PAGE 2: Program/Project Demographics

Q1: Facility Name: University of Alabama at Birmingham Remote Telehealth Pulmonary Rehabilitation Program

Q2: Program/Project Name: COPD Get With It Program: Telehealth Intervention to Reduce Hospital Readmissions

Q3: Address
   Address: Spain Rehabilitation Center, 1717 6th Avenue South, Room 480
   City: Birmingham
   State: AL
   Zip Code: 35249

Q4: Contact Person's Name: Surya P Bhatt

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PAGE 3: AACVPR Certified Program (10 points)

Q8: Does your Institution operate an AACVPR Certified Program (Cardiac or Pulmonary)? Yes

PAGE 4: Introduction (10 points)

Q9: (10 points) In 100 words or less please complete the following statement; "We believe our program is unique and innovative because..."

Exacerbations of chronic obstructive pulmonary disease (COPD) have been identified as an important target for reducing 30-day readmission rates by CMS. Multiple treatment strategies have been employed to reduce rehospitalization, with minimal success. Although pulmonary rehabilitation can significantly reduce exacerbation rates, a minority receive rehabilitation due to substantial medical and socioeconomic barriers, and lack of rehabilitation centers. We used smart technology to deliver home-based rehabilitation remotely using two-way video-conferencing for 90 days. With this innovative intervention which is the first of its kind in the nation, we reduced 30-day readmission rates from 16% to 6%, and improved quality of life scores.
Q10: Specify and describe the unique population selected for this program or service. Examples include:
- Clinical populations currently served (CR, PR, and VR)
- Subgroup within CR / PR / VR (i.e. dyslipidemia)
- Primary prevention groups
- Other Clinical conditions or populations (Obese, cancer, osteoporosis, etc)
- Children, elderly, women, minorities, underserved (rural), etc

The Telehealth Rehabilitation intervention is aimed at decreasing readmissions following hospitalization for acute exacerbation of chronic obstructive pulmonary disease (COPD). The program is free of cost for hospitalized patients and hence is especially useful for the indigent population served by the University of Alabama at Birmingham (UAB) hospital. We have now extended this program to stable COPD outpatients who do not have access to pulmonary rehabilitation programs in rural and underprivileged neighborhoods throughout the state of Alabama.

Q11: Please specify how this population was identified and how their needs were identified:

COPD is a chronic inflammatory disease associated with substantial morbidity and mortality. The majority of COPD-related morbidity and health-care costs are due to acute exacerbations, particularly those that require hospitalization. A significant proportion of patients have a recurrent exacerbation within a short duration of their index hospital admission. COPD exacerbations have been identified as an important target for reducing 30-day readmission rates by the Centers for Medicare and Medicaid Services (CMS). Multiple treatment strategies have been employed to reduce pulmonary inflammation and reduce the rate of recurrent exacerbation, including inhaled steroids and bronchodilators, and systemic steroids. Though each of these drugs reduces the rate of recurrent exacerbations by approximately 20 percent, no additional benefit is observed when they are used in combination and a substantial number of patients suffer frequent events despite maintenance therapy. Initiation of pulmonary rehabilitation can significantly reduce the rate of exacerbations by 80% in the first 4 months following an exacerbation. However, despite proven benefits, only 20% of patients receive pulmonary rehabilitation, and an inability to exercise in the acute phase is a major factor. In this regard, it has been shown that using neuromuscular electrical stimulation (NMES) to cause muscle contraction in patients with COPD results in an increase in muscle diameter, quadriceps muscle strength, and exercise capacity, as well as reduced dyspnea and improved quality of life.

In this intervention, we combined the benefits of NMES to provide short term muscle conditioning, and remote pulmonary rehabilitation for long term conditioning, to reduce exacerbation rates and improve quality of life. To reduce the rate of readmissions, we had already initiated an Integrated Practice Unit (IPU), a virtual unit comprised of health care professionals from various departments including Pulmonary Medicine, Physical Therapy, Pulmonary Rehabilitation, and Social Work, coordinating patient care during and post-hospitalization, with periodic follow up phone calls and a return visit with a Pulmonologist within two weeks of discharge from hospital. These subjects are followed for 90 days post discharge to assess readmission rates. With this intervention, 30-day readmission rates marginally decreased from 18% to 16% at our institute. A major limitation of this current intervention was the limited availability of pulmonary rehabilitation.

