmission Among Patients with AECOPD	Krishnan et al. (2019)	Determine the 30-day readmission rate after hospitalization for COPD exacerbation and the predictors of readmission Searched Article ASP 2/2020 Fit – Yes, Predictors of readmission risk for focused interventions	Nonexperimental Quantitative Retrospective cohort Level III Grade B Multivariate Cox regression analysis Unable to locate study/Mendeley not opening for Limitations	530,229 patients National Readmission Database 2016 Unable to locate study/Mendeley not opening for Inclusions/Exclusions	Readmission rates 16.3% (All-cause) and 5.4% (COPD). Independent predictors of readmission: leaving AMA, treatment at high volume centers, high Charlson, low income, urban teaching centers, male, Medicaid insurance, younger age, large hospital bed size, and prolonged LOS	Identify multiple independent predictors of readmissions that can be used to identify high-risk patients who would benefit the most from interventions	Cited - unknown Trust – Yes Unable to review full text Recent study Very large sample size All cause and COPD Charlson Socioeconomics
Predictors of Early Readmission Among Patients 40-64 Years of Age	Sharif et al. (2014)	Determine frequency and predictors of early readmission for patients 40-64 y/o hospitalized with COPD	Retrospective cohort study Level III B c-stats improved to 0.717 adding provider and	Large national database (8,263 patients) within 12 mo (Jan 2009 – Nov 2011) of the index hospitalization and 30 days post discharge	Primary outcome: All-cause 30-day readmission (8%) Secondary outcome: reasons for and factors associated with readmission		Cited – 74 Trust – yes Provider and system factors often unknown at time of index admission

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Hospitalized for COPD		Reference hand search 3/2020 Fit – Yes, Tied to readmission and modifiable risks	system factors to patient factors (alone c-stat 0.677) Descriptive statistics with Chi-squared for readmission rates across category levels and Student t tests for continuous variables Multivariate logistic regression models SAS 9.2 Limitations: ICD9 (including 490, 493)/coding, No info on disease severity or complexity of index admission, not generalizable as age studied was 40-64, no socio-economic or	Inclusion: Commercial insurance, Age 40-64, Hospitalized with primary Dx COPD Excluded: Medicare/caid	(Patient – male, comorbidities HF, CA, OP, Depression; Provider – no Rx prior statins, and no discharge SABA, steroid, or antibiotic; and System – LOS<2d or >5d, lack of follow up after discharge) Results: Provider and system factors are important modifiable factors in early readmission		

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			adherence information				
Reducing COPD Readmissions Through Predictive Modeling and Incentive-Based Interventions	Zhong et al. (2019)	Develop an optimization model to support decision making during interventions to reduce readmission rate and cost 2/2020 Fit- Yes, Predictive Modeling for high-risk stratification	**? Level III A** New Research/ Modeling framework: risk factor and level of risk prediction model and intervention model Odds ratios for categorical data Chi-square for contingency tables Limitations: limited data, Only high-risk patients but did not consider heterogeneity in the subgroup, Interventions available/not available, Health behaviors – it is unknown if incentive(s)	Physician and staff interviews All patients with COPD from hospital database, 114 of 134 had admission records, 24 patients readmitted within 30 days (rate 21%) Inclusion/Exclusion not identified	24 variable risk factors identified Limited size with missing values could not reach significance for readmissions dependent to variables Intervention flow model using mathematical formulas to determine cost incentives for interventions (Rehab, PCP follow up, both or none) to reduce readmissions or accept agreed % loss for highest risk patients	Investigate the impact of patient compliance on readmission probability. Results could serve as guidelines or best outcomes to help hospitals determine/cap budget for patient-centered incentives, appropriate level of incentive and resources Partner with insurance and other facilities for shared costs/value to incentive planning Community hospital pilot pending	Trust – Yes Innovative model: What is the minimal investment/incentive to commit to a high-risk patient and how much of a decrease in readmission can be accepted? Define what is the goal % for readmission

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			modify behaviors, Limited study to readmissions as opposed to other outcomes				
RISK STRATIFICATION TOOLS (Optimal: c-statistic, validated, clinical setting use, comorbidity, and psychosocial-economic factors)							
A New Method of Classifying Prognostic Comorbidity in Longitudinal Studies: Development and Validation	Charlson et al. (1987)	Develop prognostic taxonomy for comorbid conditions that may alter risk of short-term mortality Reference hand search 3/2020 Fit – Yes, Readmission tool using comorbidity	**? Level III B** Hallmark study of the prognostic impact of comorbidity Statistical Analysis Chi-square test calculated by log rank method, Cox's regression using PHGLM procedure (like SAS), scoring system using Hutchinson and Thomas method, relative risk from proportional hazards model,	Sample with inclusion/exclusion: Derivation cohort (all patients admitted to a medical services) 604 patients x1 mo in 1984 in NY hospital Followed one-year mortality Then 685 patients treated for breast CA at Yale Hospital between 1962 and 1969	Develop comorbidity index One-year mortality rates significantly worse with CA and AIDS; liver disease, paralysis The major differences were between pts w/o comorbidity and those with 1+ 2 predictors of morbidity: age and comorbidity (every 10 years of aging was equivalent to 1 comorbidity)	Classify patients with comorbidity index to reduce restrictive eligibility criteria during studies Patients at greater risk can be evaluated or randomized separately	Cited – 24.9K Trust -Yes Older hallmark study, need to review multiple times Comorbidity study only Mortality study

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			Survival and staging curves for the testing population using Kaplan and Feinstein Methods Limitations Power may have been underestimated due to deaths and /or how deaths defined, relatively small n, Validated weighted index but comorbidity-age composite not validated				
Original Study for ERA: Use of An Electronic Administrative Database to Identify Older Community Dwelling Adults at High Risk for Hospitalization or ED visits:	Crane et al. (2010)	Goal: demonstrate the use of an electronic EMR to create an administrative index which is able to risk-stratify this heterogeneous population Hand search 3/20202 Fit- Yes, Risk stratification tool	Retrospective cohort Score evaluated for sensitivity and specificity Level III B c-stat not found Limitations: Low response rates (50-60%), Recall bias,	12,650 community-dwelling and assisted living adults >60 y/o assigned to internal med PCP Jan 1, 2005 Excluded: SNF Information electronically abstracted Look risk factors over the previous two years:	Primary outcome: Total number of ED visits and hospitalizations Results: Patients in the highest 10% risk group (included all comorbid conditions) had a relative risk of 9.5 for ED or hospitalization year	Useful for managed care setting but challenging to adopt in fee-for-service due to limited access to various data bases	Cited – 72 Trust -Yes What if age <60 with comorbidity ERA performed better than Probability of Repeated Admission (PRA) and Community Assessment Risk Screen (CARS)

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The Elders Risk Assessment Index			Literacy, Time, Cost, Coding, Retrospective, External care may have occurred w/o knowing, No functional status measure (difficult to have data w/o interview or objective measure)	Demographics, Comorbidities (DM, CAD, HF, stroke, COPD, Hx CA, Hx hip fracture, dementia) and Hospitalizations	one and relative risk 13.3 for hospitalization in subsequent year		Retrospective only No c-stat found
International Validity of the "HOSPITAL" Score to Predict 30-day Potentially Avoidable Readmissions in Medical Patients	Donze et al. (2016)	Externally validate HOSPITAL score, internationally, multicenter Reference hand search 3/2020 Fit – Yes, risk stratification tool for 30-day readmission avoidable readmissions	Retrospective cohort Level III A/ B Statistical Analysis: Pearson goodness to fit, Proportions, means, and medians with IQR, two-sided, Brier score and Logistic regression c-stat 0.72 SAS 9.3 Limitations: all medical so not	9 hospitals in 4 countries Jan-Dec 2011 117,065 patients Inclusions: All adult patients from medical department, LOS >1 day Exclusions: Transfers, AMA	Primary outcome: Identify all 30 day potentially avoidable readmissions and then validated using SQLape algorithm "HOSPITAL" identified high risk 30 day potentially avoidable readmissions	Use of the score can easily ID patients in need of intensive transitional care; however, the variables are predictors and not necessarily modifiable risk factors so the variables cannot be used to guide interventions	Cited – 72 Trust – yes Medical patients, non-specific to COPD and inclusive of oncology Dependent on lab Most effective interventions high complexity (Naylor et al., 1999 RCT)

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			generalizable, additional variable of functional and socioeconomic status, 30 day may not be appropriate time frame, delays in ability to score if data not available (transitional are is best if started early), labs may change by time of discharge				
The PEARL Score Predicts 90-day Readmission or Death after Hospitalization for AECOPD	Echevarria et al. (2017)	Tool to 1) predict 90-day readmission or death without readmission and 2) assess performance at 30 days and compare the new tool with other prognostic scores. Developed in two hospitals (the derivation cohort) and validated in: (a) the same	Quantitative Quasi-experimental Prospective Internal and External Validation Level II B Cohorts pooled for weighting /re-weighting levels CI appropriate, SPSS and Sigma Plot/Rubin's,	2,417 patients in the UK Inclusions: Primary Dx COPD, Spiro, Age>35, Smoking Hx Exclusions: Terminal illness limiting survival <1 year, Prior inclusion in same cohort	Primary outcome: Validate tool for 90-day readmission to cover high-risk period. Secondary outcome: Assess tool performance at 30 days The PEARL score was consistently discriminative and accurate. Higher PEARL scores were associated with a	The PEARL score is a simple tool, superior to others, effectively stratifies patients' risk of 30-90-day readmission or death, which could help guide readmission avoidance strategies within the clinical and research setting	Cited - 24 Trust -Yes Superior to ADO, BODEX, CODEX, DOSE, LACE COPD specific but includes comorbidity with high impact, Levels of risk, Accounts for factors associated with higher predictive

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		hospitals later (internal validation cohort) and (b) four further UK hospitals (external validation cohort) COPD readmissions Risk stratification CINAHL, Medline+ NURS620 Search 2/2020 Fit- Yes, Risk stratification tool	ROC, logistic regression, Hosmer-Lemeshow goodness to fit, Kaplan-Meier and log rank test c-statistic of 0.73, 0.68 and 0.70 in the derivation, internal validation, and external validation cohorts Limitations: Different country Retrospective bias but external cohort was prospective and individually powered Researchers blind to outcome		shorter time to readmission		model recommendations Application to outpatient Simple tool Outperforms: BODE LACE CODE ADO DOSE
Validation of the DECAF Score to Predict Hospital	Echevarria et al. (2016)	Validate the DECAF score, internally and externally, and	Quantitative Nonexperimental Prospective Internal and	1,725 patients 2 UK hospitals (internal validation) and 4 UK hospitals	Primary outcome: in-hospital mortality prediction	It can identify low-risk patients for HAH or early	Cited – 33 Trust – Yes Mortality study

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Mortality in Exacerbations of COPD		compare performance to other predictive tools Reference hand search 3/2020 Fit – Yes, predictive tool for COPD mortality and risk stratification	External Validation Level III B Prognostic value determined using AUROC curve c-stat 0.77 Generalizable Main limitation: Internal validation was in part retrospective	(external validation) between Jan 2012 and May 2014 Inclusions: primary diagnosis AECOPD, Prior Spiro, Age >35, Smoking Hx >10 pack-years Exclusions: Survivability <1 year	Secondary outcome: assessment of optimal thresholds for pH and eosinpenia, prediction of 30-day mortality Robust predictor of mortality	discharge and high-risk patients for escalating care plans or early palliative care	Dependent on lab eMRCD strongest predictor Superior to APACHE II, BAP-65, CAPS, CURB-65
Readmission After COPD Exacerbation Scale: Determining 30-day Readmission Risk for COPD Patients.	Lau et al. (2017)	Develop a predictive readmission scale to identify COPD only patients at higher readmission risk COPD Hospital admission Risk stratification Google Scholar NURS620 Search 2/2020 Fit- Yes, Risk stratification tool	Nonexperimental Quantitative Retrospective Level III B Chi square, univariate and multivariate analysis, binary logistics regression. c-stat not found SAS software Limited by retrospective design, generalization, possible coding, and	339,389 patients NY and CA (derivation cohort) and 258,113 patients WA and FL (validation cohort). Data abstracted from State Inpatient Database (2006–2011), and the Readmission After COPD Exacerbation (RACE) Scale was developed to predict 30-day readmission risk Excluded readmissions for reasons other than COPD	Endpoint: 30-day readmission for COPD and overall IP mortality COPD readmission rates 6-7%. Factors were age 40–65; male; African American; income; Medicaid and Medicare; anemia; CHF; depression; drug abuse; psychoses independently associated w/ readmissions Results:RACE scale explained 92.3% of	Patient-specific readmission-reduction strategies can be implemented to improve patient care, reduce readmissions and healthcare expenditure	Cited - 7 Trust – Yes Inpatient study Older age was not scored and yet majority over 65 and at higher risk Retrospective study

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			sampling errors and possibly underestimated		readmission variability		
Evaluation of a Modified BOOST Tool in the Acute Care Setting: A Retrospective Analysis *Original study 2009: Project BOOST Seeks to Improve Care Transitions	Robertson (2017) Original authors: Society of Hospital Medicine (2009)	Evaluate the effectiveness of the modified 8P risk tool predicting unplanned 30-day readmission in patients with heart failure and COPD COPD, Readmission Risk stratification CINAHL, Medline+ NURS620 Search 2/2020 Fit- Yes, risk stratification tool	**Nonexperimental Quantitative Retrospective Or Quasi-experimental** as subset of population was randomized Level III B Statistical Analysis: Contingency tables compare risk scores. Adjusted residuals calculated for significance between groups. Chi sq., Binomial logistic regression c-stat n/a SPSS 14.0 Limitations: Lacking validity on prediction.	All patients (356) with HF or COPD discharged Dec 2013 -Nov 2014. Exclusion: Incomplete risk assessment during admission Data from EMR. Demographic: diagnosis, age, sex, marital status, and insurance	Modified goal: Evaluate effectiveness of a modified version of the tool for HF and COPD Modified BOOST 8 risk factors: problem medications, polypharmacy, depression screening, principal diagnoses, health literacy, patient support (single), prior hospitalization, and primary care provider Higher readmits for medications, polypharmacy, and problem diagnoses, women, single status Original primary goals: Develop a tool screening kit to reduce 30-day readmission rates for general medical	The modified tool may assist in predicting the risk of readmission Further study needed for other risks e.g., is there a difference in readmission w/ home health care, early follow-up, transition programs	Cited X 1; Trust –Yes Hospitalist focus Reference #18 Advisory Board reported several readmission tools and found statistically significant readmission reduction using BOOST Original BOOST: Better Outcomes by Optimizing Safe Transitions The risk factors of depression, health literacy, support, and engagement w/ PCP were not significant for readmission in this study.

