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Population Health Management Strategies to Advert Readmissions in COPD Patients

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Abstract

Introduction: *The introduction of the Hospital Readmission Reduction Program* ***(****HRRP****)*** *by the Centers for Medicare and Medicaid Services* ***(****CMS****)*** *as part of the Affordable Care Act* ***(****ACA****)*** *promoted health care workers to use population health strategies to reduce readmissions. These strategies were used largely on patients admitted with Chronic Obstructive Pulmonary Disease* ***(****COPD****)*** *diagnosis, as it stood in the 3rd position for 30-day readmissions in the United States.*

Purpose of the Study: *The purpose of this research was to show that with effective population health strategies and models implemented, hospital readmissions could be decreased in COPD patients.*

Methodology: *This study used a literature review. 6 databases and 3 government websites were used in the study. 42 sources were collected and included in the study. These sources were reviewed and reduced to 36 sources that were used in the written research.*

Results: *The research showed that when population health strategies were used by healthcare providers, the readmissions rate could be decreased. Many different types of strategies have been developed by hospital administration, primary care providers, specialists, and CMS.*

Discussion/Conclusion: *The community of healthcare professionals worked together to collect its populations' health data and used that data for the development and implementation of population health strategies, which led to decreased readmissions for COPD. The research proved that when strategies that included increased patient education, caretaker education, and close follow up care readmissions can be adverted.*

Keywords: *'Chronic Obstructive Pulmonary Disease' OR 'COPD' AND 'Comprehensive Care Management' OR 'CCMP' AND 'Hospital Readmissions Reduction Program' OR 'HRRP' AND 'population health' AND 'readmissions' AND 'Transitional Care Management' OR 'TCM'.*

Introduction

Population Health had been defined as the health outcomes of a group of individuals, including the distribution of such outcomes within the group (Silberberg, Martinez-Bianchi, & Lyn, 2019). Reportedly, in 2019, the United States health system spent about $17 billion on readmissions annually (Obuobi, 2021). Centers for Medicare and Medicaid Services (CMS) defined readmissions under Hospital Readmission Reduction Program (HRRP) as any unplanned admission to a hospital within 30 days of the index hospitalization. One of the steps taken to reduce readmissions was the introduction of HRRP, which aligned payments with patient outcomes and instituted fines to hospitals with high readmission rates (CMS, 2020). HRRP was a mandate to CMS as part of the Affordable Care Act (ACA) and had met with many controversies (Press, & Miller 2020). In 2014, hospitals were started to be penalized for Chronic Obstructive Pulmonary Disease (COPD) readmissions under HRRP (Press, Myers, Feemster, 2020). Since COPD was the 3rd leading cause of readmissions in the United States, and the strain it had put on our national healthcare system, various hospital administrations across the United States had begun to work rigorously and decreased readmissions by learning about their local population health needs and had developed programs addressing them (Press, Au, Bourbeau, Dransfield, Gershon, Krishnan, Mularski, Sciurba, Sullivan & Feemster, 2019).

The HRRP triggered hospital administrations to collect data about current patients to identify risk factors for Chronic Obstructive Pulmonary Disease (COPD), as it affects over 13 million Americans in the U.S. and has been the leading cause of mortality in the U.S. in 2018 (Collinsworth, Brown, James, Stanford, Alemayehu & Priest, 2018). This collected data was used to develop interventions because it was projected that national medical costs attributable to COPD would be increased from $32 billion in 2010 to $49 billion in 2020 (Collinsworth et al., 2018).

The increased aging population in the U.S. and the increased diseases in this population had elevated the health care utilization and hospital resources and thus led to increased health care costs. The U.S. Census Bureau had reported that the U.S. population would grow by 9.5% between 2013 and 2025 in overall, with 65 years and older population growth at 45% (Dall, Gallo, Chakrabarti, West, Semilla & Storm, 2013). In 2015, patients aged 65 years and older, constituted 42%-52% of ICU admissions in the US (Marik, 2015).

