



Implementation of a Pulmonary Disease Navigator Program for 30-day Chronic Lung Disease Readmission Reduction

Intermountain Health

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Executive Summary

In October of 2012, statutory requirements for the Hospital Readmission Reduction Programs (HRRP) were established setting forth reductions in payments for excess readmissions.¹ HRRP is a Medicare value-based purchasing program that encourages hospitals to improve communication and care coordination to better engage patients and caregivers in discharge plans and, in turn, reduce avoidable readmissions.

Based on national survey data, the cost of COPD in the US has been estimated to be \$49.9 billion USD per year with indirect costs accounting for 41% of total costs.^{2,3} In 2013, the National Institute of Health reported that Chronic Obstructive Pulmonary Disease (COPD) was a major cause of disability and the third leading cause of death in the United States. Currently, over twelve million people are diagnosed with COPD. It is estimated that over twelve million more people may have the disease and not even know it as this chronic condition develops slowly. In the 2014 Surgeon General's report regarding the fifty-year impact of tobacco use on US health, it was reported that the total economic

cost of COPD was over \$289 billion annually.⁴ In 2014, Patel, Nagar and Dalal, published a meta-analysis of fifty-three studies to further quantify the impact of COPD on US health.⁵ They reported five key findings regarding direct and indirect costs.

An initial analysis of COPD readmissions within the Intermountain Healthcare System demonstrated a COPD 30-day readmission rate of 18.2%. We utilized our organization's baseline COPD outcomes data to help create a COPD Playbook to guide management of the disease. The playbook was driven by a multi-disciplinary care team using integrated tools within the electronic medical record such as a COPD dashboard, predictive scoring, evidence-based protocols, and order sets to facilitate transitional care across the continuum for the COPD population. From inception to pilot and then to formal establishment of the PDN (Pulmonary Disease Navigator) model utilizing the EHR solutions, total 30-day hospital readmission for COPD patients was reduced by 7%.

Lessons Learned Included:

- Illustrated the importance of identification of disease specific care goals and alignment of care pathways with primary aim. In this case, consolidating and adapting known care elements for COPD into a comprehensive plan/playbook with a specific aim towards reducing readmission rates
- Allowed recognition and integration of respiratory care into the management of COPD patients from the inpatient to outpatient settings
- Facilitated the design and follow-up of a care plan/pathway for COPD patients utilizing a care dashboard and Pulmonary Disease Navigator model. For high-touch personalized care
- Increased the awareness of patients and their home caregivers regarding their care plan in terms of their COPD process, referral resources, the need for medication compliance via delivery devices, the need for tobacco cessation, and early disease symptom exacerbation and the need for earlier intervention to avoid further worsening symptoms and protentional hospital admission
- Finally, and most importantly, these initiatives assisted in the identification of the need to provide more enhanced IT/EHR solutions with artificial intelligence to more adequately scale this for enhanced population health management (currently planned for 2023).

The Intermountain Healthcare Journey: 10 Years in the Making

How Our Journey Began

Betty's Story

Having a mother with Chronic Obstructive Pulmonary Disease (COPD) and as a registered respiratory therapist for over forty years, I was able to view first-hand the wide range of variability of care she received...some evidence-based and some not. Seeking to understand chronic lung care across our organization, a baseline outcomes medical record review was performed for both COPD and asthma patients in 2011-2012. Four abstracts were accepted for publication and national presentation at the American Association for Respiratory Care's International Congress for our organization's improvement initiatives for COPD patients between 2014-2018.⁶⁻⁹ Using outcomes from a baseline chart review of COPD "frequent fliers", a COPD Playbook was created to identify gaps in care and potential areas for improvement. This was shared with the Pulmonary Division, executive leaders, and other key stakeholders. From the first shared edition in November 2017 to current, substantial improvements have been made to institute best practices to include but not be limited to, the initiation of Pulmonary Disease Navigators, the creation of a COPD dashboard, improvement in diagnostic pulmonary function testing for definitive diagnosis, the creation of a COPD Exacerbation Protocol for use in the emergency department/in hospital setting and ambulatory outpatient clinics, and improved communication between patients, Pulmonary Disease Navigators, physicians/advanced practicing providers and other members of the healthcare team. The protocol, as well as communications, are coordinated with the help of the electronic medical record, iCentra (Cerner, Intermountain Healthcare). Upon the publication of our abstracts, Respiratory Care was approached by Intermountain Executive leaders to participate in the National Committee for Quality Assurance's grant funded, eight national hospital learning collaboratives. The Advanced Care Planning Learning Collaborative occurred with noteworthy outcomes. The Intermountain Healthcare COPD care team attended two weeks of training at Gunderson Health where education was given to more fully understand the need to meet with patients and their family members to gather information regarding end-of-life desires, provide education, complete the required forms, and honoring a patient's wishes. Twenty patients were referred to the collaborative by their primary care/pulmonary physicians. The outcomes included but were not limited to 0(0%) of patients were aware of end-of-life choices and 19 (95%) completed an advanced directive and Physician's Order for Life Sustaining Treatment (POLST). Prior to the COVID pandemic, COPD was selected for organizational-wide utilization of the Gunderson Health's Respecting Choices end-of-life program. With 19 (95%) of the COPD patients in the original trial choosing to die at home, it was our impression this could well mitigate frequent hospitalizations and 30-day readmission rates as well as in-hospital mortality. Most importantly, patient's wishes would be identified, documented, and honored. Documentation was created in iCentra, which helped facilitate the coordination of care. Using the discussion facilitation techniques learned, my mother died exactly as she has desired...in my home, surrounded by her family with the window shades open and 1940's music playing and NOT has a hospital readmission. This "gift of a lifetime" should be offered to all chronically ill patients. My mother's journey drove my passion for improving care among COPD patients. We became active lobbyists for health care initiatives each year. She never lived to see the fruits of her labors; however, Utah has since passed legislation for e-cigarette/vaping and raised the tobacco purchase age to twenty-one. Every chronic lung patient deserves evidence-based best practices which are consistently applied. We have been able to conduct care audits to assure compliance to medical executive committee approved best practice protocols for our chronic lung patients. The ease with which patient data can be acquired from the EHR now makes possible timely audits, the identification of gaps requiring closure, and timely corrective action plans to assure compliance. In the words of my mother, "I lived a high-quality, long life despite COPD because of my caring Respiratory Therapists and other providers who cared to provide me with state-of-the-art healthcare!"

Kim Bennion MSHS, RRT, CHC, FAARC


Define the Clinical Problem and Pre-Implementation Performance

Intermountain Healthcare is currently a Utah-based, not-for-profit system of 33 hospitals, including a virtual hospital that spans across Utah, Idaho, Nevada, Colorado, Montana, Kansas, Arizona, and New Mexico. Population health management of COPD patients has had multiple prongs with the creation of multiple IT/EHR solutions.

In 2011-2012, an electronic, baseline chart review of COPD patients aided in the recognition of potential gaps in care and opportunities for care improvement which were displayed in the *COPD Play Book* (Figure One). Baseline outcomes from the chart reviews were published in abstract form by the American Association for Respiratory Care.⁶ (Figure Two). The research and reporting received national recognition by the American Respiratory Care Foundation where the Charles W. Serby Research Fellowship was bestowed on the registered respiratory therapist who conducted/published the findings and created the *COPD Play Book*. Research identification of areas for improvement prompted the development of an electronic dashboard which was maintained, monitored, and applied by select respiratory therapists designated as Pulmonary Disease Navigators (PDNs). Utilizing an electronic care dashboard (Figure Three), the “*COPD Playbook*”, the electronic PDN/Respiratory Outpatient Clinic (ROC) COPD Order Set (Figure Four), and the Ambulatory High-Risk COPD Exacerbation Protocol (Figure Five-pages 1-5) embedded in the medical record, COPD patients were identified during hospitalization for care coordination by the newly developed position of Pulmonary Disease Navigators (PDN) with the key target to provide high-touch, timely health care access in arenas other than the emergency room or admission while utilizing the PDN Assessment Form in the EHR (Figure Six-pages 1-11). The key goal being to reduce all-cause 30-day hospital readmissions. An additional three AARC abstracts of outcomes were accepted for publication and international presentation during 2018 (Figures 7-9) 7,8,9. Variations in practice across the corporation are controlled by ongoing auditing and monitoring with timely feedback and continued education as needed. Results are reported via dashboards accessible to caregivers/managers/directors.

Figure One: COPD Play Book (screen shots only)

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Respiratory Care Clinical Services

COPD Playbook

Chronic Pulmonary Disease Management Proposal

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Created by Respiratory Care Clinical Services - November 2017
Revised - April 2017
Revised - August 2017
Revised - December 2018
Revised - December 2020
Revised - December 2021
Revised - Nov 2022

Executive Summary

The Respiratory Care Clinical Service Line (RCS) conducted an assessment of system initiatives regarding the care of Chronic Obstructive Lung Disease (COPD) patients. The assessment included an initial 2011-2012 probe chart review of “frequent hospital visit” COPD patients. The results of identified gaps and work to date are reported in the table below. The detailed results of the chart reviews are reported in a subsequent section of this report.

COPD Respiratory Care Proposal Status to Date

Originally created on March 7, 2016; revision April 10, 2017; revised December 29, 2018; revised Oct 2019; December 2020; December 2021 and November 2022.

| | | Status Level | | |
|---|--|---|-----------------|------------------|
| White = Not Started | Yellow = In Process | Green = Completed | Grey = Deferred | Red = Off Target |
| Goal | Status | Comments | | |
| Identify a physician champion(s) and create a COPD Work Group | Met initially in March 2017 | Met initially in March 2017 | | |
| Implement a COPD Exacerbation Protocol in all hospitals | Done, April 1, 2016 (Appendix E1-E5) | Implemented at all Intermountain hospitals and shared with Intermountain-Homestead for piloting. | | |
| Monitor the utilization of the COPD Protocol on all COPD patients | Done, April 1, 2016 (Appendix E1-E5) | RCS's RCS is currently piloting this process. | | |
| Earlier diagnosis of COPD Utilizing patient history and pulmonary function testing (PFT) | Process in progress | 2018: Dora Harris and the COPD Work Group started; however, COPD has put this on hold. | | |
| Create a COPD Playbook: Current and future care coordination of COPD patient across the continuum of health care (home, clinic, hospital, skills nursing facility) with clearly defined, accessible, patient-specific care plans communicated to all members of the healthcare team | Share with Intermountain-Homestead for adaptation. | 2022: Integration with CareCence funded by Care Centra & Adherence for artificial intelligence and population health care management. Will assist with data capture, reports, & referrals. PDNs have been discussing this manually. | | |
| Implement RCS Pulmonary Disease Navigators at key hospitals (MID, IMC, UV, DRMC & Layton) during 2018. | RCS PDN job description created and implemented | Initial discussions during 2018: • Created job description • Approved for hire • Created PDN workflows to include but not limited to: • DME discharges, perform comprehensive & focused evaluations, create & document transition care plan, communication to physician, referrals and physician suppression. | | |

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Examples of specific areas for improvement identified during the initial chart reviews and included in the COPD Playbook are displayed below:

The “COPD Playbook”

Executive Summary

The Respiratory Care Clinical Service Line (RCS) conducted an assessment of system initiatives regarding the care of Chronic Obstructive Lung Disease (COPD) patients. The assessment included an initial 2011-2012 probe chart review of “frequent hospital visit” COPD patients. The results of identified gaps and work to date are reported in the table below. The detailed results of the chart reviews are reported in a subsequent section of this report.

COPD Respiratory Care Proposal Status to Date

Originally created on March 7, 2014; revision April 30, 2015, April 10, 2017, revised December 26, 2018; revised Oct 2019, December 2020, December 2021, and November 2022

| Status Level | | | | |
|--|--|--|---|-----------------|
| White - Not Started | Yellow - In Process | Green - Completed | Grey - Deferred | Red - QO Target |
| Goal | Status | Comments | | |
| Identify a physician champion(s) and create a COPD Work Group. | Met initially in March 2017. | Met initially in March 2017. | | |
| Implement a COPD Exacerbation Protocol in all hospitals. | | Done, April 1, 2015 (Appendix E1-E5) | Implemented at all Intermountain hospitals and shared with Intermountain Homecare for adoption. | |
| Monitor the utilization of the COPD Protocol on all COPD patients. | Done, April 1, 2015 (Appendix E1-E5) | LRH's RCS is currently piloting this process. | | |
| Earlier diagnosis of COPD. Utilizing patient history and pulmonary function testing (PFT). | Process in progress manually. | 2018: Done Harris and the COPD Work Group started, however, COVID has put this on hold. 2022: Integration with CareCentra hindered by Care Centra & Adherium for artificial intelligence and population health care management. Will assist with data capture, reporting, & referrals. PDWs have been capturing this manually. | | |
| Create a COPD Playbook: Current and future care coordination of COPD patient across the continuum of health care (home, clinic, hospital, skills nursing facility) with clearly defined, accessible, patient-specific care plans communicated to all members of the healthcare team. | Shared with Intermountain Homecare for adoption. | Student intern project Casiano (Casey) Trujillo Central Region RCS Care Management job description created, filed during 2016. | | |
| Implement RRT Pulmonary Disease Navigators at key hospitals (MWD, BMC, UV, DSMC & Layton) during 2019. | RCS PDN job description created and implemented. | Initial discussions during 2016. <ul style="list-style-type: none"> Created job description Approved for hire Created PDN workflows to include but not limited to: <ul style="list-style-type: none"> DME discharges, perform comprehensive & focused evaluations, create a documented transition care plan, communication to physician, referral and physician supervision. | | |

| Goal | Status |
|--|---------------------------------|
| Identify MD champion | Completed 3/2017 |
| Implement COPD Exacerbation Protocol (all hospitals) | Completed 4/1/2015 |
| Monitor Protocol Utilization | Completed 4/1/2015 & ongoing |
| PFT result EMR integration | Manual process implemented 2018 |
| COPD Playbook Creation | Completed 2015 |
| PDN Pilot Implementation | Q4 2016 |