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			Small sample for subgroup analysis. Not generalizable		patients with interventions: Improve patient satisfaction, Improve H-CAHPS, Improve flow of information between hospitals and outpatient, Ensure high-risk patients identified for specific interventions, Improve patient and family education using teach-back process to risk-specific issues		
Which Readmissions May be Preventable? Lessons Learned from a Posthospitalization Care Transitions Program for High-risk Elders	McCoy et al. (2018)	Evaluate effects of the Mayo Clinic Care Transitions (MCCTs). Program on potentially preventable and nonpreventable 30-day unplanned readmissions among high-risk elders COPD Hospital admission Risk stratification RCT	Retrospective cohort study and propensity score-matched controls receiving usual primary care Level II B c-stat n/a t-tests, Wilcoxon rank sum, chi sq., ordinal and skewed continuous, nominal, Fishers,	365 pairs of MCCT enrollees primary care, 60 years or older (mean 83), high ERA score, live independent, in specific geo area, hospitalized for any cause between Jan 2011 and June 2013 Similar demographics and clinic characteristic Exclusions: Cancer, End of life/palliative/hospice, HIV,	Primary outcome: Rate of 30-day all cause hospital readmissions among patients enrolled in MCCT compared to matched controls Used ERA (Elder Risk Assessment Tool) Results: MCCT enrollees had significantly lower potentially preventable	MCCT significantly reduces preventable readmissions, suggesting that access to multidisciplinary care can reduce readmissions and improve outcomes for high-risk elders	Cited - 1 Trusted – Yes Combination of stratification tools: ERA (older patients only) and Charlson NP home visits Question: how was high-risk determined

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		Google Scholar NURS620 Search 2/2020 Fit- Yes, Risk stratification tool	Kaplan Meier, Cox PH model Limitations: Not powered for each category computer algorithm possible misclassification lack of generalizability due to population	AMA	readmissions, reduced by 44% 3M algorithm identified potentially preventable readmissions and subset of ambulatory care preventable readmissions		
Clinical Validation of a Risk Scale for Serious Outcomes Among Patients with COPD Managed in the Emergency Department.	Stiell et al. (December 03, 2018)	Validate, prospectively and explicitly, the OCRS when applied in ED by physicians. Ottawa COPD Risk Scale (OCRS), 10 criteria, was previously derived in ED with COPD at high risk for short-term serious outcomes COPD Hospital admission Risk stratification RCT Google Scholar	Nonexperimental Quantitative Prospective cohort Level III C Statistical Analysis: Criterion interpretation, calculated sensitivity and specificity with 95% CIs, admission proportion Limitations: Population selection may	6 tertiary care hospitals, adults with AECOPD from May 2011 to December 2013. 1415 patients with a mean age of 70.6 (SD 10.6) years and 50.2% were female. Monitored 30 days for short-term serious outcomes of death, admit to monitored unit, intubation, NIV, MI, readmission occurred in 135 (9.5%) cases Inclusion Consecutive eligible adults age >50 with	Primary outcome: validate prospectively the OCRS for its accuracy in predicting short-term serious outcomes Secondary outcome: Document acceptability with clinicians and its potential effect on patient safety and hospital admissions Results: Our study allowed physicians to apply the OCRS explicitly	This risk scale can now be used to help ED disposition decisions for patients with COPD, which should lead to a decrease in unnecessary admissions and in unsafe discharges	Cited - 6 Trust - Yes Different country ED application AECOPD defined May have application to UC or acute clinic visits

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		NURS620 Search 2/2020 Fit- Yes, risk stratification tool	be biased, unable to generalize	AECOPD considered well enough for discharge Exclusion: Extremely ill after 2 to 12 hours of ED management, confusion, disorientation, or dementia; chest pain, acute ischemic ST–T, death expected within weeks from chronic illness, long-term– or chronic-care facility; long-term hemodialysis, enrolled in the study in the previous 2 months	in real-time for patients AECOPD OCRS showed better sensitivity for short-term serious outcomes compared with current practice		
INTERVENTIONS: **Clinical – Access to care, GBT, health coaching/MI, comprehensive care, care transitions, integrated care, patient education/action plan** **Patient – Risk factors, self-management/self-monitor** **MULTIPLE INTERVENTIONS**							
Health Coaching and COPD Rehospitalization	Benzo et al. (2016)	To determine the effect of comprehensive health coaching on the rate of COPD readmissions	RCT Level 1A Statistical analysis compared two treatment groups using X2 tests, two-sided z-test Analyses SAS version 9.4	215 patients hospitalized with AECOPD received either MI health coaching plus written action plan for AECOPD and exercise advice or usual care with 1 year follow up	Primary endpoint COPD related hospitalization 12 mos. with secondary endpoints 1, 3, 6 mos. Improved QOL/CRDQ. No differences in physical activity	Health coaching feasible and possible effective intervention to reduce COPD readmissions	Trust – Yes Mayo and Health Partners study

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Update on Clinical Aspects of COPD	Celli, B. & Wedzicha, J. (2019)	To provide updated clinic aspects of COPD	Expert Opinion Review V B	COPD	Considerations for GBT	Think of COPD as a syndrome rather than a single disease	Yes
Promises and Perils of Telehealth in the Current Erra	Mahtta et al. (2021)	To provide insight for merit and failings of telehealth	Health Policy Contemporary Review V A	Telehealth services	Cost-effective, improves access and timely care, match supply and demand however Potential to widen disparities if used inappropriately, may increase costs if overused, and cybersecurity threats	Post-pandemic telehealth policy	Yes
Interventions to Reduce Rehospitalizations After COPD Exacerbations	Prieto-Centurion et al. (2014)	Report results of a systematic review of RCT evaluating interventions to decrease rehospitalizations after AECOPD Databases included in the review: Google Scholar, Web of Science, PubMed, EMBASE, CINAHL, Cochrane	Systematic Review of RCT Level 1 C Statistical Analysis c-stat because of heterogeneity of interventions, measures, outcomes, used narrative synthesis as opposed to meta-analysis Limitations Heterogeneity,	Multiple databases searched Jan 1966-June 2013 913 titles and abstracts screened; 5 studies (1,393 participants) met eligibility criteria Inclusion criteria: Search words and terms were identified. English language, RCT, COPD patients, Hospitalization within the prior 12 months, Primary outcome rehospitalization Exclusion if solo focus:	Primary outcome of all studies: rehospitalization at 6-12 months. No study examined 30-day rehospitalization Interventions classified into three categories: 1.predischarge, 2.postdischarge, 3.bridging spanned pre- and post-discharge	Evidence base inadequate to recommend specific interventions to decrease rehospitalizations after AECOPD Caution when implementing programs given heterogeneity and risk of death in one study, presence of comorbidity will be inefficient and burdensome.	Cited – 58 Only U.S. study (Fan et al, 2012) showed higher risk mortality in the intervention group at VA centers using comprehensive care (unclear which intervention was effective or harmful) Requested Fan study from Interlibrary loan 4/28/2020 Cited BOOST with caveat to

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			Possibly missed identifying an intervention, did not include pharm studies, limitations in understanding study designs	Decrease LOS, Pharmacology, Procedures, Technology-base, Pulmonary Rehab		Rather focus on care coordination in ambulatory setting and address socioeconomics supplemented with GBT Variable content of 1. interventions and context e.g., home visit topics, number and timing of visits), 2. measurements e.g., self-reports, EMR review, reporting, 3.inconsistent patient reports for socioeconomics	add EBP modules for AECOPD
COPD Readmissions: Addressing COPD in the era of Value-Based Health Care	Shah et al. (2016)	Summarize current challenges and knowledge about AECOPD readmits, inform ongoing work to improve care quality, reduce	Literature Review Level V B/C Statistical Analysis brief points of discussion:	Identified risk factors for early readmissions after AECOPD and discusses tested and emerging strategies to reduce these readmissions	Variables in coding – provider, biller and location, Defining and caring for “preventable” and “all cause” readmissions	Consensus to define AECOPD ICD9-10 provider or biller, Real time data,	Cited - 42 Trust – Yes Frailty: look at size not strength of quad and speed not duration of walk

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		readmissions after AECOPD Reference hand search 3/2020 Fit-Yes, considerations for definitions and interventions for AECOPD with readmissions	Cochrane review risk ratio 0.77, c-stat varied 0.71-0.82 Limitations Not id'd	Evaluate the current HRRP and future policy change Inclusion Defining AECOPD, Coding, Risk Prediction including comorbidity, Self-management and education with teach-back, PR, Telehealth, Medications, Financial constraints Comprehensive care management, /Exclusion	Variances in health care system readmission policies (public/private, urban/rural) and availability of diagnostic measures and interventions Telehealth demonstrated decrease in ED and hospital admits over 1 year High risk factors defined: frailty, HF, DM, renal failure, psych conditions, drug and alcohol use, disease severity/breathlessness, low BMI, discharge to post-acute care, >LOS, Medicare/caid, possible male and black race Interventions Table and Variable success of interventions shifting focus on large network collaboratives	Ability to predict and identify high-risk patients especially vulnerable patients, identify programs to improve clinical efficacy and reduce costs and address policy issues such as reimbursement to the community in value-based care Re-evaluation of the home as an ideal setting for AECOPD treatment	Great summary and considerations 1/3 patients readmitted in the first week of discharge by PCP, pulmonologist or practitioner-led home visit

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SELF-MANAGEMENT/ADHERENCE							
Post-Hospitalization Management of Patients with COPD	Blaha et al. (2018)	Aim papers reviewed b/n 2016 and 2017 for economics of interventions post HRRP **CHECK: QI** improvement project using transitions theory to better understand factors influencing COPD readmissions, analysis of nursing specific interventions, post-acute care follow-up and targeted medical interventions Fit – Yes, interventions for managing COPD	Level V B SPSS software, Pearson's chi-square Limitations: Small sample, Limited data collection period, Unable to generalize	Patients discharged to home with primary Dx COPD between Jan 2017-May 2017. Exclusion: No primary Dx COPD, Discharged to SNF Used LACE: LOS, Acuity of Admission, Comorbidity, ED services	Gaps: inconsistent Rx, Rx nonadherence, inconsistent post-discharge follow-up, specialty follow-up inconsistent Findings associated with higher readmit: Self-management/non-adherence, Rx concerns, Younger age on public insurance, >LOS, Comorbidity, GBT/flu vac and symptom control, APP or MD acceptable, Nursing and RT important	Risk stratification critical, ID risk factors important and More research needed on economic impact of interventions	Cited - 0 Some older studies included for discussion Unknowns interdisciplinary and bundled programs
TRANSITIONAL CARE **Broad range of services and environments designed to promote the safe and timely passage of patients between levels of healthcare and across care settings; improve "handoff" of patients and their family caregivers**							

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
Models of Care Across the Continuum of Exacerbation for Patients with COPD	Bourbeau & Echevarria (2019)	Approaches of care and outcomes of interest including hospital readmissions, mortality, health status and cost-effectiveness Search Article ASP PubMed 2/2020 Fit – Yes, models of care for COPD to reduce readmissions, mortality, and costs	Narrative Review Level V A Statistical Analysis Machine learning use of computations of past information to improve performance or make accurate predictions (validation studies pending in real-life scenarios) Limitation: Expert understanding with foundation of evidence for model of care. However, different country.	Different models of care across the continuum of exacerbations (1) chronic care and self-management interventions with the action plan, (2) domiciliary care (RCT) for severe exacerbation and the impact on readmission prevention and (3) the discharge care bundle (variable evidence) for AECOPD management Inclusion/Exclusion AECOPD Chronic care and self-management with action plans (cost savings), Domiciliary care including HAH criteria (cost savings), Discharge care bundle (insufficient evidence)	COPD bundles may also improve the transition of care from the hospital to the community following exacerbation and may reduce readmission rates Model of Care Based on prior cost savings and RCT	Future models should be personalized and adaptable to the patient situation, severity of disease, comorbidity, access to health care Identify patient needs, preferences, goals to design the care plan Focus on improved communication, co-morbidities, social determinants, patient education, self-management, quality of care, risk stratification and risk factor identification	Cited - 1 Trust – Yes Cited DECAF to id low-risk patients in the hospital that may be appropriate instead for HAH Defines self-management intervention well
Readmissions for COPD, 2008	Elixhauser, A., Au, D., Podulka, J. (2011)	High and variable rates of readmissions may indicate suboptimal	Statistical Brief Level V A	COPD 15 states, 190,700 admissions	Presented data regarding hospital readmissions within 30 days	Quality care including Transitional care	Yes

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
		management of patients following hospital discharge					
Nurse practitioner-led transitional care interventions: An integrative review	Mora et al. (2017)	Synthesize literature related to NP-led transitional care interventions aimed at reducing hospital readmission among community-dwelling adults >65 years of age Analyze the research question: In community-dwelling adults >65, can NP-led intervention vs standard care affect hospital readmissions Google Scholar 2/2020 Fit – Yes, intervention to decrease preventable readmissions within 30 days	Literature Review Level V A Statistical Analysis/ Synthesis of three RTCs, one meta-analysis, and four nonrandomized studies reviewed TCM intervention Limitation: APN specialty not specified, Interventions initiated in hospital, Variable study designs make it difficult to determine if decline in readmissions directly related to NP interventions,	Patients with multiple comorbidities 8 studies in a variety of international health care settings, 11,085 patients, mean age 73.9 Inclusion: Focus on randomized control trials (RTCs) containing NP-led TCM interventions with older adults	No standard intervention NPs follow patient daily IP identify Goals, Action Plan, Rxs and Communication Results: Phone calls (e.g., within 72 hrs after discharge and available by phone prn x90 days), Home visits (e.g., home within 24 hrs of discharge then weekly x4 then biweekly x4) by NPs decrease hospital readmissions but only intermittently statistically significant	Use of theoretical framework to guide care Standardized procedure and documentation protocol (checklist) for assessments and parameters to guide home visits and phone calls by NPs	Trust – Yes Cited x 17