Research conducted by Lo, Flood, Biese, Platts-Mills, Donelly & Carpenter in 2017 reported that adults who were 65 years and older only accounted for 13% of the U.S. population, but they accounted for 36% of all hospitalizations, and 20% of all emergency department visits (Lo et al., 2017). This study also found that several factors led to the elderly population re-entering hospitals, and these

factors could have been avoided with population health management strategies (Lo, et al.,2017). A Risk factor of readmission found in the elderly was social isolation and social behaviors data collected from patients' visits to the clinics gave care coordinators information on which patients required intervention (Cotterell, Buffel, & Phillipson, 2018).

The Readmissions After COPD Exacerbation (RACE) scale was a risk stratification model that provided analysis and an exact assessment of an individual's risk for readmission within 30 days. (Lau, Siracuse, & Chamberlain, 2017). Patients with COPD diagnosis had the highest 30-day readmission rate of 21% compared to other chronic conditions, and the cost incurred for these readmissions was 18% higher than those for the index hospitalization (Min, Yu & Wang, 2019). When illness was predicted, steps could be taken to prevent worsening illness and re-hospitalization (Lin, Verma, Lee, Lin & Lai, 2017). Powers, Modarai, Palakodeti, Sharma, Mehta, Jain, & Garg (2020) defined Comprehensive Care Management Programs (CCMPs) as efforts to coordinate medical and social services, assist patients and caregivers in managing medical and behavioral health conditions, and address the psychosocial drivers of poor health.

Transitional care management, a population health strategy, used the data collected about certain populations and implemented processes spanning across inpatient and outpatient health systems, leading to decreased readmissions According to a study conducted by Ridwan, Hadi, Wu & Tsai in 2019, the transition of care management had a substantial influence on both COPD-related and all-cause hospital readmissions with a decrease of readmissions of 28% and 44%. The positive effects of transitional care management in that study were moderated by the length of treatments, the type of care providers, and the use of telephone follow-ups (Ridwan et al., 2019).

According to Swanson, Vogt, Sundmacher, Hagen & Moger (2018), increased gatekeeping from primary care providers was associated with decreased hospital readmissions in cases that were initially admitted with COPD. Hospitals with gatekeeping and patient lists and workable disease management programs were successful in curbing readmissions both before and after index hospitalization, while the hospitals without gatekeeping and patient lists managed to curb readmissions only after index hospitalization (Swanson et al., 2018).

COPD care bundles improved the transition of care from the hospital to the community after an episode of exacerbation, which might be reflected in decreased readmission rates (Bourbeau & Echevarria, 2020). An analysis conducted by Trout, Bhansali, Riley, Peyerl & Chiong Jr in 2020, found that the integrated care pathway approach, a part of the continuity of care, lowered 30-day readmissions for COPD by 37% and 90-day all-cause readmissions by 36% over 9 months (Trout et al., 2020).

Hospital at Home schemes was developed to reduce the load on hospitals regarding readmissions. These schemes provided care to the COPD exacerbation patients at their home under the agile guidance of healthcare professionals, that would had otherwise needed in-patient care at the hospital. A review published by Jeppesen, Brurberg, Vist, Wedzicha, Wright, Greenstone &Walters **(**2012**)**, showed that inpatient readmission rates were lowered in favor of hospital at home schemes, as it provided a greater patient satisfaction and lowered the average overall health care cost per patient as compared to the conventional care provided in the hospital **(**Jeppesen et al., 2012**)**.

Telemedicine was defined as the distribution of health services by health care providers, where a diagnosis could be established when the distance was a critical factor of concern **(**Criner & Han, 2018**)**. It included monitoring of the patients' symptoms and vital signs, using web-based visits, telephonic calls, and electronic diaries. A home-based training, that was supervised by healthcare professionals, and counseling sessions offered by video conferences were found to be safe and feasible in patients with severe COPD **(**Rosenbek, Hansen, Pedersen, Titlestad, Christensen, Kidholm, Rayce, Bowes & Møllegård, 2015**)**.