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The “COPD Playbook”

| | | |
|--|--|---|
| Pt/pts discharged from hospital with documented care plan. | 2020 PDWs are meeting with hospital COPD inpatients and creating care plan. | Multiple processes in progress, however, programming in iCARE occurring. Hardcopy COPD care plan resides on last page of E2426e Easier with COPD patient education booklet (revised by Dr. Shogren and PDWs). Discussed as a key indicator in the initial corporate COPD Work Group. |
| Alternative options for care (i.e., home and specialty clinic versus Emergency Department and hospital inpatient stays) | 2021: Need to capture high risk outpatients as well. Part of COPD Work Group key indicators. Pilot ending Q1 2019. | PDWs functioning in ROC clinics deployed. 2019: Pilot completed with RTs in Homecare for COPD/chronic hospital “frequent” visit patients. (Zero hospital visits this year for enrolled patients). Coordinate with Transition Care, Schmidt Clinic and Homecare. |
| Improved physician, nursing, Respiratory Therapy and other clinical support services, patient and caregiver education and compliance to the care plan (medication, diet, patient/caregiver education and clinic visit) | Completed previously in 2019; enhancement being considered for scaling success via CareCentra integration. | Built community partners (e.g., Utah Department of Health, pharmaceutical companies). Implemented Copher Health post-discharge calls with clinical workflows with limited success. |
| Improve patient/caregiver education regarding signs & symptoms, care plan details, disease management and care plan compliance (i.e., tobacco utilization, diet, exercise, narcotic use for chronic pain). | Completed in 2018. | 2022: Integration with CareCentra hindered by Care Centra & Adherium for artificial intelligence, population health care and medication management. Will assist with data capture and reporting. PDWs have been capturing this manually. Inpatient patient/caregiver COPD and tobacco cessation education revamped 2019. Shared with Homecare. Homecare transition and outpatient education to follow up post hospital discharge. SBAR form created for hospital-to-home hand-off of higher acuity patients. 2022: Integration with CareCentra hindered by Care Centra & Adherium for artificial intelligence, population health care and medication management. Will assist with data capture and reporting. PDWs have been capturing this manually. |

| Goal | Status |
|---|---|
| Pts discharged with documented COPD Care Plan | Completed manually 2018 |
| PDNs in ROC to improved HC access | Pilot completed 2018; full implementation 2019 |
| Enhanced communication of Care Plan to all team members | Completed 2019 |
| Pt/caregiver education (e.g., disease, Care Plan) | Education revision & Highrisk patient SBAR Handoff embedded in EMR 2015 |

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The "COPD Playbook"

| | | |
|---|--|--|
| Provide timely referrals of patients who meet the criteria for pulmonary rehabilitation, polysomnography, dietary, smoking cessation and pulmonary consultations: <ul style="list-style-type: none"> Assessing severity via pulmonary function testing (PFT) FEV1, FEV1/FVC and clinical signs/symptoms | Communication process within iCentra completed 2019. Data Rehab referral is a system 2021-2022 goal for COPD patients. | Dr. Ted Moon is now leading this project. Accessible results from all care settings. Accuracy of testing (education from CR PFT lab (Liz Huggins) as well as standard calibration of Primary Care office PFT equipment (done). Required documentation for medically necessary PFT requirements created and sent to physicians by Dr. Ted Moon (October 2021). Consider Primary Care as drivers. 2022: Integration with CareCentra funded by Care Centra & Subsequent for artificial intelligence, population health care and medication management. Will assist with data capture and reporting. PDNs have been capturing this manually. |
| Identify and standardize COPD prognostication criteria | Literature search conducted and potential elements to include in progress. Student intern performing data extractions: 1) COPD prognostication criteria, 2) home monitoring utilizing artificial intelligence for higher risk chronic lung patients (COPD & asthma) | Q2 2018 Met with Gagne for all at-risk populations for admission/readmission or ED visits using <u>Statewide</u> patient data. Project ended by Ventures. 2021: Met with MID Clinic for possible data integration. Retrospectively access data to determine any statistical significance. Will require data analysis. 2022: Integration with CareCentra funded by Care Centra & Subsequent for artificial intelligence, population health care and medication management. Will assist with data capture and reporting. PDNs have been capturing this manually. |
| Identify when discussions for Palliative/Hospice Care are appropriate (i.e., mild vs moderate disease severity) | Programming in iCentra completed for general and Resp Care specific ACP discussion documentation and Goal Attainment Scoring. Discussed and presented at | RTs as Advanced Care Planning consultants. Will require completion of the Gunderson Health ACP training/certification if this is to be the standard. RCS Admin Director completed the course April 2017. Was placed on hold during the pandemic. Due to contracting issues, the NCGA Phase 1 team were required to create their own |

| Goal | Status |
|--|--|
| Timely referrals (e.g., PR, PFT, dietary, sleep study) | 2022 manual process completed; electronic referrals for some |
| COPD Prognostication Criteria | To be completed (Q3 2023 iCARE study: AI/RPM) |
| Advance Care Planning | EMR documentation screens completed 2018; |
| System Standard for Advance Care Planning | 2019 IH contract with Gunderson Health; COPD selected as pilot group for implementation; COVID slowed implementation |

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Defining the Clinical Problem(s) & Performance

| | |
|---|--|
| System Palliative Care 2019. Place on hold 2021 due to COVID. | discussion processes, 2020 and discussion notes. Completed Q2 2018. Phase 1 process completed Sept 2018. 2019: Intermountain contracted with Gunderson Health's Respecting Choices with RTs/PDNs to certify, however, COVID has delayed full implementation. 2022: When CareCentra is integrated AND if our identified prognostication is effective, we will be able to more accurately determine prognostication criteria. These referrals may assist with early identification, discussions/planning and tracking of outcomes. |
| Verify/honor advanced directives for COPD patients: <ul style="list-style-type: none"> Determine whether patients were enrolled in hospice before death as well as how long prior to death Determine hospice length of stay | COVID delayed the full implementation of Gunderson Health's Respecting Choices system implementation. Goal: Q2 2021 Currently, nursing is asking for Advanced Directives and providing the booklet if requested; however, a need exists to: <ol style="list-style-type: none"> Have these discussions with Primary Care physicians at time of COPD diagnosis and before additional acute exacerbations with PDN support. Build on evidence-based outcomes to educate patients/caregivers prognostication criteria will help with this) DO NOT RCS to coordinate with system Palliative Care/Hospice Team to determine RCS use, etc. |
| Track and report CMS proposed rule COPD outcomes and hospital readmission rates | Receiving monthly reports since 2018 |
| Employ RRTs at the Telecritical Care desk, eventually with oversight for all "boots on the ground" Respiratory Care Services interventions | Implemented Q1 2020 EDW and Gary Peterson as well as Vicent Data loaded and reported monthly. Q1 2020: RRTs placed at Telecritical Care desk. Manuscript of interventions and outcomes pending for 2022. |
| Create and implement a COPD Action Plan in iCentra | Completed 2019. |
| Student intern project for outcomes data "Ten Years" after initial baseline data reported commenced Jan 2022 and due for completion April 1, 2022. | Student intern project for outcomes data "Ten Years" after initial baseline data reported commenced Jan 2022 and due for completion April 1, 2022. 2022: Abstracts for publication to JGIM's Respiratory Care Journal, accepted and published Oct 2022; presented at International Congress Nov 2022. |

AB = Advisory Board (Research Council of Washington for research, technology and consulting); 11 strategies for strengthening COPD inpatient and post-discharge care). The table above was created to address all AB strategies before the 2015 AB Playbook for Reducing COPD Readmissions was published. Only one key strategy was not specifically identified/addressed: creation of patient interviews for a 360-degree perspective; however, Cipher Health post-discharge questions were created and implemented summer 2017.

| Goals | Status |
|--|---|
| Verify/honor advance directives | Completed 2021 with EMR integration |
| Track/report CMS COPD 30-day Hospital Readmissions | 2018: monthly reports created and disseminated |
| Employ RRTs at Telecritical Care Desk | Completed Q1 2020 |
| Create COPD Action Plan in iCentra EMR | Completed 2019 |
| 10-Years of COPD abstract outcomes publication project (student interns) | 2021-2022; completed for publication and international presentation in Nov 2022 |

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Figure Four: High Risk Pulmonary Patient Order Set in Electronic Medical Record

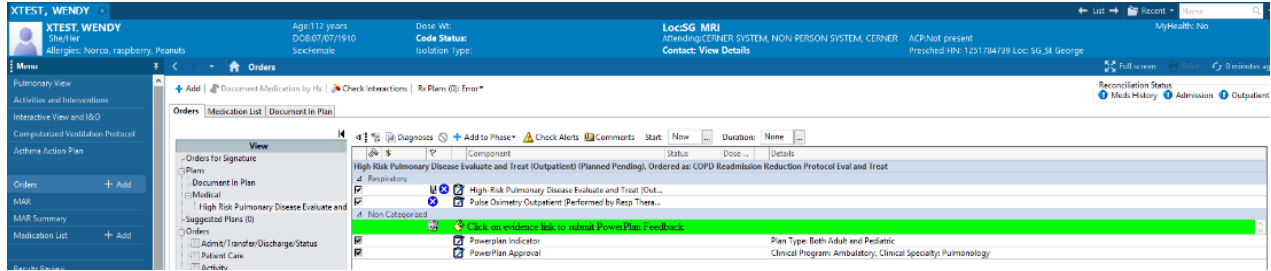
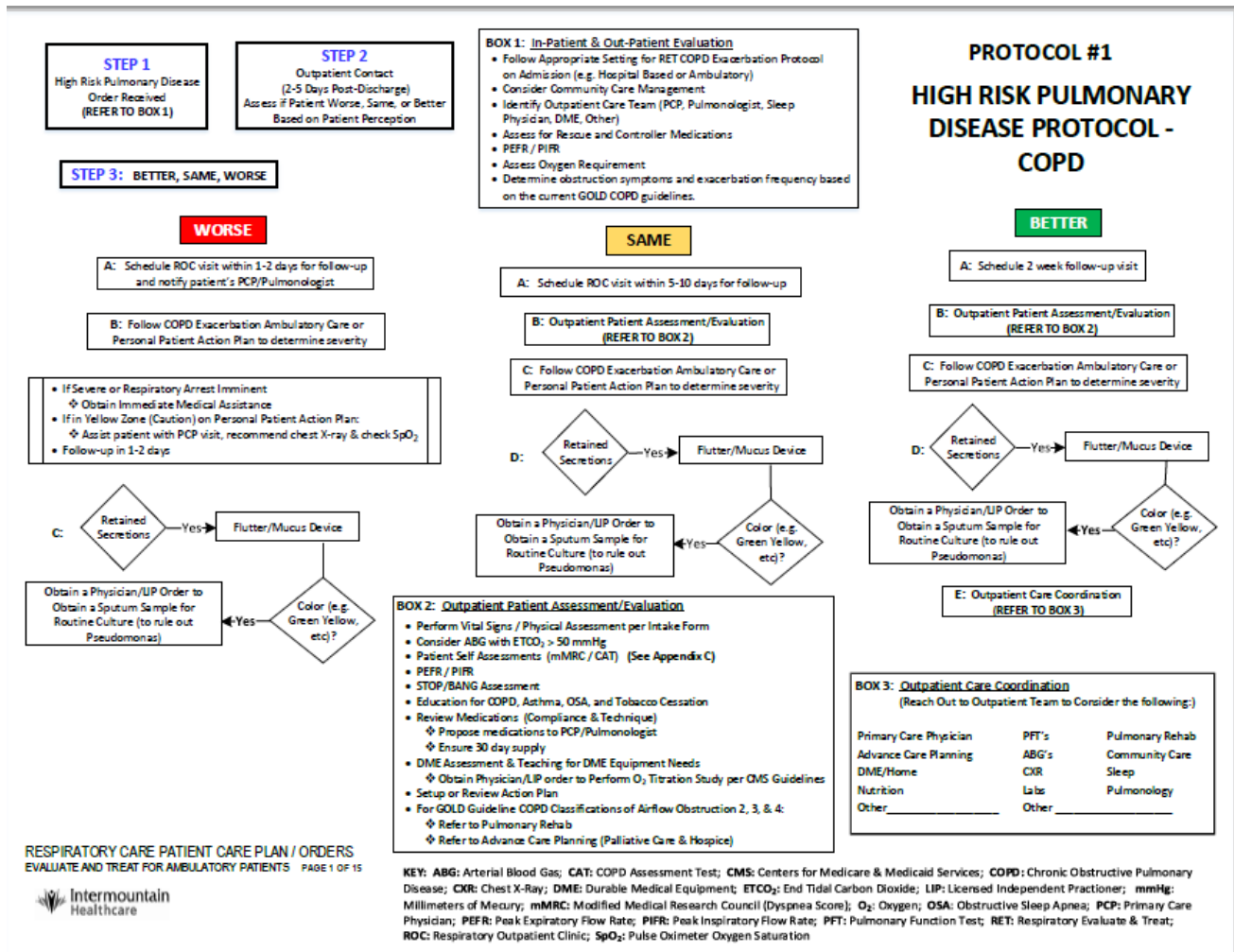
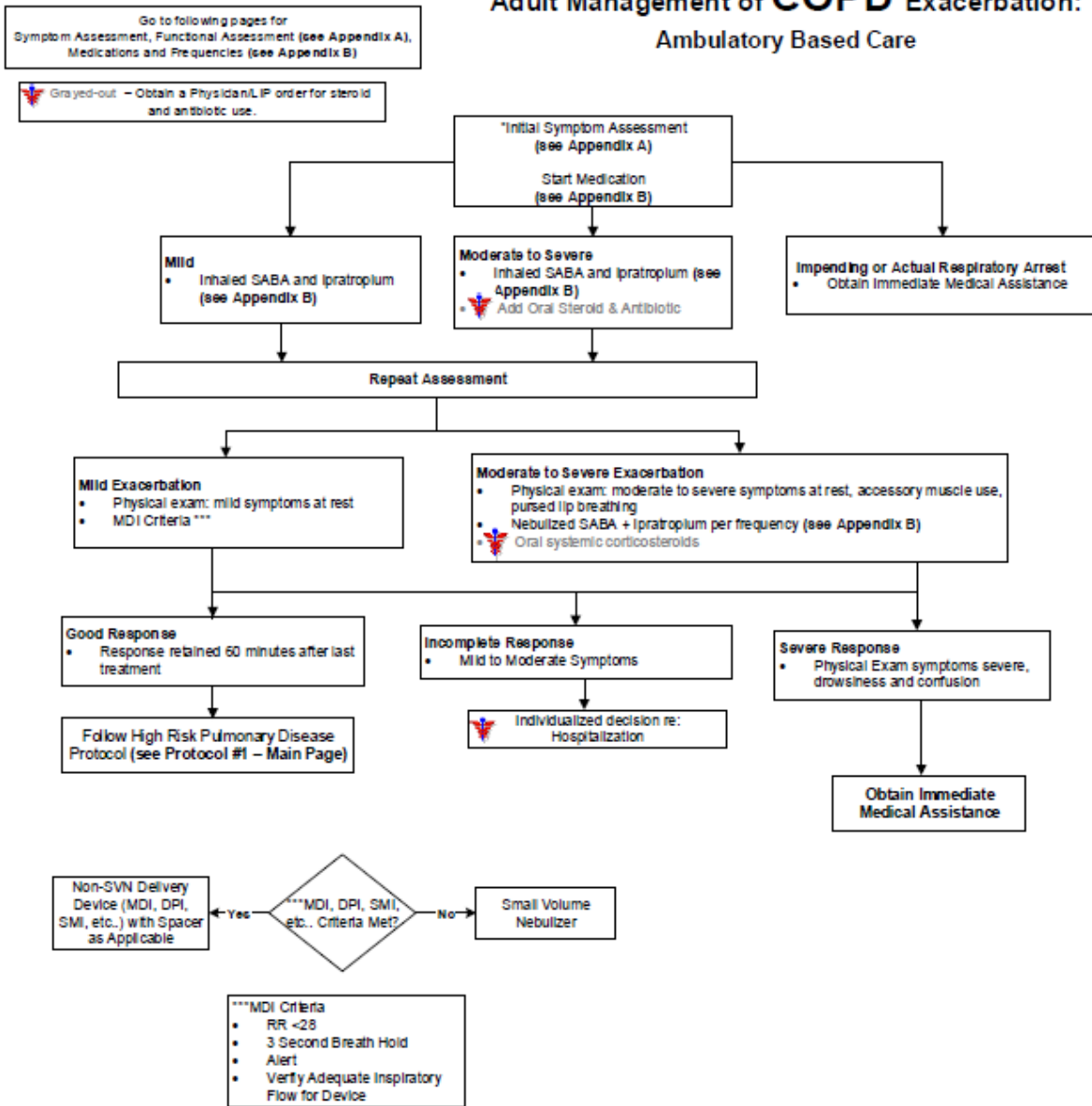


Figure Five: Ambulatory High-Risk COPD Exacerbation Protocol (embedded in EHR) Page 1.