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
			Lack of distinction between nurse and NP, HMO, Each patient did not receive the intended intervention				
COMPREHENSIVE CARE STUDIES **Provide personal health services for diagnosis, treatment, follow-up, and rehabilitation of patients and aims to offer personalized treatment to suit individual needs. Comprehensive care consists of self-management and pulmonary rehabilitation and involves multiple healthcare providers working together closely to provide formal structured programs for patients**							
Development and feasibility of a COPD self-management intervention delivered with motivational interviewing strategies	Benzo et al. (2013)	Aim to increase patient engagement and commitment to improve self-management with overarching goal to reduce COPD related hospitalizations	Quasi prospective randomized pilot	12 weekly sessions to train registered nurse and respiratory therapist using MI with 44 patients (544 encounters)	Pilot self-management intervention including motivational interviewing to guide patient, increase patient engagement and commitment to self-management with goal to reduce readmissions in COPD patients, produced no harm and improved patient satisfaction and self-management primarily through use of written action plan and patient	Improved QOL, fit and patient acceptability of self-management intervention	Trust -Yes Mayo and Health Partners

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
					engagement (Benzo et al., 2013)		
Reducing Readmission in Heart Failure and COPD	Kalhan, R., & Mutharason, R. (2018)	Present 10 practical tips to reduce readmissions in this challenging population Search Article WorldCat 2/2020 Fit - Yes	Gray Lit Level V B Expert report but limited discussion comparative to degree of literature not cited Statistical Analysis – n/a Limitations Consider practical practice considerations for reducing readmissions, but emphasize that these recommendations are not robustly evidence based	Tips in Practice Management Inclusion/Exclusion COPD and HF	"Map" Diagnose accurately, detect AECOPD early, risk stratification, specialist management, modify underlying disease substrate, EBP health coaching w/ feedback, early follow-up prior to discharge, address comorbidities, at home services	The multidisciplinary care teams needed to support these care models pose expense to the health-care system Little is known about which patients benefit most from specialist care. One approach to consider is to identify patients at highest risk using prediction tools for COPD and HF In the context of an ACO, or bundled payments, financial incentives align well with team-based integrated care delivery model	Cited - 2 Trust –Yes Effective process of care interventions or bundles of care interventions that scale reliably across practice settings and health-care systems have yet to be described for either HF or COPD Quality references to research

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
						Activate the patient and develop critical health behaviors	
Comprehensive Care Program for Patients with Chronic Obstructive Pulmonary Disease: A Randomized Controlled Trial	Ko et al. (2017)	Assess whether a comprehensive care program would decrease hospital readmissions and LOS Search Article ASP 2/2020 Fit – Yes, interventions for managing COPD	RCT Level I B SPSS 21, intention to treat, binominal regression, Mann-Whitney U test, Cox PH model and log rank test Limits: Unknown if generalizable outside of China, 90% male, longer time of study needed to see if effects could be maintained, cost effectiveness not studied	180 patients June 2010-2012 Research clinic China Intervention: Nurse education, Pulmonary Rehabilitation, 3 monthly calls by nurse x1 year, respiratory specialist every 3 months x 1 year Inclusion: Patients admitted with AECOPD Exclusion: Age <40, Asthma, or other chronic lung disease, severely limiting or terminal disease, unable to give informed consent	Primary endpoint: hospital readmission rate at 1 year Secondary endpoints: QOL, mortality, lung function, and exercise capacity at 1 year Results: Comprehensive COPD program can reduce hospital readmissions for COPD and LOS, in addition to improving symptoms and quality of life	Heterogeneity of interventions, population studied, follow-up and outcome difficult to recommend but comprehensive individualized care plans can decrease hospital readmits and LOS over 1 year Further studies to test which component contributes to the desired outcomes with cost efficacy	Cited - 18 Trust - Yes
Reducing COPD Hospital Readmissions: An official ATS workshop Report	Press, V., Au, D., Bourbeau, M. et al. (2018)	Workshop Report on current best practices and models for addressing COPD readmissions	Gray Lit Level V A Designs ranged from QI to value-based models	Clinicians, researchers, payers, program leaders, nationally to present and discuss 5 case presentations with	Points of discussion: Communicate, Patient education, Behavior modification, Health coaching,	Attention to inability to afford Rx, gaps in care quality, move beyond 30-day penalty especially for	Cited - 8 Trust -Yes

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
		Fit – Yes, reported risk stratification tool, interventions	Statistical Analysis/ c-stat – n/a but comments on c-stat Limitations – n/a	greatest potential for success Inclusion/Exclusion (improve ID of AECOPD upon admission) readmission reduction programs Single and multisite	Guideline base therapy, Rigorous studies w/RCT, Quality of care to not focus on 30-day readmit, Improve risk factor identification and high-risk patients	safety net hospitals with lower socioeconomics	
Insights About the Economic Impact of COPD Readmissions Post Implementation of the HRRP	Press, V., Konetzka, R., & White, S. (2018)	Describe insights about the economic impact of COPD **readmissions** Search Database CINAHL, Medline, Nexis Uni Topic: Variable results risk factors, higher costs, interventions, significance of problem	Expert Review Level V B/C Statistical Analysis/ c-stat n/a Limitations – n/a	Based on articles published over 18 months Inclusion/Exclusion Evidence of Significance and Interventions related to AECOPD Readmissions	Interdisciplinary teams, bundle care interventions, quality of care, and improved process measures Results: Success at reducing readmissions and cost savings varied across the studies The literature points to factors and conditions placing patients at higher risk of readmissions and may lead to higher costs Interventions aimed at reducing readmissions after index admissions for AECOPD have demonstrated variable results		Cited – 9 Trust –Yes

Title	Author/Year	Research Aim Search Terms Database Dates Fit (PICOT)	Type of Evidence Level /Quality c-stat Limitations	Population Inclusion/ Exclusion	Outcomes/ Results	Recommendations or Implications for Study	Times cited Trust Notes
					Most interventions did not reflect cost-based analyses		
INTEGRATED CARE STUDIES **An overarching term for a broad and multi-component set of ideas and principles that seek to better co-ordinate care around people's needs. Merge key aspects in design and delivery of care systems that are fragmented (combine parts to form a whole) and provide attentive treatment to patients in need to improve care/outcomes.**							
Effectiveness of Community-Based Integrated Care in Frail COPD Patients: A RCT.	Hernández (2015)	Community-based Integrated Care (IC) service in preventing hospitalizations and ED visits in stable frail COPD patients COPD and hospital admission and risk stratification; RCT Google Scholar NURS620 Search 2/2020 Fit- Yes, Intervention for AECOPD	RCT Level I A t-test and x2 tests multivariate logistic and Cox regression analysis STATA 10.0 Limitations: Not possible to id planned vs unplanned readmissions. IC management not adopted in the community thus was not continued. No included in clinical trials registry. Long delay between data collection and reporting	Apr to Dec 2005, 155 frail community-dwelling COPD randomly assigned The IC intervention (a) empower self-management; (b) individualized care plan; (c) access to a call center; and (d) coordination between the levels of care. Hospital admissions, ED visits and mortality were monitored for 6 years Inclusion Ag >45, COPD related Dx including TB, living at home within the hospital area Exclusion nursing home, involved in another study, death, unable to locate	Primary Aim: Assess IC effectiveness in subset of COPD pop that is high risk Results: IC statistically enhanced self-management, reduced anxiety and depression and improved health-related quality of life IC statistically reduced ED visits and mortality but not hospital admission No differences between the two groups were seen after 6 years	The study facilitated two key requirements for adoption of IC services in the community: 1.Change management, 2. Workforce preparation. Appropriate Population-based risk stratification for case findings and individual risk prediction of patients (age, frailty, severe FEV1) to support decision-making	Cited - 19 Trusted -Yes How did they define "frail" Did not reduce readmission but did reduce ED use for admissions (coordinated admission from OP to IP) and mortality

Appendix B Johns Hopkins Evidence-Based Practice
Synthesis and Evidence Tool

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings Evidence That Answers the EBP Question
Level I · Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	RCT	A	• Reduced readmissions 1, 3, 6, 9 mo but not 12 mo, improved QOL and dyspnea score (Benzo et al., 2016) • Intervention: Motivational Interviewing health coaching with action plan, hotline • RN, RT TC, F2F x1 (2 hour) then phone (weekly)
	RCT	A	• Decreased ED use and mortality improved self-management but no decrease readmission. Recommended appropriate risk stratification and preparation of the community workforce (Hernandez et al., 2015) • Intervention: Integrated Care intervention (using communication, self-management, pulmonary nurse, hotline) • Specialty respiratory RN • Home visit (2 hr with specialty RN, PCP, nurse, SW) (3 day then frequency tailored to patient)
	RCT	B	• Reduced readmissions 12 mo (Ko et al., 2017) • Intervention: Comprehensive Care Communication, GBT, hotline • Respiratory physician (initial and if necessary, thereafter) and respiratory nurse, Physiotherapist, PCP • TC, community
	Systematic Review of 5 RCT	B/C	• Reduced readmissions 6-12 months • Intervention: Multiple communications, patient hotline and COPD patient education (Prieto-Centurion et al., 2014) • RN, RN-SW-MD, RN-PT-RT • Home visits, Calls (monthly)
Level II	Experimental- quasi	A	• Overarching goal reduced readmission

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings Evidence That Answers the EBP Question
· Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis			• Intervention: Pilot SM with action plan, hotline, MI produced no harm, improved patient satisfaction (Benzo et al., 2013) • RN, RT • F2F (weekly)
	Experimental- quasi	A	• Risk stratification predicts readmission and death 30, 90 days • COPD patients for high risk of readmission or death identified with good c-stats using the PEARL tool for risk stratification with a summary of interventions, resources, recommendations to reduce risk of readmissions (Echevarria et al., 2017)
Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without meta-synthesis	Systematic Review Qualitative Synthesis	B	• Identified high-risk readmissions at 30 day • Readmission PM needed to identify high risk patients and interventions compatible with clinical workflows and administrative use for resource allocation (Kansagara et al., 2011) • Functional and Social variables improved PM
	Systematic Review Qualitative Synthesis	B	• PMs for risk stratification 2 weeks - years • Multimorbidity are strong predictors for readmissions (Alonso-Moran et al., 2015)
	Non-experimental	A/B	• Risk factors predict readmission at 30 day • Readmissions are associated with identified patient and clinical factors. A COPD-specific risk stratification algorithm is needed reflecting these factors (Jacobs et al., 2018)
	Non-experimental	B	• Predictors of 30-day readmissions • Risk stratification and mortality prognosis associated with specific comorbidities including (Krishnan et al., 2019)

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings Evidence That Answers the EBP Question
Level IV · Opinion of respected authorities and/or reports of nationally recognized expert committees/consensus panels based on scientific evidence	N/A	N/A	N/A
Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence	Integrative Review of RCT, PM	A	• Models of care to reduce readmissions 30 days – 2 years • Intervention: Transitional Care to community with patient education, action plan, SM, communication, adapting to patient-specific situation, disease severity, comorbidities, access to care telemedicine. Need transitional studies from acute care to community care (Bourbeau & Echevarria, 2020) • Health coaches, case managers or health navigators, health care professionals • PR, Community (increase care contact with higher risk)
	Integrative Review of 3 RCTs, 1 meta-analysis, 4 non-RCTs	A	• Decrease 30-day preventable all-cause readmissions (Mora et al., 2017) • Intervention: NP-led Transitional Care patient hotline, communications • NP, PCP • Home visits, phone calls (3-day, weekly)
	Professional Society Workshop Report	A	• Focus and quality beyond 30 days readmit • Intervention: Comprehensive 1. Communication, 2. Patient adherence, education, SM, MI, health coaching, prompt access to care 3. GBT and include multimorbidity and social determinants, 4. Rigorous study designs needed, 5. Address quality with mortality metrics, patient satisfaction, symptoms and exercise tolerance 6. Identification risk factors and high-risk patients (Press et al., 2018) • RN, NP, PR, Pulmonary Physician champion

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings Evidence That Answers the EBP Question
			• Home visit care manager, specialty clinic, e-consults (2-3 days, within 1 week)
	Quality Improvement Report	A/B	• Reduced 30-day readmission rate • Intervention: Retrospective review evaluating cause of readmissions for areas of improvement using a face validated tool for risk stratification and transitional care. (Deniger et al., 2015) • NP (for high risk) and RN (for moderate risk) • home visit within 48 hrs followed by phone visits prn for highest risk group and telephone call within 72 hrs then prn for moderate risk
	Quality Improvement Report	B	• Reduced 30-day readmission rate • Intervention: Transitional Care pilot PR, SM, follow up communications and phone calls, GBT, targeted interventions in high-risk group have greatest potential to reduce readmissions (Blaha et al., 2018) • Specialists, RN, PCP, health coach • Home visits, telehealth, PR (weekly)
	Integrated review but w/o identified search strategy or consistently defined study design of publications reviewed	B/C	• Reduced readmission 30 days • Intervention: Comprehensive care management with identified risks table, communication, SM, education teach to goal, early follow up, evaluated policies for HRRP on goals and value-based care (Shah et al., 2016) • RN, RT, pulmonologist, PCP • Home visits, telehealth (within 1 week)

COPD Chronic Obstructive Pulmonary Disease
EBP Evidence-Based Practice
F2F Face to Face Pulmonary Clinic Visit
GBT Guideline-Based Therapy
HRRP Hospital Readmission Reduction Program
NP Nurse Practitioner
PCP Primary Care Provider
PM Predictive Model
PR Pulmonary Rehabilitation
PT Physical Therapist
RCT Randomized Control Trial
RN Registered Nurse
RT Respiratory Therapist
SM Self-Management
SW Social Worker
TC Transitional Care

Appendix C PEARL Risk Stratification Tool

PEARL Score *Prediction of 90-day readmission or death risk*		Circle
P	**P**revious admissions (≥2) *Admission to inpatient hospital ward. Do not count attendance at A&E, Ambulatory Care or day-case units.*	3
E	**e**MRCD 4 (Stops for breath after about 100m or after a few minutes on the level) **e**MRCD 5a (Too breathless to heave the house unassisted but independent in washing and/or dressing) **a**MRCD 5b (Too breathless to leave the house but requires help with washing AND dressing)	1 2 3
A	**A**ge (≥80)	1
R	**R**ight sided heart failure *Clinical diagnosis of Cor Pulmonale (with or without imaging)*	1
L	**L**eft sided heart failure *Confirmed by cardiac imaging*	1
	Total PEARL Score	
90-day risk of readmission or death: **PEARL 0-1 (low risk) = 20.7%; PEARL 2-4 (intermediate risk) = 42.1%; PEARL ≥5 (high risk) = 66.4%**		

Echevarria, C., Steer, J., Heslop-Marshall, K., Stenton, S. C., Hickey, P. M., Hughes, R., … Bourke, S. C. (2017). The PEARL score predicts 90-day readmission or death after hospitalization for acute exacerbation of COPD. Thorax, 72(8), 686–693. https://doi.org/10.1136/thoraxjnl-2016-209298 (S. Bourke, personal communication, June 26, 2020). Reproduced with permission for open and free use.