We identify all patients hospitalized with COPD exacerbation via a hospital-wide daily census. We approach all patients to enroll in the Remote Telehealth Program. After obtaining informed consent, each patient is offered NMES initiation and training for the duration of their hospital stay and for use at home until they return to Clinic as scheduled within 2 weeks of hospital discharge. The NMES protocol includes placing bipolar self-adhesive electrodes over the distal-medial and proximal-lateral portion of bilateral quadriceps femoris muscle group, and delivery of stimulation pulses (30 Hz trains of 300 μsec biphasic pulses) using a NMES stimulator. A 5 sec on/25 sec off work/rest ratio is used initially, progressing to 10 sec on/30 sec off. Current from the stimulator is manually increased and determined by patient tolerance. The goal for each patient is to reach the highest tolerable amplitude (up to 100mA). Training will be performed on each quadriceps femoris muscle, 30 minutes/day, 5 days/week till return to Clinic.

At their return visit to the COPD Clinic, patients start remote telehealth exercises. This consists of 30 minute exercise sessions 3 days a week for an additional 10 weeks, including aerobic training, upper body strengthening exercises and breathing technique exercises. Patients are provided a smartphone that is data enabled to facilitate two-way video-conferencing. Pulse oximeters and blood pressure manometers are also provided for safety monitoring. This provides patients with flexibility in the timing and location of their exercise training for the 90 days post-hospital discharge intervention. All patients answer questionnaires on dyspnea and quality of life, and also perform a six-minute walk distance at the 2 week and 12 week time points.
Q12: Please identify other opportunities within this target population (referrals or procedures):

The implementation of the telehealth intervention has coincided with the increase in referrals to traditional pulmonary rehabilitation. Our annual volume of traditional pulmonary rehabilitation has increased approximately three-fold in the past 2 years, resulting in for the first time, more pulmonary than cardiac rehabilitation patients at UAB.

Q13: Please explain considerations given to undeserved or rural populations:

The remote telehealth rehabilitation service is primarily offered to patients who are hospitalized but do not have access to traditional pulmonary rehabilitation either due to distance from their home or due to economic constraints. A large proportion of enrolled participants are from the minority population, predominantly African American and women. We have now extended this intervention from hospitalized patients only to all eligible stable outpatients in the state of Alabama.

PAGE 6: Research basis for program (up to 5 points)

Q14: Does your program have a research basis: Yes
Q15: If "yes", please indicate the specific guideline(s), scientific evidence, or research articles used in planning this program. Also include, research that supports that this type of innovative program can be/is effective.

This program was initiated with the help of an institutional grant for research, and is now a stand-alone clinical program supported by the hospital. We have an ongoing database that will help assess the continued efficacy of this intervention. The principal investigator, Dr. Bhatt also has secured pilot funding from the NIH sponsored REACT (Rehabilitation Research Resource to Enhance Clinical Trials) Center Pilot Studies Program to study the mechanisms underlying these positive results. This project involves obtaining blood and muscle biopsies before and after intervention to assess the molecular and genetic signaling in systemic circulation as well as skeletal muscles.

The intervention is the first of its kind using an exercise program to target COPD readmissions. We based our intervention on the benefits of exercise on exacerbation rates when patients undergo pulmonary rehabilitation delivered at rehabilitation centers. A pooled study of nine randomized controlled trials showed that pulmonary rehabilitation can reduce the rate of hospital admissions by 80% in the first four months following an exacerbation (pooled odds ratio 0.22, 95%CI 0.08 to 0.58), and also improve exercise tolerance and quality of life (Puhan et al). We also used neuromuscular electrical stimulation (NMES) early on to prevent deconditioning, based on its documented effects on muscle mass on strength. NMES has been safely used during acute exacerbations in a small pilot study and was associated with a reduction in oxidative stress in the stimulated muscles.