Adult Management of COPD Exacerbation: Ambulatory Based Care



KEY: COPD: Chronic Obstructive Pulmonary Disease; DPI: Dry Powder Inhaler; LIP: License Independent Practitioner; MDI: Metered Dose Inhaler; RR: Respiratory Rate; SABA: Short Acting Beta Agonist; SMI: Soft Mist Inhaler; SVN: Small Volume Nebulizer; Physician Order

RESPIRATORY CARE PATIENT CARE PLAN / ORDERS

EVALUATE AND TREAT FOR AMBULATORY PATIENTS, PAGE 2 OF 15



**FORMAL EVALUATION OF ADULT COPD EXACERBATION SEVERITY IN THE
Ambulatory Based Care**
(To be used with Management of Adult COPD Exacerbation Flow Diagram)

Appendix A

Assessment

| <i>SYMPTOMS</i> | <i>MILD</i> | <i>MODERATE</i> | <i>SEVERE</i> | <i>SUBSET: Respiratory Arrest Imminent</i> |
|---|-------------------------------|----------------------------------|----------------------------------|--|
| Breathlessness/Dyspnea | While walking Can lie down | While at rest Prefers sitting | While at rest Sits forward | Marked while at rest Sits forward |
| Talks In | Sentences | Phrases | Words | |
| Alertness | May be agitated | Usually agitated | Impaired | Drowsy or confused |
| Respiratory Rate | Increased | Increased | Often >30/minute | |
| Use of Accessory Muscles; Sternomastoid & Abdominal, Pursed Lip Breathing | Usually Not | Commonly | Marked | Marked |
| Breath Sounds | Intermittent wheezing | Moderate wheezing | Absent or tight, Severe wheezing | Absent or tight |
| Pulse/Minute | <100 | 100-120 | >120 | Bradycardia |

Functional Assessment

| | <i>MILD</i> | <i>MODERATE</i> | <i>SEVERE</i> | <i>SUBSET: Respiratory Arrest Imminent</i> |
|--|------------------------------------|----------------------|--------------------------------|--|
| PaO ₂ (on home oxygen) and/or PCO ₂ | Normal (ABG not usually necessary) | Hypoxic | Possible cyanosis | Possible cyanosis |
| | Increased | Moderately increased | Possible respiratory failure | Respiratory Failure |
| pH | Normal Compensated | <7.35 Noncompensated | <7.35 Noncompensated | <7.30 Noncompensated |
| SaO ₂ and/or SpO ₂ percent (on home O ₂) | 85-88% | <85% | <80% | <80% |
| Peripheral Edema | May be increasing | Increasing | New onset marked | New onset marked |
| Sputum Volume and Purulence | Increased volume | Increased volume | Increased volume and purulence | Increased volume and purulence |
| Activities of Daily Living | Mild reduction | Moderate reduction | Marked reduction | Marked reduction |

KEY: ABG: Arterial Blood Gas; COPD: Chronic Obstructive Pulmonary Disease; O₂: Oxygen; PaO₂: Arterial Oxygen Pressure; PCO₂: Partial Pressure of Carbon Dioxide in Blood; pH: Measurement of Blood Alkalinity or Acidity; SaO₂: Arterial Blood Oxygen Saturation; SpO₂: Pulse Oximeter Oxygen Saturation

Notes:

- The presence of several parameters, but not necessarily all, indicates the general classification of the exacerbation.
- Many of these parameters have not been systematically studied, especially as they correlate with each other. Thus, they serve only as general guides.
- The emotional impact of COPD systems on the patient and family is variable but must be recognized and addressed and can affect approaches to treatment and follow-up.

RESPIRATORY CARE PATIENT CARE PLAN / ORDERS

EVALUATE AND TREAT FOR AMBULATORY PATIENTS, PAGE 3 OF 15



**FORMAL EVALUATION OF ADULT COPD EXACERBATION SEVERITY IN THE
Ambulatory Based Care
(To be used with Management of Adult COPD Exacerbation Flow Diagram)**

Appendix B

**SABA by Nebulizer or MDI for Exacerbation
Medication Dosage and Frequency Guidelines for Respiratory Therapy**

| <i>See Appendix A for full list of Symptoms</i> | MILD <i>(Intermittent wheezing)</i> | MODERATE <i>(Moderate wheezing, history of asthma)</i> | SEVERE <i>(Severe wheezing, severe dyspnea, unable to sleep)</i> | SUBSET: Respiratory Arrest Imminent |
|---|--|---|--|--|
| Ambulatory Adult ROC | 2.5 mg Albuterol once, then 2.5 mg Albuterol Q1 hour PRN Add 0.5 mg Ipratropium to first dose | 2.5 - 5 mg Albuterol once, then Q4 hours and Q1 hour PRN Add 0.5 mg Ipratropium to first dose and then Q4 hours NOTE: If the patient needs more than (2) Q1 hour treatments, return to Initial Assessment on Adult Management of COPD Exacerbation Flow Chart and notify Physician/LIP | Patient to Emergency Department (Follow Hospital Exacerbation Protocol) | Patient to Emergency Department (Follow Hospital Exacerbation Protocol) |

KEY: COPD: Chronic Obstructive Pulmonary Disease; LIP: Licensed Independent Practitioner; MDI: Metered Dose Inhaler; mg: Milligram; PRN: As Needed; Q1: Every 1 Hour; Q4: Every 4 Hours; ROC: Respiratory Outpatient Clinic; SABA: Short Acting Beta Agonist

Notes:

- The presence of several parameters, but not necessarily all, indicates the general classification of the exacerbation.
- Many of these parameters have not been systematically studied, especially as they correlate with each other. Thus, they serve only as general guides.
- The emotional impact of COPD systems on the patient and family is variable but must be recognized and addressed and can affect approaches to treatment and follow-up.

RESPIRATORY CARE PATIENT CARE PLAN / ORDERS
EVALUATE AND TREAT FOR AMBULATORY PATIENTS, PAGE 4 OF 15



Note: The COPD Ambulatory Exacerbation Protocol (pages -4 above) is an example of design and implementation as well as thoughtful application of information and technology.

mMRC Dyspnea Scale

| Grade | Dyspnea related to activity |
|-------|--|
| 0 | Breathlessness only on strenuous exercise |
| 1 | Breathless when hurrying on the level or walking up a slight hill |
| 2 | Walks slower than other people of same age on the level due to shortness of breath or need to stop for breath when walking at own pace |
| 3 | Short of breath after walking few minutes on the level or about 100 yards (90m) |
| 4 | Too breathless to leave the house, or breathless when dressing or undressing |

Modified from The Medical Research Council Dyspnea scale (mMRC dyspnea scale)

Appendix C

Adult Management of COPD

Ambulatory Based Care Assessment Tests

CAT Test

COPD Assessment Test (CAT)

| | SCORE |
|--|----------------------|
| I never cough 0 1 2 3 4 5 I cough all the time | <input type="text"/> |
| I have no phlegm (mucus) in my chest at all 0 1 2 3 4 5 My chest is completely full of phlegm (mucus) | <input type="text"/> |
| My chest does not feel tight at all 0 1 2 3 4 5 My chest feels very tight | <input type="text"/> |
| When I walk up a hill or one flight of stairs I am not breathless 0 1 2 3 4 5 When I walk up a hill or one flight of stairs I am very breathless | <input type="text"/> |
| I am not limited doing any activities at home 0 1 2 3 4 5 I am very limited doing activities at home | <input type="text"/> |
| I am confident leaving my home despite my condition 0 1 2 3 4 5 I am not at all confident leaving my home because of my lung condition | <input type="text"/> |
| I sleep soundly 0 1 2 3 4 5 I don't sleep soundly because of my lung condition | <input type="text"/> |
| I have lots of energy 0 1 2 3 4 5 I have no energy at all | <input type="text"/> |
| TOTAL SCORE | <input type="text"/> |



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Examples of thoughtful application of information and technology (EMR documentation screens):

Figure Six: COPD Phase 1 PDN Initial Assessment

Page 1 (above & below)

Page 2.

Page 3.

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

COPD Assessment

PCP: SYSTEM, NON-PERSON, SYSTEM, CERNER

Other Physicians: []

ACT for 12 years: []

✓ STOP-BANG

Social History

✓ Cardiac and Pul

✓ Chest Xray and

✓ Outpatient RD

✓ Medication His

✓ Interpreter/Ac

COPD Hospitalizations in the Past Year: [1]

COPD ED/Instacare Visits in the Past Year: [0]

COPD Primary Care Visits in the Past Year: [1]

Supplemental Oxygen

Oxygen Flow Rate: [] L/min

Home Regimen: Yes No

Home Liter Flow: [] L/min

O2 Home Use Frequency: Continuous With exercise At night

Comments

Segoe UI: [9]

Page 3 cont.

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

COPD Assessment

PCP: SYSTEM, NON-PERSON, SYSTEM, CERNER

Other Physicians: []

ACT for 12 years: []

✓ STOP-BANG

Social History

✓ Cardiac and Pul

✓ Chest Xray and

✓ Outpatient RD

✓ Medication His

✓ Interpreter/Ac

COPD Hospitalizations in the Past Year: [1]

COPD ED/Instacare Visits in the Past Year: [0]

COPD Primary Care Visits in the Past Year: [1]

Supplemental Oxygen

Oxygen Flow Rate: [] L/min

Home Regimen: Yes No

Home Liter Flow: [] L/min

O2 Home Use Frequency: Continuous With exercise At night

Comments

Segoe UI: [9]

Page 4.

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Asthma Control Test for people 12 years and older

1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or home?

All the time Most of the time Some of the time A little of the time None of the time

2. During the past 4 weeks, how often have you had shortness of breath?

More than once a day Once a day 3-6 times a week Once or twice a week Not at all

3. During the last 4 weeks, how often did you asthma symptoms (wheezing, coughing, shortness of breath, chest tightness, or pain) wake you up at night or earlier than usual in the morning?

4 or more nights a week 2 or 3 nights a week Once a week Once or twice Not at all

4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?

3 or more times per day 1 or 2 times per day 2 or 3 times a week Once a week or less Not at all

5. How would you rate your asthma control during the past 4 weeks?

Not controlled at all Poorly controlled Somewhat controlled Well controlled Completely controlled

SCORE

TOTAL: []

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Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Obstructive Sleep Apnea Questionnaire

Primary Care Physician: [Name, Corner] Total Score: []

STOPBANG Risk Interpretation

- High Risk for Moderate to Severe OSA (5-8)
- Intermediate Risk for OSA (3-4)
- Low Risk for OSA (0-2)
- Diagnosed OSA
- Patient Unable to Answer
- Negative Sleep Study within 3 yr and <10% weight gain

Have you had a sleep study and been diagnosed as having sleep apnea?

- Yes
- No
- Patient Unable to Answer
- Negative Sleep Study within 3 yr and <10% weight gain

STOP-BANG Questions

Snoring: Do you snore loudly (louder than talking or loud enough to be heard through closed doors?)

- Yes
- No

Tiredness/fatigue: Do you often feel tired, fatigued, or sleepy during the daytime, even after a "good" night's sleep?

- Yes
- No

Observed apnea: Has anyone ever observed you stop breathing during your sleep?

- Yes
- No

Pressure: Do you have or are you being treated for high blood pressure at home?

- Yes
- No

Height: [] cm Weight: [] kg

Body Mass Index: Over 35?

- Yes
- No

Body Mass Index: []

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Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Social History

Mask all as Reviewed

Category: Tobacco

Details: Use: Never smoker. Last Updated: 04/11/2019 10:44 MD

Use: Never smoker. Last Updated: 08/17/2021 13:56 MD

Use: Former smoker. Type: Cigarettes. Total pack years (# pack/day x # years) 72. Stopped age: 59 Years. Last Updated: 12/09/2022 16:29 MST

Category: Alcohol

Substance Use

Sexual, Gender Identity and Orienta...

Home/Environment

Employment/School

Hobbies/Interests

Page 7.