Appendix D Stetler Theoretical Model

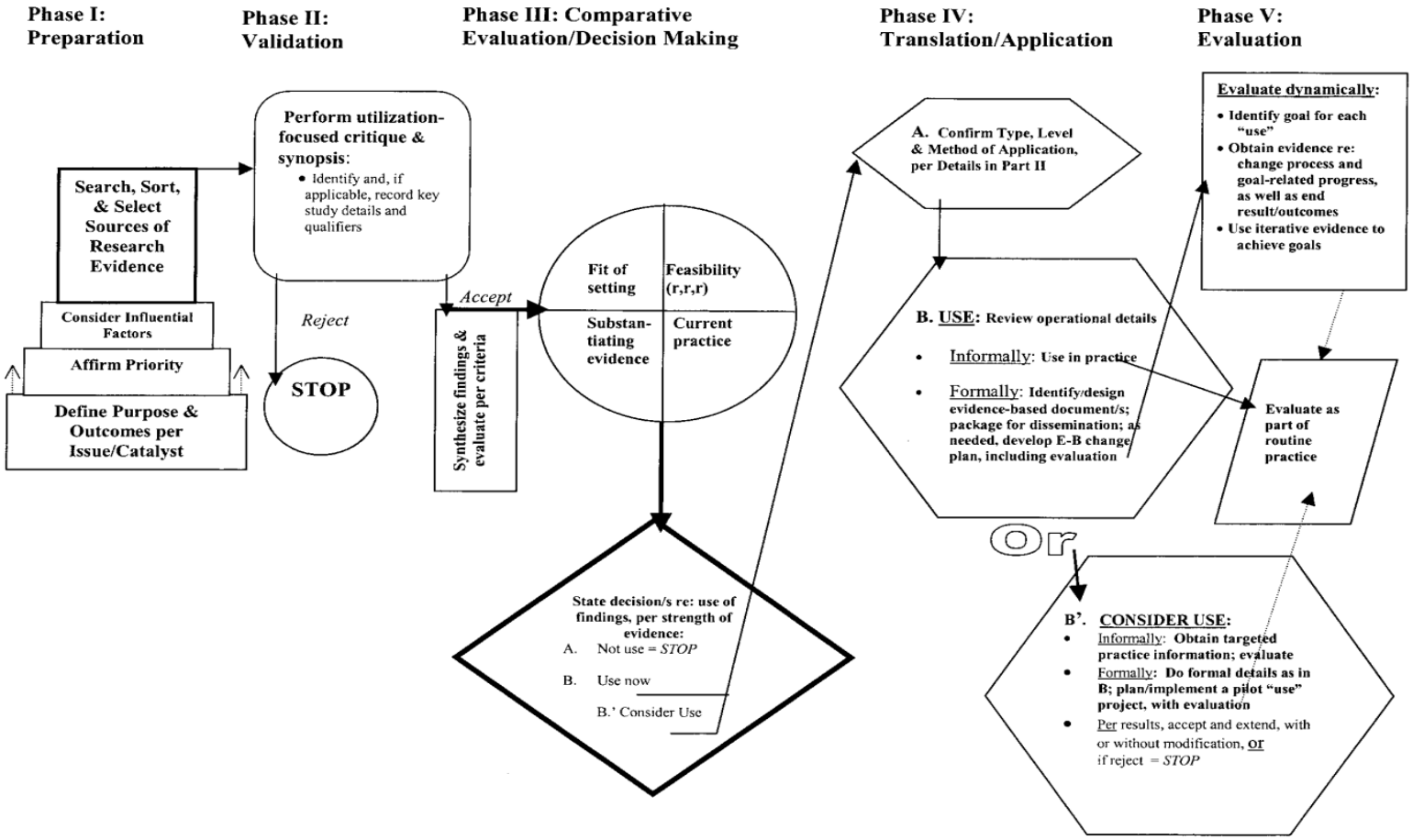

Figure 3A. Stetler Model, Part I: Steps of research utilization to facilitate EBP.

Stetler, C. (2001). From, Updating the Stetler Model of research utilization to facilitate evidence-based practice. Nursing Outlook, 49(6). Retrieved from https://doi.org/10.1067/mno.2001.120517. Copyright © 2001 by Mosby, Inc. No permission for use required.

Appendix E Logic Model

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
What we invest: resources and contributions	**What we do**	**What we accomplish or produce from the activities**	**Who we reach with our activities**	**The expected changes attainable during the DNP Scholarly Project timeline.**	**The expected changes attainable 6 months - 2 years after the DNP Project is implemented.**	**Fundamental changes for participants or community because of project activities, 3-5 years after project implementation.**
Human Stakeholders, Center for Excellence, IRB Health System Partners, Providers, Computer Personnel (Coders) Clinic Managers **Organization** Computer, Audiovisual, Office Supplies, Meeting space, medical devices, Pulmonary Function Testing (PFT) lab **Financial:** Cost of medical devices for patient care using telehealth, Transportation if domicile care	• Schedule meetings for the following activities/actions: • Approval for SP pilot (done 9/2020) • Agree on process to confirm diagnosis • Develop transition from hospital discharge to pulmonary clinic process (communication/ message, referral, ICD9/10 AECOPD, COPD, Respiratory failure as primary/secondary diagnosis, inclusion/exclusion) • Define pulmonary clinic visit: 1-2	• Patients have timely access to the pulmonary clinic	Patients	**1.** 50% of COPD patients referred to the pulmonary clinic are seen within 7-14 days of discharge (PO) **2.** 50% of COPD patients referred to the pulmonary clinic access 3 out of 4 outpatient pulmonary clinic visits within 30 days s/p discharge (PO) Tool: Data spreadsheet	11. Two additional system sites offer access to the pulmonary clinic within 1-2 years following the SP (PO)	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
	provider(s), timing (days/wks./months) and length of visit (30 and 60 min), location (clinic, telehealth, domicile) • Develop collaborating guidelines with physicians • Develop audit/data spreadsheet					
Human: Providers, Computer Personnel, Clinic Staff, Clinic Management **Organization:** Computer, Office supplies, medical devices **Financial:** Cost of personnel time for training and building templates, data entry and analysis, Costs of medical devices and office supplies	• Create EHR COPD template using technology (hotline calls and pulmonary care visits) to include who (at least one provider, 1-2 MA), does what during encounter (includes risk stratification tool (PEARL*), tables for risks, motivations, barriers, eMRCD*, GBT*, comorbidity using SOAP* format) • Training event for EHR COPD template by project lead X2 (initial and follow up) • Develop attendance record	• EHR COPD template created • Training completed for template use by X number of people • Document, communicate/advocate and coordinate timely patient care needs with the patient care team that impacts preventive care to improve outcomes and reduce readmissions	Patients and care team, Clinic Staff (1-2 MAs)	**3.** At least 1 pulmonary provider(s), and staff (1-2 MA) in the healthcare facility pulmonary clinic receive training by the project lead to use the EHR COPD template by the end of May 2021 (CO/PO) Tool: In-person meeting for training, EHR COPD template, Data spreadsheet Forms survey	12. 90% of COPD patients in the pulmonary clinic have their care plan communicated to the PCP, care team at the time of the patient clinic visit (CO/PO)	17. Developed system-wide interprofessional communication pathway between hospitals and community levels within 3-5 years (this will include hospital COPD stakeholders, pulmonary clinic, palliative care, primary care, rehabilitation, nursing, respiratory care, pharmacy, social work, population health and patients ("full cycle care" (Hickey & Brosnan, 2017)

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
Human: Computer Personnel Providers, Clinic Staff (MAs), Patients **Organization:** Clinic Space, Computer **Financial:** Cost of personnel time during routine pulmonary clinic visit	• 1-2 Provider(s), 1-2 clinic staff (MAs) action/complete risk stratification tool in EHR COPD template during the pulmonary clinic visit based on completed training • Develop audit/data spreadsheet • Select Likert Satisfaction tool (provider post-test)	• Risk stratification tool use during the pulmonary clinic visit • Patients receive risk stratification identifying higher risk patient population that requires focused, patient-specific interventions and intensified resource allocation	Providers and Patients	**4.** 80% of COPD patients in the healthcare facility pulmonary clinic have risk stratification documentation in the EHR or data spreadsheet by the 2nd pulmonary clinic visit or between June and by the end of August 2021(CO). Tools: EHR audit PEARL, Data Spreadsheet, Likert provider post-test	13. 80% of COPD patients at highest risk for resource utilization are identified system-wide within 1-2 years of implementing risk stratification	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented
Human: Computer Personnel, Providers, Clinic Staff, Patients **Organization:** Clinic Space, Computer **Financial:** Cost of personnel time for training and building templates, data entry and analysis, Costs of office supplies	• Develop and embed motivation scale (pre/post test) in her COPD template • 1-2 Provider(s), 1-2 clinic staff (MAs) complete motivational assessment in EHR during the pulmonary clinic visit based on completed training • Develop audit/data spreadsheet	• Motivations table template created • Patient motivation is identified to improve outcomes and reduce readmissions	Patients and Providers	**5.** 80% of COPD patients in the pulmonary clinic are able to identify patient- specific motivation impacting patient care as documented in the EHR by the 2nd pulmonary clinic visit between June and by the end of August 2021 (CO) Tool: Data Spreadsheet,	14. Resource allocation budget approval coordinated with Stakeholders within 1-2 years for preventive care measures to help patients manage COPD (PO)	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
				Patient Interview, Likert patient motivation pre/post-test)		
Human: Computer Personnel, Providers, Clinic Staff, Patients **Organization:** Clinic Space, Computer **Financial:** Cost of personnel time for training and building templates, data entry and analysis, Costs of office supplies	• Develop and embed checklist table of risk factor with SDoH template in EHR • 1-2 Provider(s), 1-2 clinic staff (MAs) complete risk factor assessment in EHR COPD template during the pulmonary care visit based on completed training • Develop audit/data spreadsheet	• Risk factor with SDoH checklist table template created • Patient-unique risk factors with SDoH are identified that require specific attention to improve outcomes and reduce readmissions	Patients and Providers	**6.** 80% of COPD patients in the pulmonary clinic are able to identify at least one patient-specific risk factor(s) including SDoH for AECOPD documented in the EHR by the 2nd pulmonary clinic visit between June and by the end of August 2021 (CO) Tool: Data Spreadsheet, Patient interview, Multiple Choice Checklist	14. Resource allocation budget approval coordinated with Stakeholders within 1-2 years for preventive care measures to help patients manage COPD (PO)	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented
Human: Stakeholders, Providers, Clinic Staff, Computer Personnel, Patients **Organization:** Clinic Space, Computer **Financial:**	• Develop and embed open ended question in EHR COPD template • 1-2 Provider(s), 1-2 clinic staff (MAs) complete patient beliefs and barriers in EHR during the pulmonary care visit	• Barriers question created • Patients and Stakeholders understand patient beliefs and barriers that may interfere with the care plan interventions, poor outcomes and contribute to readmissions	Patients, Providers and Stakeholders	**7.** 80% of COPD patients in the healthcare facility pulmonary clinic can identify at least 1 patient- specific perceived barrier(s) impacting patient	14. Resource allocation budget approval coordinated with Stakeholders within 1-2 years for preventive care measures to help patients manage COPD (PO)	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
Cost of personnel time for training and building templates, data entry and analysis, Costs of office supplies	based on completed training			care documented in the EHR by the 2nd visit between June and by the end of August 2021 as measured by EHR audit or data spreadsheet tool (CO) Tools: Data Spreadsheet, Patient interview		
Human: Stakeholders (CNE), Providers, Clinic Managers, Hospital and Clinic Staff, Computer Personnel **Organization:** Clinic Space, Computer, Office Supplies Patients Human: Organization: Computer, Audiovisual, Office Supplies **Financial:** Cost of training and using personnel time during routine patient pulmonary care visit Costs of office supplies	• Develop audit/data spreadsheet • Select Likert Knowledge Scale (post-test patient)	• Patient care experience scale created with one patient measure from interview using post-rating 1-5: • Patient: "Overall, how helpful was this project to your understanding of your medical condition?" (Course/Project evaluation or Post-Visit Patient Satisfaction) •	Patients and caregivers	**8.** 80% of COPD patients in the healthcare facility pulmonary clinic report their care experience by the end of August 2021 (CO) Tool: Likert Scale	15. 80% of COPD patients referred to pulmonary clinic identify their patient care experience (CO)	16. COPD hospital readmissions decreased by 2% within 3-5 years after system-wide patient-specific preventive care measures implemented