The purpose of this research was to show that with effective population health strategies and models implemented, hospital readmissions could be decreased in COPD patients.

Methodology

The hypothesis derived from this research was that with the implementation of population health strategies, the rate of hospital readmissions for patients with COPD could be decreased.

The methodology used to derive this hypothesis was through literary reviews, which constituted of research articles, journals, and peer-reviewed articles published between 2010 and 2021. These were obtained from PubMed, Google scholar, NCBI, Cochrane Library, ScienceDirect, EBSCOhost, CDC.gov, CMS.gov, and Census.gov databases. The usage of the internet and google search engine was restricted to gather more information from government and other private websites. Keywords used for the search were ‘Chronic Obstructive Pulmonary Disease’ OR ‘COPD’ AND ‘Comprehensive Care Management Program’ OR ‘CCMP’ AND ‘exacerbations’ AND ‘Acute Exacerbation of COPD’ OR ‘AECOPD’ AND ‘gatekeeping’ AND ‘Hospital Readmissions Reduction Program’ OR ‘HRRP’ AND ‘population health’ AND ‘readmissions’ AND ‘Transitional Care Management’ OR ‘TCM’. The inclusion criteria were articles obtained in English and studies conducted across various states in the U.S. and Ontario, Canada, between 2010 and 2021. A total of 42 literary reviews passed this inclusion and were included in the research. The exclusion criteria were the publication year as the articles used

to derive this hypothesis were sourced from 2010 to 2021 and did not include publications from the earlier years to include more relativity to the research paper. This research was done by BA, ME, and SP and validated by AC who enacted the role of a reviewer and assessed if the references met the inclusion criteria.

Discussion

The purpose of this research was to analyze if a connection existed between population health strategies focused on patients admitted with a COPD diagnosis and reduction of readmissions.

The results of the literature review showed when population health strategies were applied readmissions could be reduced.

The community of healthcare professionals worked together to collect its populations' health data and used that data for the development and implementation of population health strategies, which led to decreased readmissions for COPD. The research proved that when strategies that included increased patient education, caretaker education, and close follow up care readmissions can be adverted.

Identification of the COPD diagnosed population by the hospital staff, while they were still in hospital beds, and with patient enrollment in a comprehensive care management program **(**CCMPs**)** after discharge, readmissions could be reduced **(**Shah, Press, Huisingh-Scheetz, & White, 2016**)**. Hence, continuity of care should be probed and investigated further to ensure that hospitals engage in increased primary care continuity to influence the secondary care use and outcomes for COPD patients, particularly on readmissions.

In a study conducted by Nguyen, Chu, Liu, Lee, Suh, Korotzer, Yuen, Desai, Coleman, Xiang & Gould in 2014, it was reported that patients who were engaged in any levels of moderate or vigorous physical activity had a 34% lower risk of readmission within 30 days after the index hospitalization. Thus, this study elucidated the importance of a shift from an inactive lifestyle to an active lifestyle for a decreased rate of index hospitalizations and readmissions **(**Nguyen et al., 2014**)**.

Predictive models for readmission aided clinicians in developing strategies targeting those at elevated risk of hospitalization and readmissions. The earlier COPD predictive models, ADO **(**Age, Dyspnoea, Airflow Obstruction**)**, BODEX **(**BMI, airflow obstruction, Dyspnoea, Exacerbation**)**, DOSE **(**Dyspnoea, Obstruction, Smoking, Exacerbation**)**, CODEX **(**Comorbidity, Obstruction, Dyspnoea, Previous severe exacerbations**)**, were developed to predict mortality rate and provided modest predictions for readmissions **(**Kong & Wilkinson, 2020**)**. The CADOT index was used as an alternative

to the BODEX and ADO indices, as it had better prognostic capabilities. **(**Brat, Svobodo, Hejduk, Plutinsky, Zatloukal, Volakova, Popelkova, Novotna, Engova, Franssen, Vanfleteren, Spruit, Koblizek, 2020**)**.