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Cardiac and Pulmonary History

Cardiac History

- None
- Arrhythmia
- Hypertension
- Congestive heart failure
- Edema
- Orthopnea
- Atherosclerotic Heart Disease
- Thrombosis
- Myocardial Infarction
- Post Heart Surgery (within 4 weeks)
- Other:

Pulmonary History

- None
- Sleep apnea
- Pneumonia
- Upper respiratory infection
- Lung carcinoma
- Asthma
- History of Asthma
- bronchitis
- Lobectomy
- Pneumonectomy
- Fibrosis
- Cystic Fibrosis
- Emphysema
- Bronchiectasis
- Chronic obstructive pulmonary disease
- Other:

Diagnosis (Problem) being Addressed this Visit

| Priority | Annotated Display | Condition Name | Date | Code | Clinical Dx |
|----------|--|--|------------|---------|-----------------------------|
| 1 | Maturity onset diabetes mellitus in youth (MODY) | Maturity onset diabetes mellitus in youth (MODY) | 09/19/2018 | E13.9 | Maturity onset diabetes ... |
| 2 | Pre-procedural laboratory examination | Pre-procedural laboratory examination | 11/11/2020 | Z01.812 | Pre-procedural laborator... |
| 3 | COPD with acute exacerbation | COPD with acute exacerbation | 03/02/2021 | J44.1 | COPD with acute exacerb... |

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Chest Xray and Surgical History

Chest XRay

Clear

Unavailable

Pleural Effusion

Acute Infiltrate

Atelectasis

Infiltrates in more than one lobe

Emergent Changes

Air trapping

Other:

Surgical History

None

General surgery

Lower abdomen

Spinal

Cerebral

Thoracic

Thoracic with Pulmonary Disease

Upper Abdominal

Other:

Mark all as Reviewed

Procedures

+ Add | Modify | Display: All

| Procedure | Last Reviewed | Procedure Date |
|----------------------------------|---------------|----------------|
| BKA - Below knee amputation | | 08/15/2022 |
| Test finding | | 11/18/2020 |
| Test AND/OR disease related diet | | 11/14/2018 |

Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Outpatient Readmission Reduction Billing

ROC Clinic Billing

In person

Phone call

Scheduled video visits

Phone call, no answer

Assessed Patient Immediate Needs

Community Care Management

Health Care Team Identified

Rescue and Controller Medications

Oxygen and DME Supplies

Patient Status (insert flow diagram)

Better

Same

Worse

All Education, ETCO2, SpO2, oxygen start and patient discharge training included with in person eval above. For Aerosol, Vibratory Device, ABG, create an order and follow tasks to document and bill.

Assessments

ETCO2: mmHg

Inspiratory Flow for MDI/DPI Checked: Yes No

Inspiratory Flow Measured: 120 L/min

Peak Flow: 135 L/min

Flow Resistor/Medication Inhaler Tested

None / PMDI

Low / Breezhaler

Medium-Low / Autohaler

Medium-Low / Diskhaler

Medium-Low / Elipta

Medium / Genuair

Medium / Spiromax

Medium / Clickhaler

Medium / Turbohaler / Symbicort

Medium-High / Turbohaler / Pulmicort

Medium-High / Twisthaler

Medium-High / Nexthaler

High / Easyhaler

High / Handhaler

Blood Gas

Inhaler Spacer Technique

Patient Refused

Verbalizes understanding

Demonstrates

Needs further teaching

Needs practice/supervision

RT Charge Inhaler Spacer Technique

Inpatient taught with medication administration

Inpatient taught with placebo - No treatment

ED/ROC/Outpatient WITH Treatment

ED/ROC/Outpatient NO Treatment

Education/Teaching

| | Verbalizes understanding | Demonstrates | Needs further teaching | Needs practice/supervision | Patient Refused |
|--|--------------------------|--------------|------------------------|----------------------------|-----------------|
| Ed-Asthma Understanding Anatomy & Physiology Lungs | | | | | |
| Ed-Asthma Controlling Asthma Symptoms | | | | | |
| Ed-Asthma Asthma Medications | | | | | |
| Ed-Asthma Pediatric Patients | | | | | |
| Asthma Action Plan | | | | | |
| Ed-COPD Assessment/Treatment Overview | | | | X | |
| COPD Daytime Therapy | | | | | |
| COPD Medications | X | | | | |
| COPD Breathing Technique | | X | | | |
| Ed-COPD Action Plan | X | | | | |
| Ed-OSA What is OSA | X | | | | |
| Ed-OSA How do I know I have OSA | | | | | |
| Ed-OSA Testing for OSA | | | | | |
| Ed-OSA Treating OSA | X | | | | |
| Ed-OSA BEH/ALTI Therapies for OSA | | | | | |
| Ed-Tobacco Use Cessation Education Provi | | | | | |
| Ed-Tobacco Why Quit | | | | | |
| Ed-Tobacco Getting Ready to Quit- Part 1 | | | | | |
| Ed-Tobacco Getting Ready to Quit- Part 2 | | | | | |
| Ed-Tobacco Staying Quit | | | | | |
| Ed-Tobacco Resource for Helping you Quit | | | | | |
| Ed- RT Vaping Education | | | | | |

Page 9 cont.

Social History

- Cardiac and Pul
- Chest Xray and
- Outpatient RO
- Medication His
- Interpreter/Ac

RT Charge Transtracheal Tube Cleaning

Equipment/Supply Given

Yes No

ROC Clinic Recommendations

- Sleep Referral/Stop bang >=5
- Pulmonary Rehab
- Nutrition
- Advanced Care planning
- Chest X-Ray
- Six minute walk
- Palliative care

ROC Direct Referrals

- Community care
- Pharmacy (30 day meds supply)

ROC Clinic New Home Health/DME

- Oxygen therapy
- NIV for Resp Failure AVAPS
- NIV for Resp Failure AVAPS AE
- NIV for Resp Failure IVAPS

PT has no PFT Test

No PFT in the last 2 years

Treatments Ordered per Protocol

- Arterial blood gas
- Inhalation treatment
- Sputum culture for Pseudomonas
- End Tidal CO2
- Vibratory/oscillatory device

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Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Medication History

Reconciliation Status: Meds History Admission

Displayed: All Active Orders | All Inactive Orders | All Active Medications, All Inactive Medications 24 Hrs Back

| Order Name | Status | Dose ... | Details |
|---|------------|---------------------|---------------------|
| acetaminophen | Future | 650 mg, Oral, Day | Administer 30 min |
| cytarabine | Future | 75 mg, IV Push, D | Target Dose: cytar |
| diphenhydramine | Future | 5 mg, IV Piggybac | Administer 30 min |
| insulin lispro (Humalog 100 units/mL injectable solution) | Documented | | See Instructions, F |
| insulin lispro (Humalog 100 units/mL injectable solution) | Prescribed | | See Instructions, * |
| oxyCODONE (oxyCODONE 5 mg oral tablet) | Documented | 1 tabs, Oral, every | |
| palonosetron | Ordered | 0.1 mg, IV Piggyb | |
| pegaspargase | Future | 2,500 units, IV Pig | Target Dose: pegasp |
| tiotropium (Spiriva Respimat 28 ACT 2.5 mcg/inh inhalation aerosol) | Documented | 1 puffs, Inhale, Da | |
| vinCRiStine | Future | 1,965 mg, IV Piggy | Round to the near |
| Zero Time | Future | N/A, N/A, Day of | |

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Respiratory Outpatient Readmission Reduction - XTEST, PACIFIC

*Performed on: 12/09/2022 16:24 MST By: STUCKI, RCP, TAMMY

Language Assessment

Registration Preferred Language: Spanish

PATIENT'S Preferred Language

- English
- Spanish
- American Sign Language
- Arabic
- Bosnian
- Cambodian
- Cantonese
- Chuukese
- Croatian
- Farsi
- French
- German
- Japanese
- Korean
- Lao
- Mandarin
- Marshallese
- Navajo
- Portuguese
- Romanian
- Russian
- Samoan
- Serbian
- Somali
- Swahili
- Tagalog
- Thai
- Tongan
- Turkish
- Vietnamese
- Other Language

Interpretation Type

- In-person Licensed/Certified Interpreter
- Qualified Bilingual Staff(OBS)/Provider(Trained/limited role)
- Video/Pad
- Phone
- Interpreter not used

Interpreter Name & ID Number

Other Interpretation Type/Comment

Reason Interpreter Not Used

- Patient declined; communicated in English
- Patient declined; used an adult friend/family member as interpreter
- Home/caregiver declined; communicated in English
- Patient asleep, unable to communicate, intubated or sedated
- Pt declined, assist by bilingual Provider/caregiver(not OBS)
- Could not locate rare language interpreter via in-person/video/phone

Interpretation Provider

- Patient
- Spouse
- Significant other
- Designated Home Care
- Daughter
- Family member
- Father
- Friend
- Grandfather

Home CAREGIVER'S Preferred Language

- English
- Spanish
- American Sign Language
- Arabic
- Bosnian
- Cambodian
- Cantonese
- Chuukese
- Croatian
- Farsi
- French
- German
- Japanese
- Korean
- Lao
- Mandarin
- Marshallese
- Navajo
- Portuguese
- Romanian
- Russian
- Samoan
- Serbian
- Somali
- Swahili
- Tagalog
- Thai
- Tongan
- Turkish
- Vietnamese
- Other Language

Home CAREGIVER'S Other Language (Not on List)

Consents, assessment, education, and discharge planning require the use of an interpreter.

Interpreter services should be used any time the patient or home caregiver needs the support of an interpreter in order to actively participate.

State Law requires that a Home Caregiver be identified on admission to inpatient care and that this person be involved in education and discharge support/planning so that the patient has a resource on return home.

Figure Seven: 2018 AARC Published Abstract/Poster for In-Hospital Mortality and 30-Day Readmission Rates

Outcomes from the Implementation of a Pulmonary Disease Navigator for Higher Risk Patients, In-Hospital Mortality and 30-Day Readmission Rates

Kim Bennion MSHS, RRT, CHC, Scott Daniel RRT, Kyle White RRT, Gardner Gee and Tammy Stucki RRT

Background

Dixie Regional Medical Center is a 245-bed hospital and is one of 23 acute care hospitals of the Intermountain Healthcare Corporation. To improve CMS Core Measures¹ for COPD hospital 30-day readmission and mortality, we instituted a Pulmonary Disease Navigator (PDN). PDN duties include but are not limited to:

- 1) Earlier disease education
- 2) Creation of documented care plans
- 3) Transition Care Management
- 4) Timely, medically necessary referrals (e.g., PFT, pulmonary rehab)
- 5) Post-discharge follow-up phone calls for care plan adherence
- 6) Medication instructions
- 7) Training patients on the proper use of CPAP, BiPAP and other equipment
- 8) Airway clearance methods
- 9) Breathing exercises
- 10) Tobacco cessation and all aspects of symptom management
- 11) Interdisciplinary pulmonary care training

We sought to identify what, if any, outcomes might be improved with the addition of the PDN.

Method

Between May 2017 - March 2018, 127 patients were identified as diagnosed with COPD and followed by our PDN. Of these 127, 67 (53%) were admitted with COPD exacerbation. We sought to determine what, if any, impact the PDN might have on COPD patient care and outcomes. Daily readmission and hospital mortality data was gathered on a daily basis using various tracking programs. COPD education was taught to new admissions and readmitted patients.

Results

Pre and Post Pulmonary Disease Navigator Outcomes

| DRMC COPD In-Hospital and 30-Day Mortality All Payer by Quarter | | | | | |
|---|---------|-------------------------|--------------------|--------------------|---------------|
| Discharge Qtr | Cases # | In-Hospital Mortality # | In-Hospital Rate % | Mortality 30-Day # | 30-Day Rate % |
| Qtr 2-2016 | 42 | 3 | 7.14 | 7 | 16.67 |
| Qtr 3-2016 | 32 | 0 | 0 | 0 | 0 |
| Qtr 4-2016 | 52 | 2 | 3.85 | 6 | 11.54 |
| Qtr 1-2017 | 87 | 4 | 4.6 | 11 | 12.64 |
| Qtr 2-2017 | 73 | 3 | 4.11 | 6 | 8.22 |
| Qtr 3-2017 | 43 | 3 | 6.98 | 6 | 13.95 |
| Qtr 4-2017 | 58 | 1 | 1.72 | 2 | 3.45 |
| Qtr 1-2018* | 89 | 2 | 2.25 | 5 | 5.62 |

*incomplete quarter data

Conclusion

PDN implementation occurred Q3 2016. It is interesting to compare Q2 2016 with Q2 2017, as well as Q4 2016 with Q4 2017 outcomes for both in-hospital mortality and 30-Day readmission rates. While we cannot conclude an absolute cause and effect relationship solely with the implementation of the PDN implementation Q3 2017, the drop in both outcomes tends to strengthen our suggestion that employing a PDN impacted our outcomes. Other detailed outcomes are reported in separate abstracts.

Since initial implementation of the PDN, we can assume and report other benefits. These include, but are not limited to:

- 1) Physicians requesting PDNs in their offices
- 2) Physicians requesting RRTs as telemedicine consultants
- 3) Enhanced patient/healthcare team communication
- 4) Improved timeliness of medically necessary referrals (e.g., Tobacco Cessation, PFT, and Advance Care Planning)
- 5) Elevation of Respiratory Therapy as a profession.

It is our impression that patients, their families and members of the healthcare team benefit from detailed, timely, coordinated interventions that are best guided by Respiratory Therapists under the general supervision, direction and orders from patient physicians.

References

¹<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html>

Figure Eight: 2018 AARC Published Abstract/Poster for Inhaled Medication Delivery and Inspiratory Flowrates

Adult Inhaled Medication Delivery and Inspiratory Flowrates

A Pulmonary Disease Navigator's Findings Among Medically Complex Patients

Kim Bennion MSHS, RRT CHC, Scott Daniel RRT, Kyle White RRT, and Tammy Stucki RRT

Background

Dixie Regional Medical Center is a 245-bed hospital and is one of 23 acute care hospitals of the Intermountain Healthcare Corporation. To improve CMS Core Measures¹ for COPD hospital 30-day readmission and mortality, we instituted a Pulmonary Disease Navigator (PDN). PDN duties include the assessment of care plans to include medications and their delivery as well as several other services. Tracking inspiratory flow rate (IFR) capabilities among medically complex COPD patients, the PDN reported patient inability to generate manufacturer's recommended IFR for their devices in a number of patients. Dry Powered Inhalers (DPI) generally require an inspiratory flow of 30-90 LPM. Studies have suggested that ideal IFR will determine laminar flow and thus better deposition of the medication². We utilize the InCheck Dial[®] to assess the patient's ability to generate adequate IFR in lieu of DPI resistance. DPIs and pressurized metered dose inhalers (MDI) are rated based on resistance (low to high). Further requirements to consider for DPI/MDI use are: 1) respiratory rate < 28, 2) 3 second breath hold, and 3) patient alert.

Method

Between May 2017-March 2018, 127 patients were identified as being diagnosed with COPD and were followed by our PDN.

Figure One: In-Check Dial[®] inspiratory flow device.

Results

PDN outcomes for patient IFRs are reported in Table One.

Figure Two: We utilize the InCheck Dial[®] to assure adequate patient inspiratory flow.

References

¹<https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html>

²Kanabuchi K, Kondo T, Tanigaki T, Tajiri S, Hayama N, Takahashi Y and Iwao K (2011). Minimal inspiratory flow from dry powder inhalers according to a biphasic model of pressure vs. flow relationship. Tokai J Exp Clin Med. 2011 Apr 20;36(1):1-4.

³Mahler DA (2017). Peak inspiratory flow rate as a criterion for dry powder inhaler use in chronic obstructive pulmonary disease. Ann Am Thorac Soc. Jul;14(7):1103-1107. doi: 10.1513/AnnalsATS.201702-156F5.