Key references:

Efficacy results: To date, we have enrolled 50 patients. With this intervention, we have successfully reduced our all-cause 30-day readmission rates from 16% to 6% (p<0.001). Nine (18%) dropped out of the program, compared to a 50% attrition rate in our traditional pulmonary rehabilitation program.

Compared to baseline measurements, there were substantial improvements in respiratory morbidity indices. The COPD Assessment Test (CAT) scores decreased from 18.9±6.5 to 13.6±6.5 (p<0.0001). The San Diego Shortness of Breath Questionnaire improved from 56.4±22.3 to 44.6±25.6 (p<0.0001). The 30-second chair sit-stand test score improved from 6.6±4.4 to 9.8±5.5 (p<0.0001), and the 6-minute walk distance improved from 234±99 m to 307±100 m (p<0.0001). The majority of respiratory morbidity indices improved by greater than the MCID.

Q16: Describe in detail your model of collaboration; how have you worked to include a variety of caregivers into your program?

The telehealth rehabilitation intervention is a truly multidisciplinary effort. The referral process is initiated by nurse practitioners, internists, hospitalists and pulmonologists involved in the care of COPD admissions. The referral results in a consult for an exercise physiologist who then evaluates the patient. Social workers are involved in making patients have access to medications. We also have a respiratory therapist on the team for education regarding inhaled medication use. A tobacco cessation counselor provides counseling to active smokers and helps with aids for tobacco cessation. Finally, all patients enrolled are seen by a dedicated pulmonologist within 2 weeks of discharge, and progress in the program communicated to the primary care provider.
Q17: Who are the caregivers involved in this collaborative process? (identify members of the team):

CR/PR staff, Physician, Family, Other Health Care Professionals, Other (please specify) Tobacco cessation counselors, social workers, home health.

Q18: Describe (or show evidence of) how participant results are shared among all team members and provide examples of this communication process:

We have scheduled multidisciplinary meetings on alternate Tuesdays to discuss progress of individual participants, treatment plans, and any barriers to delivering care. These meetings include a pulmonologist, rehabilitation team manager, 3 exercise physiologists and a respiratory therapist. Every 3 months, as part of our quarterly cardiopulmonary rehabilitation meeting, we present all data analyzed to the team directly involved in this project, as well as other pulmonologists and cardiologists. We also closely interact with caregivers in our integrated practice unit, a multidisciplinary team of providers which targets reducing COPD readmissions. This team, in addition to pulmonary physicians, includes hospitalists, nurse practitioners, respiratory therapists and social workers. For example, we receive a daily hospital-wide census to identify COPD patients hospitalized for acute exacerbation. We approach the patient to elicit interest in participating in the telehealth program. If the patient shows interest, we speak with the treating provider to enable activation of resources. This includes visits from a tobacco cessation counselor for active smokers, social workers to assist with medications and financial needs, and a multidisciplinary discharge plan that results in a 2-week follow up visit with a pulmonologist at the COPD clinic.

Q19: Are patient self-management strategies included? (including primary prevention, behavior modification, compliance and surveillance)

Yes

Q20: If yes: Provide details of the education process used and explain how it encourages patient self-management. State the process for identifying barriers to learning, determining state of readiness for learning, and identifying patient’s preferred learning style. Identify by what means education information is provided to the patient/participant:

The telehealth program stresses on patient education and self-management. Education sessions are provided via smartphone on a variety of topics that help patients manage their disease. These include videos on what COPD is, when to get help, medications and inhalers, using inhalers appropriately, inhaler technique, and coping with chronic disease. One-on-one video sessions also cover these topics, giving participants an opportunity to ask questions, and for our respiratory therapists and exercise physiologists address deficiencies via demonstration. Self efficacy is stressed on as this central to long term disease management. Early recognition of COPD exacerbations is addressed. Repetition is very important with this population and telehealth sessions enable education and reiterations. All education is provided at a 6th grade reading level.