The LACE **(**Length of hospital stay, Acuity of admission, Comorbidities, Emergency department use**)** index is a predictive tool for readmissions with suboptimal discriminative ability to predict 30-day readmission following hospitalization with COPD exacerbation. The PEARL **(**Previous admissions, Extended Medical Research Council dyspnoea score, Age, Right-sided heart failure, Left-sided heart failure**)** score had five indices, low-risk, intermediate-risk, high-risk, and which had stratified patients according to the risk of readmission or death within 90 days **(**about 3 months**) (**Kong & Wilkinson, 2020**)**.

Results

The research study yielded in a result that the population health management strategies were aimed to target the vulnerable population of COPD patients, who were more prone to readmissions. Identification of the patients that were more susceptible to readmissions in their index hospitalization played a vital role in the decreased readmissions. Lin, Verma, Lee, Lin & Lai stated that if illness could be predicted, preventive steps could be taken that can lead to reduced readmissions **(**Lin et al., 2017**)**. Continuity of Care program was enforced by Primary Care Physicians, as part of the gatekeeping program, which led to early intervention with the aid risk assessment predictors. Comprehensive Care Management Programs reduced the rate of readmissions in COPD patients, which led to reduced burden on medical expenditures. Transitional Care Management programs constituted COPD Care Bundles which aided in decreased readmission rate in COPD patients, as this program bridged the gap between the care management pre-discharge and post-discharge. Self-management plans and telemedicine approaches also had an impact on reduced readmission rate.

Study Limitations

Limitations of the study were due to the limited scope of study due to non-inclusion of other diseases and comorbidities that contributed to the readmissions rate. Publication bias could be introduced as only 6 databases and 3 federal websites were used for the study. Finally, research bias could also be introduced as the group that conducted the study was currently in pursuit of the healthcare system, thus viewing the study with research bias.

Practical Implications

The practical implication of the study suggested that population health strategies could be implemented to reduce the rate of readmissions in COPD patients. This knowledge could be further used to include the rate of readmissions due to other diseases and comorbidities, as the health care needs and outcomes continue to evolve with each passing day.

Population health strategies used by hospitals to reduce readmission in patients with COPD

A study conducted in 2014 at Danbury Hosiptal, community teaching hospital in Connecticut found that with the implementation of the Comprehensive Care Management Program **(**CCMP**)** model, the rate of readmission was reduced from 21.5% to 13.6% in patients with Acute Exacerbation of COPD **(**AECOPD**) (**See Figure 1**) (**Euceda, Kong, Kapoor, Dilauro, Ogunnaike & Chronakos, 2018**)**. A study conducted by Powers, Modarai, Palakodeti, Sharma, Mehta, Jain & Garg **(**2020**)** found that the implementation of CCMPs with high-cost Medicaid patients reduced medical expenditures by 37% and inpatient utilization by 59%. In a 2-month patient COPD education program, that included telephone calls and direct patient access to nurses and respiratory therapists, approximately 40% reduction in both AECOPD hospitalizations and Emergency Department visits were recorded **(**Shah, Press, Huisingh-Scheetz, & White, 2016**)**.