⁴Braman S, Carlin B, Hanania N, Mahler D, Ohar J, Pinto-Plata V, Shah T, Eubanks D, Dhand R (2018). Results of a Pulmonologist Survey Regarding Knowledge and Practices With Inhalation Devices for COPD. Respiratory Care July 2018, 63 (7) 840-848; DOI: <http://doi.org/10.4187/respcare.05717>


Table One: Adult Patient Inspiratory Flows for Inhaled Medication Delivery

| Adult Inspiratory Flow Rates n=127 # (%) | | | |
|--|-----------|-----------|-----------|
| < 80 LPM* | < 70 LPM* | < 65 LPM* | < 50 LPM* |
| 23 (18) | 12 (9) | 13 (10) | 2 (2) |
| 23 (18%) patients had IFR < 90 LPM* | | | |

Inhaler Resistance Range

Figure Three: We utilize the In-Check Dial[®] to assure adequate patient inspiratory flow.

Figure Nine: 2018 AARC Published Abstract/Poster for COPD Pulmonary Function Testing



What Pulmonary Function Testing (PFT) Frequency is Recommended for COPD Patients?

Kim Bennion MSHS, RRT CHC, Scott Daniel RRT, Kyle White RRT, and Tammy Stucki RRT

Background

Dixie Regional Medical Center is a 245-bed hospital and is one of 23 acute care hospitals of the Intermountain Healthcare Corporation. To improve CMS Core Measures for COPD hospital 30-day readmission and mortality, we instituted a Pulmonary Disease Navigator (PDN). In tracking PFT and result availability in the medical record, we found inconsistency in the frequency of PFTs performed. We sought to determine if diagnostic PFTs had been done and how often PFTs were performed in stable and unstable patients. We sought to obtain baseline data.

Method

Between May 2017-March 2018, 127 patients were identified as diagnosed at some time with COPD by our PDN. Sixty-seven (53%) were admitted due to a COPD exacerbation. Seventy-four of the 127 (58%) had a resulted PFT viewable in their medical record.

Results

Frequency of PFT results in the medical record are reported in Table One. Three (5%) had a COPD stage noted in their medical record, but they had never had a PFT.

While clinical presentation may assist with supporting staging for referrals such as pulmonary rehabilitation, CMS expects staging to be based on PFT results. We include staging reference document in the COPD Exacerbation Protocol which is one of many system, standardized, evidence-based protocols we have under the umbrella of what we call RT Evaluate and Treat (Figure One).

Table One: Pulmonary Function Testing in COPD Patients

| COPD Patients w/ PFT in Medical Record | | |
|--|----------|----------|
| | n (%) | n (%) |
| Exacerbation 30 days | 67 (53%) | 67 (53%) |
| Stable | 60 (47%) | 60 (47%) |

Conclusion

Controversy remains regarding the frequency for PFTs in the diagnosis and ongoing care for COPD patients. We have identified patients who did not meet either GOLD guidelines (forced vital capacity FEV1/FVC < 0.70) or Lower Limits of Normal (LLN) criteria for COPD but were given a COPD diagnosis by ED/hospitalist physicians. This complicates accurate identification of COPD patients. Our pulmonologist identified patients have normal spirometry but low DLCO and positive for emphysema. Current GOLD guidelines view smokers with preserved lung function but respiratory symptoms as having similar outcomes as "COPD". One study suggested increased diagnosis accuracy by including an extensive history, physical examination spirometry, diffusion testing and the consensus of an expert panel. The American Thoracic Society recommends a PFT when respiratory symptoms present; however, Mehta's suggestion that PFTs can be done before clinical symptoms are evident especially in early smokers may have merit¹⁴. Debate continues regarding the frequency of repeat PFTs in COPD patients. More research will be required before conclusions can be accurately drawn.

Figure One: COPD Exacerbation Protocol Staging Reference



We created an observation room/service to care for COPD patients to avoid inpatient admissions but report only a small utilization. It is our impression that earlier symptom deterioration recognition with patients still in their home would be most ideal. We are working with several vendors to create and utilize COPD "nudging" electronically. The Hodge Theory, originally developed by James Wilk in 1995, is gaining traction internationally in terms of healthcare behavior and motivation economics. It involves a weekly patient entry into a "diary" of several questions that relate to symptoms in terms of if they are better, the same or worse. It can nudge the patient, physician and care managers. We will be utilizing nudges to our PDNs in our model. We are pursuing this novel idea to investigate what, if any, benefit might be appreciated in caring for our COPD patients across the system.

We have added the ability to meet with, evaluate and treat COPD patients in our new, Respiratory Outpatient Clinic (Figure Two) where we are one of two hospitals piloting a COPD Readmission Reduction Protocol.

Since initial implementation of the PDN, we report other benefits. These include but are not limited to: 1) physicians requesting PDNs in their offices, 2) physicians requesting RRTs as telemedicine consultants, 3) enhanced patient/healthcare team communication, 4) improved timeliness of medically necessary referrals (e.g., tobacco cessation, PFT, advance care planning), and 4) elevation of Respiratory Therapy as a profession. It is our impression that patients, their families and members of the healthcare team benefit from detailed, timely, coordinated interventions that are best guided by Respiratory Therapists under the general supervision, direction and orders from physicians.



Figure Two: Respiratory Outpatient Clinic

References

- <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html>
- Zak Mohamed Hossain FA, Zanen P, Sachs AP Verheij T, Lammers JW & Broekhuizen RD (2012). Spirometric thresholds for diagnosing COPD: 0.70 or LLN, pre- or post-dilator values? COPD 9(4):338-43.
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Quality Measures of Standard Adherence

St. George Regional Hospital (SGRH), previously known as Dixie Regional Medical Center (DRMC-245 beds) and Intermountain Medical Center (IMC-504 beds) were selected as PDN pilot sites. PDN workflow is based on the system COPD Readmission Reduction Protocol (Figure Five above). Duties include, but are not be limited to: 1) inpatient evaluations before hospital discharge to include community care management, 2) evaluations in the Respiratory Outpatient Clinic, 3) evaluation of care plans and patient compliance to care plan, 4) assessment of oxygen requirement or other durable medical equipment needs, 5) physician contact for referrals for medically necessary services for which patients met physician defined clinical criteria (protocols), 6) medications and their delivery, 7) patient/caregiver education, 8) the utilization of a COPD observation unit (SGRH only), and 9) scheduled 2-week post-discharge clinic visits to include pre-/post-pulmonary function testing, 6-minute walk, tobacco cessation, sleep study, pulmonary rehabilitation and serious illness discussions/advance care planning with goal attainment scaling as part of the National Committee for Quality Assurance Serious Illness Learning Collaborative, a \$50,000 grant funded project. Between May 2017 - March 2018 at DRMC, 127 patients were identified as diagnosed with COPD and followed by the PDN. Of these 127, 67 (53%) were admitted with COPD exacerbation. At IMC between November 2017-September 2018, 417 patients were diagnosed with COPD (DRG 190, 291 & 192) and/or had a COPD diagnosis in their medical record. All 417 were contacted by a PDN. Outcomes were tracked, analyzed, and reported via the COPD dashboard.

Following the PDN pilot program at the facilities demonstrated the benefit of the PDN program in reducing 30-day All-Cause Readmissions for COPD (Figures Ten & Eleven from St George Hospital, formerly known as Dixie Regional Medical Center) the program was expanded to include the three additional trauma centers: McKay-Dee Hospital (MKDH), Latter-day Saint Hospital, (LDSH) and Utah Valley Hospital (UVH). The system average before the pilot began in 2017 for 30-day All-Cause Readmission was 18.2% as compared

to 11.2% following PDN and information technology solutions. Even though this is below the CMS penalty, Intermountain sought to further reduce the readmission rate at the PDN sites. We then further refined documentation tools to assist the PDNs in detailing the following inpatient and outpatient information: inpatient evaluations to include community care management, outpatient evaluation of care plans, oxygen requirements and other durable medical equipment needs, medication regimen evaluation, and referral recommendations to the provider for protocol driven outpatient services, like pulmonary function testing, pulmonary rehab, sleep study, and advanced care planning. Figures Twelve and Thirteen are example reports of the 2017-2022 CMS Penalty and Intermountain Healthcare System all-cause COPD Hospital Readmission Outcomes. Key process indicators (KPIs) are reported as value-based care with the utilization of standardized clinical practice utilizing evidence-based protocols, performing ongoing auditing and monitoring, and quarterly reporting to senior leadership. With CMS penalties in play, Respiratory Care leadership has provided reports since 2016 in terms of quality, community stewardship, healthcare access, and growth.

Figures Ten & Eleven: SGRH Initial Outcomes Utilizing PDN and EHR Solution

RESULTS

Pre and Post Pulmonary Disease Navigator Outcomes

| DRMC COPD In-Hospital and 30-Day Mortality All Payer by Quarter | | | | | |
|---|---------|-------------------------|--------------------|--------------------|---------------|
| Discharge Qtr | Cases # | In-Hospital Mortality # | In-Hospital Rate % | Mortality 30-Day # | 30-Day Rate % |
| Qtr 2-2016 | 42 | 3 | 7.14 | 7 | 16.67 |
| Qtr 3-2016 | 32 | 0 | 0 | 0 | 0 |
| Qtr 4-2016 | 52 | 2 | 3.85 | 6 | 11.54 |
| Qtr 1-2017 | 87 | 4 | 4.6 | 11 | 12.64 |
| Qtr 2-2017 | 73 | 3 | 4.11 | 6 | 8.22 |
| Qtr 3-2017 | 43 | 3 | 6.98 | 6 | 13.95 |
| Qtr 4-2017 | 58 | 1 | 1.72 | 2 | 3.45 |
| Qtr 1-2018* | 89 | 2 | 2.25 | 5 | 5.62 |

*incomplete quarter data

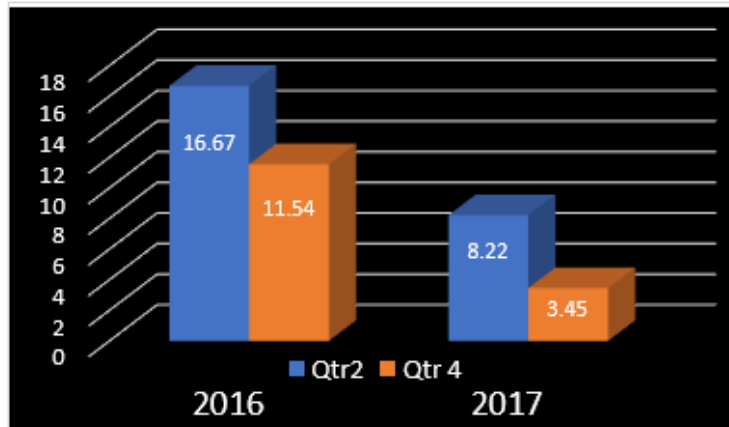
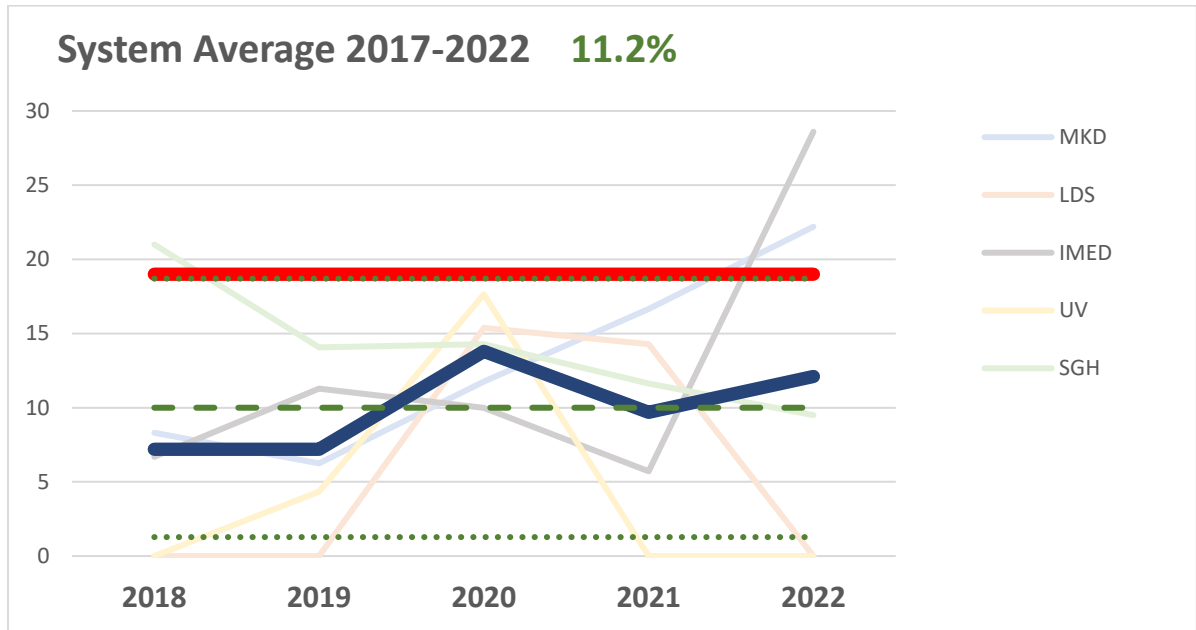
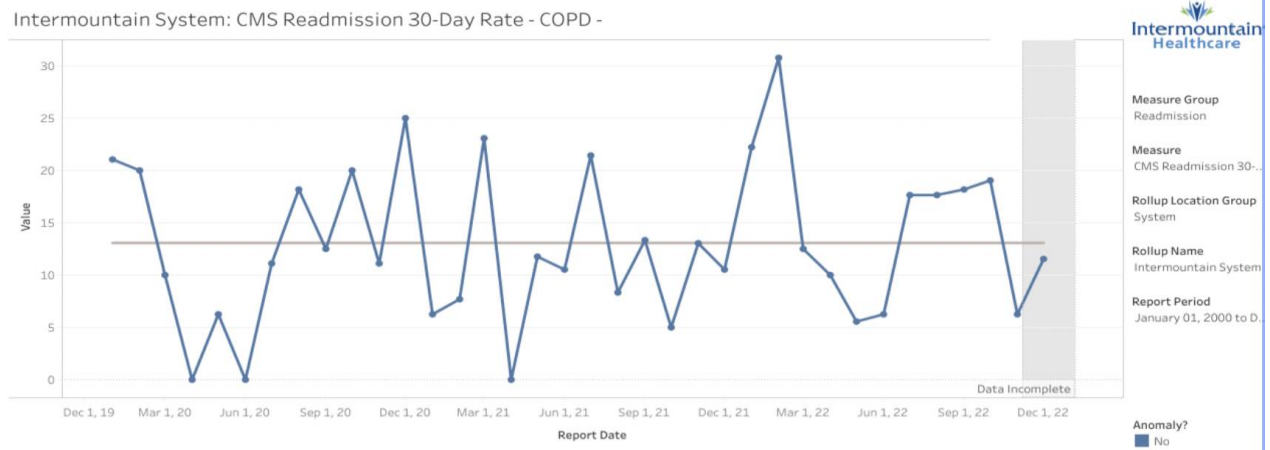


Figure Twelve: 2017-2022 CMS Penalty and Intermountain Healthcare System All Cause COPD Hospital Readmission Outcomes



Graphic display of the impact of the utilization of standard of care and outcomes with the support of information technology solutions.