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
Human: Stakeholders, Providers, Computer Personnel, Hospital and Clinic Staff, Clinic Management **Organization:** Clinic Space, Computer, Office Supplies **Financial:** Cost of personnel time	• Patient pulmonary clinic visits forwarded to patient care team • Agree how to document sent/faxed external communication within EHR • Develop audit/data spreadsheet	• Document, communicate/advocate and coordinate timely patient care needs with the patient care team at pulmonary clinic visits and at time of agreed transfer back to PCP	Patients and care team	**9.** 80% of COPD patients in the healthcare facility pulmonary clinic have their care plan communicated to the PCP and/or care team between June and by the end of August 2021 (CO/PO) Tool: Data spreadsheet	12. 90% of COPD patients in the pulmonary clinic have their care plan communicated to the PCP, care team at the time of the patient pulmonary clinic visit (CO/PO)	17. Developed system-wide interprofessional communication pathway between hospitals and community levels within 3-5 years (this will include hospital COPD stakeholders, pulmonary clinic palliative care, primary care, rehabilitation, nursing, respiratory care, pharmacy, social work, population health and patients ("full cycle care" (Hickey & Brosnan, 2017)
Human: Stakeholders, Health System Foundation, Champions, Computer Personnel **Organization:** Office space, Computer, Office supplies **Financial:**	• Create a report and communicate using technology/virtual meeting high risk patient needs • Provide recommendations for patient resource allocation	• Document created and filled out • Communication of resources needed to provide patient-specific care that impacts ability to provide preventive care to improve outcomes and reduce readmissions	Stakeholders, Providers and Patients	**10.** Document of project outcomes: readmission rate, risk stratification, resource and support services needed for value-based care communicated to	14. Resource allocation budget approval coordinated with Stakeholders within 1-2 years for preventive care measures to help patients manage COPD (PO)	18. Predictive modeling coordinated with Stakeholders within 3-5 years for preventive care measures to help patients manage COPD

Resources*/Inputs	Activities	Outputs		Outcomes: Short term	Outcomes: Intermediate	Outcomes: Long term
Cost of personnel time				Stakeholders by the end of May 2022 (PO) Tool: Report and/or PowerPoint presentation		

***PI Principle Investigator, *Risk stratification tool is the PEARL** (Echevarria et al., 2017b) **throughout the logic model, *eMRCD dyspnea scale, *GBT Guideline-Based Therapy, *SOAP Subjective Objective Assessment Plan patient's pulmonary clinic visit note**

Resources

Personnel:

- Stakeholders: Administration (Acute Care Service Line), Nursing Leadership (Chief Nursing Officer, Center for Nursing Excellence)
- Champions (Pulmonary Specialty Physicians)
- Providers (pulmonary physicians, nurse practitioner, physician assistants)
- Hospital staff (? discharge planner, 3 COPD educators, ? pulmonary rehabilitation, call center)
- Clinic Staff (1-2 trained: MA, RT, schedulers, front office, medical records, call center)
- Computer personnel: IT, Data analytics, EHR/EPIC builders, Coders (1 each)
- Clinic managers
- Faculty

Supplies & Equipment:

- Computer (1 each for personnel involved, ~15)
- Office supplies: Paper, printer (1), ink cartridge, pens, highlighters, stapler/staples, binder clips, telephones (2)
- Medical devices: telehealth iPad/iPhone, stethoscopes, oximeters, vital sign equipment (1 each)

Space:

- Hospital, Clinic (Exam rooms (1-2), PFT lab (1), Online TEAMS meeting space, Transportation to locations)

From, Adapted from, Logic Model Foundation Development Guide, pg. 4.
http://www.wkkf.org/resource-directory/resource/2006/02/wk-kellogg-foundation-logic-model-development-guide.

Appendix F Risk Factors and Social Determinants of Health

Risk Factors/SDoH Table

COPD Readmission prior 30 days	{Yes (1 Point) No:1600000101}
Prior all cause Hospitalization	{Yes (1 Point) No:1600000101}
Length of Stay <2 >5days	{Yes (1 Point) No:1600000101}
Comorbidity: Respiratory, Cardiac or Pneumonia	{Yes (1 Point) No:1600000101}
Comorbidity (3 or more of the following: HF, CVD, HTN, PVD, Dysrhythmias, Bronchiectasis, Infection, Anemia, CA, GERD, Dysphagia, DM, Liver Disorder, Renal Failure, OP, OSA, Cognitive Impairment, Psych/Depression/Anxiety)	{Yes (1 Point) No:1600000101}
Polypharmacy >/=7 or High Risk Rx (anticoag, digoxin, diuretic, narcotic/benzo, insulin)	{Yes (1 Point) No:1600000101}
Social Support (married, children) Lacking or None	{Yes (1 Point) No:1600000101}
Discharge to SNF, LTC in past 6 months:	{Yes (1 Point) No:1600000101}
Clinical Judgement for Risk/Failure	{Yes (1 Point) No:1600000101}
Score risk factors/SDoH: 0-3 (Moderate), score >/=4 (High)	**{NUMBERS; 0-9:23973}**

Appendix F. Adapted from, Deniger, A., Troller, P., & Kennelty, K. A. (2015). Geriatric Transitional Care and Readmissions Review. The Journal for Nurse Practitioners, 11(2), 248–252. https://doi.org/https://doi.org/10.1016/j.nurpra.2014.08.014. (A. Deniger, personal communication, October, 2020). Adapted with permission

Appendix G Memorandum of Understanding

Memorandum of Understanding

Between

Xx, Doctor of Nursing Practice (DNP) student
Xxx
and
Xxxx

This Memorandum of Understanding (MOU) outlines the terms and understanding between the *Xx*, a DNP student at Xxx, and *Xxxx* to pilot a Chronic Obstructive Pulmonary Disease (COPD) readmission project implementing patient risk stratification and facilitating resource allocation.

Background

COPD affects 250 million people worldwide and contributes to the third leading cause of death globally, nationally, and locally (Heron, 2019; Idaho Department of Health and Welfare [IDHW], 2017; World Health Organization [WHO], 2019). The cost of COPD is near $50 billion in the U.S. and acute exacerbation COPD contributes to 70% of COPD-related health care costs and over $15 billion annually for hospital readmissions (Centers for Disease Control and Preventions [CDC], 2020; Press et al., 2018). The local COPD readmission rate is high and comparable to the national rate at 19.5% (Medicare, n.d.). High readmission rates due to COPD have a negative financial and cultural impact on hospital systems. Medicare penalizes health care institutions up to 3% of reimbursements for hospital readmissions (CMS, 2012). Patients with COPD readmissions have high co-morbidities, complex medical needs and to date, there is no single intervention to reduce readmissions (Dal Negro et al., 2015; Press et al., 2018). There is growing advocacy to identify patients who are the top percent users of health care resources and how to support these patients in the health care setting and in their community setting (Mitchell, 2019; RWJF, 2017). Risk stratification is a process that predicts patients at highest risk for resource utilization in order to help prioritize patient-specific, highly complex, time and staff consuming interventions (Crane et al., 2010; Press et al., 2018; Scalable Health, 2018). Identifying and managing high risk populations to track improvement in outcomes over time, demonstrates value to payers known as value-based care (National Council Organization, 2017). Focus is needed for highly intense, quality of care aimed at patient-specific risk stratification, patient-specific risk factor identification and preventive care with strategically allocated resources in outpatient and community settings (Benzo et al., 2013, 2016; Kalhan & Mutharason, 2018; Press et al., 2018).

Purpose

The aims of this pilot project are using expedited transitional care from the time of hospital discharge to outpatient specialty care to identify moderate and high-risk patients through risk stratification, target preventive care interventions through highly intense evaluations, and communicate patient-specific needs for resource allocation.

Intended Project Outcomes

- Improved identification of patients with moderate to high risk for COPD readmission
- Improved communication of patient-specific risks, motivations and barriers to care
- Improved communication for resource allocation specific to higher risk patient needs

Duration
The Scholarly Project will begin within the healthcare facility February 2021 and end April 2022. The initial work starts in February 2021 with the inception of planning activities and training for the implementation phase. The implementation of the project for data collection initiates May 2021 and ends August 2021. Data analysis and evaluation continues through February 2022. The project culminates at the end April 2022 with the dissemination of information in a final report.

Reporting
The DNP Scholarly Project will include a final report, an abstract and an oral presentation of the report for potential publication by April 2022. Interim discussions or reports will be provided throughout the project timeline at the discretion of the DNP student and healthcare facility. The DNP student will submit a Final Project Report for publication in Scholarworks. Scholarworks is a collection of services designed to capture and showcase all scholarly output by the Xxx community, including doctoral dissertations and doctoral project reports.

The final document will be submitted for approval to the Nursing Research Director in the Nursing and Patient Care Center of Excellence. XXXXXXXXX research determination letter will outline specific ethics for the documentation and sharing of information.

No personal identifiers will be included, and all data will be reported in aggregate form. The author welcomes any comments or suggestions from the Xxxx but reserves the right to publish findings and analysis according to professional standards and principles of academic freedom. For any work of a scholarly nature, the author agrees to follow the healthcare facility preferences in how it is to be named (or not) in the work.

Agency preferences for how they are named/referred to within the student's work
The organization will be referred to as a healthcare facility in the intermountain west in school documents, abstract, publication, final report, and professional presentations.

Student and Healthcare Facility Contact

_____ Date:
(*DNP Student signature*)
Xx, Xxx DNP student

_____ Date:
(*Healthcare Facility Contact signature*)
Xx, DNP, RN, NEA-BC, RNC-OB, Senior Director, Nursing & Patient Care Center of Excellence, Xxxx

Appendix H COPD Template

Date of Visit: @TD3@

Patient Name: @NAME@
Date of Birth: @DOB@
PCP: @PCP@

REASON FOR VISIT: @CCN@

In an effort to avoid potential COVID-19 exposure in this patient, this visit occurred by telehealth. Verbal consent {STOP if was not:25643::was} obtained from patient, parent or guardian to provide telehealth services after informed of risks, benefits and alternatives.

Patient identification completed: {Yes/No:2::Yes}
Mode of Communication: {Blank:19197::"Telephone", "Video"}
{If Video specify application (Optional):37698}
Patient Location: {State Location:37697::Idaho}, {Blank:19197::"Home Residence"}
Provider Location: {Blank:19197::"Clinic"}

{Telehealth Time Coding (Optional):38424}

Subjective:

@NAME@ is a pleasant @AGE@ {desc; ethnicity:30356} **@SEX@** who presents for follow up on COPD.
Individuals present include: {LG Patient/Caregiver:40345}

VISIT (insert COPD Visit 1, 2, 3 or 4)

Insert appropriate Visit 1-4 under Subjective:

VISIT 1/4 <u>Hospital Followup, Risk Stratification, Emergency Action Plan, GBT</u>
Since discharge or last visit, any all-cause re-hospitalizations or ED/UC:
{YES/NO/***:38137} Date: ***
Tell me what you understand about your most recent hospitalization: ***

Current Symptoms:
Cough {Desc; cough:27341}
Wheeze {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022902}
Chest pain {desc; chest pain:17949}
SOB: ***

- PEARL (see E below)

PEARL Tool (Echevarria et al., 2017) prediction of readmission or death

P	Prior Admission (>/=2) Admission to inpatient hospital, not Ambulatory or day surgery	{Yes3/No/:40354}
E only score the worse/highest value (4, 5a **or** 5b)	eMRCD 4 (stops to breath after about 100m or after a few minutes on level ground)	{Yes1/No/:40373}
	eMRCD5a (too breathless to leave the house unassisted but can independently shower/dress	{Yes2/No:40374}
	eMRCD 5b (too breathless to leave the house unassisted and requires help with shower/dress)	{Yes3/No/:40354}
A	Age (>80)	{Yes1/No/:40373}
R	Right sided heart failure (with or without imaging of Echo or CXR, or based on clinical s/s age >45, FEV1 <50%, Pa02 <55 or C02 >45, ankle edema, JVD, ascites, EKG)	{Yes1/No/:40373}
L	Left sided heart failure (screen with s/s/BNP but must be confirmed on Echo to score, cannot be clinical)	{Yes1/No/:40373}
	Total PEARL Score	**{numbers 1-12:10294}**
	PEARL 0-1 (low risk) = 20.7% (return to PCP) PEARL 2-4 (moderate risk) =42.1% (followup SLIPA) PEARL >5 (high risk) = 66.4% (followup SLIPA)	

Do you need help around the house: {YES/NO/***:38137}
What are you doing for your health right now: ***

Rx:
Inhaler names: ***
Are the inhalers helpful: {YES/NO/***:38137}
Oxygen therapy: {IFT OXYGEN:304010602}
PAP therapy: {YES/NO/***:38137}
Adherence: {Adherence:33815}

Do you have a plan in the event that your breathing is worsening? {LG Breathing Worse Plan:40349}

Routine Exercise or Pulm Rehab: {Yes/No/NA/:32993}

Priority self-management behavior for pulmonary care
What do you value/enjoy/think about most often: ***
What are your strengths: {BH Strengths:39839}
What is a priority you would like to work on that could improve your health/situation: {LG Health/Situation Priority:40350:a}

Connect thoughts and behaviors with values, strengths, and priorities.
What would you be willing to try before our next meeting? ***

Motivational Questions
"How important is it for you to manage your COPD?" {NUMBERS; 1-10 (OUT OF 10):10902}
"Why it {IS/ IS NOT:23127} important?" ***

"How confident are you that you can help manage your COPD?" {NUMBERS; 1-10 (OUT OF 10):10902}
"How would you change your confidence level ?" ***

What seems most personally relevant to you of all we have discussed today: ***
Reflect and summarize then confirm interview captured the discussion.

Review risk stratification level (see PEARL), emergency action plan, GBT, revise as needed and if readmitted

Describe what to expect next Visit 2: symptoms/emergency plan, self-management, Risk Factors, Priorities, Barriers to Care.