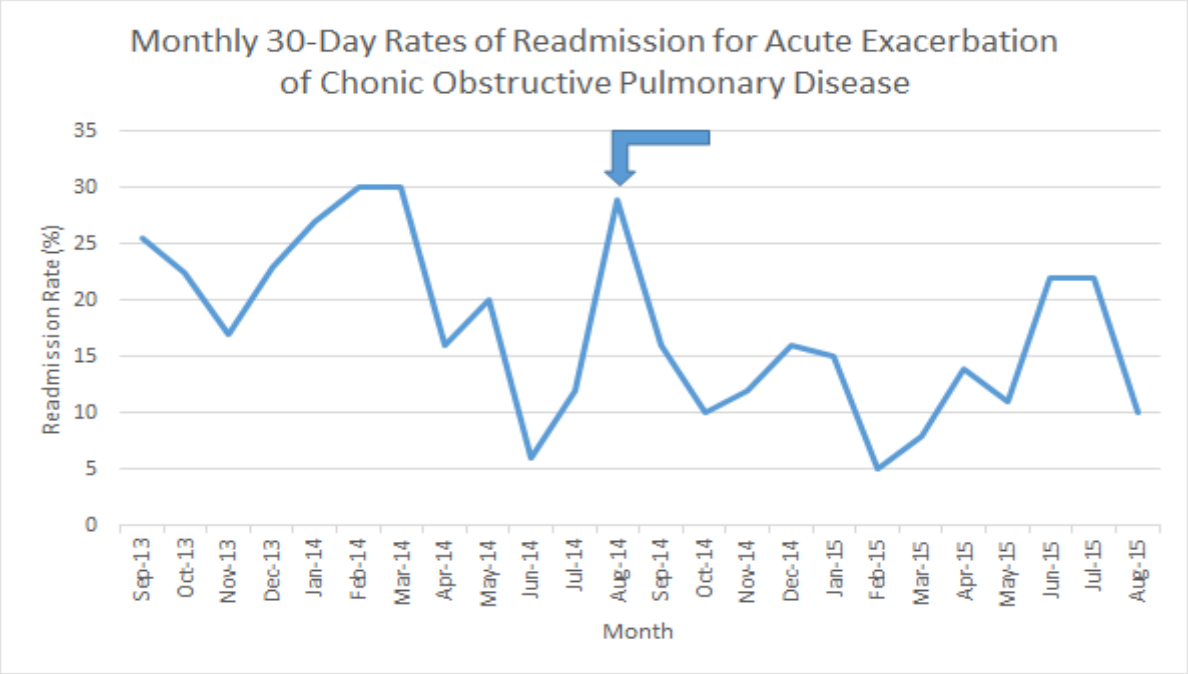

Figure 01 Monthly 30-day rates of readmission for acute exacerbation of chronic obstructive pulmonary disease during the 1-year periods pre-and post-implementation of a comprehensive care management program **(**CCMP**)** in September 2014.

*Source: **(**Euceda, et al., 2018**)***

In another study conducted by Kriplani, Chen, Ciampa, Theobald, Cao, McBride, Dittus, and Speroff (2019), found a significantly lower 30-day readmission rate of 9.4% for patients that had received Transition of Care Management (TCM) compared to patients that had received usual care at 18.8% (See Figure 2). Nursing staff conducted this care management by either phone or in-person. Nursing staff addressed gaps in care, patient education, post-discharge instructions, medication safety, and adherence, and coordinated outpatient follow-ups, and schedules a follow-up appointment with PCP (Kripalani, et al., 2019).

	Usual Care N=6,276	TCC Care N=762	TCC (Full) N=460	TCC (Partial) N=302	P-Value (Usual Care vs.TCC Care)
Readmissions					
30-day	1,182 (18.8%)	72 (9.4%)	41 (8.9%)	31 (10.3%)	<0.001
90-day	1,975 (31.5%)	151 (19.8%)	86 (18.7%)	65 (21.5%)	<0.001

Figure 2 Unadjusted rates of readmission over 30 and 90 days in TCC Care vs. Usual Care.

Source: (Kripalani, et al., 2019)

COPD care bundles used in transition of care management consisted of evidence-based practices that optimized patient outcomes post-discharge for hospitalization of AECOPD (Ospina, Mrklas, Deuchar, Rowe, Leigh, Bhutani & Stickland, 2016). Comprehensive care bundle developed with a focus on diagnostic testing, comorbid conditions management, palliative care discussions, and outpatient follow-up arrangements showed a 16% reduction in all-cause 30-day readmissions, decreased 30-day mortality rate, and significant improvement of AECOPD-specific readmissions at 90 days (about 3 months) (Kong & Wilkinson, 2020).