Figure Thirteen: Intermountain Healthcare CMS 30-Day Readmission Rate Dec 1, 2019 – Dec 1, 2022



Measure Steward Organization

The Medicare Hospital Readmission Reduction Programs (HRRP) tracks all outcomes relative to the six included diagnoses and procedures for targeted tracking of 30-day unplanned admissions.¹ CMS calculates the payment reduction and component results for each hospital based on its performance during a rolling performance period. The payment adjustment factor is the form of the payment reduction CMS uses to reduce hospital payments. Payment reductions are applied to all Medicare fee-for-service base operating diagnosis-related group payments during the FY (October 1 to September 30). The payment reduction is capped at 3 percent (that is, a payment adjustment factor of 0.97).

CMS sends confidential Hospital-Specific Reports (HSRs) to hospitals annually. CMS gives hospitals 30 days to review their HRRP data as reflected in their HSRs, submit questions about the calculation of their results, and request calculation corrections. The Review and Correction period for HRRP is only for discrepancies related to the calculation of the payment reduction and component results.¹

Numerator – Intermountain follows the Medicare HRRP as the guideline for numerator inclusion. Overall, we include those adult patients ≥ 18 years of age with a 30-day readmission diagnosis of COPD.

Denominator of Intermountain COPD Patient Readmissions Extraction

While the Medicare HRRP program assigns reimbursement penalties for 30-day hospital, all cause readmissions based on DRG 190, 191 and 192 Intermountain initiatives have focused on adults ≥ 18 years of age with a diagnosis of COPD in the medical record. However, one of the gaps of care identified in 2011-2012 included the inclusion of patients in the COPD diagnosis of COPD based on clinical findings with a lack of definitive diagnosis of COPD via pulmonary function testing. A lack of access via the EHR to PFT results if performed in physician clinics was also noted. To address this, an information technology solution was created to link PFT results to be viewable in via the patient's EHR.

Clinical Exemption Criteria from the Measurement Cohort

While included in the Medical HRRP results, Intermountain has excluded patients with a DRG diagnosis of 190, 191 or 192 who is < 18 years of age/or hospice care. It should be noted that very few patients with the designated DRG diagnosis are < 18 years of age. The majority of pediatric patients with the designated COPD DRG diagnosis codes are cared for in our stand-alone pediatric hospital which are not included in the Medicare HRRP program/COPD outcomes reports.

The data extraction is a by-product of EHR documentation obtained from the enterprise data warehouse (EDW) or the HealthIntent population health platform and claims data.

Design and Implementation Model Practices and Governance

ARCIE Reference Document:

This was an initiative originating from the work of and coordinated by Respiratory Care Clinical Services. Continued monitoring of compliance continues to be their stewardship.

| | |
|------------------|---|
| Approved | Organization's President, CEO, COO, Nursing Chief Officer, and Chief Information Officer and Hospital Medical Executive Committees |
| Reviewed | Representatives from Respiratory Care Services and System/Facility Respiratory Care Medical Directors, Hospitalists, Intensivists, Pulmonologists, Primary Care Physicians, Hospital and Home Care nurses, and Respiratory Therapists and aides, Information Technology Consultants, Patient/Provider Education Consultants |
| Consulted | Representatives from Respiratory Care Services and System/Facility Respiratory Care Medical Directors, Hospitalists, Intensivists, Pulmonologists, Primary Care Physicians, Hospital and Home Care nurses, and Respiratory Therapists and aides, Information Technology Consultants, Patient/Provider Education Consultants |
| Informed | Representatives from Respiratory Care Services and System/Facility Respiratory Care Medical Directors, Hospitalists, Intensivists, Pulmonologists, Primary Care Physicians, Hospital and Home Care nurses, and Respiratory Therapists and aides, Information Technology Consultants, Patient/Provider Education Consultants |
| Executed | Respiratory Care Services and System/Facility Respiratory Care Medical Directors, Hospitalists, Intensivists, Pulmonologists, Primary Care Physicians, Hospital and Home Care nurses, Respiratory Therapists and aides, Information Technology Consultants, Patient/Provider Education Consultants |

Sub-committees met ad hoc as various documents and processes were created. Utilize charts describing critical multidisciplinary committees if applicable. Education to staffs included interactive computer training modules with case scenarios, FACT sheets and hands-on trainings (Figures Sixteen & Seventeen-pages 1-3). Super User trainers were utilized to conduct trainings and to document competencies following didactic and computerized training modules.

Figure Sixteen: Example of COPD Diagnosing and Staging FACT Sheet Education

| Fact Sheet: COPD Diagnosis and Staging | |
|--|---|
| Applies to | Clinicians treating Chronic Obstructive Pulmonary Disease patients |
| Why it's important | COPD is common and underdiagnosed. Good care improves outcomes and reduces costs. Treatment for COPD differs based on the stage of COPD. Accurate diagnosis and staging of disease severity is critical to delivering the most effective treatment for COPD patients. |
| Key points | <p>Spirometry testing is required for diagnosing COPD (and for differentiating it from asthma or other chronic lung diseases). Spirometry testing should be performed for any patients with chronic symptoms suggestive of COPD or for patients over 40 with risk factors for COPD, especially a smoking history.</p> <p>Diagnosis: Along with elevation of symptoms, the diagnosis of COPD is confirmed with an FEV1/FVC ratio of less than about 70%. Lower limits of normal (LLN) can vary based on the patient's age, sex, height and ethnicity. Aging patients will increasingly fall below 70% FEV1/FVC ratio, but be within their lower limit of normal range (LLN) and would therefore be considered "normal".</p> <p>Severity Classification: Along with severity of symptoms, the FEV1 percent of predicted helps classify severity.</p> <ul style="list-style-type: none"> Stage 0: FEV1/FVC ratio \geq 0.70 or within LLN; FEV1 > 80% of predicted Stage 1: Mild obstruction; FEV1/FVC ratio < 0.70; FEV1 > 80% of predicted; cough may be present Stage 2: Moderate obstruction; FEV1/FVC ratio < 0.70; FEV1 50-80% of predicted; Dyspnea on exertion; Cough and sputum sometimes present Stage 3: Severe obstruction; FEV1/FVC ratio < 0.70; FEV1 < 50% of predicted; Increased dyspnea, reduced exercise capacity; Fatigue, exacerbations Stage 4: Very Severe; FEV1/FVC ratio < 0.70; FEV1 < 30% of predicted; Chronic respiratory failure; Life-threatening exacerbations <p>Treatment: is based on severity classification stage. All diagnosed COPD patients should receive core treatment including:</p> <ul style="list-style-type: none"> Smoking Cessation education Evaluation for oxygen therapy Influenza and pneumococcal vaccines Avoidance of inhalation exposures Consideration of alpha-1 antitrypsin deficiency test |
| Links to other resources | <ul style="list-style-type: none"> https://dx.doi.org/10.1177/0885066614264259 (COPD Care Process Model) |
| Check yourself | <ul style="list-style-type: none"> Do you know what test is required for COPD diagnosis and staging? Do you know how to find the COPD Care Process Model? |

Click here to return to Contents

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Figure Seventeen: Example of EHR Computerized Training Module for Education-Page 1

The "Why"

What are the Protocols?

Taking the Lead

WORKING WITH THE PATIENT

Assessing the Patient

Comprehensive Evaluation

Focused Assessment

DOCUMENTATION AND ICENTRA

Developing a Plan of Care

iCentra

Completing the Orders

CONCLUSION

Wrap Up

Lesson 7 - Developing a Plan of Care

Lesson 8 of 10

iCentra

In the activity below, you'll walk through how to find the Respiratory Evaluate and Treat protocols in iCentra. Read the information in yellow boxes and follow the instructions in the orange boxes.

Page 2.

The "Why"

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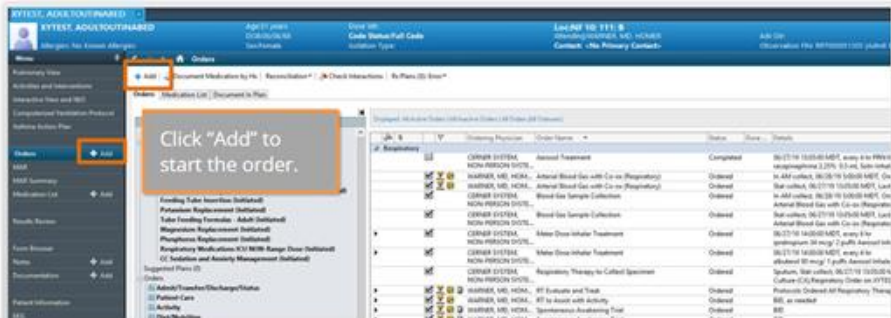
CONCLUSION

Wrap Up

Lesson 8 of 10

iCentra

In the activity below, you'll walk through how to find the Respiratory Evaluate and Treat protocols in iCentra. Read the information in yellow boxes and follow the instructions in the orange boxes.




Page 3.

Respiratory Therapy: An Introduction to the Evaluate and Treat Protocols

30% COMPLETE

- INTRODUCTION
- The "Why"
- What are the Protocols?
- Taking the Lead
- WORKING WITH THE PATIENT
- Assessing the Patient
- Comprehensive Evaluation
- Focused Assessment
- DOCUMENTATION AND iCENTRA



Respiratory Therapy Protocols standardize the way we evaluate patients and set up care plans across the system. In addition, they help us:

- Improve the quality of patient care
- Decrease variation in ordering and practice
- Decrease utilization of inappropriate, non-medically necessary services
- Improve compliance and productivity
- Set the stage for further research and development to protect and promote our professional standing

This module will help you learn more about protocols, practices, and orders necessary to be successful.

CONTINUE

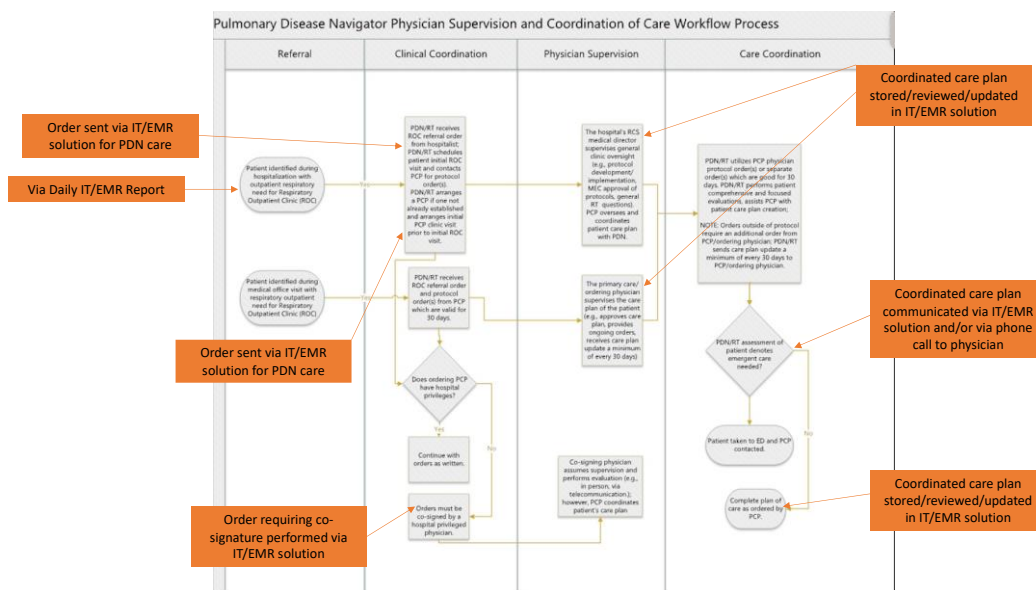
Tools, Resources, and Timeline for Clinical Staff Training

Under the direction of a pulmonary medical director, and a committee of pulmonary disease navigators, and based on the COPD GOLD Standards, the Ambulatory High-Risk COPD Protocol was developed as well as EHR workflows to include but not be limited to the order set, communication of order, documentation of intervention(s) as well as outcomes reporting generation. Respiratory Care Medical Directors at each hospital presented all aspects of the referral and care workflows mentioned above to the Medical Executive Committees for approval. Further, the Respiratory Care Medical Directors were tasked with the dissemination of the protocols, processes, and workflows prior to implementation. Outcomes of the two-facility pilot previously reported in this application were included. Hospital-based caregivers of all disciplines were educated on high-level information regarding the new initiative. Hospital-based respiratory therapists were provided more detailed education in care coordination with the pulmonary disease navigators in terms of items listed previously in the workflow and electronic medical record. Respiratory Therapists received both didactic training with reinforced learning via computer-based protocols which provided case examples for protocol application practice. All of this occurred the quarter prior to go-live. The merging of protocols and the electronic medical record inclusion in physician/advance practice provider Power Plans has improved workflows, patient throughput, and minimized the number of charting "clicks" required to care for this subset of patients.

Clinical Transformation enabled through Information and Technology

This section is devoted to describing the longitudinal clinical workflow and all the different touchpoints where information and technology drives improved adherence to the standard of care.

Figure Fifteen: Flow Chart Longitudinal Clinical Workflow Integrating IT/EHR Solution Touch Points



Note: PDNs can “propose orders” to providers for authentication within the EHR.

Multiple disciplines now have access to the protocol, patient history, clinical data, behavioral health data, social determinants of health data, and/or behavior health data to risk adjust the patient. The protocol as well as the data listed above were used for clinical decision support and communication of care. Throughout the process, key system leaders met with the IT clinical support team met to revise the IT/EHR support tool to enhance patient care and timely interventions. Medication management was a pivotal patient safety best practice that was identified. Using the protocol questions in association with the ongoing patient education to their care plan, patients were more aware of the signs/symptoms of an exacerbation and were able to receive earlier, at home exacerbation mitigating interventions.