Patients with COPD face multiple barriers to receiving effective management. These include financial and psychosocial barriers such as depression, anxiety, loneliness and lack of social support. We attempt to identify these barriers via questionnaires on the initial enrollment visit.

Q21: If yes: Describe behavior modification techniques or interventions used. Explain how patient / participant compliance to treatment plans is tracked and how issues of non-compliance are addressed:

We administer an exhaustive psychosocial risk factor survey (PRFS) to all participants at enrollment and at discharge. This enables us to perform a “readiness for behavior change” assessment. We provide feedback to patients’ care providers if PRFS scores indicate a need for possible medical management or for intensifying current medical therapy. We provide education regarding coping with chronic health condition. This includes easily understandable written material, video, or verbal counseling by staff or psychologist. We encourage patients to attend our monthly pulmonary support group through the traditional pulmonary rehabilitation program.
Q22: What is evaluated in your patient outcomes tracking system:

We enroll patients during hospitalization, and at the first return visit to the Pulmonary clinic at 2 weeks, we assess baseline respiratory morbidity and retest these measures at completion of the 12 week intervention. Our primary outcome is 30-day all-cause readmission rate. Secondary outcomes include (a) The 30-Second Chair Stand Test to assess skeletal muscle dysfunction, leg strength and endurance (b) Functional capacity using the six minute walk test. (c) Dyspnea using the San Diego Shortness of Breath Questionnaire score (SOBQ) (d) COPD related Quality of life using the COPD Assessment Test (CAT) and (e) Psychosocial Risk Factor Survey (PRFS) to measure the primary psychosocial risk factors of depression, anxiety, anger/hostility, emotional guardedness and social isolation.

Q23: How is your patient outcomes tracking system measured?

We assess baseline respiratory morbidity and retest these measures at completion of the 12 week intervention. Our primary outcome is 30-day all-cause readmission rate. Secondary outcomes include (a) The 30-Second Chair Stand Test to assess skeletal muscle dysfunction, leg strength and endurance. Scores range from 4 to 14, depending on age and sex. Higher scores indicate higher levels of functioning. Minimum clinically important difference (MCID) is 2 (b) Functional capacity using the six minute walk test. MCID is 26 m (c) Dyspnea using the San Diego Shortness of Breath Questionnaire score (SOBQ, MCID = 5) (d) COPD related Quality of life using the COPD Assessment Test (CAT, MCID = 2) and (e) Psychosocial Risk Factor Survey (PRFS) to measure the primary psychosocial risk factors of depression, anxiety, anger/hostility, emotional guardedness and social isolation.

Q24: Describe your outcomes to date (provide "n," pre- & post-values, %change, & supporting narrative):

To date, we have enrolled 50 patients. With this intervention, we have successfully reduced our all-cause 30-day readmission rates from 16% to 6% (p<0.001). Nine (18%) dropped out of the program, compared to a 50% attrition rate in our traditional pulmonary rehabilitation program. Compared to baseline measurements, there were substantial improvements in respiratory morbidity indices. The COPD Assessment Test (CAT) scores decreased from 18.9+6.5 to 13.6+6.5 (p<0.0001). The San Diego Shortness of Breath Questionnaire improved from 56.4+22.3 to 44.6+25.6 (p<0.0001). The 30-second chair sit-stand test score improved from 6.6+4.4 to 9.8+5.5 (p<0.0001), and the 6-minute walk distance improved from 234+99 m to 307+100 m (p<0.0001). The majority of respiratory morbidity indices improved by greater than the MCID.