Insert appropriate Visit 1-4 under Subjective:

VISIT 2/4 Risk Factors/Social Determinants, Priority of Care, Barriers to Care
Since discharge or last visit, any all-cause re-hospitalizations or ED/UC: {YES/NO/***:38137} Date: ***

Current symptoms:
SOB {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022069}
Cough {Desc; cough:27341}
Wheeze {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022902}
Chest pain {desc; chest pain:17949}

Rx:
Inhaler names: ***
Oxygen therapy: {IFT OXYGEN:304010602}
PAP therapy: {YES/NO/***:38137}

Adherence: {Adherence:33815}

Do you have a plan in the event that your breathing is worsening? {LG Breathing Worse Plan:40349}

How did work go on your self-management activity from last visit? {LG Self Management Activity :40352}

Negotiate a new plan or continue plan, or modify plan.
Connect thoughts, behaviors and goals to values, strengths and priorities from prior visit

Review VISIT 1, risk stratification, emergency plan, GBT, education, revise as needed

Risk Factors/SDoH Table

COPD Readmission prior 30 days	{Yes (1 Point) No:1600000101}
Prior all cause Hospitalization	{Yes (1 Point) No:1600000101}
Length of Stay <2 >5days	{Yes (1 Point) No:1600000101}
Comorbidity: Respiratory, Cardiac or Pneumonia	{Yes (1 Point) No:1600000101}
Comorbidity (3 or more of the following: HF, CVD, HTN, PVD, Dysrhythmias, Bronchiectasis, Infection, Anemia, CA, GERD, Dysphagia, DM, Liver Disorder, Renal Failure, OP, OSA, Cognitive Impairment, Psych/Depression/Anxiety)	{Yes (1 Point) No:1600000101}
Polypharmacy >/=7 or High Risk Rx (anticoag, digoxin, diuretic, narcotic/benzo, insulin)	{Yes (1 Point) No:1600000101}
Social Support (married, children) Lacking or None	{Yes (1 Point) No:1600000101}
Discharge to SNF, LTC in past 6 months:	{Yes (1 Point) No:1600000101}
Clinical Judgement for Risk/Failure	{Yes (1 Point) No:1600000101}
Score risk factors/SDoH: 0-3 (Moderate), score >/=4 (High)	**{NUMBERS; 0-9:23973}**

Additional Risk Factors Table:
{LG Additional Risk Factors:40353:p}
Age >75-80, Culture (AI/AN higher local risk), Gender (women higher risk), Drugs (Illicit), Smoking, Air Pollution, Deconditioning, Frailty (Quad size, 6MWT speed), Falls 2 or more or any in the past year, Low self-health, Unemployment, Low income level (does not own home), Low education level (less than HS education), State insurances, Medication or Vaccination Non-adherence, Medication (access or technique)

Barriers to Care
Do you think your risk factor score and risk factors above affect your care:
{Yes/No/NA/:32993}
Do you feel you have personal barriers to your care and what are they:
{Yes/No/NA/:32993}
Use affirmation and reflection.

Connect thoughts and behaviors with values, strengths, and priorities.
What would you be willing to try before our next meeting? ***
What seems most personally relevant to you of all we have discussed today: ***
Reflect and summarize then confirm interview captured the discussion.

Describe what to expect next Visit 3: Self-management and Goals of care (in-person visit if possible). Revise and update at each visit and if needed readmissions

Insert appropriate Visit 1-4 under Subjective:

VISIT 3/4 Goals of Care
Since discharge or last visit, any all-cause re-hospitalizations or ED/UC:
{YES/NO/***:38137} Date: ***

Current symptoms:
SOB {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022069}
Cough {Desc; cough:27341}
Wheeze {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022902}
Chest pain {desc; chest pain:17949}

Rx:
Inhaler names: ***
Oxygen therapy: {IFT OXYGEN:304010602}
PAP therapy: {YES/NO/***:38137}
Adherence: {Adherence:33815}

Do you have a plan in the event that your breathing is worsening? {LG Breathing Worse Plan:40349}

Review Visits 1 and 2 risk stratification level, emergency plan, GBT, Risk Factors/Social Determinants, Priorities and Barriers to Care, revise and/or add a new goal

How did work go on your self-management activity from last visit? {LG Self Management Activity :40352}
Negotiate a new plan or continue plan, or modify plan.
Connect thoughts, behaviors and goals to values, strengths and priorities from Visits 1 and 2 or that are new

Goals of Care
Acknowledge these can be meaningful and rewarding but difficult discussions to work through: {YES/NO/***:38137}
In the event you are unable to speak for yourself, who speaks for you? ***
What is your understanding of your lung disease? {DESC; STABLE/IMPROVING/WORSENING:2100020620} {Prognosis:23446}
What is your understanding of what impacts your lung disease? ***
What are you hoping for or your expectations? ***
What do you *not* want to happen? ***

What is important to you in our care for you? {LG Important Care:40355}

What support or resources do you have or need? {LG Support/Resource:40356}

Do you have an advance directive and/or POST form (confirm in snapshot): {YES/NO/***:38137}
If needed discuss CPR outcomes, survival, quality of life post resuscitation: {YES/NO/***:38137}

What seems most personally relevant to you of all we have discussed today: ***
Connects thoughts, behaviors and goals to values, strengths and priorities set previously

Describe what to expect next Visit 4 and future visits: Review visits 1, 2 and 3. Revise and update at each visit and if needed readmissions

Insert appropriate Visit 1-4 under Subjective:

VISIT 4/4 Review and Motivation
Since discharge or last visit, any all-cause re-hospitalizations or ED/UC: {YES/NO/***:38137} Date: ***

Current symptoms:
SOB {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022069}
Cough {Desc; cough:27341}
Wheeze {DESC NONE OCCASIONAL DAILY CHANGE FROM BASELINE:2100022902}
Chest pain {desc; chest pain:17949}

Rx:
Inhaler names: ***
Oxygen therapy: {IFT OXYGEN:304010602}
PAP therapy: {YES/NO/***:38137}
Adherence: {Adherence:33815}

Do you have a plan in the event that your breathing is worsening? {LG Breathing Worse Plan:40349}

How did work go on your self-management activity from our prior visit? {LG Self Management Activity :40352}
Negotiate a new plan or continue plan, or modify plan.

Motivational Questions
"How important is it for you to manage your COPD?" {NUMBERS; 1-10 (OUT OF 10):10902}
"Why it {IS/ IS NOT:23127} important?" ***

"How confident are you that you can help manage your COPD?" {NUMBERS; 1-10 (OUT OF 10):10902}
How would you change your confidence level ***

What seems most personally relevant to you of all we have discussed today and prior visits: ***
Connects thoughts, behaviors and goals to values, strengths, and priorities
Review Visits 1, 2 and 3 risk stratification, emergency plan, self-management, GBT, Risk Factors, Priority of Care, Barriers to Care, Goals of Care, Revise and/or add a new goal

Please have MA ask the patient the following question after provider's Visit 4 completed prior to the the patient departing clinic: "Overall, how helpful was this COPD program to help you understand your medical condition"? {Numbers; 1-5:17750} 1 is lowest score not helpful and 5 is highest score most helpful.

***

Review of Systems: (address pertinent)

@SOCHX@

@PMH@

@IMM@

@ALLERGY@

@CMEDNODISPNOREFILL@

Objective:

@VS@

Visit */4** completed {LG Visit Mode:40357}

Physical Exam:
General appearance: {Exam, General Card:22982}
HEENT: {exam; heent:31974}
CARDIO: {heart exam:315510}
PULM: {Auscultation Lung:20254}
ABD: {Exam; abdomen brief:12273}
EXT: {Exam; extremity:5109}
NEURO: {exam; neuro physical:17800}
PSYCH: {psych exam:16943}

Diagnostics Review/Overview:
Spiro-confirmed obstruction {Yes/No/*:32965}
@RESUFAST(FEV1,FEV1PCT)@
Exacerbation(s): ***
Hospitalization(s): ***

COPD stage: {GOLD Stage categories for COPD (Optional):35758}

6 Minutes Walk Test: {YES/NO/***:38137}

Chest image (COPD or RV changes):
@LASTIMG(rad1039)@
@LASTIMG(RAD6027)@

Echo (RV TAPSE [or EKG R axis deviation] and LV EF)
@LASTECHO@

Labs:
AAT
@RESUFAST(A1APHENOTYPE,A1ATRYPSIN)@

ABG:
@RESUFAST(PH,PCO2ART,PO2ART,BICARBONATE,BASEEXCESS,PHADJ,O2SATART,LACTATE,FIO2,SAMPLETYPE,DELSYS,ALLENTEST,BODYTEMPERAT)@

CBC:
@RESUFAST(WBC,HGB,HEMATOCRIT,EOSINOMAN,EOSINOABS)@

Smoking and/or environmental exposure {YES/NO/***:38137}

Vaccinations
@IMM@

Oxygen therapy
Resting SPO2 on room air: *** %
Walking SPO2 *without* oxygen: *** %
Walking SPO2 *with* oxygen: *** % on *** LPM

Pulmonary Rehabilitation or routine home exercise: {YES/NO/***:38137}

Rx/Inhaler therapy: ***

INHALER EDUCATION:	{INHALER EDU GIVEN BY:31486}
RE-DEMO:	{INHALER EDU PT REDEMO:31487}
SPACER:	{SPACER GIVEN/NOT:31525}

(Pharmaceutical Assistance {YES/NO/***:38137})

PAP COMPLIANCE DATA DOWNLOAD
@FLOW(11,14,301070,2100001264,2100001271,2100001272,2100001273,2100001261,2100001275,2100001276,2100001277,2100001278,2100001279,7070561,7070563,437,4376,4377,4378,4380,4382,4490,2100001268,2100001269,2100001267,4381,12845:LAST)@

Assessment/Plan:

@PROBAPNOTES@

@NAME@ has a COPD PEARL risk score {Desc; low/moderate/high:110033} for readmission or death due to AECOPD: {LG Score Risk:40375}

{kar He She They:38442} has COPD, {Mild/Moderate/Severe:27396} with symptoms {DESC; STABLE/IMPROVING/WORSENING:2100020620}

Summary of evaluation and differential or contributing factors to pulmonary care: ***

Emergency Action Plan discussed: {YES/NO/***:38137::"yes"}
Risk Factor/SDoH (from Visit 2) score is {Desc; low/moderate/high:110033}.
Barrier to care (from Visit 2): {Yes/no/NA/Results Pending:38513::"Results pending"}
Goals of Care (from Visit 3): {Yes/no/NA/Results Pending:38513::"Results pending"}
CODE STATUS: {Code Status:22922}

Patient-specific recommendations are the following:
Patient's self-management priority: ***
Diagnostic Tests Recommended: ***

Tobacco Counseling: Patient {WAS/WAS NOT:2100118327} counseled on the risks of tobacco use. @CAPHE@ @TOBHXP@.

Medication Reconciliation: {YES/NO/***:38137}

02 therapy: {increase/continue/decrease:33428}
- Current *** LPM
- Adherence: {Adherence:33815}

PAP therapy: {YES/NO/***:38137}
- Adherence: {Adherence:33815}

Inhalers: ***
Roflumilast if indication (severe COPD with AECOPD): {YES/NO/***:38137}

Vaccinations: {up to date:24347}

Exercise (Pulmonary Rehabilitation or PT): {Responses; yes/no/refused:28835}

Support/Referral: {Desc; advisable/necessary/not necessary:16725} for ***

Comorbidity Management/Previous referrals {LG Previous Referrals:40376} ***

Patient Education*:* {CRehab Learner Primary Learning Style:32047}; confirmed {YES/NO/***:38137}
- Resource Live Well with COPD booklet and/or COPD Pocket Consultant Guide App {YES/NO/***:38137}
- Patient and/or patient's family, {ACTIONS; HAVE/HAVE NOT:19434} received the appropriate education on the treatment stated above, and have expressed understanding and comprehension of the plan.

Orders:

@DIAGORDERS@

Patient-specific resource(s) needed:
{LG Risk Factors and Recommended Resource Allocation:40379}

@FOLLOWUP@
{LG Follow Up:40377}

In an effort to avoid potential COVID-19 exposure in this patient, this visit occurred by telehealth. Verbal consent {STOP if was not:25643::was} obtained from patient, parent or guardian to provide telehealth services after informed of risks, benefits and alternatives.

Patient identification completed: {Yes/No:2::Yes}
Mode of Communication: {Blank:19197::"Telephone", "Video"}
{If Video specify application (Optional):37698}

Patient Location: {State Location:37697::Idaho}, {Blank:19197::"Home Residence"}
Provider Location: {Blank:19197::"Clinic"}

{Telehealth Time Coding (Optional):38424}
Consider E/M 99496 Visit 1 if TOC within 7 days and routine E/M Visit 2-4
AVS provided to patient and/or caregiver: {YES/NO/***:38137}
Route closed chart note to PCP/Care Team: {YES/NO/***:38137}

Appendix I Appropriateness for Inclusion and Exclusion

Patient, @name@, is contacted at the recommendation of the hospitalist for screening and discussion of participation in COPD quality improvement initiative. Interpreter present: {INTERPRETER NEEDED:3040223}

Appropriate Criteria for Project

YES	NO
Hospitalized during time frame of project implementation {.:1150429621}	Active Oncology treatment {no default YES:28775}
Primary or secondary diagnosis of AECOPD {.:1150429621}	Discharge to hospice, SNF, or LTC {no default YES:28775}
Patient agreement to participate {.:1150429621}	Non-system PCP {no default YES:28775}
Discharge home {.:1150429621}	Patient declines {no default YES:28775}
Resides in county serviced {.:1150429621}	
Confirmed age 45 and older {.:1150429621}	
Obstruction on any prior Spirometry {.:1150429621}	

Patient {DOES/DOES NOT:24725} qualify for COPD quality improvement initiative.

- Does not qualify - no further work with patient.
- Does qualify then proceed with PEARL

Letter to patient with discussion of the project. Questions were answered and{He She They:38442} would like to participate in the initiative.