Patient Information and Technology Interventions

Currently, the Intermountain Healthcare LIVE score is available daily from EHR embedded calculations by facility for all patients with COPD. It is a prognostication score for mortality, readmission, and comorbidity (Figure Sixteen). PDNs and other disciplines utilize this score for identification of patients at risk as well as patient referrals including but not limited to advanced care planning, disease home management, and referrals to other service lines for comorbid condition management. The LIVE score combines a patient's simple laboratory values (levels of hemoglobin, albumin, creatinine, chloride, and potassium) to identify those patients who are at high risk of death or further disease advancement, and who may most need referrals to palliative care and advanced care planning resources. The PDN has the ability to guide the patient and family through these end-of-life decisions.

Patients are called by the PDNs as part of the assessment (refer to Ambulatory High-Risk COPD Protocol) to both report symptoms as well as the RPM measures following discharge. This data is used to drive/adapt the individualized care plan.

As previously mentioned, this has set the groundwork for the artificial intelligence platform that will have a patient IT interface for remote patient monitoring.

Figure Sixteen: The COPD LIVE Risk Score

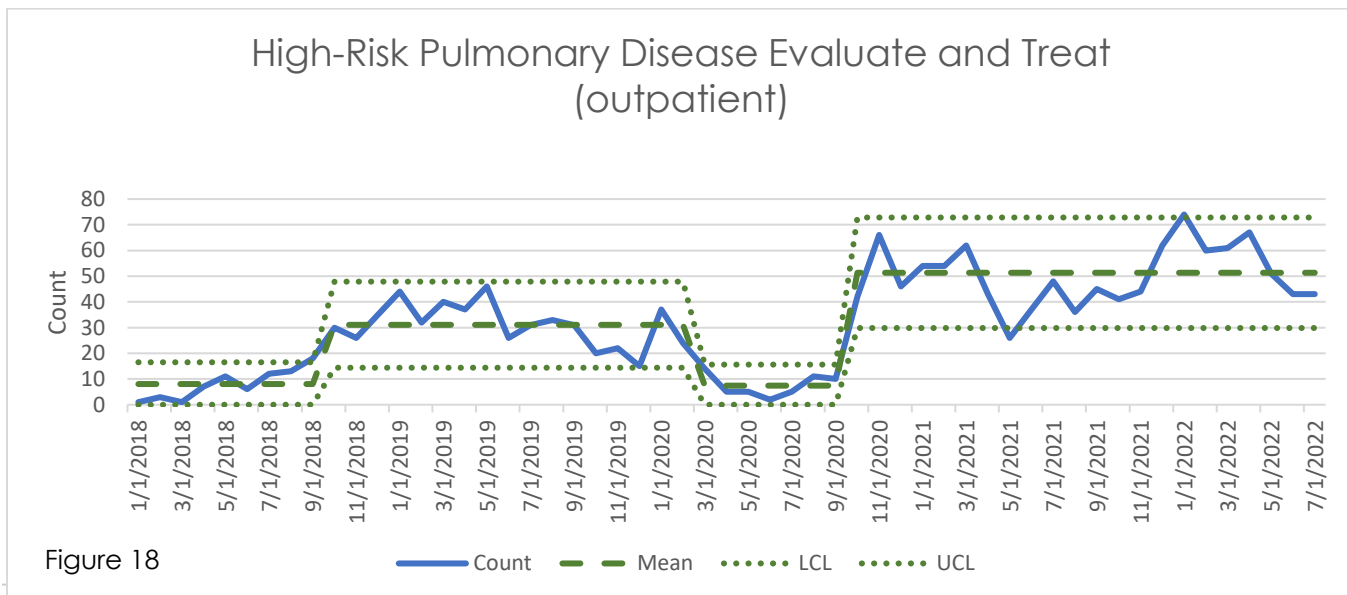
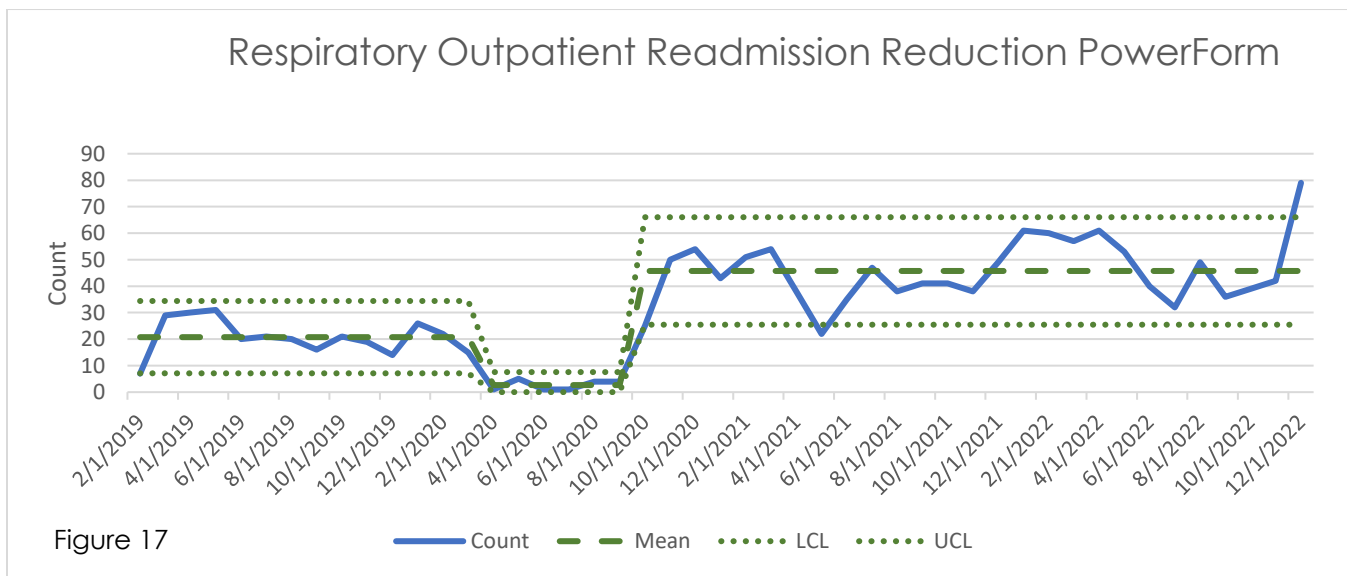
| | |
|------------------------|---|
| Risk Score Info | <p>LIVE score is a COPD risk score that ranges from high(1) to low(5) for mortality, readmission and comorbidity It is externally validated (National VA data and U of Chicago). * Denotes a Preliminary Score, Not Enough Lab Values Available</p> <p>IMRS - Intermountain Risk Score. READMIT 30 - Risk of readmission within 30 days for CHF. DEATH 30 - Risk of all-causes of death within 30 days. DEATH YEAR - Risk of all-causes of death within 1 year. All are externally validated.</p> <p>IMACE - Risk of Cardiovascular, acute MI or stroke mortality within 3 years. ICOPD - Risk of readmission within 30 days for patients with COPD. PNEUM - Risk of readmission within 30 days for patients with pneumonia. All are internally derived and validated based on laboratory data.</p> |
|------------------------|---|

Improving Adherence to the Standard of Care

Over the past ten years, clinicians have worked tirelessly with data extraction, the creation and application of the Ambulatory COPD High-Risk Protocol, refinement of both in person assessment and RPM data to evaluate patient status, provide education to patients and their home caregivers, and to communicate care plan outcomes to multiple disciplines using IT/EHR solutions.

Intermountain Health utilized our organization's baseline COPD outcomes data to help create the PDN model which ultimately provided the workflows to decrease the total 30-day hospital readmission for COPD by 7%. The guiding benchmark for the outcome is to remain above the CMS penalty line.

The adherence to the standard of care is represented by the increase in utilization of the EHR tools, which represent an increase in the PDN engagement activity. (Figures 17 -19).



Telephone Follow-up Visit for Respiratory Risk Readmissions

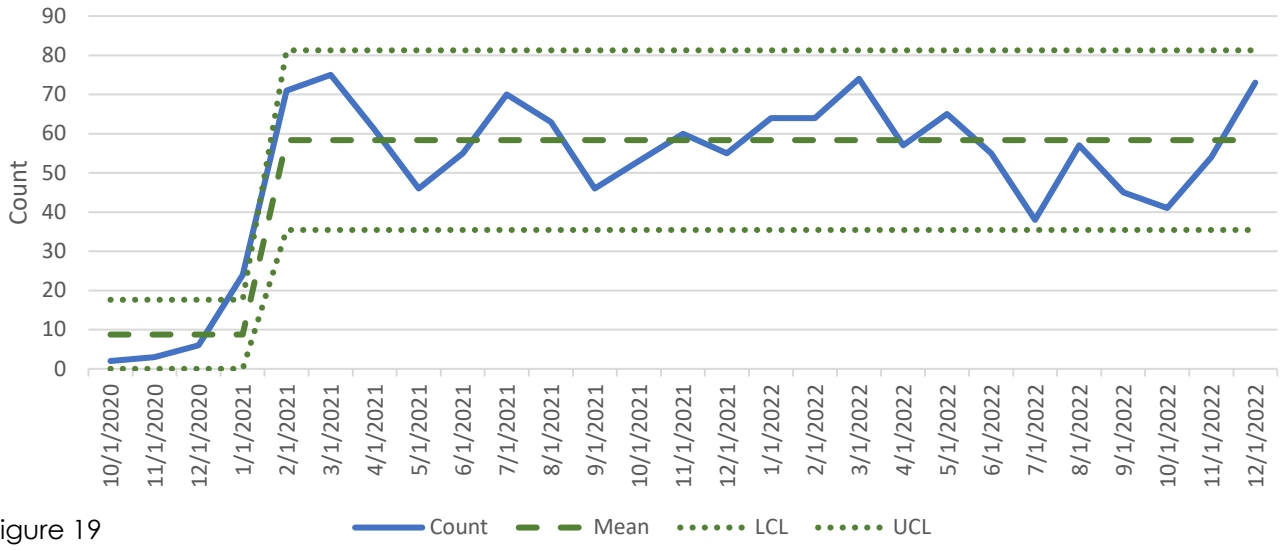


Figure 19

Improving Patient Outcomes

Six major direct and indirect outcomes were appreciated as a result of utilizing enhanced information technology. These include but are not limited to:

- Decrease in all cause 30-day readmission rates for this subset of complex COPD patients from 18.2 to 7.1% when comparing readmissions from 2017 (initiation) to 2022 – Figure twelve
- Identification of patients unable to “trigger” medication delivery devices due to inadequate patient inspiratory flow required to overcome the resistance of devices (19%-24% of patients identified in this category). Medication and/or delivery devices were changed upon physician notification and order
- Enhanced coordination of the patient's individual care plan among all care clinicians (e.g., physicians, respiratory therapists, nursing, pharmacists)
- Timely communication of patient status as all documentation was accessible to all clinicians as well as the ability to “author for” orders for the physician/advance practice provider. These were routed to the provider's inbox for order authentication prior to implementation. This allowed for more timely changes in the patient's care plan as needed saving human resource time.
- The Ambulatory COPD High-Risk Protocol was embedded in the EHR/IT solution and associated with the patient's specific medical record thereby assuring federal regulatory requirement compliance. This also served as a resource/reminder of the various steps in the protocol as well as “hard stops” which notified the PDN when an additional physician order was required.
- During the COVID pandemic, a time when chronic lung patients are at high-risk for severe exacerbations, only 1 of 53 patients enrolled in the SGRH study required hospital admission. The initiatives implemented over the last 10 years, including the EHR/IT solutions, made timely, high-touch care in the home possible. Providing alternative health care access proved highly valuable.
- With the system initiatives implemented, 30-day hospital admission rates as a system for this subset of patients has decreased from 18.2% to 7.1% which is well below the national average. The Medicare 3-month reports is our external performance benchmark. Further, we partner with Vizient data monthly to track outcomes as well our Select Health insurance arm outcomes. These resources are used for clinical care refinement as needed. Further, our participation in the National Committee for Quality Assurance (NCQA) Advance Care Planning Collaborative, assisted us with identifying those patients for referral to palliative and advance care planning.

- **Figure Twelve: 2017-2022 CMS Penalty and Intermountain Healthcare System All Cause COPD Hospital Readmission Outcomes**