A study conducted by Campelo, Ribeiro de Oliveira, Carneiro, Maciel, & Pedroso in 2021, found a 22% reduction in preventable hospitalizations by using primary care providers as gatekeepers. Primary Care Physicians used gatekeeping to ensure continuity of care, which led to early intervention, preventive testing, and assessment of the risk of readmission. Lau, Siracuse, & Chamberlain (2017) proved that the Readmissions After COPD Exacerbation (RACE) scale had predicted 92.3% of readmission variability in the cohorts included in their study. Components of the RACE scale and assigned values can be seen in (Figure 3). Using the RACE scale during admission helped to identify patients that were at elevated risk for readmissions. Once identified, the health care strategies during hospital stay and after discharge was implemented to avoid those predicted readmissions (Lau, Siracuse, & Chamberlain, 2017).

Values for components of Readmission After COPD Exacerbation **(**RACE**)** Scale	
Characteristic	**Point value**
Age component	
40–64 years	7
65+ years	0
Gender component	
Male	6
Income component	
1st quartile	4
2nd quartile	2
Race component	
African American race	3
Primary payer component	
Medicaid	33
Medicare	18
Comorbidities component	
Psychoses	8
Depression	7
Drug abuse	7
Anemia	2
Congestive heart failure	2
Max score	**79**
Note: Anemia combines chronic blood loss anemia and iron deficiency anemia.	

Figure 03

*Source: **(**Lau, Siracuse, & Chamberlain 2017**)***

Anxiety, depression, alcohol, and drug abuse were associated with a higher COPD readmission rate in Medicare beneficiaries **(**Singh, Zhang, Kuo & Sharma, 2016**)**. Co-morbidities, previous hospitalizations, history of earlier exacerbations, and increased length of stay in index hospitalization were significant risk factors for 30-day and 90-day all-cause readmissions after an episode of COPD exacerbation **(**Alqahtani, Njoku, Bereznicki, Wimmer, Peterson, Kinsman, Aldabayan, Alrajeh, Aldahir, Mandal, Hurst, 2020**)**. A population-cohort study conducted in Ontario used health administrative data and found that many socioeconomic factors and comorbidities governed the increased risk of readmissions or death **(**Gershon, Thiruchelvam, Thiruchelvam, Aaron, Stanbrook, Vozoris, Tan, Cho, To, 2019**)**.

Self-management strategies, combined with the prescribed action plan had qualitative benefits related to the quality of life, as compared to usual care **(**Lenferink, Brusse-Keizer, Valk, Frith, Zwerink, Monninkhof, Palen & Effing, 2017**)**. Self-management plans included optimization of physiological wellbeing and adaptation to the illness, for improved patient health outcomes **(**Effing, Bourbeau, Vercoulen, Apter, Coultas, Meek, Valk, Partridge & Palen, 2012**)**. Self-management also included education from health care providers on the importance of exercise and leading an active lifestyle. A study by Nguyen, Chu, Liu, Lee, Suh, Korotzer, Yuen, Desai, Coleman, Xiang & Gould, in 2014 reported that patients who were engaged in any levels of moderate or vigorous physical activity had a 34% lower risk of readmission within 30 days after index hospitalization as compared with inactive patients. This study thus elucidated the importance of a shift from an inactive lifestyle to an active lifestyle for a decreased rate of index hospitalizations and readmissions **(**Nguyen et al., 2014**)**.

A telemedicine approach in COPD exacerbations was found useful as it led to early detections and reduced emergency visits or readmissions **(**Ulrik, Ringbaek, Laursen, Green, Brøndum & Frausing, 2015**)**. A Cochrane systematic review of ten randomized controlled trials had revealed that the risk of emergency department visits and readmissions could be decreased with the utilization of telemedicine **(**McLean, Nurmatov, Liu, Pagliari, Car & Sheikh, 2012**)**.

Conclusion

The literature review of the population health management strategies in COPD patients indicated that decreased readmissions were associated with effective measures being implemented. The findings of the review were in consensus with the decreased rates of 30-day readmissions in COPD patients and 90-day all-cause readmissions. However, further study is required to elaborate further on its

effectiveness in patients with other co-morbidities, as the health care needs and outcomes continue to be ever-changing.

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