Based on PEARL, patient has {Desc; low/medium/high:30203} for readmission. Recommendations are as follow:

- Low-risk patients are discharged to their PCP for follow-up or as planned by the hospitalist.
- Uncompleted risk stratification and moderate - high risk patients may be referred to pulmonary clinic for COPD and transitional care management. Patient agrees to and hospitalist authorized urgent referral generated to pulmonary clinic today for Dx COPD.

Appendix J Participant Letter

You are receiving this letter asking you to voluntarily participate in a quality improvement program. Xx, a Doctor of Nursing Student working with the Xxxx pulmonary specialty group, will be leading this program in agreement between Xxxx and academic institution.

The goals of the program:

- Identify patients at increased risk of rehospitalization due to their diagnosis of Chronic Obstructive Pulmonary Disease (COPD).
- Provide increased medical support and best practices for lung care through visits with a specialty trained nurse practitioner working with a lung doctor and your primary care doctor to determine patient engagement, risk factors, and barriers to care.

There are no financial obligations to participating. The project is not supported by a grant or contract. There is no federal agency or department involved. The project is not funded by the academic institution. The project receives in-kind donations related to the resources and activities to fulfil the project.

Participants will include:

- Age 45 years and older, all incomes, genders, and residents of the defined metro area
- Admitted to the healthcare facility between the dates of June 1, 2021 and August 31, 2021
- The admission diagnosis must be primarily related to COPD
- The COPD must have been confirmed by breathing tests
- Discharged to home environment
- Participant will be excluded if they do not meet criteria or decline participation

Description of the project:

- Participants will not receive financial rewards
- The program does not place the participant at any known increase or unreasonable risk
- The participant may withdraw from the program at any time
- Participant data will be kept confidential, protected, secured, encrypted and de-identified
- XXXXXXXXX Hospitalist notifies the program lead of the participant interest to participate and authorizes referral
- Prior to discharge from the hospital, the program lead or another provider will meet the participant in the healthcare facility to describe the program, answer questions and confirm willingness to participate in the program
- Once discharged, patient will be asked to participate in the following:
    - Weekly visits with one of the providers listed below for a period of 1 month
    - Visits are be completed in person at the first visit and then by video or phone visits as the patient prefers
    - Participant may be asked to have initial lab work and a heart ultrasound if indicated.
    - Complete two surveys that will take approximately 5 minutes each
- Participant will be interviewed (30-60 minutes duration) as during a usual patient clinic appointment

- Participant will continue to see their usual primary care provider and other specialists
- Care will be communicated to care team
- A final report will be provided to the healthcare facility and university for publication

Principal Faculty Advisor: Dr. Xx, Director of DNP in Leadership Program and Associate Professor, School of Nursing Xxx

Quality Improvement Program Leader: Xx

Appendix K Transitional Care Management and Primary Care Provider Letter

Scheduler starts after referral received.

Scheduler
@name@
- Interpreter: {ED SANE INTERPRETER USED:19851}
- Any prior Spiro/PFT ok
- Patient needs follow-up appointments scheduled simultaneously in 1 month:
    - APP. If Home Health referral {no, yes:23860} ; If yes, then contact lead APP to schedule.
    - Within 7 calendar days of discharge, 1 hour (F2F preferred over Telehealth) x1: {yes/no ***:36042::"Yes"};
        - if unable to schedule in 7 days then next available ie 14 days and notify XX
    - Weekly visits x3, 30 min (Telehealth option): {yes/no ***:36042::"Yes"}
    - Appointment note: “COPD Pilot ***/4”
    - Appointment made for Date *** with Provider ***
    - Schedule with pulmonologist (if new to any pulmonologist 60 min or if established then assigned pulmonologist in 2-3 months; if not available then usual TE process): {yes/no ***:36042::"Yes"}
- Additional information needed and requested (example risk stratification pending or patient requests): {Yes/No/*:32965}
- Patient also is also in a health partner program): {no, yes:23860}
- Send high priority to select MAs and lead APP

MA
@name@
Date of contact (within 48 business hours of discharge date but not same day excluding holidays and Sa-Su): ***
- Document attempt X2 {YES/NO/***:38137}

Sources of information:
- Interpreter: {ED SANE INTERPRETER USED:19851}
- Source of information: {SOURCE:25620}
- Other sources of information: {Source; lab:60363}

Discharged from Location: ***
Discharge Date ***
Diagnosis/problem (as stated or listed 1st and 2nd from discharge note): ***
Medication changes at time of discharge and now home:
- Medication list updated: {YES/NO/***:38137}

Needs follow up on any hospital discharge orders pending or lab/complete: {YES/NO/***:38137}
Additional information needed and requested from patient: {YES/NO/***:38137}

Appointment confirmed as highly complex visit:

- Date ***
- Provider ***

Send **high priority** to XXX and PCP (below)

Note to Provider @PCP@:

@name@ has agreed to participate in a quality improvement (QI) initiative to advance evidence-based practice. This initiative is an agreement between XXX, a Doctor of Nursing Student with a local academic university and the healthcare facility. The program will be implemented between XXX.

Program Goal:
Reduce readmission with a diagnosis of COPD.

How: 1) apply risk stratification and 2) provide increased visits for 1 month by a pulmonary specialty trained nurse practitioner to confirm best practice pulmonary care, determine and communicate patient engagement, risk factors, and barriers to care to improve value-based care and resource allocation.

The patient is asked to continue follow up appointments with their usual health care provider(s) in addition to being a participant in the QI pilot program. Providers and care team members associated with the participant will receive information about their care during the time of the program. A final report will be provided to the university and healthcare facility as well.

Please contact XXX, NP for further questions.
Thank you.

Appendix L Outcome Measures

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique

1. 50% of COPD patients referred to the pulmonary clinic are seen within 7-14 days of discharge (PO)
2. 50% of COPD patients referred to the pulmonary clinic access 3 out of 4 outpatient pulmonary clinic visits within 30 days s/p discharge (PO)
	Instrument:
	• Data Collection Spreadsheet
	
	Data:
	• Re-created Data Collection Spreadsheet tracking:
	  ○ Timely access to care from time of discharge
	  ○ Number of pulmonary clinic visits completed/patient
		1. To quantify the ability of the clinic to meet evidence-based clinic visit recommendations
		
		2. Tracked if appointments completed at specified times.
			• Retrospective chart audit of EHR
			• Data Collection Spreadsheet
			
			Quantitative Descriptive statistic "x % or n patients were able to access the pulmonary clinic timely"

3. At least 1 pulmonary provider(s), and staff (1-2 MA) in the healthcare facility pulmonary clinic receive training by the project lead to use the EHR COPD template by the end of May 2021 (CO/PO)	Instrument:
	• In-person meeting for training
	• COPD template
	• Data Collection Spreadsheet
	• Forms
	
	Data:
	• Project lead created a COPD template to use for patient care encounters, organized meeting to train staff on using template:
	• EHR COPD template created documenting evidence-based care for guideline-based therapy (including education, emergency action plan and hotline), risk stratification, motivation, and barriers to care
	  ○ Data Collection Spreadsheet marked attendance of trainees
	  ○ Provider: "How would you rate the ease for use of the EHR patient care template" with comments box (Product testing)
		1. Provider(s) and staff attended training for use of COPD template in EHR:
		  a) to reduce variation in patient care
		  b) to complete project aims and
		  c) to improve quality outcome.
			Retrospective review of Data Collection Spreadsheet
			
			Dichotomous item (Yes/No)

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique
4. 80% of COPD patients in the healthcare facility pulmonary clinic have risk stratification documentation in the EHR or data spreadsheet by the 2nd pulmonary clinic visit or between June and by the end of August 2021(CO).	Instrument: • PEARL Risk Stratification Tool (Echevarria, 2017) • Data Collection Spreadsheet • Likert provider post-test question • Tool Data: • Data from patient interview to complete PEARL Tool housed in patient EHREHR and transferred to Data Spreadsheet • PEARL (Echevarria et al., 2017) used in context for AECOPD for risk of readmission and/or death at 30 and 90-days after discharge developed in two hospitals and validated in a total of six hospitals (four external). n = 2417 patients. Five variables of PEARL: • Prior admission (Patient descriptors, interviews, report from index admission documented in chart/pulmonary clinic visit note), • eMRCD (dyspnea score with frailty component as patient descriptor, interview, chart review), • Age (patient descriptor, interview, chart review), • Right ventricular function (procedure and laboratory results of Echo RV TAPSE [or EKG R axis deviation], physical exam positive edema), • Left ventricular function (procedure and laboratory results of Brain Naturetic Peptide [BNP], Echo LVEF, Physical exam positive edema). Each variable is weighted/scored with final scoring as follows: • PEARL 0-1 (low risk) = 20.7%. • PEARL 2-4 (intermediate risk) = 42.1%. • PEARL ≥5 (high risk) = 66.4%. PEARL has the following research c-statistics: Derivation 0.73 Internal Validity 0.68	Communicate patient risk stratification for readmission or death as: high, moderate, or low risk using: • PEARL as a context specific research validated tool (Echevarria, 2017) Obtain provider satisfaction measures	• Retrospective chart audit of EHR • Data Collection Spreadsheet Quantitative Descriptive Statistics Pie Chart “x % or n patient completed risk stratification” “x % or n were high risk while x% or n were moderate risk. Of the moderate risk “x % or n have additional risks for trajectory toward high risk” “x% of providers thought tool was useful” “x% rated ease for use x” Providers: “x% of providers reported satisfaction with xyz” Data report from Microsoft Forms for provider satisfaction

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique
	External Validity 0.70 The C-statistic can range from 0.50 to 1.00, with higher values indicating better predictive models. A rough rule for interpretation is that C-statistics above 0.80 indicate very good models, between 0.70 and 0.80 good models, and between 0.50 and 0.70 weak models. Presented at healthcare facility journal club to providers and acute care leadership. Provider Data: • Likert Provider Satisfaction post-rating scale 0-10 ○ Provider: "How would you rate the ease for use of this tool?" with comments box (Product testing)		

5. 80% of COPD patients in the pulmonary clinic are able to identify patient-specific motivation impacting patient care as documented in the EHR by the 2nd pulmonary clinic visit between June and by the end of August 2021 (CO)	Instrument:
	• Likert Motivation Scale of patient pre/post-test questions
	• Data Collection Spreadsheet
	
	Data:
	• Data from patient Interview housed in patient EHR
	• The following are two patient motivation questions using a standard motivational interviewing ruler 0-10:
	  1. Patient: "How important is it to you to manage your COPD?"
	  2. Patient: "How confident are you that you can help manage your COPD?"
		Communicate readiness or motivation measured from patient interviews to provide insight into patient's perceptions about how they feel about change.
		Identify patients who are willing or persuaded to improve their health versus patients not willing to change to facilitate goals of care, budgets for resource allocation or anticipated readmissions and policy decision-making
			• Retrospective chart audit of EHR
			• Data Collection Spreadsheet
			
			Quantitative Descriptive statistic Bar Graph
			"x % or n patient had x motivation to impact their care with x% confident in their ability to manage care and x% willing to help"

6. 80% of COPD patients in the pulmonary clinic are able to identify at least one patient-specific risk factor(s) including social determinants for AECOPD documented in the EHR by the 2nd	Instrument: • Multiple Choice Checklist, re-created Risk Factor Table • Data Collection Spreadsheet Data: • Multiple choice provides the following drop-down or checklist menu and free-listing option for risk factors (Deniger et al., 2015), housed in patient EHR:	Communicating risk factors unique and specific to every patient are important to identify during patient interviews to support patient-specific needs	• Retrospective chart audit of EHR • Data Collection Spreadsheet Quantitative (Descriptive statistics,

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique
pulmonary clinic visit between June and by the end of August 2021 (CO)	○ Demographics (age, place of residence, access) ○ Ethnicity ○ Physical Characteristics (2+ falls or frailty by PEARL) ○ Lifestyle Behaviors (smoking, alcohol, non-compliance) ○ Socioeconomics (Medicare/caid, no home ownership) ○ Hospitalizations (any prior, <2>4 days in hospital) ○ Comorbidity (3+) ○ Diagnostics (HF, COPD, Pneumonia) ○ Medications (high risk or 5+) ○ Primary Care (none) ○ Follow up (none) ○ Monitoring (available at home or not)		pie chart) and Qualitative data (themes, “Risk factor x was a contributing factor to AECOPD x % of the time”)

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique
7. 80% of COPD patients in the healthcare facility pulmonary clinic can identify at least 1 patient-specific perceived barrier(s) impacting patient care documented in the EHR by the 2nd visit between June and by the end of August 2021 as measured by EHR audit or data spreadsheet tool (CO)	Instrument: • Multiple Choice Checklist, re-created by project lead • Data Collection Spreadsheet Data: • Multiple choice provides the following drop-down or checklist menu and free-listing option for barriers to care housed in patient EHR: ○ Personal and Biologic ○ Household and Social ○ Healthcare System and Economics ○ Environmental ○ Other	Communicate the patient's perceived or real barriers to care	• Retrospective chart audit of EHR • Data Collection Spreadsheet Qualitative Develop categorical patterns "x % or n patient were able to identify at least 1 barrier to care" "x was the most frequently cited barrier to care" or "the top two cited barriers to care were…" or "the patterns identified as barriers to care were xyz"