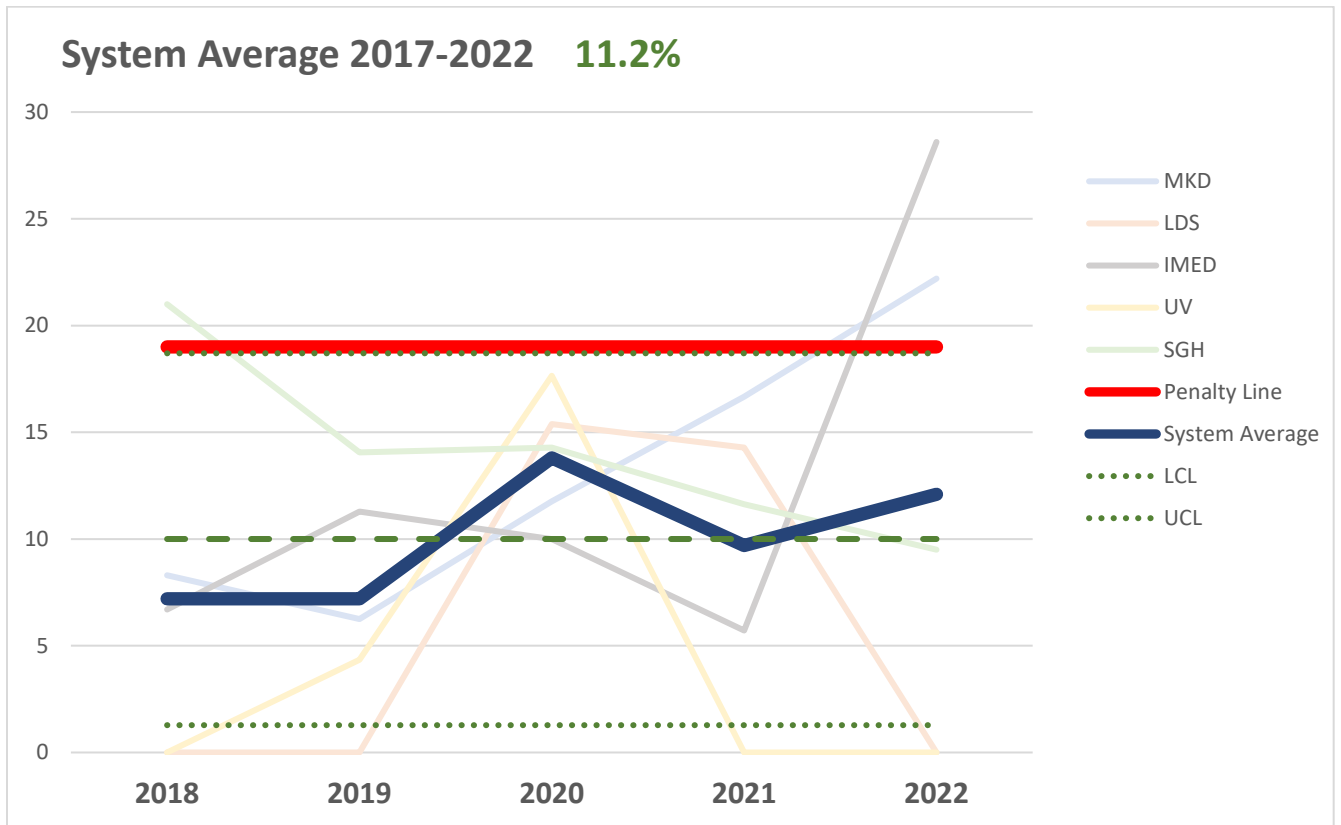
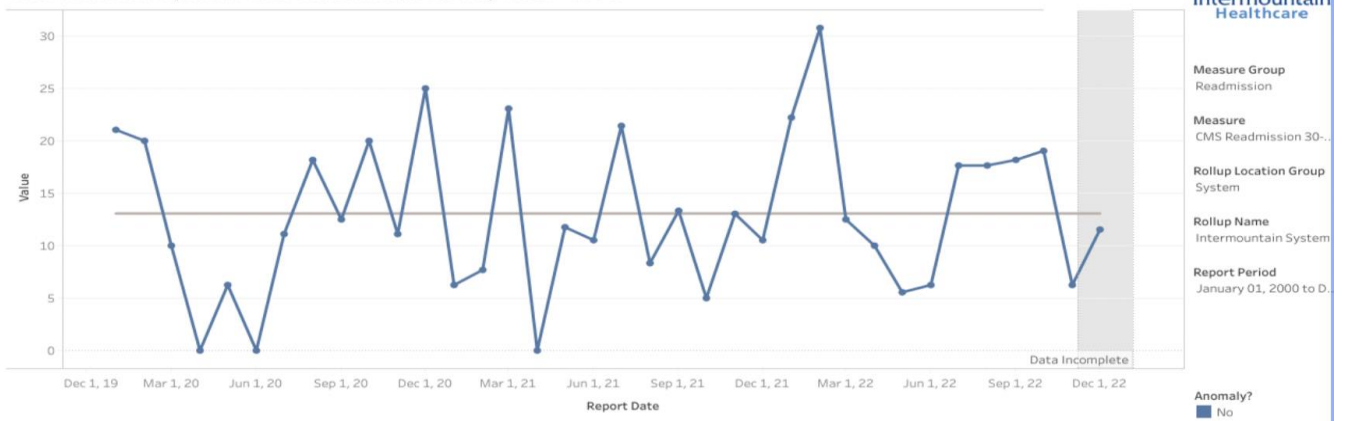


Figure 13

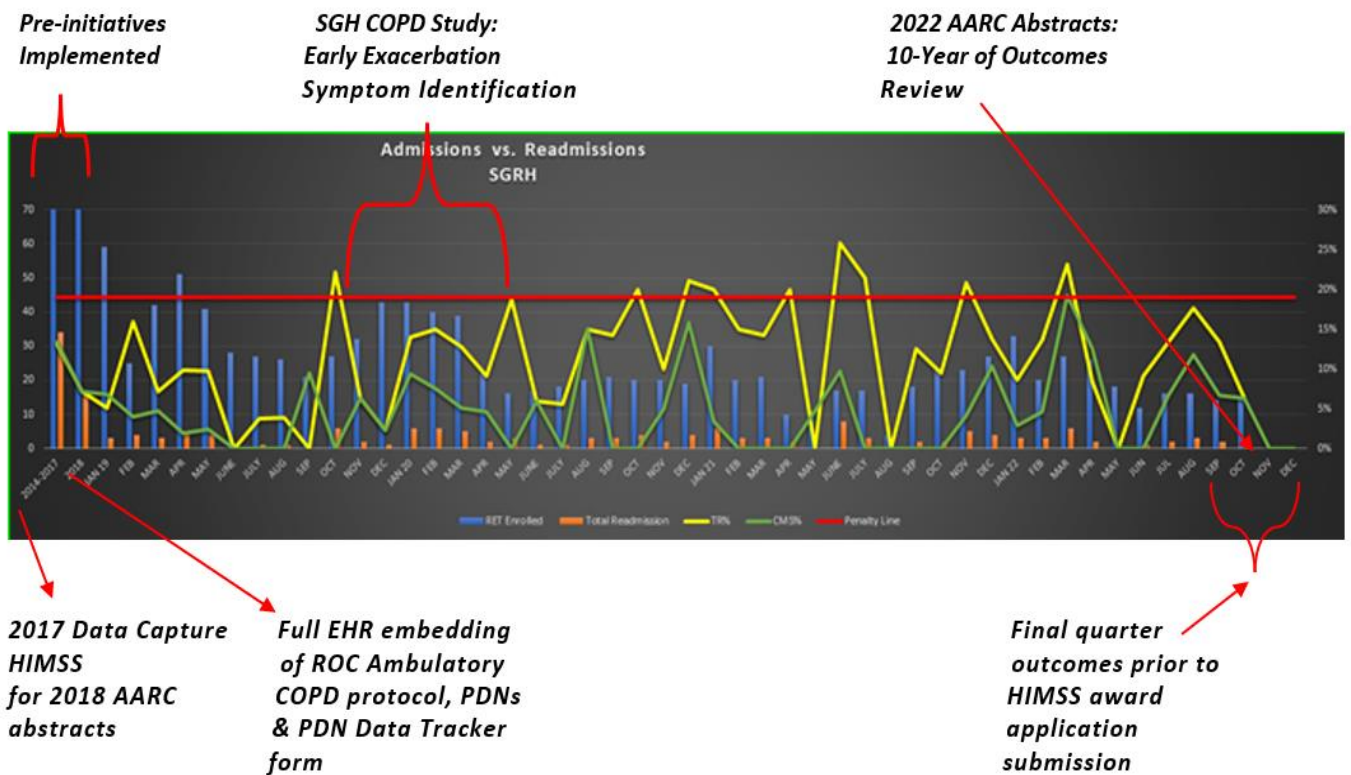
Intermountain System: CMS Readmission 30-Day Rate - COPD -



Accountability and Driving Resilient Care Redesign

The capability to monitor monthly outcomes and utilization of the PDN tools has been a key factor in the success and sustainment of the decrease in COPD 30-day readmissions as shown the sample below. (Figure 18).

Figure Eighteen: COPD Hospital Readmission Rates by Payor at St George Hospital 2014-2017 (Pre-initiatives) and 2018 – November 2022 Hospital (Post-initiatives)



Key:

- Orange: Total readmissions
- Yellow: All payors
- Green: CMS readmissions
- Blue: Intermountain Healthcare internal readmission rate
- Red: CMS penalty line

Besides monthly reporting of the key initiative to decrease and maintain COPD 30-day readmission rates below 8%, tracking of the number of diagnostic pulmonary function testing, referrals to Pulmonary Rehabilitation and palliative care/hospice, patient care plan compliance (e.g., tobacco cessation, medication compliance for taking as prescribed and the ability to overcome medication delivery device resistance) and improved access to healthcare in other sites rather than the emergency room/in-patient

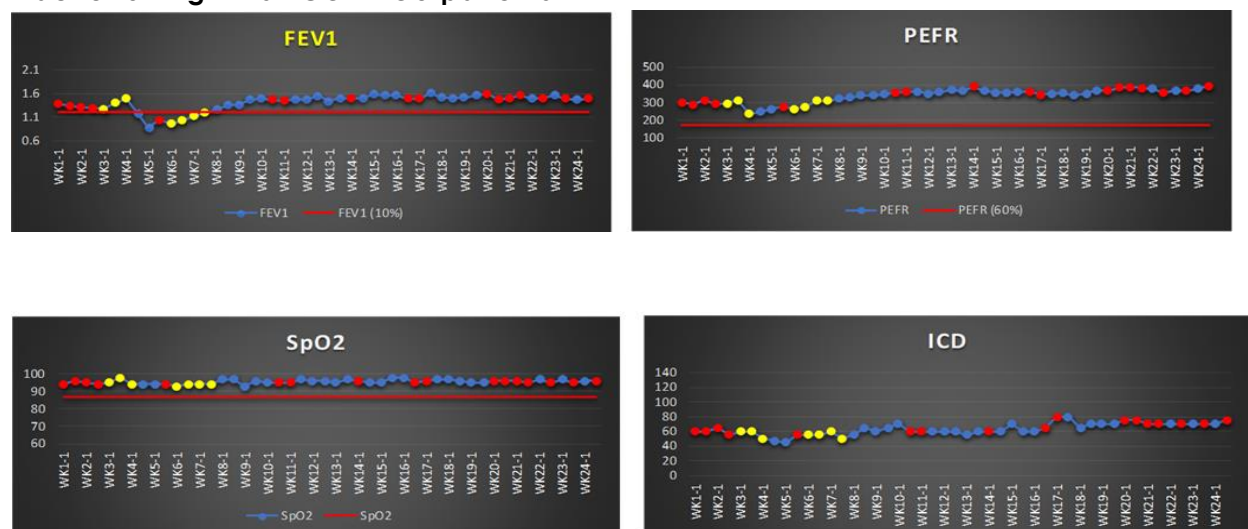
admission were also tracked/reported. Routine chart audits/reports via the EHR/IT solution were performed to assure compliance to the defined

process (e.g., order co-signatures obtained as required, PDN documentation completed).

In 2018, AARC abstracts reported three key findings:

- Thirty-day readmissions and in-hospital mortality outcomes (Figure Seven above)
- Patients were identified as those unable to overcome the medication device resistance by tracking and documenting their inspiratory flow capabilities. If unable to demonstrate adequate inspiratory flow, providers were contacted both by communication in the IT/EHR solution created for this project as well as via phone as needed to change medication. This was published in the *Respiratory Care Journal*.⁸ The poster of these outcomes is presented in Figure Eight above.
- Pulmonary function testing was accessible in the EHR for only 58% of patients studied. This was due to both in accessibility of PFTs performed as well as those who had never had a diagnostic PFT and/or patients not having a PFT in over two years (Figure Nine).
- A funded study was conducted at SGH to determine what, if any, available devices for physiological, remote patient monitoring might assist in earlier capture of COPD exacerbation and thus, more timely intervention. The study included the primary outcome of healthcare access and hospital readmissions for COPD patients. Secondary outcomes included patient engagement, interventions, and the determination of which, if any device, proved valuable in earlier identification of an exacerbation. PDNs tracked the outcomes of the use of three monitoring devices (pulse oximetry, expiratory flow, and inspiratory flow) as well as patient symptom reporting utilizing the COPD Ambulatory Protocol each week. A screen shot example of the study's information technology tracker of the three devices utilized by the COPD outpatients is reported in Figure Nineteen.

Figure Nineteen: Example of the St George Hospital Study Information Technology Tracker of High-Risk COPD Outpatients



- Of 53 trial patients, 1 (2%) patient enrolled in the study was readmitted to the hospital within six months.
- Compared to a patient identifying worsened cough, shortness of breath, or mucous production, **a drop in the FEV1 by 10% was noted on average 3 days prior to patient reporting.**

As a result of our work to date as well as these study outcomes, the organization has received \$2 million of unrestricted funding integrating one of the original study devices with another device and artificial intelligence embedded in the medical record across the system for COPD RPM beginning in 2023. This solution is an artificial intelligence platform for remote patient monitoring. The goal is to include 5,000 patients with these primary and secondary outcomes:

- Primary Outcomes:
 - Decrease hospital readmissions rates
 - Decrease 30-day, in hospital mortality
 - Increase diagnostic pulmonary function testing (definitive COPD diagnosis and disease staging)
 - Improved coordination of care between all healthcare arenas and multiple disciplines (e.g., surveys/feedback)
 - Improved patient access to healthcare (e.g., referrals, right time, right place at least cost, patient surveys/feedback)
- Secondary Outcomes:
 - Improved patient & provider compliance to Ambulatory COPD & Asthma Exacerbation Protocols (MEC approved annually; revised per COPD GOLD and GINA asthma standards)
 - Earlier identification of symptom exacerbation
 - Improved patient outcomes in improved healthcare access
 - “Nudging” for improved care plan compliance
 - Aggregation of population health for reporting
 - Earlier identification and treatments of patients with undiagnosed obstructive sleep apnea (OSA) or non-compliant with previously ordered therapy(ies)

Intermountain Health has partnered with vendors with an artificial intelligence (AI) platform utilizing four remote patient monitoring devices to fully scope this “high-touch, personalized care”. This will allow for compliance and outcomes tracking to improve accountability. Our current dashboards are visible to the PDNs, physicians, and other caregivers. With the addition of the AI platform, reports can be as specific as to each patient as well as aggregated population health outcomes. A more accurate registry for COPD as well as adult asthma patients will be created via the AI platform with gradual integration into the electronic medical record. This stepped wedge cluster randomization trial is slated for implementation during August 2023-August 2025.

How Does One Truly Measure Success?

Brian's Story

I never really fit in with my family. At the age of 10, I started smoking. I watched my father overdose so many times. By the age of 38, I had two heart attacks, had stents placed and was diagnosed with COPD. I continued to smoke. I was homeless and literally living on the streets for 10 years prior to meeting Kim and the Respiratory Therapists (RTs). They changed my life.

I was entered into the NCQA study and had some very heart-felt discussions with Kim and Helen. They were patient with me as I asked them questions over and over about my end-of-life options. We documented everything on the required forms which made me feel so much more secure that my wishes would come true.

Kim made me the lead of the COPD Patient Family Advisory Council. We met for six months having dinner with other COPD patients like me. We made some real changes to improve our care and the care of others. Every time I would lead a meeting, I felt like such a loser because I was still smoking. I had many discussions with my RTs about it. Finally, I was able to quit! Kim once asked me what was different this time. I told her that it was the first time I really felt like people cared about me. If I had a question, I had a consistent person to talk to. I still reach out to my RT every day! They got me into government assisted housing, Medicaid, and medications. I keep my clinic appointments. I even got my driver's license and a car!

People with chronic disease like me honestly don't want to stay sick. Too often, we just don't know how to care for ourselves. My RTs help me know what I should do when I'm not feeling well. This program changed my life. As they put it, it is "high-touch, personalized, timely healthcare when it is needed most." I love my RTs, and I love this program!

Brian P.
Patient

Brian passed away on April 11, 2023, we thank him for allowing us to be a part of his life and healthcare.

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