Q25: Describe your program/ process-related outcomes - how do you know your program is successful (how did your patients do)? Describe outcomes to date (provide pre- & post-values, %change, & supporting narrative):

To date, we have enrolled 50 patients. With this intervention, we have successfully reduced our all-cause 30-day readmission rates from 16% to 6% (p<0.001). Nine (18%) dropped out of the program, compared to a 50% attrition rate in our traditional pulmonary rehabilitation program. Compared to baseline measurements, there were substantial improvements in respiratory morbidity indices. The COPD Assessment Test (CAT) scores decreased from 18.9+6.5 to 13.6+6.5 (p<0.0001). The San Diego Shortness of Breath Questionnaire improved from 56.4+22.3 to 44.6+25.6 (p<0.0001). The 30-second chair sit-stand test score improved from 6.6+4.4 to 9.8+5.5 (p<0.0001), and the 6-minute walk distance improved from 234+99 m to 307+100 m (p<0.0001). The majority of respiratory morbidity indices improved by greater than the MCID.
Q26: Describe the evidence of Operational Benefit gained from this program (e.g., growth documented by increased visits or patients; enhanced efficiency and process as evident by improved productivity; improved customer and/or physician satisfaction):

To the best of our knowledge, this is the first telehealth intervention designed to deliver pulmonary rehabilitation early after COPD exacerbation to reduce hospital readmission and improve quality of life. Based on the results in the first years, we have now expanded this facility to stable clinic patients with COPD, thus extending this service to rural and underserved patients in the state of Alabama. Anecdotally, we have received excellent feedback from our patients about the care they have received through this program and the improvements they have noticed in their health.

Q27: Describe the evidence of Financial Benefit gained from this program (e.g., return on investment (how it is measured); description of revenue or reimbursement sources; indication of cost savings, in-direct revenue enhancement elsewhere in organization; any evidence of payer cooperation or support):

Telehealth interventions are currently not reimbursed by payers in the state of Alabama, except for some interventions that are delivered to patients at remote clinics in the presence of a healthcare provider. This intervention is paid for by the hospital currently, and return on investment is primarily through cost savings by reducing hospital readmission.

About one-fifth of all patients hospitalized for an acute exacerbation chronic obstructive pulmonary disease (AECOPD) are readmitted within 30 days of discharge, accounting for the majority of COPD-related healthcare costs. Significant differences observed in readmission rates by geography and care delivery practices prompted the Centers for Medicare & Medicaid Services (CMS) to conclude that up to 75% of these readmissions were preventable. In late 2014, CMS started penalizing hospitals up to 3% of all Medicare billing for higher than historic rates of readmissions following COPD exacerbations. In addition to penalties for excess readmissions, CMS has developed a number of alternative payment models aimed at reimbursing providers and hospitals based on outcomes rather than volume, including the Bundled Payments for Care Improvement (BPCI) initiative. By incentivizing outcomes, CMS aims to align provider and patient interests and reward healthcare systems for efficient, coordinated, and high quality care. The University of Alabama at Birmingham (UAB) entered a contract with CMS to pilot a BPCI initiative in which payments for all inpatient and outpatient care related to a hospitalization for COPD and the 90 day post-acute period would be bundled. If aggregate Medicare spending during the episode is below a target price, UAB has the opportunity to share in the savings, and if spending is above the target price, CMS is repaid a portion of the overage. CMS disallows use of individualized patient data for small number of patients and hence we could not access a breakup of costs for these patients except for the BPCI target price which includes costs incurred potentially at institutions other than ours. We had per patient data available for hospital and post-hospital care costs for expenses at our institution alone. The 2014 Medicare costs for index admission inpatient costs are 5258 USD per patient, and 30-day readmission inpatient costs are 10,728 USD per patient. The costs for the Remote Pulmonary Rehabilitation Program in the first two years of operation have been $116,725 per year (including initial equipment costs which are less likely to be recurring costs). Based on these numbers, reducing readmissions by n of “18” enables us to break even. We are currently in the process of scaling up from a 1:1 intervention to exercising 3 to 4 patients at the same time, thus substantially reducing costs.

Q28: Describe the evidence of Health Benefit gained from this program (e.g., increased health awareness and/or decreased health risk; improved health of community (or population targeted) as evidence by improved health knowledge and/or behavior; decreased hospital, physician or ER visits):

To date, we have enrolled 50 patients. With this intervention, we have successfully reduced our all-cause 30-day readmission rates from 16% to 6% (p<0.001). Nine (18%) dropped out of the program, compared to a 50% attrition rate in our traditional pulmonary rehabilitation program, thus suggesting a greater awareness and patient involvement.