Outcome	Data Collection Instrument / Data	Analysis Goal	Analytic Technique
8. 80% of COPD patients in the healthcare facility pulmonary clinic report their care experience by the end of August 2021 (CO)	Instrument: • Likert Scale Patient Experience post-test questions. Data: • One patient measure from interview using post-rating 1-5: 1. Patient: "Overall, how helpful was this project to your understanding of your medical condition?" (Course/Project evaluation or Post-Visit Patient Satisfaction)	"…good patient experience is associated with important clinical processes and outcomes. ... Patients with better care experiences often have better health outcomes" (https://www.ahrq.gov/cahps/)	Post-evaluation from interview question using Likert scale Quantitative Descriptive statistic "x % of patients reported x experience participating in the pilot project, x % recommend this project be continued for other patients, x% thought this project communicated their needs"
9. 80% of COPD patients in the healthcare facility pulmonary clinic have their care plan communicated to the PCP and/or care team between June and by the end of August 2021 (CO/PO)	Instrument: • Data Collection Spreadsheet Data: • EHR patient encounter COPD template	Communication and coordination of timely patient care needs with the team is critical. Call or forward completed EHR COPD template note to the PCP and/or care team at the time of the patient care visit.	• Retrospective chart audit of EHR • Data Collection Spreadsheet Dichotomous item (Yes/No)
10. Document of project outcomes: readmission rate, risk stratification, resource and support services needed for value-based care communicated to Stakeholders by the end of May 2022 (PO)	Instrument: • Document created by project lead Data: • Readmission Rate • Readmission Risk Factors • Patient Motivation • Barriers to Care • Resources Needed	Communication to stakeholders/decision-makers will facilitate policy and budgets for real impact on patient-specific factors at completion of the pilot project	• Retrospective chart audit of EHR • Data Collection Spreadsheet Document on outcomes and recommendations Dichotomous item (Yes/No)

Appendix M Data Collection Spreadsheet

De-identifier key	Year of birth	Gender	COPD template (included emergency action plan and GBT (GOLD)	Provider and staff training EHR	Index diagnosis	Discharge disposition (location)	Risk stratification tool (PEARL)	Risk factors/SDoH table	Motivation score (pre-test/post-test, Likert EHR)	Barriers listed
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

Clinic follow up by clinical staff (timeframe 2 days by telephone or mychart)	Visit 1 (60 min, home or F2F, other, with provider)	Visit 2 (30 min, telehealth with provider)	Visit 3 (30 min, telehealth with provider)	Visit 4 (30 min, telehealth with provider)	30-day readmission, # days between admit, Index Dx, Discharge Dx, LOS	Provider Satisfaction for PEARL (post-project, Likert)	Patient Care Experience (post-project, Likert)	Communication to PCP	Report with recommendations to stakeholders

Appendix N CITI Training Certificate

CITI PROGRAM

Completion Date 12-Jul-2020
Expiration Date 12-Jul-2023
Record ID 37456622

This is to certify that:

Linda Gould

Has completed the following CITI Program course:

Not valid for renewal of certification through CME. Do not use for TransCelerate mutual recognition (see Completion Report).

Human Research (Curriculum Group)
Social & Behavioral Researchers (Course Learner Group)
1 - Basic Course (Stage)

Under requirements set by:

Boise State University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w269f8d73-45c5-48e6-a7d9-c53388b85ad5-37456622

Appendix O Internal Review Board Letter of Determination

Re: IRB Determination: Risk Stratification to Improve Value-Based Care: A COPD Pilot Project in a Pulmonary Specialty Clinic

Dear Xxxxxxxxx,

I appreciate your request for IRB determination regarding protection of the rights and welfare of subjects involved in the above referenced project.

The purpose of this DNP project is to implement a pilot program for patients hospitalized with COPD,
to include risk stratification in order to expedite transitional care from hospital discharge to access of
an outpatient pulmonary specialty clinic.

Intended project outcomes include:

• Improve identification of patients with moderate to high risk for COPD readmission
• Improve communication of patient-specific risks, motivations, and barriers to care
• Improve communication for resource allocation specific to higher risk patient needs

While the project is a systematic investigation, it is not designed to develop or contribute to generalizable knowledge. Patients will not be randomized to different interventions. The project does
not entail greater risk to individuals than would normally be anticipated under the standard-of-care.

The project does not meet criteria for human subjects research but rather is evidence-based quality
improvement (QI). The project does not need to be reviewed by XXXXXXXXX Research or the SLHS
IRB. For any extramural presentations where results of this QI project are revealed, it is required to
avoid any use of the word research in a poster, any other representation of the project or in its verbal
description.

Additional Notes:

1. This determination could be affected by substantive changes in the project design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our
office for clarification.
2. Please note that federal regulators have made it clear that any publication describing a project as
research must have prior IRB review and approval. Therefore, projects determined to be Evidence

Mailing Address: Street Address:
Institutional Review Board Institutional Review Board

Appendix P Timeline

Project: Operationalizing Risk Stratification in a Pulmonary Specialty Clinic to Improve Outcomes in Adult Patients with COPD																			
Month/Year																			
PHASES	Jun 2020	Jul	Aug	Sep/	Oct	Nov	Dec	Jan/ 2021	Feb	Mar	Apr	May	Jun Jul Aug	Sep	Oct	Nov	Dec	Jan Feb Mar 2022	Apr May
PLANNING																			
Literature review and synthesis of evidence																			
Theoretical model selected																			
Timeline and logic model outcome measures																			
Risk management for SWOT																			
Scholarly project proposal submitted																			
Develop project scope																			
Define milestones																			
IT development: Risk stratification tool, COPD care plan																			
Faculty, Stakeholder, Champion -team meetings																			
Plan for data analysis and collection																			
Plan for evaluation and measurement tools																			
Budget and resource procurement																			
Software selection																			
IRB review and QI determination																			
Plan for dissemination																			
Plan for reporting																			
My Clinical Exchange																			
Training sessions																			
Hospital discharge planning - team meetings																			
Clinic staff - team meetings																			
Policy analysis																			

Project: Operationalizing Risk Stratification in a Pulmonary Specialty Clinic to Improve Outcomes in Adult Patients with COPD																			
Month/Year																			
PHASES	Jun 2020	Jul	Aug	Sep/	Oct	Nov	Dec	Jan/ 2021	Feb	Mar	Apr	May	Jun Jul Aug	Sep	Oct	Nov	Dec	Jan Feb Mar 2022	Apr May
IMPLEMENTATION																			
Patient pulmonary clinic visits (F2F, Telehealth, Domicile)																			
Patient calls																			
Communication regularly – team meetings																			
DATA COLLECTION																			
Data points defined																			
Collect data																			
Monitor and manage unforeseen changes																			
Update stakeholders																			
DATA ANALYSIS																			
Evaluation of measures																			
Data analysis and interpretation																			
Update stakeholders																			
DISSEMINATION																			
Evaluation of project																			
Scholarworks																			
Presentation of results																			
FINAL REPORT (Academia and Healthcare Facility**)**																			
Project completion with academics (optional extensions/expansions with healthcare facility)																			
Scholarly project presentation and manuscript (Academia and Health System)																			
Commencement																			

Appendix Q Resource Allocation

Risk Factor	Yes/No	Resource	Risk Factor	Yes/No	Resource
Age >75-80		Community apps and programs list	Drugs (Illicit)		Counselor
Gender		Support groups	Alcohol		Counselor
BMI (<24 or >35)		Lifestyle Medicine, Nutritionist, Health coach	Exercise none		Pulmonary Rehab, PT, YMCA, Gym
Follow up not scheduled		Primary Care Provider	ABG (hypoxia or hypercapnia)		02 therapy, BiPAP, DME
Unemployment		Social Worker	Medication Non-adherence		Health coach, Pharmacy
Income level (low, does not own home)		Social Worker	Respiratory Medications (uncovered or poor technique)		Pharmacist, RT
Insurance (none or Public)		SW, SHIBA, Rx assistance	Home Monitoring Absent Digital Gap		Telehealth, RPM, Pharmacy, Insurance, Technologist
Pulmonary Provider (none)		Pulmonologist Referral	FEV1/FVC <50		Pulmonologist
PCP (none)		Primary Care Provider Referral	Smoking		Tobacco Cessation, Health coach, Counseling
Advance Directives		Palliative Care, Attorney	Education level low		Match learning, Health coach

Appendix R Expense Report (Year 1)

A1 | COPD Scholarly Project Expense Report

	A	B	C	D	E	F	G
1	COPD Scholarly Project Expense Report						
2						**Grand Total**	**$ 19,795.00**
3	**Expense Category**	**Expense Description**	**Explanation of Expense**	**Type of Cost (variable/fixed)**	**Volume**	**Cost per Unit**	**Total**
4	Personnel	Salaries were obtained from	Training sessions and meetings				
5	Personnel	DNP Project Lead and APPs	**OP APPs** (1 Lead NP and 1	Fixed	1 APP: 1 hr X 2 trainin	$60/hr	$ 4,980.00
6	Personnel	Pulmonologist (x1	Initial training meeting (1 hr).	Fixed	DNP lead training 1 hr	$60/hr (DNP) and 15	$ 2,040.00
7	Personnel	Respiratory Therapist (x1	confirm PFT/obstruction,	Variable	1/2 hr PFT and/or edu	$30/hr	$ 120.00
8	Personnel	Scheduler (x1)	Initial training x1 (1 hr) then re-	Variable	1 hr X 2 training sess	$15/hr	$ 90.00
9	Personnel	Receptionist (x1)	Initial training x1 (1 hr) /re-	Variable	1 hr X 2 training sessi	$15/hr	$ 105.00
10	Personnel	Operator call center (x1)	Initial training x1 (1 hr)	Variable	1 hr X 2 training sessi	$15/hr	$ 30.00
11	Personnel	Medical Assistant (x1)	Initial training meeting x1 (	Variable	1 hr X 2 training sessi	$20/hr	$ 360.00
12	Personnel	Site Manager (x1)	Initial training x1 (1 hr)	Fixed	1 hr X 2 training sessi	$35/hr	$ 70.00
13	Personnel	Nurse Researcher (x1 CNE)	Provide guidance for project	Fixed	scheduled meetings (	$65/hr	$ 1,560.00
14	Personnel	Service Line Administrator	Provide project guidance and	Fixed	scheduled meetings 1	$70/hr	$ 700.00
15	Personnel	Service Line Director (x1)	Provide project guidance and	Fixed	scheduled meetings 1	$65/hr	$ 195.00
16	Personnel	Data Analyst (x1)	Provide guidance for data	Variable	scheduled meetings a	$35/hr	$ 210.00
17	Personnel	IT/EHR (x1)	Co-create with DNP Lead EHR	Variable	scheduled meetings a	$30/hr	$ 330.00
18	Personnel	Coder (x1)	Provide guidance for coding.	Variable	2 hrs meeting/side m	$25/hr	$ 50.00
19	Personnel	Medical Record (x1)	Initial meeting (1 hr) prn for	Variable	1 hr meetings/side m	$15/hr	$ 15.00
20	Personnel	Benefits	20-30% of total salaries		deferred		$3,070
21	Office						
22	Office Space	Clinic (x1-2 exam room)		Fixed	$1,500/year divided by 4		$ 375.00
23	Office Space	Clinic utilities - water, electric, sewer		Fixed	included in clinic exam room fees		0
24	Office Supplies/Mate	Phone, printer, ink, paper, pens, highlighters, stapler, clips, thun		Variable	$1,000/year divided b	$250	$250
25	Office System	License for programs, app services			unknown		0
26	Office Equipment	Computer		Variable	X1	$2,000	$2,000
27	Office Equipment	iPad			X1	$500	$500
28	Office Equipment	Sphygmomanometer			X1	$20	$20
29	Office Equipment	Stethoscope			X1	$200	$200
30	Office Equipment	Oximeter			X1	$50	$50
31	Office Equipment	Thermometer			X1	$40	$40
32	Office Equipment	Exam table			X1	$750	$750
33	Office Equipment	Exam table paper			X3	$15x3	$45
34	Office Equipment	Stadiometer and Scale			X1	$400 x 1	$400.00
35	Office Equipment	Pulmonary function lab			X1 PFT lab rental @ $	$50 X3	$620
36	Office Travel	Vehicle (x1 personal)	Mileage 57.5 cents/mi x 30 mile	Variable	donated X 36 trips @	$17.25 X 36	$620

Appendix S Year 2-3 Budget Report

A1 (COPD Pilot) 2-3 Year Budget

	A	B	C	D	E
1	(COPD Pilot) 2-3 Year Budget				
2	**Yearly Totals:**	**$ 19,795.00**	**$ 70,959.04**	**$ 258,825.55**	
3	**Expense Category**	**Year 1**	**Year 2**	**Year 3**	**Rationale**
4	Personnel	$ 10,855.00	$ 39,300.00	$ 144,567.00	Projected cost is based on projected patient volume seen by APPs: pilot yr 1 with 10 APPs, expanded hosptal wide to with 35 APPs yr 2, system wide with 125 APPs yr 3. The labor costs can be reduced if RNs and RTs replace APPs for certain patient volume.
5	Personnel	$ 3,070.00	$ 11,114.04	$ 40,883.55	
6	Office	$ -			
7	Office Space	$ 375.00	$ 1,312.50	$ 4,687.50	
8	Office Space	$ -	$ -	$ -	
9	Office Supplies/Mater	$ 250.00	$ 875.00	$ 3,125.00	
10	Office System	$ -	$ -	$ -	
11	Office Equipment	$ 4,625.00	$ 16,187.50	$ 57,812.50	
12	Office Travel	$ 620.00	$ 2,170.00	$ 7,750.00	

Appendix T Statement of Operations Report

A1:C1 | fx | COPD Statement of Operations

	A	B	C
1	**COPD Statement of Operations**		
2	**Operating Income**		**$ 7,200.00**
3			
4		**Revenue Total**	**$ 26,995.00**
5	**Source**	**Description**	**Amount**
6	Ex. DNP Student	hourly wages estimated @ 100 hrs x $60	$ 6,000.00
7	Organization X	space, equipment, materials & supplies, personnel	$ 13,795.00
8	Patient charges (x8 patients)	office visit, diagnostic lab	$4,800
9	Financial penalty saving	no readmissions	$2,400
10	Hospital errors	-	-
11			
12		**Expenses Total**	**$ 19,795.00**
13	**Expenses**	**Description**	**Amount**
14	Personnel		$ 10,855.00
15	Personnel		$ 3,070.00
16	Office		$ -
17	Office Space		$ 375.00
18	Office Space		$ -
19	Office Supplies/Materials		$ 250.00
20	Office System		$ -
21	Office Equipment		$ 4,625.00
22	Office Travel		$ 620.00
23			